GENERAL SPECIFICATIONS FOR ROAD WORKS

GENERAL TECHNICAL SPECIFICATIONS FOR ROAD WORKS

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GENERAL TECHNICAL SPECIFICATION

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

(i)	Length and breath	10m
(ii)	Height, depth or thickness of earthwork, Sub-bases, bases, surfacing the structural members	5mm
(iii)	Areas	0.01 Square Meter
(iv)	Cubic contents	0.01 Cubic Meter

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

Measurement of Lead for Materials.

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

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

Surface Regularity or Sub grade & Pavement Courses.

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

PERMITTED TOLERANCES OF SURFACE REGULARITY FOR PAVEMENT COURSES

Sr.	**Type of Construction**		**Longitudinal Profile with 3 meter straight edge**				**Cross Profile**
		Maximum permissible undulation in mm	**Maximum number of undulation permitted in any 300 m length exceeding in mm**				**Maximum permissible variation from specified profile camber template mm**
			18	**12**	**10**	**6**	
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1.	**Earth Sub grade**	**36**	**30**	**-**	**-**	**-**	**15**
2.	**Granular / lime / Cement Stabilised sub-base**	**23**	**-**	**30**	**-**	**-**	**12**
3.	**Water Bound Macadam with nominal size metal (20-50) mm**	**18**	**-**	**-**	**30**	**-**	**8**
4.	**Semi-dense Carpet @ @**	**15**	**-**	**-**	**-**	**20**	**6**

Notes:

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

Surface evenness requirement in respect of both the longitudinal and cross profiles should be simultaneously satisfied.

3.1 Rectification.

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

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

Granular/Sub-base: Same as at (i) above except that the degree of compaction and the type of materials to be used shall conform to the specified requirements.

Lime /Cement stabilised soil sub-base: For Lime/Cement treated materials where the surface is high, the same shall be suitably trimmed while taking care that the material is below is not disturbed due to this operation. However, where the surface is low, the same shall be corrected as described herein below:

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

Water Bound Macadam Base: Where the surface is high or low, the top 75mm shall be scarified reshaped with added material as necessary and recomputed. The area treated at a place shall not be less than 5 meters long and 2 meter wide.

Bituminous Constructions: For bituminous constructions, other than wearing course, where the surface is low, and the deficiency shall be corrected by adding fresh material and reoccupation to specification where this surface is high, the full depth of layer shall be removed and replaced with fresh material and compacted to specifications. For wearing course, where the surface is high or low, the full depth of the layer shall be removed and replaced with fresh material and compacted to specifications in all cases where the removal and replacement of a bituminous layer is involved, the area treated shall not, be less than 5 meter long and not less than 1 lane wide.

Quality Control Tests During Construction.

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

TESTS ON EARTHWORK FOR EMBANKMENT CONSTRUCTION:

5.1 Borrow Material:

Sand Content (IS: 2720 Part IV)

Two test per 8000 Cubic meters of soil.

Plasticity Test (IS: 2720 Part-V)

Each type to be tested. Two tests per 8000 Cubic Meters of soil.

Density test (IS: 2720 Part VII)

Each type to be tested. Two tests per 8000 Cubic Meters of soil.

Moisture Content Test (IS: 2720 Part-II)

One test for every 250 Cubic meters of soil.

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

Following materials shall conform to the Indian Standards shown against them:

Cement … … … … … … … … … … IS: 269

Sand for Masonry … … … … … … … … … IS: 2116

Sand for concrete … … … … … … … … … IS: 383

Coarse Aggregate … … … … … … … … … IS: 383

Mild Steel … … … … … … … … … … IS: 432

High yield strength

Hot Rolled … … … … … … … … … IS: 1139

Cold Twisted … … … … … … … … … IS: 1786

Barrel thickness of pipes of different class shall be as under:

Sr. No.	Internal Dia. of pipe in mm.	Barrel thickness (in mm)		
		NP 1	**NP 2**	**NP 3**
1.	80	25	25	-
2.	100	25	25	-
3.	150	25	25	-
4.	250	25	25	-
5.	300	30	30	-
6.	350	32	32	75
7.	400	32	32	75
8.	450	35	35	75
9.	500	-	35	75
10.	600	-	40	80
11.	700	-	40	80
12.	800	-	45	90
13.	900	-	50	100

14.	1000	-	55	100
15.	1100	-	60	115
16	1200	-	65	115

STANDARD SPECIFICATIONS FOR ROAD WORKS ITEMS

ITEM 1 A Earthwork for embankment including clods, dressing with all lead and lift (including watering and consolidation). (a) From borrow pits within land width.

The land width on which the earthwork is to be done shall be cleared of all trees having a girth of 30 cm and less, loose stones, vegetation, bushes, stumps and all over objectionable materials. All the materials cleared will be property of Authority. Useful material shall be arranged in convenient stacks along the roads boundary or as directed at places within 50 meters lead, and handed over to the Authority in convenient sections. Unsuitable material shall be burnt or otherwise disposed off by the contractor at his own cost without causing any nuisance, inconvenience or damage to the works, property or people in the neighbourhood. In all cases, the materials shall be disposed off in a neat manner.

After clearing the site, the alignment of the road shall be properly set out true to line, curves, slopes grades and sections as shown in the plan or directed by the Engineer-in-charge, The contractor shall provide all labours and materials such as lime, string, pegs, nails, bamboos, stones, mortar, concrete etc. required for setting out, establishing Bench Marks and giving profiles. The contractor shall be responsible for maintaining the B.MS. profiles alignments and other marks as long as they are required for the work in the opinion of the Engineer-in-charge. If the contractor defaults in this respect the authority at the cost of the contractor may restore them.

When an existing embankment is to be widened, continuous, horizontal benches, each at least 0.3 meter wide, shall be cut into existing slope for ensuring adequate bond with the fresh embankment material to be added The material obtained from the cutting of benches can be utilised in the widening of the embankment. Where the width of the widened portions is insufficient to permit the use of usual rollers, compactions shall be carried out with the help of tandem/sheep foot rollers, mechanical tampers or other approved plant. The dumping of material from trucks for widening operations shall be avoided except in difficult circumstances when the extra width is too narrow to permit the movement of any other type of hauling equipment.

The soil to be used for embankment shall be free from trees, stumps, roots, rubbish or any other objectionable materials. Only materials considered suitable by the Engineer-in-charge shall be used for the construction and that considered unsuitable should be disposed off as directed by him the selection of materials to be used in the construction of embankment shall be made after soil survey and the authority carries out investigations. The embankment shall consist of earth available from roadside borrow pits on either side with all lead and lifts.

The materials satisfying the density requirements given in the table shall be employed for embankment construction.

Type of Work	**Laboratory Dry Density When tested as per I.S. 2720 (Pt. VII)**
- Embankment up to 3 meter height	Not less than 1.44 gm/cc
- Embankment exceeding 3-meter height or embankment of any height subject to long period inundation.	Not less than 1.52 gm/cc
- Top 0.5 meter of embankment below the sub grade level and shoulder (Where earth shoulder are specified)	Not less than 1.65 gm/cc

No borrow pits shall be allowed at the following sites along the road.

(i) Up to 30meters on either side of C.D. Works.

(ii) Up to 15meters on either side of cart track crossing for which approaches are to the constructed.

If there is top layer of black cotton or other objectionable soils, the same shall be removed and disposed off elsewhere and usable material found at lower level would only be used in earthen embankment.

The embankment shall be constructed in uniform layers not exceeding 250mm loose thickness. The soil shall be spread uniformly over the entire width of the embankment. Unless otherwise directed by the Engineer-in-charge. The Authority shall carry out the consolidation including watering and rolling of earthwork. The operation of laying the successive layer of earth shall have to be suitably synchronised with the consolidation work. If the soil as delivered to the road is too wet, it shall be dried by exposure to the sun till the moisture content is acceptable for compaction. All clods of hard lumps of earth shall be broken to have maximum size of 15cm when being placed in the embankment and a maximum size of 5 cm when being placed in the top 45 cm of the embankment. The work of next layers shall be allowed only after the first layer below it has been thoroughly compacted to the density specified.

Where an embankment is to be placed on sloping ground, the surface of the ground shall be benched in the step of trenches or broken up in such a manner that the new material shall have perfect bond with the existing surface. Where the embankment is to be placed over existing surfaces, when the embankment is to be placed over an old concrete, pavement shall be broken up in pieces not to exceeded 0.1 m and may be left under the new-embankment. If the existing road surface is of granular or bituminous type and lies within 1 Meter of the new sub grade level, the same shall be scarified to a depth of minimum 50mm so as to provide ample bond between the old and the new material.

To avoid interference with construction of abutments, wing walls or return walls of culverts/bridge structures, the contractor shall, at point to be determined by the Engineer-in-charge, suspend work of embankments forming approaches to such structures, until such time as the construction of the latter is sufficiently advanced to permit the completion of approaches without the risk of interference of damage to the bridge work. Unless directed otherwise the filling around culverts, bridge and other structures up to a distance of twice the height of embankment from the back of the embankment shall be carried out independent of the work on the main embankment. The fill materials shall not be placed against any abutment or wing wall unless permission has been given by the Engineer-in-charge but in any case not until the concrete or masonry has been in position for 14 days. The embankment shall be brought up simultaneously in equal layers on each side of the structure to avoid displacement and unequal pressure. The sequence of work in this regard shall be got approved from the Engineer-in-charge. Where the provision of any filter medium is specified behind the abutment, the same shall be laid in layers simultaneously with the laying of fill material and material used for the filler shall confirm to the requirement rollers or other heavy equipment, the compaction shall be carried out by mechanical tampers or other methods approved by the Engineer-in-charge. Care shall be taken to see that the compaction plant does not hit or come too close to any structural members so as to cause any damage to them.

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

The consolidation of earthwork including rolling and watering at O.MC. as per laboratory requirement shall be carried out by the Authority, the field and laboratory investigations and the authority shall carry out testing of samples. However, the contractor shall give full co-operation and shall bear the charges for layout and collection of samples for testing at authorised Government laboratory. The work of lying of earthwork in layers shall be synchronised with the work of compaction and consolidation of the earthwork and the operations shall also be synchronised with the field and laboratory testing. When density measurement reveal any soft areas in the embankment. The Engineer-in-charge shall direct that these areas shall be compacted further. In spite of that specified compactions is not achieved, the materials in the soft area shall be removed as directed and replaced by the approved materials. Deduction of 15% shall be made for the shrinkage from the sectional measurements to be paid to the contractor, if measured before

first monsoon and 10% measured after one or more monsoon have passed over the earth embankment.

The earthwork measurement shall be paid on cross sectional measurements and computing the volumes of earthwork in cubic meters by average area method. The contractor shall sign day to day levelling work and also original cross sections in token of his acceptance etc. the working sections both longitudinal and cross of the ground shall be taken by the Engineer-in-charge before the actual earthwork is started. The contractor or his authorised representative shall attend day-to-day levelling work. And sign with date the field book daily, in token of this acceptance. If there is any disagreement the contractor shall inform of it in writing to the officer concerned of any complaint shall be taken. Merely not signing of the level book shall not be deemed as disagreement. The Executive Engineer shall also verify levelling work to the extent of 5% before commencement of earthwork and on finalisation. The contractor shall maintain the embankment by filling in ruts, rain cuts depression due to shrinkage etc. to proper formation and grade till this item is finally measured and accepted by the authority. Measurement shall be taken on compacted earthwork; no deduction for shrinkage shall be made from gross measured quantity of compacted earthwork. However the contractor shall have to bear loss of quantity due to all settlement as well as other types of deformations etc. if any that might have taken place at the time of taking the final measurement of this item If the authority does not do the Compaction as stipulated in para-10 in that case shrinkage from such earthwork quantity shall be deducted as per norms i.e. 10% after monsoon and 15% before monsoon.

The rate of earthwork includes clearing jungles, dog belling, fixing profiles, erecting necessary pillars or stones for bench mark for levelling purpose, excavating earth from borrow pits, breaking clods, conveying and spreading earth in layers with all lead and lift, finishing the entire embankment to the proper profile camber, grade and slopes. The rate also includes all labour, material, tools, equipment and incidentals necessary to complete the work according to the specification. Cutting stuff of cutting in ordinary soil, soft murrum, soft rock, hard murrum and hard rock shall be utilised in embankment construction under this item within the lead specified in that 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 brought from borrow pits will be paid in this item

ITEM 1 B Earthwork for embankment including breaking clods, dressing with all leads and lift (excluding watering and consolidation). (a) From borrow pits within land width.

The land width on which the earthwork is to be done shall be cleared of all trees having a girth of 30 cm and less, loose stones, vegetation, bushes, stumps and all other objectionable materials. All the materials cleared will be property of Government. Useful material shall be arranged in convenient stacks along the roads boundary or as directed at places within 50 meters lead, and handed over to the Authority in convenient sections. Unsuitable material shall be burnt or otherwise disposed off by the contractor at his own cost without causing any nuisance, inconvenience or damage to the works, property or people in the neighbourhood. In all cases, the materials shall be disposed off in a neat manner.

After clearing the site, the alignment of the road shall be properly set out true to line, curves, slopes grades and sections as shown in the plan or directed by the Engineer-in-charge, The contractor shall provide all labours and materials such as lime, string, pegs, nails, bamboos, stones, mortar, concrete etc. required for setting out, establishing Bench Marks and giving profiles. The contractor shall be responsible for maintaining the B.MS. Profiles alignments and other marks as long as they are required for the work in the opinion of the Engineer-in-charge. If the contractor defaults in this respect the authority at the cost of the contractor may restore them.

When an existing embankment is to be widened, continuous, horizontal benches, each at least 0.3 meter wide, shall be cut into existing slope for ensuring adequate bond with the fresh embankment material to be added The material obtained from the cutting of benches can be utilised in the widening of the embankment. Where the width of the widened portions is insufficient to permit the use of usual rollers, compactions shall be carried out with the help of tandem/sheep foot

rollers, mechanical tampers or other approved plant. The dumping of material from trucks for widening operations shall be avoided except in difficult circumstances when the extra width is too narrow to permit the movement of any other type of hauling equipment.

The soil to be used for embankment shall be free from trees, stumps, roots, rubbish or any other objectionable materials. Only materials considered suitable by the Engineer-in-charge shall be used for the construction and that considered unsuitable other disposed off as directed by him. The selection of the materials to be used in the construction of embankment shall be made after soil surveys and investigations carried out by the Department. The embankment shall consist of earth available from roadside borrow pits on either side with all lead and all lifts.

Location, shape and size of borrow pits shall be as indicated by the Engineer-in-charge. Pits shall not be dug continuously. Ridges of not less than 8 metres width should not be left at interval not exceeding 300metres. Small drain shall be cut through the ridges of facilitate drainage the outer edge of borrow pits shall be so regulated that the bottom does not cut an imaginary line having a slope of 1 vertical to 4 horizontal projected from the edge of final section of the bank, the maximum depth in any case being limited to 1.5 metres. Also no pits shall be dug within 5 metres of the toe of the final section of the road embankment.

No borrow pits shall be allowed at the following sites along the road.

Up to 30 metres on either side of C.D. works.

Up to 15 metres on either side of cart track crossing for which approaches are to be constructed.

If there is top layer of black cotton or other objectional soils, the same shall be removed and disposed off elsewhere and usable material found at lower level would only be used in the embankment.

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

Where an embankment is to be placed on sloping ground, the surface of the ground shall be benched in the steps of trenches or broken up in such a manner that the new material shall have perfect bond with the existing surface. Where the embankment is to be placed over an existing surface. When the embankment is to be placed over an existing road surface, the surface shall be scarified to minimum depth of a 5cm so as to provide ample bond between the old and new material. However when the embankment. If the existing road surface is of granular or bituminous type and lies within 1 Mt. of the new sub grade level, the same shall be scarified to a depth of minimum 50mm so as to provide ample bond between the old and the new material.

To avoid interference with the construction of abutment, wing walls or return walls of culverts/bridge structures, the contractor shall, at point to be determined by the Engineer-in-charge, suspend work on embankments forming approaches to such structures, until such time as the construction of the latter is sufficiently advanced to permit the completion of approaches without the risk of interference of damage to the bridge work. Unless directed otherwise the filling ground culverts, bridges and other structures up to a distance of twice the height of embankment. The fill materials shall not be placed against any abutment or wing wall unless permission has been given 14 days, the embankment shall be brought up simultaneously in equal layers on each side of the structure to avoid displacement and unequal pressure. The sequence of work in this regard shall be got approved from the Engineer-in-charge. Where the provision of any filter medium is specified behind the abutment, the same shall be laid in layers simultaneously with the laying of fill material. The material used for the filter shall confirm to the requirements for filler medium and will be paid extra in the relevant item.

The embankment shall be finished in conformity with the alignment, level, cross section and dimensions shown on the plans or as directed by the Engineer-in-charge. Where the alignment of the road is in a curve, the top of the embankment shall be formed with the super elevation and the increased width shown on the drawings or as the Engineer-in-charge may direct. Finishing

operations shall include the work of shaping and dressing the shoulder, roadbed and the slopes to conform to the cross section.

The earthwork measurement shall be paid on cross sectional measurements and computing the volumes of earthwork in cubic meters by average area method. The contractor shall sign day to day levelling work and also original cross sections in token of his acceptance etc. the working sections both longitudinal and cross of the ground shall be taken by the Engineer-in-charge before the actual earthwork is started. The contractor or his authorised representative shall attend day-to-day levelling work. And sign with date the field book daily, in token of this acceptance. If there is any disagreement the contractor shall inform of it in writing to the officer concerned of any complaint shall be taken. Merely not signing of the level book shall not be deemed as disagreement. The Executive Engineer shall also verify levelling work to the extent of 5% before commencement of earthwork and on finalisation. The contractor shall maintain the embankment by filling in ruts, rain cuts depression due to shrinkage etc. to proper formation and grade till this item is finally measured and accepted by the authority. Measurement shall be taken on compacted earthwork; no deduction for shrinkage shall be made from gross measured quantity of compacted earthwork. However the contractor shall have to bear loss of quantity due to all settlement as well as other types of deformations etc. if any that might have taken place at the time of taking the final measurement of this item If the authority does not do the Compaction as stipulated in para-10 in that case shrinkage from such earthwork quantity shall be deducted as per norms i.e. 10% after monsoon and 15% before monsoon. However the contractor shall have to bear loss of quantity due to all settlements as well as other types of deformations etc. if any, that might have taken place at the time of talking the final measurements of this item.

The rate of earthwork includes clearing jungles, dog belling, fixing profiles, erecting necessary pillars or stones for bench mark for levelling purpose, excavating earth from borrow pits, breaking clods, conveying and spreading earth in layers with all lead and lift, finishing the entire embankment to the proper profile camber, grade and slopes. The rate also includes all labour, material, tools, equipment and incidentals necessary to complete the work according to the specification. Cutting stuff of cutting in ordinary soil, soft murrum, soft rock, hard murrum and hard rock shall be utilised in embankment construction under this item within the lead specified in that 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 brought from borrow pits will be paid in this item.

ITEM 1 C Earthwork for embankment including breaking clods, dressing with all lead and lift (excluding watering and consolidation). (b) From borrow pits within _____ kms. lead.

The land width on which the earthwork is to be done shall be cleared of all trees having a girth of 30 cm and less, loose stones, vegetation, bushes, stumps and all other objectionable materials. All the materials cleared will be property of Government. Useful material shall be arranged in convenient stacks along the roads boundary or as directed at places within 50 meters lead, and handed over to the Authority in convenient sections. Unsuitable material shall be burnt or otherwise disposed off by the contractor at his own cost without causing any nuisance, inconvenience or damage to the works, property or people in the neighbourhood. In all cases, the materials shall be disposed off in a neat manner.

After clearing the site, the alignment of the road shall be properly set out true to line, curves, slopes grades and sections as shown in the plan or directed by the Engineer-in-charge, The contractor shall provide all labours and materials such as lime, string, pegs, nails, bamboos, stones, mortar, concrete etc. required for setting out, establishing Bench Marks and giving profiles. The contractor shall be responsible for maintaining the B.MS. Profiles alignments and other marks as long as they are required for the work in the opinion of the Engineer-in-charge. If the contractor defaults in this respect the authority at the cost of the contractor.

When an existing embankment is to be widened, continuous, horizontal benches, each at least 0.3 meter wide, shall be cut into existing slope for ensuring adequate bond with the fresh embankment material to be added The material obtained from the cutting of benches can be utilised in the

widening of the embankment. Where the width of the widened portions is insufficient to permit the use of usual rollers, compactions shall be carried out with the help of tandem/sheep foot rollers, mechanical tampers or other approved plant. The dumping of material from trucks for widening operations shall be avoided except in difficult circumstances when the extra width is too narrow to permit the movement of any other type of hauling equipment.

The soil to be used for embankment shall be free from trees, stumps, roots, rubbish or any other objectionable materials. Only materials considered suitable by the Engineer-in-charge shall be used for the construction and that considered unsuitable other disposed off as directed by him. The selection of the materials to be used in the construction of embankment shall be made after soil surveys and investigations carried out by the Department. The embankment shall consist of earth available from roadside borrow pits on either side with all lead and all lifts.

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

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

Where an embankment is to be placed on sloping ground, the surface of the ground shall be benched in the steps of trenches or broken up in such a manner that the new material shall have perfect bond with the existing surface. Where the embankment is to be placed over an existing surface. When the embankment is to be placed over an existing road surface, the surface shall be scarified to minimum depth of a 5cm so as to provide ample bond between the old and new material. However when the embankment. If the existing road surface is of granular or bituminous type and lies within 1 Mt. of the new sub grade level, the same shall be scarified to a depth of minimum 50mm so as to provide ample bond between the old and the new material.

To avoid interference with the construction of abutment, wing walls or return walls of culverts/bridge structures, the contractor shall, at point to be determined by the Engineer-in-charge, suspend work on embankments forming approaches to such structures, until such time as the construction of the latter is sufficiently advanced to permit the completion of approaches without the risk of interference of damage to the bridge work. Unless directed otherwise the filling ground culverts, bridges and other structures up to a distance of twice the height of embankment. The fill materials shall not be placed against any abutment or wing wall unless permission has been given 14 days, the embankment shall be brought up simultaneously in equal layers on each side of the structure to avoid displacement and unequal pressure. The sequence of work in this regard shall be got approved from the Engineer-in-charge. Where the provision of any filter medium is specified behind the abutment, the same shall be laid in layers simultaneously with the laying of fill material. The material used for the filter shall confirm to the requirements for filler medium and will be paid extra in the relevant item.

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

The earthwork measurement shall be paid on cross sectional measurements and computing the volumes of earthwork in cubic meters by average area method. The contractor shall sign day to day levelling work and also original cross sections in token of his acceptance etc. the working sections both longitudinal and cross of the ground shall be taken by the Engineer-in-charge before the actual earthwork is started. The contractor or his authorised representative shall attend day-to-day

levelling work. And sign with date the field book daily, in token of this acceptance. If there is any disagreement the contractor shall inform of it in writing to the officer concerned of any complaint shall be taken. Merely not signing of the level book shall not be deemed as disagreement. The Executive Engineer shall also verify levelling work to the extent of 5% before commencement of earthwork and on finalisation. The contractor shall maintain the embankment by filling in ruts, rain cuts depression due to shrinkage etc. to proper formation and grade till this item is finally measured and accepted by the authority. Measurement shall be taken on compacted earthwork; no deduction for shrinkage shall be made from gross measured quantity of compacted earthwork. However the contractor shall have to bear loss of quantity due to all settlement as well as other types of deformations etc. if any that might have taken place at the time of taking the final measurement of this item If the authority does not do the Compaction as stipulated in para-10 in that case shrinkage from such earthwork quantity shall be deducted as per norms i.e. 10% after monsoon and 15% before monsoon. However the contractor shall have to bear loss of quantity due to all settlements as well as other types of deformations etc. if any, that might have taken place at the time of talking the final measurements of the item.

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

The borrow pits will be so excavated as to form a road side longitudinal gutter to drain the water, interrupted by such gutter.

The width of the drain shall be restricted to 1.5 mts, only. The depth will be restricted to such grade so as to drain the water efficiently. All balance quantity of earth shall be brought from distant borrow areas only.

If there is top layer of black cotton or other objectionable soils, the same shall be removed and disposed off elsewhere and usable material found at the lower level will only be used in the earthen embankment, if the contractor chooses to utilize this material.

The drain should be aligned along the boundary of the land width of the road. Not pit, other than this drain, shall be dug within 5 metres of the toe to the final section of the road embankment.

No borrow pits shall be allowed in the length in which earth obtained for cutting from cutting is specified to be used in embankment.

The rate of earthwork includes clearing jungles, dog belling, fixing profiles, erecting necessary pillars or stones for bench mark for levelling purpose, excavating earth from borrow pits, breaking clods, conveying and spreading earth in layers with all lead and lift, finishing the entire embankment to the proper profile camber, grade and slopes. The rate also includes all labour, material, tools, equipment and incidentals necessary to complete the work according to the specification. Cutting stuff of cutting in ordinary soil, soft murrum, soft rock, hard murrum and hard rock shall be utilised in embankment construction under this item within the lead specified in that 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 brought from borrow pits will be paid in this item.

ITEM 1 D Earthwork for embankment including breaking clods, dressing with all lead and lift (including watering and consolidation). (b) From borrow pits within _____ kms. lead.

1. The land width on which the earthwork is to be done shall be cleared of all trees having a girth of 30 cm and less, loose stones, vegetation, bushes, stumps and all other objectionable materials. All the materials cleared will be property of Government. Useful material shall be arranged in convenient stacks along the roads boundary or as directed at places within 50 meters lead, and handed over to the Authority in convenient sections. Unsuitable material shall be burnt or otherwise disposed off by the contractor at his own cost without causing any nuisance, inconvenience or damage to the works, property or people in the neighbourhood. In all cases, the materials shall be disposed off in a neat manner.

2. After clearing the site, the alignment of the road shall be properly set out true to line, curves, slopes grades and sections as shown in the plan or directed by the Engineer-in-charge, The

contractor shall provide all labours and materials such as lime, string, pegs, nails, bamboos, stones, mortar, concrete etc. required for setting out, establishing Bench Marks and giving profiles. The contractor shall be responsible for maintaining the B.MS. profiles alignments and other marks as long as they are required for the work in the opinion of the Engineer-in-charge. If the contractor defaults in this respect the authority at the cost of the contractor..

3. When an existing embankment is to be widened, continuous, horizontal benches, each at least 0.3 meter wide, shall be cut into existing slope for ensuring adequate bond with the fresh embankment material to be added The material obtained from the cutting of benches can be utilised in the widening of the embankment. Where the width of the widened portions is insufficient to permit the use of usual rollers, compactions shall be carried out with the help of tandem/sheep foot rollers, mechanical tampers or other approved plant. The dumping of material from trucks for widening operations shall be avoided except in difficult circumstances when the extra width is too narrow to permit the movement of any other type of hauling equipment.

4. The soil to be used for embankment shall be free from trees, stumps, roots, rubbish or any other objectionable materials. Only materials considered suitable by the Engineer-in-charge shall be used for the construction and that considered unsuitable other disposed off as directed by him. The selection of the materials to be used in the construction of embankment shall be made after soil surveys and investigations carried out by the Department. The embankment shall consist of earth available from roadside borrow pits on either side with lead and all lifts, and within land width in the manner specified in para 12 below. /The road, if any, required for the purpose of haulage of earth by men, animals or vehicles will be constructed (if not existing) and maintained by the contractor at his own cost. He material satisfying the density requirements given in the table below shall be employed for embankment construction.

Type of Work	**Laboratory Dry Density When tested as per I.S. 2720 (Pt. VII)**
- Embankment up to 3 meter height	Not less than 1.44 gm/cc
- Embankment exceeding 3-meter height or embankment of any height subject to long period inundation.	Not less than 1.52 gm/cc
- Top 0.5 meter of embankment below the sub grade level and shoulder (Where earth shoulder are specified)	Not less than 1.65 gm/cc

Field density shall be percentage of laboratory density as recommended by the Gujarat Engineering research institute.

5. Department will extend all necessary co-operation in helping contractor to get borrow area from nearby Government or Panchayat land, if available. However, department is not responsible if no such area is made available to the contractor and it that case, contractor will have to make his own arrangement to get borrow area for borrowing earth of the approved quantity even by making temporary arrangement with the private land owners.

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

7. Where an embankment is to be placed on sloping ground, the surface of the ground shall be benched in the steps of trenches or broken up in such a manner that the new material shall have perfect bond with the existing surface. Where the embankment is to be placed over an existing surface. When the embankment is to be placed over an existing road surface, the surface shall be scarified to minimum depth of a 5cm so as to provide ample bond between the old and new material. However when the embankment. If the existing road surface is of granular or bituminous

type and lies within 1 Mt. of the new sub grade level, the same shall be scarified to a depth of minimum 50mm so as to provide ample bond between the old and the new material.

8. To avoid interference with the construction of abutment, wing walls or return walls of culverts/bridge structures, the contractor shall, at point to be determined by the Engineer-in-charge, suspend work on embankments forming approaches to such structures, until such time as the construction of the latter is sufficiently advanced to permit the completion of approaches without the risk of interference of damage to the bridge work. Unless directed otherwise the filling ground culverts, bridges and other structures up to a distance of twice the height of embankment. The fill materials shall not be placed against any abutment or wing wall unless permission has been given 14 days, the embankment shall be brought up simultaneously in equal layers on each side of the structure to avoid displacement and unequal pressure. The sequence of work in this regard shall be got approved from the Engineer-in-charge. Where the provision of any filter medium is specified behind the abutment, the same shall be laid in layers simultaneously with the laying of fill material. The material used for the filter shall conform to the requirements for filler medium and will be paid extra in the relevant item Where it may be impracticable to use power rollers or other heavy equipment, the compaction shall be carried out by the mechanical tempers or other methods approved by the Engineer-in-charge. Care shall be taken to see that the compaction plant does not hit or come too close to any structural members so as to cause any damage to them.

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

10. The consolidation of earthwork including rolling and watering at O.MC. as per laboratory requirement shall be carried out by the Authority, the field and laboratory investigations and the authority shall carry out testing of samples. However, the contractor shall give full co-operation and shall bear the charges for layout and collection of samples for testing at authorised Government laboratory. The work of lying of earthwork in layers shall be synchronised with the work of compaction and consolidation of the earthwork and the operations shall also be synchronised with the field and laboratory testing. When density measurement reveal any soft areas in the embankment. The Engineer-in-charge shall direct that these areas shall be compacted further. In spite of that specified compactions is not achieved, the materials in the soft area shall be removed as directed and replaced by the approved materials. Deduction of 15% shall be made for the shrinkage from the sectional measurements to be paid to the contractor, if measured before first monsoon and 10% measured after one or more monsoon have passed over the earth embankment.

11. The earthwork measurement shall be paid on cross sectional measurements and computing the volumes of earthwork in cubic meters by average area method. The contractor shall sign day to day levelling work and also original cross sections in token of his acceptance etc. the working sections both longitudinal and cross of the ground shall be taken by the Engineer-in-charge before the actual earthwork is started. The contractor or his authorised representative shall attend day-to-day levelling work. And sign with date the field book daily, in token of this acceptance. If there is any disagreement the contractor shall inform of it in writing to the officer concerned of any complaint shall be taken. Merely not signing of the level book shall not be deemed as disagreement. The Executive Engineer shall also verify levelling work to the extent of 5% before commencement of earthwork and on finalisation. The contractor shall maintain the embankment by filling in ruts, rain cuts depression due to shrinkage etc. to proper formation and grade till this item is finally measured and accepted by the authority. Measurement shall be taken on compacted earthwork; no deduction for shrinkage shall be made from gross measured quantity of compacted earthwork. However the contractor shall have to bear loss of quantity due to all settlement as well as other types of deformations etc. if any that might have taken place at the time of taking the final measurement of this item If the authority does not do the Compaction as stipulated in para-10 in that case shrinkage from such earthwork quantity shall be deducted as per norms i.e. 10% after

monsoon and 15% before monsoon. However the contractor shall have to bear loss of quantity due to all settlements as well as other types of deformations etc. if any, that might have taken place at the time of talking the final measurements of this item.

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

The borrow pits will be so excavated as to form a road side longitudinal gutter to drain the water, interrupted by such gutter.

The width of the drain shall be restricted to 1.5 mts, only. The depth will be restricted to such grade so as to drain the water efficiently. All balance quantity of earth shall be brought from distant borrow areas only.

If there is top layer of black cotton or other objectionable soils, the same shall be removed and disposed off elsewhere and usable material found at the lower level will only be used in the earthen embankment, if the contractor chooses to utilize this material.

The drain should be aligned along the boundary of the land width of the road. Not pit, other than this drain, shall be dug within 5 metres of the toe to the final section of the road embankment.

No borrow pits shall be allowed in the length in which earth obtained for cutting from cutting is specified to be used in embankment.

13. The rate of earthwork includes clearing jungles, dog belling, fixing profiles, erecting necessary pillars or stones for bench mark for levelling purpose, excavating earth from borrow pits, breaking clods, conveying and spreading earth in layers with all lead and lift, finishing the entire embankment to the proper profile camber, grade and slopes. The rate also includes all labour, material, tools, equipment and incidentals necessary to complete the work according to the specification. Cutting stuff of cutting in ordinary soil, soft murrum, soft rock, hard murrum and hard rock shall be utilised in embankment construction under this item within the lead specified in that 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 brought from borrow pits will be paid in this item.

ITEM 1 E Rolling and watering of earthwork in layer with power roller including filling in depression which occurs during the process.

For spreading materials in layer and bringing the appropriate moisture content, the embankment materials shall be spread uniformly over the entire width of the embankment in layers not exceeding 250mm in loose thickness. Successive layers of embankment shall not be placed until the layers of embankment shall not be placed until the layer under construction has been thoroughly compacted to the requirements set down hereunder: -

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

If the materials delivered to the roadbed are too wet it shall be dried, by evaporation and exposure to the sun, till the moisture content is brought done to acceptable standard for compaction. Should circumstances arise, where owing to wet weather, the moisture content can't be reduced to the required level by the above procedure, work of compaction shall be suspended.

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

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

Clods or hard lumps of earth shall be broken to have maximum size of 150mm when being placed in the lower layers of the embankment and a maximum size of 60mm when being placed in the top 0.5-meter portion of the embankment below the sub grade.

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

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

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

Sr. No.	**Type of work/Materials.**	**Field dry density as per cent age of maximum laboratory dry density as per IS: 2720 (Part-VII)**
1.	Top 0.5-meter portion of embankment below sub grade level and shoulders.	Not less than 100.
2.	Other portion of embankment.	Not less than 95.
3.	Highly expensive class	85 to 90

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

When density measurements reveal any soft areas in the embankment further compaction shall be carried out as directed by the Engineer-in-charge. If in site of that the specified compaction is not achieved, the materials in the soft areas shall be removed and replaced by approved materials and compacted to the density requirement, to the satisfaction of the Engineer-in-charge.

Measurements for payment: Taking cross section at intervals in the original position before the work starts and after its completion and computing of the volume of earthwork in cubic metres by the method of average and areas shall measure Consolidation of earth embankment construction. The measurements of fill materials from borrow are shall be the different between the net quantities of suitable materials brought from roadway and drainage excavation. For this purpose it shall be assumed that one cubic meter of suitable materials brought from roadway and drainage excavation forms. One cubic meter of compacted fill and all bulking or shrinkage shall be ignored.

Stripping including storing and reapplication of topsoil shall be measured as volume in cubic meter.

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

ITEM 2 Earthwork in cutting in all sorts of soil and soft murrum including conveying murrum including conveying and putting the stuff in spoil bank maintaining minimum distance of five meter between top edge of cutting and top of spoil bank. (a) Within 200 meters from the ends of the cutting with all required lead and lift.

The land width on which the earthwork is to be done shall be cleared of all trees having a girth of 30 cm and less, loose stones, vegetation, bushes, stumps and all over objectionable materials. All the materials cleared will be property of Authority. Useful material shall be arranged in convenient stacks along the roads boundary or as directed at places within 50 meters lead, and handed over to the Authority in convenient sections. Unsuitable material shall be burnt or otherwise disposed off by the contractor at his own cost without causing any nuisance, inconvenience or damage to the works, property or people in the neighbourhood. In all cases, the materials shall be disposed off in a neat manner.

After clearing the site, the alignment of the road shall be properly set out true to line, curves, slopes grades and sections as shown in the plan or directed by the Engineer-in-charge, The contractor shall provide all labours and materials such as lime, string, pegs, nails, bamboos, stones, mortar, concrete etc. required for setting out, establishing Bench Marks and giving profiles. The contractor shall be responsible for maintaining the B.MS. profiles alignments and other marks as long as they are required for the work in the opinion of the Engineer-in-charge. If the contractor defaults in this respect the authority at the cost of the contractor may restore them.

Profiles of the section including the roadside gutters to be excavated shall be laid at suitable intervals, of 10m to 50m or other intervals as directed by the Engineer to conform to the curved or straight alignment, sections, grades and side slopes. The lineout shall be clearly marked & profiles of embankment where excavated materials are to be used shall be set up with the line marked on each side. The roadway section shall first be excavated in steps. These steps shall be smoothened to the required slope when the excavation reaches the road formation. The contractor shall on no account excavate beyond the slopes or below the specified grade unless so directed by the Engineer in writing. If excavation is done below the specified level or outside the section, it shall not be paid for and the contractor shall be required to fill up at his own cost such extra excavation in the road portion, with approved materials of the embankment grade in layers watered and fully compacted to attain maximum density laid down for the embankment in its relevant item The Engineer may require measurement ridges and dead men to be left at specified intervals or place and kept in tact till ordered to be removed for the purpose of check measurements. The excavation shall be finished neatly, smoothly and evenly to the correct lines, curves grades sections & side slopes shown on the plans or directed by the Engineer. The sub grades if loose, shall be scarified, watered and compacted to the same density as the embankment. The section, side slopes and catch water gutter shall be maintained by the contractor at his own cost in such a way that the formation and gutters will be well drained by providing necessary diversions etc. and not damaged due to obstruction of any drainage. Necessary passages shall be provided for leading away seepage, springs, surface flow or rainwater safely without damaging the work. If any damage occur due to default of the contractor in this respect he shall make good the damage at his own cost. If it is necessary in the execution of the work to interrupt existing surface drainage, irrigation channels, and sewers or under drainage, temporary arrangements shall be provided till such time as is necessary. The contractor at his own cost shall be make good the interrupt drainage and sewer etc., unless separately provided in the tender. Any damage to the existing works or work in hand caused as a result of his operations or negligence shall be measured along with the main cutting in cubic meters.

If sides occur in the cutting they shall be removed as ordered by the Engineer. If finished slopes slide into the road way before the final acceptance of the work such slides shall b e removed by the contractor and shall be paid for at the contract rate for the class of excavation involved provided the slides are not due to any negligence of the contractor. The classification of the material in slides shall conform to its condition at the time of removal and payment made accordingly regardless of its prior condition. Care shall be taken to see that excavation is arranged in a safe way so that there will be no risk to the work or workmen by slides falling materials, boulders and collapsing sides etc.

If there is traffic nearby or if there are town and villages in the neighbourhood, barricades and or traffic signals shall be provided day and night for the duration of the work in such away as to prevent accidents. Warning signals shall be displayed at 7 meter from the danger point on both sides giving sufficient warning. If necessary, signallers shall be stationed at each end to regulate traffic where it is heavy. Measures shall betake to see that the excavation does not affect or damage adjoining structures or property. If there is damage to property, injury to workers, the members of the public animals etc. due to the negligence of the contractor, he will be responsible and liable to all the consequences including compensation.

All the excavated materials shall be property of Government. When the useful excavated material is to be used in embankment within a lead 200 meters and all lift it shall be directly deposited at the required location in specified layers. No handling or conveyance charges shall be paid if the material is temporarily deposited elsewhere and subsequently conveyed to site of deposition. The

sequence of operations should be arranged properly. Materials required for items other than bank shall be arranged in near stacks at convenient places without interfering with the drainage in any way. If no Government land is available but the excavated useful stuff is to be stacked temporarily before use under the same agreement, the contractor shall make his own arrangement for the stacking of these materials temporarily on private land by paying rents etc. without claiming any compensation. Surplus material not required for use on embankment or unsuitable materials may be used of his own to uniformly widen embankment to flatten slopes and to fill low places in the road land if so permitted by the Engineer. Materials not required for use whatsoever may be disposed off by the contractor at his own cost in a manner approved by the Engineer. The excavated materials shall not be deposited within 3 meter from top edge of slope or toe of the bank. The lead shall be measured from the junction point of cutting and embankment up to 200 meter on either side.

If the contractor does not wish to utilise the quantity of cutting within the specified lead for any reason then he may do the embankment work with the earth from other sources (except borrow pits) in the length of the road where cutting stuff is to be utilise but in the case, the full or part quantity of acceptable quality stuff for which payment is made or to be made will be deducted form the net quantity of the earthwork in the embankment arrived at within the chain age measured as above.

The contract rate shall be for unit of one cubic meter for the strata mentioned in the wording of the item of the excavation acceptably completed, limited to the dimensions shown on the plans or as directed by the Engineer. Excavation shall be measured in its original position by taking cross sections before the work starts and after it is entirely completed. The quantity shall be worked out by the average end area method. When the classification of the strata changes, the contractor shall bring this to the notice of the Engineer, who will then verify and if necessary take levels for the changed strata for purpose of measurement.

(B) IN SPOIL BANK: Specification shall be as per item 2(A) except that the excavated stuff shall be deposited in spoil bank instead of using same in road embankment.

ITEM 3 Supplying and stacking murrum binding materials including materials on road side including filling boxes with all lead & lift etc. complete.

Materials for the purpose shall be of approved quality. Any material, which is found inferior, shall be rejected and the contractor shall remove such rejected materials from the site at his own cost. The material shall be collected from quarries approved by the Executive Engineer. The material shall be granular and gritty.

The Executive Engineer prior to collection on site shall be approved the material. It shall be free from all rubbish, dust and any organic materials as well as clod of black cotton soils. Materials shall not be allowed to be collected from within the road boundary. Material to be used as crust and for side shoulders shall be as per C.B.R. report and that to be use bind age in W.B.M road construction shall have P.I. value of less than 6 as determined in accordance with IS 2720 (Part-V) The material to be used should be got tested prior to its use in construction. Testing charges shall be borne by the contractor.

River or nala or sea sand required for the work shall be clear, sound, property, graded, free from organic materials silt clay etc. and shall be got approved by the Engineer-in-charge. The sand shall be obtained and brought from the source approved by the Engineer-in-charge. The sand shall be well graded.

The payment shall be made on Cubic Meter basis.

Stacking shall be done by filling in the standard steel boxes of 2m X 1.5 X 0.5m size, which shall be supplied by the Authority if available on rent. Otherwise contractor shall make his own arrangement. No deduction for voids shall be made from the grade measurements. Where any doubt exists as to whether the quantity of stacks of murrum in a hectometre is not confirming with the cubic content of the standard pharas (2 X 1.5 X 0.5 M) the same shall be got corrected by the contractor if so ordered by the Engineer-in-charge for which no extra payment shall be claimed by the contractor. If the quantity of murrum in any stack in a particular hectometre is found to be less than the standard measurements viz., 1.5 centimetres. The entire collection in the hectometre shall

be paid on the basis of the quantity so found. The Contractor in a fairly level ground shall do regular stacks. Stacking of the murrum shall be done in a manner as directed by the Engineer-in-charge.

For road work completed stacking of murrum as per requirement shall be carried out in 2-kilometre length before spreading. The collection shall always, be commenced at one end of the K.M and be carried continuously towards the other end unless the Engineer-in-charge shall direct otherwise.

The payment shall be made on cubic meter basis without deduction for voids. The contractor shall maintain all stacks in regular and proper size till the whole materials are collected, measured and finally accepted by the authority. The spreading of materials shall not be allowed till the materials are fully stacked and completed kilometre wise.

The rate includes cost of collection, conveyance to the site with all leads and lifts and filling the boxes including all labour, tools, equipment and other incidental expense.

The rate quoted are inclusive of all shall such tools, duties, fees, royalties, taxes etc.

ITEM 3 A Supplying and stacking hard murrum/sand/yellow earth/binding materials on road site including filling boxes with all leads and lift etc. complete on site of work as per specification.

The materials for the purpose shall be of approved quality. Any materials, which are found inferior, shall be rejected and the contractor shall remove such rejected materials from the site at his own cost. The material shall be approved by the Executive Engineer or his authorised agent.

Para 3 to 8 of Item No. 3 shall apply.

The sand used as crust shall be as per C.B.R. Report.

9. The measurements shall be taken on cubic metre basis.

ITEM 4 Supplying standard size stone aggregate.

ITEM 4 A Supplying and stacking of hand broken stone aggregates chippings etc. of had stone of size 25mm. to 90mm. size nominal size free of disintegrated pieces, deleterious and organic matter including filling boxes with all lead and lift etc. complete for W.B.M. road.

The stone metal shall be obtained from quarries approved by the Executive Engineer prior to collection. The metal shall be of approved quality with all leads and lift. The metal shall be obtained from hard tough, sound durable, stone of close texture as is locally available and reasonably free from decay and weathering. Pieces of the stone shall be angular and roughly cubical in shape and round belonged or flaky materials shall be rejected. No round or oblong pebbles or angular chips large or smaller then specified size should be allowed. The size of metal shall be 40mm to 63mm and shall be hand broken. All unsound weathered or disintegrated stone obtained from the upper surface layer or other layers of bounders shall be rejected.

The samples of metal collected from approved quarries shall be got tested at Government recognised laboratory as may be directed to the contractor. The test result shall conform to the standard requirements laid down for metal to be used for W.B.M work.

The physical requirements for standard size B.T. metal shall conform to the test result indicated in the Table below:

Type of Construction	Test	Test Method	Requirement
Base (a) OR Sub Base	Los Angeles Abrasion Value Aggregate impact Value Flakiness index	I.S. 2386 Part IV I.S. 2386 Part IV or I.S. 2386 Part I	50 percent Max. 40 percent Max. 15 percent Max.

The grading requirements of the metal to be used for W.B.M shall be as under:

Sr.	Size Range	Sieve Designation	Percentage by weight Passing thought the sieve

No.			
1.	63mm to 40mm	80 mm 63 mm 50 mm 40 mm 20 mm	100-100 90-100 35-70 00-15 00-05

The size of metal for W.B.M shall be 25mm to 90mm wherein tolerance limit for over size shall be up to 10% and that for lower size should be up to 10%.

Whenever any doubt exists as to where the above requirements are satisfied, whole or any part of the collection of metal shall be got screened by the contractor at his own cost, if so ordered by Engineer-in-Charge.

Stacking shall be done by filling in the standard steel boxes of 2m X 1.5m X 0.5m size which shall be supplied by the Department if available on rent otherwise shall make his own arrangement and no deduction for voids shall be made from the gross measurements. Where any doubt exists as to whether the quantity of Stacks of metal in an hectometre is not conforming with the cubical content of the standard pharas (2 X 1.5 X 0.5m) shall be got corrected by the contractor if so ordered by the Engineer-in-Charge for which no extra payment shall be claimed by the Contractor. If the quantity of metal in any stacks in particular Hectometre found to be less than the standard measurements viz. 1.5 centimetres the entire collection in the Hectometre shall be paid on the basis of the quantity so found. Regular stacks shall be done by the Engineer-in-Charge. Collection of metal shall be completed in two hectometre wise as per the final requirement and measurement shall be recorded two hectometre-wise. If the quantity of metal as per the final requirement is not collected in any two consecutive. H. M and std. boxes are not filled in completely in two hectometres, measurements shall not be recorded and payments shall not be done.

For roadwork complete stacking of metal as per requirement shall be carried out in 2km length before spreading. Other Deputy Engineer as per rules shall be crosschecked the metal stacks before spreading. The collection shall always, commence at one end of the km and be carried continuously towards the other end unless the Engineer-in-Charge shall direct otherwise.

The payment shall be on cubic meter basis without deduction of voids. The contractor shall maintain all Departments. The spreading of materials shall not be allowed till the materials are fully stacked and completed kilometre wise.

The rate includes cost of collection, conveyance to the site with all lead and lift and filling the boxes including all labour, tools, equipment and other incidental expenses. The rates quoted are inclusive of all such tools duties, fees, royalties, taxes etc.

ITEM 4 B Supplying and stacking of hand broken crushed stone aggregate chippings etc. of hard stone of 40mm. to 63mm. size nominal size free of disintegrated pieces, deleterious and organic matter including filling boxes with all lead and lift etc. complete for road work.

Para to 1 to 9 of item of hand broken metal size 25mm to 90mm size will apply except the size of metal mentioned in para 1 and the table of grading requirements. These will be as under.

Para 1 to size will be 40mm. To 63mm. Instead of 25mm. To 90mm. In para 1.

4. The grading requirements of the metal to be used for W.B.M shall be as under:

Sr. No.	Size Range	Sieve Designation	Percentage by weight Passing thought the sieve
1.	63mm to 40mm	80 mm 63 mm 50 mm 40 mm	100-100 90-100 35-70 00-15

		20 mm	00-05

The size of metal for W.B.M shall be 40mm. To 63mm. where in tolerance limit for oversize shall be 10percent and that for lower size should be up to 15 percent and below 25mm it shall be up to 5 percent

Standard for acceptance at reduced rate and rejection shall be as under:

Retained on 63mm square mesh sieve:

Not more than 30%

Retained on 75mm square mesh sieve:

Nothing will be retained & 100% metal shall pass through the sieve. For the over size metal, payment at reduce Rate should be made as under:

90% of accepted tender rates for the metal retained between 10% and 20% on square mesh sieve of 63mm gauge.

75% of accepted tender rates for the metal retained between 20% and 30% on square mesh sieve of 63mm gauge.

If more than 30% of metal is retained on specified sieve, (i.e. 63mm square size) the stack shall be rejected. Also if any stone aggregate retained on 75mm sieve, the stack shall be rejected.

The quantity for which reduced rate will be applicable is the quantity retained on the above-mentioned square mesh sieve and not the whole quantity.

For example in a stack of 1.5 Cu.m. metal if 18% is retained on square mesh sieve of the prescribed size (i.e. 63 mm) the reduced rate of 90% will be applicable to 0.27 Cu.m. only and the balance quantity of 1.23 Cu.m. shall be paid for at the accepted rates for standard size metal.

Before any secured advance for metal is paid to the contractor, the metal shall have to be tested for its quality in the laboratory. Contractors' request for such secured advance will be considered only after test results of metals are received and results are satisfactory.

[As per Government circular No. SSR 1070-1B-191-22-S of 5-3-92]

ITEM 4 C Supplying and stacking of machine crushed stone aggregate chipping etc. of hard stone of 20 to 50mm. nominal size free of disintegrated piece, deleterious and organic matter (For bitumen surface dressing etc.) as per I.R.C. code including filling the boxes with all lead and lift etc. complete.

1 The field of M.C. metal shall be of approved quarry as shown on the quarry chart as well as approved by the Executive Engineer prior to collection.

2 The M.C. metal shall be hard, tough, sound durable, black trap field metal of close texture, free from decay and weathering. Each piece of the stone shall be angular and roughly cubical in shape and round elongated or flaky material shall be rejected. No round or oblong pebbles or angular chips larger or smaller than specified size shall be allowed.

3 All unsound, weathered or disintegrated stone obtained from the upper surface layer of the quarry or other layer of boulders shall be rejected. The physical requirement for standard size metal shall conform to the test results indicated in para 3 of item 4.

4 The M.C. metal shall be as nearly uniform in size as possible and shall conform to following minimum requirements of passing through the rings:

Test Method	Requirement
63 mm	100
50 mm	95-100
40 mm	35-70
20 mm	0-10

5 Wherever and doubt exist as to whether the above requirement are satisfied in whole or part, the collection of M.C. metal shall be got screened by the contractor if so ordered by the Executive Engineer and for which no extra payments shall be claimed by the contractor.

6 Any collection, which does not fully satisfy the above requirements, is liable to be rejected altogether.

7 Stacking shall be done by filling in the standard steel pharas of 2.00 X 1.50 X 0.50 metre and no deduction of voids shall be made from the gross measurements.

8 The contractors on a fairly level ground shall do regular stacks. All the stacks shall be marked by white wash immediate on being measured and recorded by the Engineer-in-charge.

9 The rate includes blasting the rock, it any, breaking the metal, stacking, measuring in pharas etc. complete.

ITEM 4 D Supplying & stacking machine crushing stone aggregate chipping etc. of hard stone of 25mm. to 40mm. nominal size free of disintegrated pieces deleterious and organic matter including filling the boxes with all lead and lift etc. complete on site of the work for bituminous surface dressing etc. as per I.R.C. code.

As per Item No. 4 (C) except that gradation of Aggregate shall be as under.

Sieve Size	% By Weight passing Through
50 mm	95-100
40 mm	65-90
20 mm	0-10
10 mm	0-5

ITEM 4 E Supplying and stacking of quarry spauls materials at site including filling boxes with all lead and lift.

The quarry spauls shall be approved BY THE executive Engineer prior to collection filling the boxes shall not be allowed till the metal is broken to the specified site.

The quarry spauls shall be as uniform in size as possible. The quarry spaul shall be hard, tough, solid durable of black trap quarry of close texture, free from decay and weathering. The store. The stone shall be angular and roughly cubical in shape and round elongated or flaky materials shall be rejected. No sound or long rubble or angular chips smaller than specified size should be allowed.

All unsound, weathered or disintegrated stone obtained from the under surface layer of the quarry or other boulders shall be rejected.

Wherever any doubt as to weather above requirement are satisfied in whole or part of the collection it shall be got screened by the Contractor if so ordered by the Executive Engineer, and for which no exta payment shall be claimed by the contractor.

Any collection does not fully satisfy the above requirements are liable to be rejected all together.

Stacking shall be made by the contractor shall make stacking by steel pharas of 2 M X 1.5 M X 0.5 M and no deduction of voids shall be made from the gross measurements.

The contractor on a fairly level ground shall make regular stacks. The entire stack shall be marked by white wash immediately on being measured and recorded by the Engineer-in-charge.

The rate includes blasting the rock, if any, breaking the quarry spauls, stacking measuring in pharas etc. complete.

Stacks shall as per actual requirements and any materials in excess shall have to be transported by the contractor at the places directed by the Executive engineer at the risk and cost of the contractor.

White stacking materials the depositing should commence at one end of the K.M. and carried continuously towards the other ends unless the Executive Engineer at the risk and cost of the contractor.

While stacking materials the depositing should commence at one end of the K.M. and carried continuously towards the other and unless the Executive Engineer shall direct otherwise and as a rule measurements shall be taken after metal for half kilometre or Km. has been fully collected. Any fraction of this distance shall not be measured up.

ITEM 4 F Supplying and stacking rubble of hard stone on road side with all leads and lift as directed.

The rubble stone shall be black in colour, shall be hard, tough, sound durable and of close texture, free from cracks and it shall e obtained from the approved quarries.

The rubble obtained from the top surface of the quarry is soft one and hence such soft variety shall not be accepted. All unsound weathered or disintegrated stones obtained from the upper portion of the quarry shall be rejected.

The quarry shall be well protected shall be dug by removing all the katcha and weathered stuff till approved quality of materials is available.

The length and breadth shall not exceed 1/f (1,2) times the thickness of the stones.

The rubble stacks shall be made on a fairly level ground and stacks shall be so made that rubble stones are stacked as close as possible so as to leave no excessive voids and no hollows are left out.

The tendency to prepare the stacks by keeping excessive voids or keeping hollow places shall not be tolerated.

The stacks shall be uniform in length and breadth and top portion shall be in level so that height at any points is uniform.

All the stacks shall be of standard dimensions, which shall be prescribed by the Executive Engineer deduction for voids shall not be made.

The Executive Engineer, prior to collector on site, shall be approved the rubble or otherwise it is liable to rejection for which no claim shall be entertained.

The contractor shall maintain all stacks in regular and proper sizes till the whole material is collected. Measured and finally accepted by the department, 15 percent spauls will be allowed for filling in interstices.

The rubble shall be stacked in quantities as per hectometre wise requirement as directed by the Executive Engineer of his agent.

Measurement shall be given only when the full quantity of a half Kilometre is stacked measurements shall be recorded and paid only once in a hectometre and no piecemeal measurements shall be recorded and paid.

Stacks shall be made as per actual requirements and any material in excess shall have to be transported by the contractor at the places directed by the Executive Engineer at the risk and cost of the contractor.

ITEM 4 (A) (As approved by R. & B. D Circular NO. SSR / 080 / IB / 547 (28) C DT. 15.3.88)
Specifications for W. B. M.: (sub base/base course)

1.0 ITEM: Providing and laying water bound macadam of crushed/broken stone aggregates of… MM. compacted thickness mechanically interlocked by rolling and bonded together with screenings/approved quality of murrum of gritty material and water in accordance with the requirements of specifications etc. complete.

MATERIALS:

Coarse aggregates: General requirements: The coarse aggregates shall be stone metal obtained from quarries approved by the Executive Engineer prior to collection. The metal shall be of approved quality with all leads and lifts. The metal shall be obtained from the hard tough, sound durable, stone of close texture as is locally available and reasonably free from decay and weathering. Pieces of the stone shall be angular and roughly cubical in shape and round elongated of flaky materials shall be rejected. No round or oblong pebbles or angular chips larger or smaller than specified size shall be allowed. The size of metal shall be 40mm to 63mm and shall be crushed/hand broken. All unsound weathered or disintegrated stone obtained from the upper surface layer of the quarry or other layers & boulders shall be rejected.

Physical Requirements: The aggregates shall conform to the physical requirements as indicated in the table No. 1 hereafter.

TABLE NO. 1
Physical Requirements of Coarse Aggregates for Water Bound Macadam

Sr. No.	Type of Construction	Test	Test Method	Requirements

1.	Sub Base	Los Angeles Abrasion value * Or Aggregate Impact value	IS: 2386 (Part IV) IS: 2386 (Part IV) Or IS: 5640**	50 % (Max.) 40 % (Max.)
2.	Base	Los Angeles Abrasion value * Or Aggregate Impact value	IS: 2386 (Part IV) IS: 2386 (Part IV) Or IS: 5640**	50 % (Max.) 40 % (Max.)
		Flakiness Index	IS: 2386 (Part IV)	15 % (Max.)

***** Aggregates may satisfy requirements of either of the two tests.

****** Aggregates like vricks, metal kankar leterite which get softened in presence of water, shall be tested for impact value under wet condition in accordance with IS: 5640

Grading requirements: The coarse aggregate shall conform to the grading requirements as indicated in Table No. 2 below:

TABLE NO. 2
Grading Requirements of Coarse Aggregates.

Grading No.	Size Range	Sieve designation	Percent by weight
2.	63mm to 40mm	80 63 40	100 85-100 0-15

Screenings/approved quality of murrum/gritty materials: Screenings/murrurm/gritty materials to fill in the voids in the coarse aggregates and to act as binding materials shall generally consist of predominantly non-plastic materials such as murrum or gravel (other than rounded river borne material) provided and liquid limit and plasticity index of the materials is below 20 & 6 respectively & fraction passing 75% micron sieve does not exceed 10 percent.

As far as possible, screenings/murrum/gritty materials shall conform to the grading set forth in Table No. 3 below:

TABLE NO. 3
Grading for Screenings/Approved Quality of Murrum/Gritty Materials.

Grading Classification	Size of Screenings	Sieve designation	Percent by weight Passing the sieve
A	12.5 mm	12.5 mm 10.0 mm 4.75mm 150 micron	100 90-100 10-30 0-8
B	10 mm	10 mm 4.75mm 150 mm	100 85-100 10-30

CONSTRUCTION OPERATIONS:

Preparation of base: The sub-grade/sub-base to receive the water bound macadam course shall be prepared to the specified grade and camber and made free of dust and other extraneous materials. Any ruts or soft yielding places shall be corrected in an approved manner and rolled until firm Where water bound macadam is to be laid over and existing black topped surface, 50 mm X 50 mm furrows shall be

cut at an angle of 45 degrees to the centre line of the road at 1 meter intervals in the latter before laying the coarse aggregate.

Spreading course aggregate: The coarse aggregate shall be spread uniformly upon the prepared base in such quantities that the thickness of the compacted layer is 100 mm for grading 1 and 75-100 mm for gradings 2 and 3 as specified.

The spreading shall be done from stockpiles along the side of the road way or directly from vehicles. In no case shall the compacted or partially compacted base be permitted.

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. No segregation of large or fine particles shall be allowed and the coarse aggregate, as spread shall be of uniform gradation with no pockets of fine materials.

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

Rolling: Immediately following the spreading of the coarse aggregate, rolling shall be started with three wheeled power rollers of 6 to 10 tonne capacity or tandem or vibratory rollers of approved type. The weight of the roller shall depend upon the type of the aggregate and be indicated by the Engineer-in-charge.

Except on super elevated portions where the rolling shall proceed from inner edge to the outer, rolling shall begin from the edges gradually progressing towards the centre. First the edges shall be compacted with roller running forward and backward. The roller shall then move inwards parallel to the centre line of the road, in successive passes uniformly lapping preceding tracks by at least one half width.

Rolling shall continue until the aggregates are thoroughly keyed and the creeping of aggregates ahead of roller is no longer visible. During rolling slight sprinkling of water may be done, if necessary. 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 and longitudinally with templates and any irregularities corrected by loosening the surface, adding or removing necessary amounts of aggregates and re-rolling until the entire surface conforms to desired camber and grade. In no case shall the use of screenings be permitted to make up depressions.

Application of screenings/murrum/gritty materials: After the coarse aggregate has been rolled to clause 3.3 screenings/murrum/gritty materials 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/murrum/gritty materials are being spread so that vibration of the roller cause them to settle in to the voids of the coarse aggregate. The screenings/murrum/gritty material shall not be dumped in piles but spread uniformly in successive thin layer either by the spreading motion of hand shovels or by mechanical spreaders, or directly from trucks. Trucks operating for spreading the screenings/murrum/gritty materials shall be so driven as not to disturb the coarse aggregate.

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

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

Sprinkling and grouting: After the screenings/murrum/gritty material has been applied, the surface shall be copiously sprinkled with water, swept and rolled. Hand brooms shall be used to sweep the wet screenings/murrum/gritty material in to void and to distribute them evenly. The sprinkling, sweeping and rolling operations shall be continued with additional screenings applied as necessary, until the coarse aggregate has been thoroughly well-bounded and firmly set in fits full depth and a grout has been formed of screenings/murrum/gritty material. Care shall be taken to see that the base or sub grade does not get damaged due to the addition of excessive quantities of water during construction.

Setting and drying: After the final compaction of water bound macadam course the road shall be allowed to dry over nigh eight Next morning hungry spots shall be filled in with screenings/murrum/gritty material as directed, slightly sprinkled with water if necessary and rolled. No traffic shall be allowed of the road until the macadam has set. The Engineer-in-charge shall have the discretion to stop hauling traffic from using the completed water bound macadam course if in his opinion it would cause excessive damage to the surface.

4.0 SURFACE FINISH: The surface finish of construction shall confirm to the following requirements:

4.1 General: All works performed shall conform to the lines grade, cross sections and dimensions shown on the drawings or as directed by the Engineer-in-charge subject to the permitted tolerances described hereinafter.

4.2 Horizontal Alignments: Horizontal alignments shall be reckoned with respect to the centre line of the carriageway as shown on the drawings. The edges of the carriageway as constructed shall be correct within a tolerance of $\pm$ 25mm there from the corresponding tolerance for edges of the roadway and lower layers of pavement shall be $\pm$ 40mm.

4.3 Longitudinal profile: The levels of the sub grade and different pavement course as constructed shall not very from those calculated with reference to the longitudinal and cross-profile of the road shown on the drawings or as directed by the Engineer-in-charge, beyond the tolerances mentioned below:

Sub grade $\pm$ 25mm
Sub base $\pm$ 20mm
Base course $\pm$ 15mm
Wearing course $\pm$ 10mm

Provided, however, that the negative tolerance for wearing coarse shall not be permitted in conjunction with the positive tolerance for base course if the thickness of the former is thereby reduced by more than 6mm

4.4 Surface Regularity: The surface regularity of completed sub-bases, base course and wearing surfaces in the longitudinal and transverse directions shall be within the tolerances indicated in Table No. 4 below:

Sr. No.	Type of Construction	Longitudinal profile with 3 meter straight edge		Cross profile
	Template.	Maximum Permissible Undulation mm	Maximum number of undulations permitted in any 300 metres. Length exceeding: mm	Maximum permissible variation from specified profile under camber
1	2	3	4	5
4.	Water Bound Macadam 8- with normal size metal (20-50) mm and 40-63 mm size).	12	30	8

The longitudinal profile shall be checked with a 3-meter long straight edge at the middle of each traffic lane along a line parallel to the centre line of the road. The transverse profile shall be checked with a set three amber boards at intervals of 10 meters.

4.5 Rectification: Where the surface irregularity of sub grade and the various payment course fall outside the specified tolerance, the Contractor shall be liable to rectify these in the manner described below and to the satisfaction of the Engineer-in-charge:

Where the surface is high or low, the top 75mm shall be scarified, reshaped with added materials as necessary and recompacted as per the specifications of W.B.M. the area treated at a place shall not be less than 5 meter long and 2 meters wide.

QUALITY CONTROL TESTS DURING CONSTRUCTION:

General: The materials supplied and the works carried out by the Contractor shall conform to the Specifications prescribed in the preceding Clauses.

For ensuring the requisite quality of construction the materials and works shall be subjected to quality control tests, as described hereinafter, by the Engineer-in-charge. The testing frequencies set forth are the desirable minimum and the Engineer-in-charge shall have the full authority to carry out tests as frequently as he may deem necessary to satisfy himself that the materials and works comply with the appropriate specifications.

Test procedures for the various quality control tests are indicated in the respective Sections of the Specifications or for certain tests within this section. Where no specific testing procedure is mentioned, the tests shall be carried out as per the prevalent accepted engineering practice to the directions of the Engineer-in-charge.

Tests on Sub-bases & Bases:

The tests and their frequencies W.B.M types of bases & sub-bases shall be given in Table No. 5 below:

Table No. 5
Control tests & their frequency for Sub-base & bases of water bound macadam

Sr.	Type of Construction	Test	Frequency
1	Water bound macadam	Aggregate impact Value Grading Flakiness index Caterer limit	One test per 1200 Cu.m. One test per 100 Cu.m. One test per 200 Cu.m. One test per 25 Cu.m. of materials for screenings

Compaction Control: Control shall be exercised by taking at least one measurement of density for each 1000 square meters of compacted area, or closer as required to yield the minimum number of test results for evaluating a day's works on statistical basis. The determination of density shall be in accordance with IS 2720 (Part XXVVIII). Test locations shall not be based on the result of one test but on the mean value of set 5-10 density determinations. The number of tests in one set of measurements shall be 5 as long as it is felt that sufficient control over materials and the method of compaction is being exercised. If considerable variations are observed between individual density results, the minimum number of tests in one set of measurement shall be increased to 10. The acceptance of work shall be subject to the condition that the mean dry density equals or exceeds the specified density and the standard deviation for any set of results is below 0.08gm/cc.

ARRANGEMENTS OF TRAFFIC DURING CONSTRUCTION:

General: The contractor shall at all time carry out work on the highway in a manner creating least interference to the traffic while consistent with the satisfactory execution of the same. For all work involving improvements to the existing highway, the contractor shall, in accordance with the directives of the Engineer-in-charge, provide and maintain during the execution of the work a passage for traffic either along a part of the existing carriage way under improvement, or along a temporary diversion constructed close to the highway.

Passage of Traffic along a part of the Existing Carriage way Improvement: This method shall be adopted where, in the opinion of the engineer-in-charge, the improvement works, namely widening of the existing pavement or reconstruction/repairs to cross-drainage works, could be carriage out on part widths at a time and the traffic could simultaneously be passed without undue delay and difficult on the other part the road. Shoulder shall be dressed and brought in the line with the pavement and maintained throughout the duration of the work to the satisfaction of the Engineer-in-charge. Where work is in progress in continuous long stretches, passing places, at least 20 meter long and 6 meter wide, inclusive of the width of the existing carriageway, shall be provided at half to one kilometre intervals as directed

by the Engineer-in-charge. Extra treatment to shoulders where necessary, shall be given by as ordered by the Engineer-in-charge.

Passage of Traffic along a Temporary Diversion: If in the opinion of the Engineer-in-charge it is not possible to pass the traffic on part width of the carriageway for any reason, temporary diversion close to the highway shall be constructed as directed. It shall be paved with locally available materials such as hard murrum, grave, brick or stone metal to the specific thickness and provided with bituminous surfacing, where directed. In all cases, the alignment gradients and surface type of the diversion, including its junctions, shall be approved by the Engineer-in-charge before the highway is detoured and closed to traffic. At cross drainage points, the contractor shall provide temporary crossing for the diversion according to the design approved by the Engineer-in-charge.

Traffic Safety and control: The control shall take all necessary measures for the safety to traffic during construction and provide, erect and maintain such barricades, including signs, markings, flags, lights and flagmen as may be required by the Engineer-in-charge for the information and protection of traffic approaching or passing through the section of the highway under improvement. Before taking up in consultation with the Engineer-in-charge.

The barricades erected on either side of the carriage/portion of the carriageway closed to traffic, shall be of strong design to resist violation, and painted with alternate black and white stripes. Red lanterns or warning light of similar type shall be mounted on the barricades at night and kept it throughout from sunset to sunrise.

At the points where traffic is to deviate from its normal path (whether on temporary diversion or part, width of the carriageway) the channel for traffic shall be clearly marked with the aid of pavement markings, painted drums or a similar device to the directions of the Engineer-in-charge. at night the passage shall be delineated with lanterns or other suitable light source.

One way traffic operation shall be established wherever the traffic is to be passed over part of the carriageway inadequate for two-lane traffic. This shall be done with the help of flagmen kept positioned on opposite sides during all hours, for regulation of traffic. The flagmen shall be equipped with red and green flags and lanterns/lights.

On both sides, suitable regulatory/warnings signs shall be installed for the guidance of road users. On each approach at least two sign shall be put up, one close to the point where transition of carriageway begins and the other 120 meters away. The signs shall be of approved design and of refractory type if so directed.

Maintenance of Diversions and Traffic Control Devices: Signs, light barriers and other traffic control devices, as well as the riding surface of diversions shall be maintained in satisfactory condition till such time they are required as directed by the Engineer-in-charge. The temporary travelled way shall be kept free of dust by frequent application of water if necessary.

Measurements for payment traffic Arrangements: All arrangements for traffic during construction including maintenance thereof but excluding initial dressing and/or extra treatment of the shoulders and construction of temporary diversions shall be considered as incidental to the works and Contractor's responsibility.

Construction of temporary diversions, initial dressing of the shoulders and extra paving at passing places shall, however, be paid for as provisional sum, if written order is issued to do so by the Engineer-in-charge.

ARRANGEMENTS OF PAYMENTS FOR W.B.M.

Water bound macadam shall be measured as finished work in position in cubic meter. The finished thickness of sub-base and base courses to be paid on volume basis shall be computed in the followings manner:

Levels shall be taken before and after construction, at greed of points 10 meters centre to centre to longitudinally in straight trenches but 5 meters at curves. Normally, on two lane roads, the levels shall be taken at four positions transversely, at 0.75 and 2.75 meters from either edge of the carriageway and on single lane roads these shall be taken at two positions transversely, being at 1.25 meter from either edge of the carriageway.

Suitable reference for the transverse grid line should be left in the embedded bricks on either ends or by other means so that it is possible to locate the grid points for level measurements after each successive course is laid.

For pavement courses laid only over widening portion, at least one line of levels shall be taken on each strip of widening, or more depending on the width on the widening as decided by the Engineer-in-charge. Not with standing the above, the needs for which may arise particularly in the case of estimation of the volume of the material for levelling course. The average thickness of the pavement course shall be the arithmetical mean of the difference of levels before and after construction at all the grid points falling in that area, provided that thickness of finished work shall be limited to those shown on the drawings or approved by the Engineer-in-charge in writing.

As supplement to level measurements, the Engineer-in-charge shall have the option to cut cores/holes to check on the depth of construction.

The contractor shall sign day to day levelling work and also original cross-section, longitudinal section in token of his acceptance etc. the working sections both longitudinal and cross of the sub grade shall be taken by the Engineer-in-charge before the actual W.B.M work is started. The contractor or his authorised representative shall attend day to day levelling work and sign with date the field book daily in token of his acceptance. If there is any disagreement the contractor shall inform of in it writing to the officer concerned with specific reference to the sections before starting further work. Started no cognisance of any complaint taken. Merely not signing of the level book shall not be deemed as disagreement.

The Executive Engineer shall also verify levelling work to the extent of 5 percent before commencement of W.B.M to proper formation and grade till this item is finally measured and accepted by the Department. The measurement shall be taken on compacted W.B.M

Any crack formation of screenings observed in between layer of W.B.M work shall be deducted from the measurements so taken and net quantity of W.B.M work shall be considered for payment.

8.0 RATES: The contract unit rate for water bound macadam sub-base/base course shall be payment in full for carrying out the required operations including full compensation for all components listed below:

Making arrangements for traffic to Clause-6 except for initial treatment to shoulders and construction of diversions.

Furnishing all materials to be incorporated in the work including all royalties, fees, rents where necessary and all leads and lifts.

All labour, tools, equipment and incidentals to complete the work to the specifications, and

Carrying out the network in part widths of roadway where directed.

ITEM 5 Spreading of soft murrum/mururm/sand/yellow/earth/blindage or road crust filling the gaps in metal and levelling to camber and gradient as directed.

Spreading of materials shall be started after the full supply in a particular K.M is collected, measured and recorded in the measurement books. Permission of the Engineer-in-charge shall be obtained before spreading. It shall be seen that the formation is dressed to the required camber and grade. If the murrum is to be spread over the metaled surface then the spreading shall be uniform and as its has to act as binding surface, it shall be used for filling the interstices for metal and forming a smooth running surface as far as possible. Murrum blind age shall be specified, as blind age shall be speared evenly with a twisting motion of the baskets. No more murrum shall be used then specified as blind age. The rate is for gross measurements and no deductions of voids shall be made. The murrum is to be speared over earthen embankment as a sub base or for side shoulders or as blindange; it shall be spread in a manner as directed by the Engineer-in-charge and as per required width and thickness. The contractor shall make good all unevenness, depression, projections etc., during consolidation work. Rate of this item includes all these operation except consolidation. The payment shall be made on centimetre basis.

ITEM 6 Spreading the stone aggregate for soiling and W.B.M. including filling the interesting to required camber and gradient (excluding spreading of blind age) (i)

40mm. to 63mm. size H.B. stone aggregates (H.B.) (ii) 25mm. to 90mm. size H.B. stone aggregate. (iii) chipping varying from 6mm. to 25mm. size (iv) 20mm. to 50mm. size crushed.

Metal shall not be spread without permission of the Engineer-in-charge. Metal should be spread under careful supervision by trained coolies. Contractor shall see that uniform spreading as per collection of metal is done. The contractor shall spread the metal fully from the stacks without keeping any balance unless directed by the Engineer-in-charge to keep some stack in balance for making good unevenness or depressions during rolling works. To ensure that the material is spread to the required thickness, the road surface shall be marked out into length over which the contents of heaps are to be spread. The bounds of earth or murrum (one on either side) shall be laid with a distance between them equal to the width of road to be metaled and shall be enough to prevent the loose metal from spreading during consolidation as well as to retain water used for consolidation. Payment for bunds will be made in the respective item.

The metal (including old metal) shall be screened and rubbish, dust, grass shall be removed and spread evenly on the prepared surface in grade and camber by using camber board etc. so as to ensure that the surface is true to camber and grade. At least two cambers by using camber boards shall be in use at site. The surface shall be checked at every 50 ft. by means of template while the correctness of the camber in between shall be tested by string and corrected as required. Between the straight lengths and the curves in camber of road to super elevation shall be made very gradually as may be directed by the Engineer-in-charge.

The spreading of metal shall precede only 200-meter (max.) advance of the rolling operations the collection and spreading of the metal shall not be carried out in one and the same kilometre.

At the time of rolling all surface irregularities, hollow, depressions, humps etc. shall be straight height The contractor shall do the spreading of metal in required layer. The rate for this item shall be paid on cm basis and includes all the above operations with all lead and lift except consolidation.

ITEM 6 (A) Spreading the stone aggregates for soiling and W.B.M. including filling the interstices forming the surface to required camber and gradient by paver finisher (labour charges only but including hire and operating charges or paver)

Specification same as item No. 6 except that metal or stone aggregate shall be spread by paver finisher and not manually. Besides all the labour charges, the rate also includes the hire and operating charges of paver. The contractor shall have to make is own arrangement for procuring appropriate paver.

ITEM 6 (B) Spreading quarries spauls in grade & chamber complete.

1 The quarry spauls shall be only be allowed to be spread after the written permission of the Executive Engineer is obtained.

2 The permission for spreading the metal shall be given by the Executive Engineer if.

The full quantity of a particular mile (kilometre) is completely collected.

The collection of metal is also completed in the adjoining two miles (Kilometres).

The measurements are recorded in the Measurement book.

3 Q.S. shall if required, be screened, if containing rubbish dust, grass etc. it shall than be filled in basket & conveyed where required and spread evenly on the prepared surface be given twisting motion to basket at the time of spreading. The surface shall then (15m) by means of templates and strings as well as with camber boards and spirit level.

4 Between the straight length and curves and at the meeting points of the convex and concave portions of the reserve curves, the change in camber of the road, due to super elevations shall be made as well as with camber boards and spirit level.

5 At the time of spreading Q.S. a small quantity (about 4 to 5 percent) of metal as directed, shall be retained at the first instance. It shall be spread later on after partial consolidated as required to rectify the camber and to fill up the hollows if any. No extra amount shall be paid for this.

6 Measurements shall be paid as per the measurements of collection less the quantity remained to be spread and on cubic metre basis.

7 The rate includes the cost of screening the Q.S. if any spreading, sectioning, with template and adding reserved quota of metal, while rolling is in progress for making good hollows and camber.

8 The surface shall be brought to the required camber which shall be checked at every 50 ft. (15 M.) by means off templates of while the necessary of the in between shall tested by strings are corrected as required.

9 The centre line shall first be marked in the sub-grade, which is properly consolidated and has uniform camber and grade as required.

10 The Q.S. shall be laid for a small length on 25ft. (8 M.) and then the edge stones shall be laid.

11 Pegs shall be driven on either side of the road joined with strings true and parallel with a distance between they equal to the width be laid with oversize metal Similarly.

12 The Q.S. shall be laid as close as possible so as too leave minimum possible interstices and voids.

13 Before rolling is allowed on soling the side beams shall be filled up to the top the top of the soling and at least 3'-0" (1 m.) on either side so as to prevent metal layer getting disturbed at times during rolling. The rate is exclusive of all the operations as stated above.

ITEM 7 **Rolling and consolidating water bound macadam (except laterite & Kankar) incl. watering not exceeding 150mm. thickness (main layer including binding materials) including filling the depression which occur during the process with power rollers exceeding 8.0 m.t. but not exceeding 12.0 m.t.**

Immediately following the spreading of the coarse aggregate rolling shall be started with three wheeled power rollers of 8 to 10 tonne capacity of tandem roller or equivalent vibratory rollers. The weight of the roller shall depend upon the type of the aggregate and as indicated by Engineer-in-charge.

Except on super elevated portions where the rolling shall proceed from inner edge/edges shall be compacted with roller running forward and backward. The roller shall then move inwards parallel to the centre line of the road; in successive passes uniformly lapping preceding tracks by at listed half way width.

Rolling shall continue until the aggregate is thoroughly keyed and the creeping of the aggregate ahead of the roller is no longer visible. During rolling slight sprinkling of water may be done, if necessary. Rolling shall 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 and longitudinally with templates and any irregularities corrected by loosening the surface, adding or removing necessary amounts of aggregate and re-rolling until the entire surface conforms to desired camber and grade. In no case shall use of screenings be permitted to make up depressions.

The bind age material where it is required to be used shall be an applied, successively in two or thinner layer at a slow and uniform rate. After each application, the surface shall be copiously sprinkled with water, the resulting slurry swept in with hand brooms or mechanical brooms to fill the voids properly, and rolled during which water shall be applied to the wheels of the rollers if necessary to wash down the binding materials 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.

After the final compaction of water bound macadam course, the road shall be allowed to dry over height Next morning hungry sports shall be filled with screening of blind age materials as directed, lightly sprinkled with water, if necessary, and rolled. No traffic shall be allowed on the road until the macadam has set. The Engineer-in-charge shall have the discretion to stop hauling traffic from using the completed water bound macadam course if in his opinion it would cause excessive damage to the surface.

Payment will be made on meter basis of the finished work and shall include cost of watering, rent of machinery, cost of fuel, wage of drivers and cleaners earthen and murrum bound etc.

ITEM 8 **Providing and fixing indicator stone of approved stone as per I.R.C. type design in C.C. 1:4:8 including white washing etc. complete. (1) fixing in earth.**

Indicator stones shall be of approved quality and of the size 20cm X 20cm its length shall not be less than 80 centimetres. The top 38 centimetres shall be chisel dressed on all sides. The size and dimension of the indicator stones shall be exact and stones shall be neatly dressed. And finished before fixing. The indicator stones shall be fixed firmly in position in embankment or cutting as the case may be. The exposed part of the indicator stones shall be given three coats of white wash. The contractor at his own cost shall do any excavation necessary for fixing of the indicator stones. The measurement for payments shall be number of indicator stones fixed in position.

Unit rate of indicator stone includes the cost of all material, labour, tools, fixing, and white washing as directed by the Engineer-in-charge.

ITEM 8 Proving and fixing indicator stone of approved stone as per I.R.C. type design in C.C. 1:4:8 including white washing etc. complete. (2) fixing in C.C. 1:5:10.

Specification same as 8 (1) above except that the indicator stone shall be fixed in C.C. 1:5:10 which will consist of one part of cement, five part of good sand and ten parts of good brick bats. Rate includes all labour and curing etc. necessary for concrete.

ITEM 9 Providing and fixing ordinary kilometre stone of precast C.C. 1:2:4 including necessary reinforcement as per I.R.C. type design in C.C. 1:4:8 including and paints and latter etc. complete. (for N.H., S.H. and M.D.R.)

Kilometre stone shall be approved quality and shall be either black or Rajula stone or have precast 1:2:4 R.C.C. as specified in the item

The size, manner of fixing painting and lettering of K.M stone shall confirm specification as per I.R.C.-8 (Type design for highway kilometre stones). The fixing of K.M stone shall be carried out in ordinary concrete of grade specified in the item using hand broken metal field metal or gravel. The measurement for payment shall be made per No. of K.M stone fixed in position.

Unit rate for kilometre stone includes the cost of all materials, labours, tools, fixing, finishing, cutting, lettering and painting as directed by the Engineer-in-charge.

ITEM 10 Providing and fixing fifth kilometre stone precast C.C. 1:2:4 including necessary reinforcement as per I.R.C. type design in C.C. 1:4:8 including painting and lettering etc. complete. (for N.H., S.H. and M.D.R.)

1 The work shall be carried out as per the item of ordinary Kilometre stone except that the size of the fifth kilometre stone shall be bigger than that of ordinary kilometre stone as per I.R.C. 8 (Type design for highway kilometre stones) and fixing shall be in ordinary concrete of grade specified in the item The measurement for payment as well as the operations included in unit rate shall as per ordinary kilometre stone.

ITEM 11 Proving and fixing hectometre stone as per I.R.C. type design including white washing etc. complete. (1) fixing in earth/wearing coat.

Fixing in Earth: The work shall be carried out as per the item of ordinary Kilometre stone except that the size of the hectometre stone shall be smaller than that or ordinary kilometre stone as per I.R.C. 26 (Type design for 200 meter stones) and fixing shall be in ordinary concrete specified in the item The measurement for payment as well as the operations included in unit rate shall be as per ordinary kilometre stone.

Fixing in C.C. 1:5:10: Specification same as 11 (1) above except that the indicator stone shall be fixed in C.C. 1:5:10 which will consist of one part of cement, five part of good sand and ten parts of good brick bats. Rate includes all labour and curing etc. necessary for concrete.

ITEM 12 Providing and fixing guard stone as per I.R.C. type design including white washing etc. complete. (1) fixing in earth /wearing caot:

1 Fixing in Earth/Wearing Coat:

(i) The guard stone shall be approved quality and of 20cm X 15 cm. Size and its length shall not be less than 75 Cms. The top portions shall be rounded. The top 38 Cms. shall be chisel

dressed on all sides. The size, shape and dimensions of the guard stones shall be exact and shall be neatly dressed and finished.

(ii) The guard stones shall be fixed in positions as directed by the Engineer-in-charge in earth only. The exposed the part of the guard stones shall be given three coats of white wash. The contractor at his own cost shall do any excavation necessary for fixing of the guard stones. The measurement for payment shall be per number of guard stone fixed in position.

(iii) Unit rate of guard stone includes the cost of all materials, labours, tools, fixing, and white washing as directed by the Engineer-in-charge.

(iv) In case of Deep/Causeway the guard stone shall be fixed in masonry of head wall as directed by Engineer-in-charge.

2 Fixing in C.C. 1:5:10

Specification same as 12 (1) above except that the indicator stone shall be fixed in C.C. 1:5:10 which will consist of one part of cement, five part of good sand and ten parts of good brick bats. Rate includes all labour and curing etc. necessary for concrete.

ITEM 13 Providing and fixing road sign board of M.S. plates and angle iron including painting, lettering etc. complete including fixing in C.C. 1:4:8 with necessary excavation etc. complete as per I.R.C. design.

(1) Non – Reflective Type:

The board shall consist of a 90cm X 90 cm triangular plate of 6mm thickness at the top and a 90 cm X 61 cm rectangular plate of 6mm thickness below if fixed at suitable distance. This shall be fixed to the angles iron post of 75 mm x 75 mm X 6mm size by means welding or riveting as directed by the Engineer-in-charge. The angle iron post shall be split at the bottom end to 10 cm (minimum) in length and shall be fixed at right angle to the central line of the road in ordinary concrete of grade as specified in the item, using hand broken metal, field metal or gravel. Two steel bars of 12mm dia. shall be embedded in concrete for fixing as directed by the Engineer-in-charge. The top of the post shall be at a height of 25 cm above ground level and shall be at least 60 cm below ground level. Total height of post shall be 3 meter (minimum). The exposed platform shall be neatly finished and its shape shall be as directed by the Engineer-in-charge.

The post will be painted with two coats alternatively in black and white strips 23cm in height after applying one coat of anticorrosive paint. The paint shall be of approved quality the board shall be painted with approved colour and lettering shall be in accordance with I.R.C. 30 (Standard Letters and Numerals of different Heights for use on Highway designs) and as per notified signs of motor Vehicles Act respectively. The measurement for payment shall be per number of signboard fixed in position.

The unit rate includes the cost or materials, labour, tools, drilling of holes, rewetting or welding fixing, curing, lettering, and painting as directed by the Engineer-in-charge.

(2) Reflective Type:

Specifications will be same as 13 (1) above except that signs shall be reflective type.

ITEM 14 Providing and fixing village name boards as per standard I.R.C. type design of steel plate including painting, lettering etc. complete with fixing in C.C. 1:4:8 block with necessary excavation.

1 The work shall be carried out as per the item of signboards except that there shall not be top plate of 90 cm X 90 cm triangular shape and lower plate of 38cm X 61cm Rectangular plate of 6mm thickness shall be fixed at top facing towards the direction of the village.

2 The board plate shall be painted in black colour letters & figures shall be painted in white colour with an arrow directing towards the village, painting and lettering shall be done out both sides. The size of the letters & figures as well as thickness of arrow will be as directed by the Engineer-in-charge.

3 The measurement for payment as well as operations included in the unit rate shall be as per item of signboards.

ITEM 15 Supplying machine crushing stone aggregate chipping etc. of hard stone following nominal size free of disintegrate pieces deleterious and organic matter including filing the boxes. With all lead and lift etc. complete on site of road. (A) Kapchi and (B) Grit.

Stone chips shall consist of regular fragments of clean, hard, tough and durable rock of uniform quality throughout. They hall be obtained by crushing rock, and shall be free of belonged and flaky, pieces soft and disintegrated materials, and vegetable or deleterious matter. They shall satisfy the quality requirements set for the as under:

Sr. No.	Test	Test method	Requirements
1.	Los Angeles Abrasion value	*IS: 2386(Part IV)	35 % Maximum
2.	Aggregate impact value*	IS: 2385	30 % Maximum
3.	Flakiness Index	IS: 2386(Part I)	30 % Maximum
4.	Stripping value	IS: 6241	5 % Maximum
5.	Water Absorption	IS: 2386(Part III)	2 % Maximum

***** Aggregates may satisfy requirements of either of the two tests.

Size of the stone chips shall be as under:

Kapachi: 12mm size: Passing 20mm sieve and retained on 10mm sieve.

Grit: 5mm size: Passing 10mm sieve and retained on 2.36mm sieve.

The samples of stone chips collected from approved quarries shall be got tested at Government recognised laboratory as may be directed to the contractors. The test result shall conform to standard requirements laid down in para (i) above. Collection of stone ships as per approved samples shall be allowed by the Engineer-in-charge. Testing charges shall be borne by the contractor. Payment at full rates for the stone ships shall not be made till the test result from the laboratory are received and found acceptable.

Stacking shall be done by filling in standard steel boxes 2.0m X 1.5m X 0.5m size which shall be supplied by the Department if available on rent, otherwise contractor shall make his own arrangements. No deduction for voids shall be made from the gross measurements. Where any doubt exists as to whether the quantity of stacks in any hectometre is not confirming with cubic content of the standard pharas (2.5 X 1.5 X 0.5) shall be got corrected by the Contractor it so ordered by the Engineer-in-charge for which no extra payment shall be claimed by the Contractor. If the quantity in any stack in a particular hectometre is found to be less than the standard measurements viz., 1.5 centimetre the entire collection in the hectometre shall be done by the Contractor on a fairly level ground. Stacking shall be done in a manner as directed by the Engineer-in-charge.

The collection shall always commence at one end of the kilometre and be carried out continuously towards the other end, unless the Engineer-in-charge directs otherwise.

Control on quantity of materials shall be exercised by the Engineer-in-charge by carrying out the following test at the frequencies shown against each:

Sr. No.	Test	Test method	Requirements
1.	Black trap Grit / Kapachi for open graded carpet and seal coat	**(i)** Aggregate Impact Value	One test per 100 m centimetre of aggregate
		(ii) Flakiness Index of aggregate	One test per 100 m centimetre of aggregate
		(iii) Stripping value and water absorption of	Initially, one set of 3 representative specimens for each source of supply.

		aggregates	Subsequently when warranted by changes in the quality of aggregates.
		(iv) Grading of aggregate	One test per 100 m centimetre of aggregate

The payment shall be made on cubic meter as is without deduction for voids. The contractor shall be responsible for preserving the materials throughout the period the contract remains in force. The use of materials shall not be allowed till the materials are fully stacked and completed kilometre wise. The rate including cost of collection of material conveyance to the site with all lead and lift and filling boxes including all labour, tools, equipment and other incidental expenses.

ITEM 16 A Supplying and stacking 80/100 asphalt as per requirement including carting, stacking and protecting on road side etc. complete.

Bitumen shall be issued by the Department at the rate and place mentioned in Schedule 'A' of the tender. It shall have to be carted by the contractor to the site of work at his own cost. Empty asphalt drums shall have to be returned free of cost to P.W.D. store from where they are issued or as directed, if so provided in Schedule 'A'. Any damage caused to the asphalt drum or loss of asphalt after issue from the store shall be responsibility of the contractor drums of asphalt shall be so stored as to allow easy inspection and in such place as will not damage the drums and cause leakage or allow water and other foreign matter to enter. (Dilate may be included in labour).

Department in bulk at the rate and places as shown in Schedule A shall issue bitumen. For bulk asphalt contractor shall have to make adequate arrangement taking bulk asphalt at plant site according to requirement. Bulk asphalt shall be used as per instructions of the engineer-in-charge of work. The tanker of bulk asphalt should be unloaded in asphalt tank or in empty drums on site of work as directed. Proper rate for carting shall be deducted as per carting rate, if the bulk asphalt is given on site of work instead of place shown in Schedule-A. The contractor shall make the carting of bulk asphalt from Koyali Refinery as per Schedule-A

Keeping Records: - The department shall keep a day-to-day account of the supply and use of the asphalt in separate bound registers having numbered pages and in the Performa prescribed by the department. The contractor's responsible representatives shall also sign day-to-day in the register.

The payment shall be made on tonnage basis.

The contract unit rate for supplying bitumen shall include.

Obtaining the bitumen from the Department

Transporting to site

Storing stacking and protecting.

Keeping record of supply and use, and

Returning and handling over the drums in good condition to the Department, if so provided in Schedule 'A'.

ITEM 16 B Supplying and stacking 80/100 asphalt as per requirement including carting, stacking and protecting on road side etc. complete.

Bitumen shall be procured directly from refinery by the Contractor. The contractor shall make adequate arrangements for storing bulk asphalt at plant site. The contractor will produce in original the bill of Refinery, all the gate passes issued by the refinery and the number of transport tanker. The contractor will also produce the Test Certificate regarding the grade of asphalt issued by Refinery. The department does not undertake to furnish "P" form (Regarding Sales Tax Concessions) for purchase of asphalt.

On receipt and storage of bitumen, shall be got tested in GERI Laboratory or other Laboratories approved by R. & B. Department. The frequency of test is specified in Para 5.

The contractor will establish on site of work site laboratory in area not less than 25 Sq.m. with pucca construction and equipped with instruments to enable to carry out the following tests.

Penetration test as per I.S. 1203

Softing point test as per I.S. 1204

Ductility as per I.S. 1208

Viscocity test as per I.S. 1206

Specification Gravity test as for I.S. 1202

The above instruments shall be certified as per I.S. standard, the same should be regularly calibrated and should be maintained in efficient condition.

The registers for use, temperature and other quality requirements of bitumen will be maintained at plant site. The registers will be printed, as per formats approved by R. & B. Department and authorized for use by the Engineer-in-charge. The entries in the registers will be made by the departmental representative and signed by the contractor or his authorized representative.

Frequency of Tests: As regards quality of binder, three tests of one sample per two tankers will be done on plant site. The tests will be carried out as per Table 900.4 of section 900 of M.O.S.T. standard specifications. The frequency of use of specifications will be as under:

No. of Tanker	No. of Tests	No. of Tanker	No. of Tests
Up to 10	One	50 to 100	Four
11 to 20	Two	For further every 50 tanker	One
20 to 50	Three		

ITEM 17 2 cm. thick open graded premix carpet surfacing with 0.27 cum. Of stone chipping (12 mm. size 0.18 cum. And 10 mm. size 0.09 cum.) mixed with 14.4 Kg. Of bitumen per 10 Sq.m. of road surface excluding rolling and consolidation etc. complete. (stone chipping and bitumen shall be paid separately.)

The work shall consist of laying an open graded carpet of 2-cm thickness in a single course and seal coat (excluding coat of asphalt, stone chips and rolling) composed of suitable small sized aggregates premixed with a bituminous binder on a previously prepared base.

The material shall be proportional as per the quantity given in the following table:

Quantities of materials required for 10 Sq.m. of road surface for 2 Cm. Thick open graded premix carpet with seal coat.

Aggregate for Carpet:

Stone chipping …	12 mm size 6 mm size		0.18 Cubic Meter 0.09 Cubic Meter
Stone chipping …			
		Total:	**0.27 Cubic Meter**

Aggregate for Seal Coats:

(B) Stone Chipping …	6 mm. size		0.12 Cubic Meter

Binder for Premixing (Quantities in terms of straight run-bitumen)

(i) For Carpet For 0.18 centimetre of 12 mm size stone chipping at 52 Kg/centimetre For 0.18 centimetre of 6 mm size stone chipping at 64 Kg/centimetre		9.36 Kg. 5.04 Kg.
	Total:	**14.40 Kg.**
(ii) For Seal Coat For 0.122 Centimetre of 10 mm size Stone Chipping at 64 Kg/centimetre		7.68 Kg.

Carpet shall not be laid during rainy whether or when the base course is damp or wet or when the atmospheric temperature in shade is 16 degree centigrade or below.

The under laying base on which the bituminous carpet is to be laid shall be prepared, shaped and conditioned to the specified lines, grade and cross-section as directed by the Engineer-in-charge.

The surface shall be well cleaned with wire brushes, sweeping with brooms and finally dusting with stacks as necessary.

Tack coat: This work shall consist of application of a single coat of bituminous material to an existing road surface preparatory to another bituminous construction. The temperature of bitumen at the time of application shall be in the range of 160 degree centigrade to 175 degree centigrade.

Binder shall be heated to temperature appropriate to the grade of bitumen used and approved by the Engineer-in-charge at the rate specified below. The rate of spread in terms of straight run bitumen shall be 5 Kg, per 10 square meter area for surface untreated water bound macadam surface. The binder shall be applied just ahead of the incoming bituminous, construction. For the purpose of calculating consumption, wastage of bitumen will not be permitted beyond 2.5%. Excess consumption over 2.5% will be charged at panel rate.

Mixers of approved type shall be employed for mixing the aggregates with the bituminous binder. The binder shall be heated to the temperature approved by the Engineer-in-charge avoiding local overheating and ensuring a continuous supply. The aggregates shall be dry before they are placed in the mixer. After about 15 seconds of dry mixing, the heated binder shall be distributed over the aggregates at the rate specified. The contractor according to the requirement at the contractor's cost provides kerosene to an extent of 4% to 6% of asphalts. The mixing of binder with chipping shall be continued until the chipping is thoroughly coated with the binder. The mix shall be immediately transported from the mixer to the point of use in suitable vehicles or wheel borrows. The vehicles employed for transport shall be clean and be covered over in transit if so directed.

The premixed material shall be spread on the road surface with rakes to the required thickness and camber, or distributed evenly with the help of a drag spreader, without any undue loss of time. The camber shall be checked by means of camber boards and inequalities evened out. As soon as sufficient length of bituminous material has been laid, rolling shall commence (Rolling shall be done departmentally), when the roller has passed over the whole area once, any high spots or depressions which become apparent shall be corrected by removing or adding premixed materials. The contractor shall provide necessary labour for keeping the roller wheels damp during rolling so as to prevent the premix from adhering to the wheels and being picked up. The edges along the transverse of the carpet laid and compacted earlier shall be cut to their full depth so as to expose fresh surface which shall be painted with a thin surface coat of appropriate binder before the new mix is placed against.

Seal coat for preparation of premix and spreading etc. paras 7 & 8 above shall apply. The coat shall be applied immediately after the laying of the bituminous course of carpet. Before application of seal coat materials, surface shall be cleaned free of any dust or other extraneous matter.

Coarse sand or stone dust flushing at the rate of 0.03 Cmt/10 Sq.m. shall be done on asphalt surface, at the contractor's own cost.

Traffic may be allowed soon after final rolling when the premixed materials have cooled down to surrounding temperature.

Control of quality of works shall be exercised by the Engineer-in-charge by carrying out the following tests at the frequencies shown against each:

Sr. No.	Type of Construction Material	Test	Frequency
1.	Tack coat	(i) Binder temperature for application	At regular close interval
		(ii) Rate of spread of binder	Two tests per day
2.	Open graded premix carpet with seal coat	(i) Temperature of binder at application	At Regular close intervals
		Binder Content (vide ASTM: D. 2172)	Two tests per day for work of every 3 Km length in one lane.
		(iii) Rate of spread of mixed material	Regular control through checks on materials and

			layer thickness.

Paras 13 to 17: As regards arrangements for traffic paras 29 to 33 of semi dense carpet shall apply.
Open graded carpet and seal coat shall be measured in cubic meters on the basis of stone chips actually used.
The contract unit rate for open grade carpet and seal coat (excluding cost of asphalt, stone chips and rolling) shall be payment in full carrying out the required operations including full compensation for-

Preparation of base.
Providing all materials like fuel, lubricants, kerosene and coarse sand or stone dust for flushing with all leads, and lifts.
All labour, tools, equipments and incidentals.
Making arrangements for control and safety of traffic.

ITEM 18 Providing and laying 20 mm. thick bituminous open graded carpet with B.T. aggregate 0.66 cm/m.t. using bituminous for tack coat at the rate of … and for mixing at the rate of 32.8 Kg/M.T. of total mix I.E. 3.28 per M.T. of total mix and heating asphalt and aggregate by continuous batching hot mix plant and spreading the same by paver finisher including consolidation with power road roller including providing equipment T & P oil, fire wood, kerosene, labour charges etc. complete. Using contractor's own machineries hot mix plant and paver finisher including flushing of sand 0.30 Cmt/100 Sq.m.

The work shall consist of construction in a single course of 20/25 mm thick semi-dense carpet as course, on previously prepared base. Single course shall also include additional thickness if any to remove unevenness of the existing surface.
The coarse aggregate shall consist of crushed stone only. These shall be clean, strong, and durable, of fairly cubical shape, free of disintegrated pieces organic or other deleterious matter and adherent coatings. The aggregates shall preferably be hydrophobic and of low porosity and shall satisfy the physical requirements set forth as under:

Physical Requirements of B.T. Aggregates For Bituminous Macadam

Sr. No.	Test	Test Method	Requirements
1.	Los Angeles Abrasion Value*	IS: 2386 (Part-IV)	35 % Maximum
2.	Aggregate Impact Value*	IS: 2386 (Part-IV)	30 % Maximum
3.	Flakiness Index	IS: 2386 (Part-I)	30 % Maximum
4.	Stripping Value	IS: 6241	25 % Maximum
5.	Water Absorption	IS: 2386 (Part-II)	2 % Maximum

***** Aggregates may satisfy requirements of either of the two tests.

Fine aggregates shall consist of crusher run screenings, natural and or mixture of both. These shall be clean, hard, durable uncoated, dry and free from injurious, soft or flaky pieces and organic or deleterious substances.
The filter, where required shall be an inert material, the whole of which passes 600 micron sieve, at least 20 percent passing 150 micron sieve and not less than 70 percent passing 75 micron sieve. The filter shall be cement, stone dust hydrated lime or fly ash approved by the Engineer-in-charge.
The mineral aggregates, including mineral filter, shall be so graded or combined as to conform to the grading as under:

B. T. Aggregate Gradation for Semi-Dense Carpet

Sieve Designation	Percent by weight passing the sieve		Sieve Designation	Percent by weight passing the sieve	
	For 25 mm.	For 20 mm.		For 25 mm.	For 20 mm.

	thickness	**thickness**		**thickness**	**thickness**
20 mm	100	–	600 Micron	10-22	10-22
12.5 mm	75 – 100	100	300 Micron	6-16	6-16
10 mm	60 – 85	75 – 100	150 Micron	4-12	4-12
4.75 mm	35 – 55	35 – 55	75 Micron	2-8	2-8
2.36 mm	20 – 35	20 – 35			

The samples of aggregate of required grading for the work shall be got approved from the Engineer-in-charge prior to transportation and collection on plant site. Only approved material shall be transported and stacked as per requirement inferior materials shall have to be removed from the plant it by the contractor at his own cost. If contractor fails to remove the inferior type of materials from the plant site, the Department at the cost of the contractor will remove the same. Collection of aggregate shall be in different stacks according to various size of aggregate.

For the purpose of collection of materials, plant site shall be established at suitable places. Where hot mix plant shall be installed, Department will extend all necessary co-operation in helping contractor to get nearby Government land for establishing plant site. However department is not responsible if no such land is made available to the contractor and in that case, the contractor will have to make his own arrangement for the same. Incoming materials shall be recorded in a register for the purpose of record.

The binder shall be straight run bitumen of a suitable grade satisfying the requirements of IS: 73. Bitumen shall be 80/100 grade and shall be supplied by the Department at the rate and the place as mentioned in Schedule 'A' of the tender and it shall have to be carted by the Contractor to the site of work at his own cost. Empty asphalt drums shall have to be returned free of cost to P.W.D. store from where they are issued or as directed, if so provided in Schedule 'A'. Any damage caused to the asphalt drums or loss of asphalt after issue from store shall be responsibility of the contractor. Drums of asphalt shall be stored so as to allow easy inspection and in such place as will not damage the drums and cause leakage or allow water and other foreign matter to enter. For the purpose of calculating consumption, wastage will not be allowed beyond 2.5 percent. Excess consumption over 2.5 percent will be charged at a panel rate.

In case bitumen is to be issued by Department in bulk, at the rate & place as shown in Schedule 'A', Contractor shall have to make adequate arrangement for stacking bulk asphalt as plant site according to requirement.

The asphalt should not be used as a fuel. If however contractor is found to be using asphalt as fuel, the quantity of asphalt utilised shall be assessed by the Executive Engineer whose decision will be final and binding to the contractor who will be charged at double the rate provided in Schedule 'A' of the agreement even though the total consumption of asphalt may be within the theoretical consumption

Department shall keep a day account of the supply and consumption of bitumen in a separate bound register having numbered pages and the proformas prescribed by the Department. Day to day signature of the Contractor's representative shall be obtained in this register. Issue rate of bitumen includes

Obtaining asphalt from Department's store,
Transporting to site,
Storing and stacking,
Keeping records of supply and construction and
Returning the empty drums in good condition to the Department.

Semi dense carpet shall not be laid during rainy weather or when the base course is damp or wet and when air temperature is lower than 16 degree centigrade.

The base on which semi dense carpet is to be laid shall be thoroughly swept and scraped clean and free of dust and foreign matter.

The work shall consist of application of a single coat of bituminous materials to am existing road surface preparatory to another bituminous construction. The temperature of bitumen at the time of application shall be in the range of 160 degree centigrade to 175 degree centigrade.

Binder shall be heated to the temperature appropriate to the grade of bitumen used and approved by the Engineer-in-charge and sprayed on the base at the rates specified below. The rate of spread of straight run bitumen for tack coat shall be 5 Kg. per 10 square meter areas for existing bitumen treated surface. The binder shall be applied uniformly. The tack coat shall be applied just ahead of the on coming bituminous construction. In case carpet is to be laid on W.B.M surface, rate of spread of Bitumen for tack will be 5kg. /10Square metre

The binder content for premixing shall be 5.5 percent by weight of the total mix unless otherwise specified in item of Schedule - B the quantities of aggregates shall be sufficient to yield the specified thickness after compaction.

The contractor shall get the job-mix formula for the mix approved by the Engineer-in-charge before starting the work. In order to obtain the required type of mix, the department may change the proportion and grading of aggregate and contractor shall have to collect materials accordingly. In case of increase or decrease in proportion of bitumen the increased or decreased quantity will be adjusted at the rate provided in Schedule 'A'. The contractor shall have the responsibility of ensuring proper proportioning of materials in accordance with the approved job-mix formula and producing a uniform mix.

Hot mix plant of adequate capacity and capable of producing a proper and uniform quality shall be used for preparing the mix. The plant may be either a batch type or continuous one, having a co-ordinated set of essential units such as dryer for heating the aggregates, device for batching, feeding by weight or volume the required quantities of aggregate, a binder heating and control unit for metering out of the correct quantity of heated binder together with a paddle mixer for intimate mixing of the binder aggregates.

The temperature of binder at the time of mixing shall be in the range of 150-165 degree centigrade and of aggregate in the range 250-165 degree centigrade. Provided also that at no time shall the difference in temperature between the aggregates and the binder exceed 14 degree centigrade.

Mixing shall be through to ensure that a homogenous mixture is obtained in which all the particles of the mineral aggregates are coated uniformly.

The mix shall be transported from the mixing plant to the point of use in suitable vehicles. The vehicles employed for transport shall be clean and be covered over transit if so directed by the Engineer-in-charge.

The mix, transported from the hot mix plant to the site shall be spread by means of a self propelled mechanical paver with suitable screeds capable of spreading, tempting and finishing the mixture to specified grade lines and cross sections. The temperature of mix at the time of lying shall be in the range 121-163 degree centigrade.

Longitudinal joints and edges shall be constructed true to the delineating lines parallel to the centre line of the road. Longitudinal joints shall be offset by at least 150mm from those in the binder course. All joints shall be cut vertical to the full thickness of the previously laid mix and the surface painted with hot bitumen before placing fresh materials.

Immediately after the spreading of hot mix, it shall be thoroughly compacted by 8-10 tones 3 wheels roller moving at a speed not exceeding 5 Km per hour. Rolling temperature shall not be less than 100 degrees centigrade. In any case the rolling shall be completed before the temperature of mix falls to above 80 degree centigrade. The work of semi carpet shall be started before 8.00 A.M and shall not be continued after 6.30 P.M in summer and 4-30 P.M in winter, because required necessary temperature is not mantel except during this period. Moreover consolidation of spreaded material is also not done well. Every day Tonnage of Hot mix materials shall not be increase more than 240 MT. When work is going on, two rollers in a working position shall be kept for consolidation on the site work.

The roller wheels shall be kept damp to prevent the mix from adhering to them but in no case shall fuel-lubricating oil be used for this purpose. Rolling shall commence longitudinally from the edge and progress towards the centre line of the pavement. The roller should proceed on the fresh material with rear or fixed wheel leading so as to minimise the pushing of the mix and each pass of the roller shall uniformly overlap not less than one third of the track made in the preceding pass. Rolling shall continue until the entire surface has been rolled to compaction and all the roller marks eliminated.

Sand or stone dust flushing at the rate of 0.03 Cmt. /Sq.m. shall be done on asphalt surface for which no separate payment will be made.

Traffic may be allowed immediately after completion of the final rolling when the mix has cooled down to the surrounding temperature.

Surface finish and quality control of work: Control of the quality of material and work shall be exercised by the Engineer-in-charge by carrying out the following test at the frequencies shown against each:

Sr. No.	Type of Construction	Test	Frequency
1.	Tack Coat	Binder temperature for application Rate of spread of binder	At regular close intervals Two test per day
2.	Semi-Dense Carpet	(i) Aggregate Impact Value Flakiness Index of aggregate (i) Stripping Value (ii) Mix grading (iii) Control temperature of binder in boiler, aggregate in the dryer and mix at the time of laying & rolling (iv) Control of binder content and gradation in the mix (Binder content test vide ASTM-2172) Rate of spread of mixed material	One test per 100 Cubic Meter of Aggregate One test per 100 Cubic Meter of Aggregate One test per 100 Cubic Meter of Aggregate One set of tests on individual constituents and mixed aggregates from the dryer for each 100 tonnes of mix subject to a minimum of two tests per plant per day At regular close intervals One test for each 100 tonnes of mix subject to a minimum of two tests per day per plant Regular control through checks on layer thickness

The Contractor shall at all times carry out work on the highway in a manner creating least interference to the flow of traffic while consistent with the satisfactory execution of the same. For all works involving improvements to the existing highway, the contractor shall in accordance with the directions of the Engineer-in-charge, provide the maintain, during the execution of the work, a passage for traffic either along apart of the existing carriage way under improvement.

In case of the improvement works, namely widening, strengthening of the existing payment or reconstruction, repairs to cross-drainage works, where such works could be carried out on part widths at a time and the traffic could simultaneously be passed without undue delay and difficulty on the other part, the road shoulder shall be dressed and brought in the line with the pavement and maintained throughout the duration of the work to the satisfaction of the Engineer-in-charge. Where work is in continuous long stretches, passing places at least 20 meter long and 6 meter wide

inclusive of the width of the existing carriageway shall be provided at half to one kilometre intervals as directed by the Engineer-in-charge. Extra treatment to shoulders where necessary, shall be given as ordered by the Engineer-in-charge.

The contractor shall take all necessary measured for the safety of traffic during construction and provide, erect and maintain such barricades including signs, marking, lights and flagman as may be required by the Engineer-in-charge for the information and protection of traffic approaching or passing through the section of the highway under improvement. Before taking up any construction an agreed programme for the control of traffic on the highway shall be drawn up in consultation with the Engineer-in-charge.

The barricades erected on either side of the carriage way/portion of the carriageway closed to traffic shall be strong to resist violation and painted with alternate black and white stripes. Red lanterns or warning lights of similar type shall be mounted on the barricades at night and kept lit throughout from sunset to sunrise. At the points where traffic is to deviate from its normal path, the channel for traffic shall be clearly marked with the aid of pavement marking, painted drums or a similar device to the direction of the Engineer-in-charge. At night the passages shall be delineated with lanterns or other suitable light source.

One-way traffic operation shall be established whenever the traffic is to be passed over part of the carriageway inadequate for two-lane traffic. This shall be done with the help of flagmen kept positioned on opposite sides during all hours. For regulation of traffic, the flagmen shall be equipped with red and green flags and lanterns light height on both sides, suitable regulatory/warning signs shall be installed for the guidance of road users. On each approach at least two signs shall be put up, on close to the point where transition of carriageway begins and other 120 meters away. The signs shall be of approved design and of reflectory type if so directed.

The payment shall be made on the tonnage basis of the weight of mix aggregate and bitumen. For this purpose the contractor shall have to install a weigh of bridge of suitable capacity for the purpose of weighment of dumpers at suitable place at his own cost as directed. Weight of empty dumper and weight of loaded dumper and weight of loaded dumper will be recorded in bound and numbered register on plant site. Department will be free get some loaded will be free to get some loaded dumpers test checked at other weight bridges. Weight Bridge will be periodically got calibrated and verified from weight and measure authorities. For the purpose of application of tack if the theoretical area as per sanctioned estimate for basis of tonne differs with the actual area of work done in the field then, the reduction in, or addition to payment shall have to be effected to the contractor on pro-rata basis depending upon the area reduced or exceed respectively.

Weight of mix materials will be done in presence of responsible person, not less than the rank of Supervisor of Department and the measurements shall be recorded by the Deputy Engineer or Junior Engineer or Supervisor, if so authorised. Record of each dumper will be maintained separately in bound and numbered register, which will be maintained by the departmental representatives and signed by the contractor. Proper gate pass system shall be established for the vehicles coming to the plants site and out going from the plant site. The location of the hectometre in which individual dumpers are unloaded shall be recorded carefully.

The contract unit rate for semi dense carpet shall be paid in full for carrying out the required operation including full compensation for:

Making arrangements of control and safety of traffic.

Preparation of base.

Providing all materials to be incorporated in the works with all leads and lifts.

All labour, tools, equipments and incidental to complete the work to the specification.

ITEM 19 Semi design carpet.

(As standardised by R. & B. Circular No. SSR-1087-205 (21) (C) dated 29-10-1987)

DESCRIPTION: This work shall consist of construction in single course, of 20/25 mm thick semi-dense carpet as wearing course, on a previously prepared base, to the requirements of these specifications.

1. MATERIALS:

Binder: The binder shall be straight run bitumen of 60/70 or 80/100 grade satisfying the requirement of I.S.: 73 The actual grade of the binder to be used shall be decided by the Engineer-in-charge.

Coarse aggregates: The coarse aggregate shall consist of crushed stone or crushed gravel. These shall be clean, durable, of cubical shape, free disintegrated pieces, organic or other deleterious matter and adherent coatings. The aggregate shall preferably be hydrophobic and of low porosity and shall satisfy the physical requirements set forth in Table given Below:

2.2 Fine aggregate: The fine aggregates shall consist of crusher run screenings, natural sand or a mixture of both. These shall be clean, hard, durable, uncoated, dry and free from injurious, soft of flaky pieces and organic or deleterious substances.

Filler: The filler, where required, shall be an inert material the whole of which passes 600 micron sieve at least 90 percent passing 150 micron sieve and not less than 70 percent passing 75 micron sieve. The filler shall be cement, stone dust, hydrated lime, fly ash and other non-plastic mineral matter approved by the Engineer-in-charge.

Aggregate gradation: The mineral aggregates, including mineral filler, shall be so graded or combined as to conform to gradings set forth in tables below:

TABLE: - Aggregate Gradation For Semi-Dense Carpet

Sieve size	% By weight passing the Sieve		Sieve size	% By weight passing the Sieve	
	37.5	**75 mm**		**37.5**	**75 mm**
40 mm	-	100	-	-	-
25 mm	100	75-100	5.6 mm	20-40	15-35
20.0 mm	70-100	60-95	2.80 mm	5-20	5-20
10.0 mm	50-85	30-55	0.75 mm	0-5	0-5

Proportioning of materials: The binder content for premixing shall be 4.25 percent by weight of the total mix. The quantities of aggregate shall be sufficient to yield the specified thickness after compaction.

The contractor shall get the job-mix formula for the mix approved by the Engineer-in-charge before starting the work.

Variation in Proportioning of material: The Contractor shall have the responsibility of ensuring proper proportioning of materials in accordance with the approved job mix formula and producing a uniform mix. A variation in binder content of $\pm$ 0.3 percent by weight of total mix shall, however, be permissible in individual specimen taken for quality control tests vide MOST Specification Section 900.

CONSTRUCTION OPERATIONS:

Weather and seasonal limitation: Lean Bound Macadam shall not be laid during rainy weather or when the base course is damp or wet.

Preparation of base: The base on which LBM is to be laid shall be prepared shaped and conditioned to the specified, lines, grade and cross section accordance with MOST Specification Clause 601 as directed by the Engineer-in-charge. The surface shall be thoroughly swept and scraped clean and free of dust and foreign matter.

Tack coat: Application of binder: Binder shall be heated to the temperature appropriate to the grade of bitumen used and approved by the Engineer-in-charge and sprayed on the base at the rate specified hereafter. The rate of spread in terms of straight run bitumen shall be 5 Kg per 10 square meter area for an existing bitumen treated surface and 10 Kg per 10 square meter area for an untreated water bound macadam surface. The binder shall be applied uniformly with the aid of sprayers. At specified temperature, so as to provide uniformly rate and unbroken spread bitumen. The tack coat shall be applied just ahead of the oncoming bituminous construction.

Preparation of the mix: Hot mix plant of adequate capacity and capable of producing a proper and uniform quality shall be used for preparing the mix. The plant should be

continuous type having a co-ordinate set of essential units such as dryer for heating the aggregates, device feeding by weight or volume the required quantities of aggregates, a binder heating and control unit for metering out the correct quantity of heated binder together with a paddle mixer for intimately mixing of the binder and aggregates. For details regarding hot mix plant the Annexure 'A' may be referred.

The temperature of binder at the time mixing of mixing shall be in the range of 150' C-177' C and aggregates in the range of 150' C - 163' C provided also that at no time shall the difference in temperature of the aggregates and the binder exceed 14' C.

Mixing shall be through to ensure that a homogeneous mixture is obtained in suitable vehicles.

The practices of the mineral aggregates are coated uniformly.

The mix shall be transported from the mixing plant to the point of use in suitable vehicles. The vehicles employed for transport shall be clean and be covered over in the transit if so directed by the Engineer-in-charge.

3.1 Spreading: The mix, transported form the hot mix plant to the site, shall be spread by means of self propelled mechanical paver with suitable screens capable of spreading, tamping and finishing the mix, true to specified grade, line and cross sections. The temperature of mix at the time of lying shall be in the range of 121' C.163' C.

Longitudinal joints and edges shall be constructed true to the delineating lines parallel to the centre line of the road; longitudinal joints shall be offset by at least 150mm from those in the binder course. All joints shall be cut vertical to the full thickness of the previously laid mix and the surface painted with hot bitumen before placing fresh material.

3.2 Rolling: Immediately after the spreading of mix, it shall be thoroughly compacted by rolling with a set of rollers moving at a speed not exceeding 5 Km per hour. The initial or breakdown rolling shall be with 8-12 tonne three wheeled rollers and the surface finished by final rolling with 8-10 tonne tender rollers, or suitable pneumatic rollers.

The roller wheelers shall be kept damp to prevent the mix adhering to them but in no case shall fuel-lubricating oil be used for this purpose. Rolling shall commence longitudinally from the edge and progress towards the centre except that at super elevated portions, it shall progress from the lower to upper edges parallel to the centre line of the payment. The roller should proceed on the fresh material with rear or fixed wheel leading so as to minimise the pushing of the mix and each pass of the roller shall uniformly overlap not less than one third of the track made in the preceding pass Rolling shall continue until the entire surface has been rolled to compaction and all the roller marks eliminated.

OPENING TO TRAFFIC: Traffic may be allowed immediately after completion of the final rolling when the mix has cooled down to the surrounding temperature.

SURFACE FINISH AND QUALITY CONTROL OF WORK: The surface finish of construction shall conform to the requirements of most specification Clause 901 Control on the material and works shall be exercised by the Engineer-in-charge in accordance with MOST Specification Clause 902.

ARRANGEMENT FOR TRAFFIC: The provision of MOST Specification Clause 105 shall apply as regards the flow to traffic during construction.

MEASUREMENT FOR PAYMENT: The payment shall be made on the tonnage basis of the weight of mix of aggregates and bitumen. For this purpose the contractor shall have to install a weight bridge of suitable capacity for the purpose of weighment of dumpers at suitable place at his cost as directed. Weight of empty dumper and weight of loaded dumper will be recorded in bound and numbered register on plant side.

Department will be free to get some loaded dumper test checked at other weighbridge. Weigh bridge will be periodically got calibrated and verified from weight and measured authorities.

For the purpose of application of tack coat if the theoretical area as per sanctioned estimate for basis of tonne differs with the actual area of work done in the field, then the reduction in or addition to payment shall have to be effected to the contractor on proportionate basis depending upon the area reduce or exceeded respectively.

Weight of mix materials will be done in presence of responsible person, not less than the rank of supervisor of Department, Deputy Executive Engineer or Assistant Engineer or Additional Assistant Engineer if so authorised. Record of each dumper will be maintained separately in bound and numbered register, which will be maintained by departmental representatives and signed by the contractor. Proper gate pass system shall be established for the vehicles coming to the plant site. The location of the kilometre, hectometre in which individual dumper are unloaded will be recorded carefully.

RATE: The contract unit rate for L.B.M shall be for payment in full for carrying out the required operations including full compensation listed in MOST Specification Clause 503.8.

ANNEXURE - A
TECHNICAL REQUIREMENTS OF HOT MIX PLANT

Composition of plant: The Hot Mix Plant shall confirm generally to IS Specifications No. IS 3066/1965 as amended from time to time and shall be equipped with the following arrangements:

Cold Aggregate Feeder: The cold aggregate feeder shall have minimum three independent bins or compartment, each provided with accurate mechanical pre-determined rate to the cold elevator or to some intermediate conveyor or directly in to the dryer. The feeder shall provide for the adjustments of total and proportional feed and shall be capable of being locked in any setting.

Dryer: The dryer shall be capable of continuously agitating the aggregates while heating to the desired temperature. At the discharge end of the dryer or any other suitable location, means shall be provided for ascertaining the temperature of the heated aggregate.

2. **Screening Unit and Gradation Control:** The dried aggregate shall be screened into not less than three sizes. The plant shall include means for accurately proportioning each bin size of aggregate either by weight or volumetric measurement. When the gradation control is by volume, the until shall include a feeder mounted under the compartment bins. Each bin shall have an accurately controlled, individual gate to form an orifice for proportioning the material drawn from each respective bin compartment. The orifice shall have positive mechanical adjustment and provided with a lock Indicators shall be provided on each gate to show the opening in centimetres.
3. **Mixer Unit:** The plant shall include a mixer of an approved twin shaft pug mill type capable of producing a uniform mix. If not enclosed, the mixer box shall be equipped with a dust hood to prevent lost of fines.
4. **Mineral Filler Supply Unit:** There shall be an independent arrangement to feed mineral filler directly in to the pug mill. The hopper to bin for mineral filler shall provide for the adjustment to proportion the feed with the aggregate and bitumen feeds and shall be capable of being locked in any setting.
5. **Bitumen Heating:** A heating system for bitumen always with effective and positive control of temperature shall be provided, to maintain proper temperature and for allowing continuous circulation between storage tank and proportioning units during the entire operating period. Suitable arrangements shall be provided for recording the temperature at the tanks and in the circulating system
6. **Synchronization:** For Synchronization of Aggregate. Bitumen and filler feeds satisfactory means shall be provided to afford positive inter-locking control between the flow of aggregate from the bins or compartment flow of bitumen from the tank and flow of mineral filler.

ITEM 20 40mm. thick asphalt concrete.

DESCRIPTION: The work shall consist of construction in a single course, of 40 mm thick-asphalted concrete as wearing surface, on previously prepared base to the requirements of these Specifications.

1. **MATERIALS:**

Binder: The binder shall be straight run bitumen of 60/70 or 80/100 grade satisfying the requirement of I.S.: 73 The actual grade of the binder to be used shall be decided by the Engineer-in-charge and it shall have to be brought by the contractor to the site of work at his own cost.

Coarse aggregates: The coarse aggregate shall consist of crushed stone or crushed gravel. These shall be clean, durable, of cubical shape, free disintegrated pieces, organic or other deleterious matter and adherent coatings. The aggregate shall preferably be hydrophobic and of low porosity and shall satisfy the physical requirements set forth in Table given Below:

2.2 Fine aggregate: The fine aggregates shall consist of crusher run screenings, natural sand or a mixture of both. These shall be clean, hard, durable, uncoated, dry and free from injurious, soft of flaky pieces and organic or deleterious substances.

Filler: The filler, where required, shall be an inert material the whole of which passes 600 micron sieve at least 90 percent passing 150 micron sieve and not less than 70 percent passing 75 micron sieve. The filler shall be cement, stone dust, hydrated lime, fly ash and other non-plastic mineral matter approved by the Engineer-in-charge.

Aggregate gradation: The mineral aggregates, including mineral filler, shall be so graded or combined as to conform to gradings set forth in tables below:

Sieve size	% By weight passing the Sieve		Sieve size	% By weight passing the Sieve	
	37.5	**75 mm**		**37.5**	**75 mm**
40 mm	-	100	-	-	-
25 mm	100	75-100	5.6 mm	20-40	15-35
20.0 mm	70-100	60-95	2.80 mm	5-20	5-20
10.0 mm	50-85	30-55	0.75 mm	0-5	0-5

Proportioning of materials: The binder content for premixing shall be 3.0 percent by weight of the total mix.

The quantities of aggregate shall be sufficient to yield the specified thickness after compaction. The contractor shall get the job-mix formula for the mix approved by the Engineer-in-charge before starting the work.

Variation in Proportioning of material: The Contractor shall have the responsibility of ensuring proper proportioning of materials in accordance with the approved job mix formula and producing a uniform mix. A variation in binder content of $\pm$ 0.3 percent by weight of total mix shall, however, be permissible in individual specimen taken for quality control tests vide MOST Specification Section 900.

CONSTRUCTION OPERATIONS:

Weather and seasonal limitation: Lean Bound Macadam shall not be laid during rainy weather or when the base course is damp or wet.

Preparation of base: The base on which LBM is to be laid shall be prepared shaped and conditioned to the specified, lines, grade and cross section accordance with MOST Specification Clause 601 as directed by the Engineer-in-charge. The surface shall be thoroughly swept and scraped clean and free of dust and foreign matter.

Tack coat: Application of binder: Binder shall be heated to the temperature appropriate to the grade of bitumen used and approved by the Engineer-in-charge and sprayed on the base at the rate specified hereafter. The rate of spread in terms of straight run bitumen shall be 5 Kg per 10 square meter area for an existing bitumen treated surface and 10 Kg per 10 square meter area for an untreated water bound macadam surface. The binder shall be applied uniformly with the aid of sprayers. At specified temperature, so as to provide uniformly rate and unbroken spread bitumen. The tack coat shall be applied just ahead of the oncoming bituminous construction.

Preparation of the mix: Hot mix plant of adequate capacity and capable of producing a proper and uniform quality shall be used for preparing the mix. The plant should be continuous type having a co-ordinate set of essential units such as dryer for heating the aggregates, device feeding by weight or volume the required quantities of aggregates, a binder heating and control unit for metering out the correct quantity of heated binder together with a paddle mixer for intimately mixing of the binder and aggregates. For details regarding hot mix plant the Annexure 'A' may be referred.

The temperature of binder at the time mixing of mixing shall be in the range of 150' C-177' C and aggregates in the range of 150' C - 163' C provided also that at no time shall the difference in temperature of the aggregates and the binder exceed 14' C.

Mixing shall be throughout to ensure that a homogeneous mixture is obtained in which all the particles of the mineral aggregates are coated uniformly.

The mix shall be transported from the mixing plant to the point of use in suitable vehicles. The vehicles employed for transport shall be clean and be covered over in the transit if so directed by the Engineer-in-charge.

Spreading: The mix, transported form the hot mix plant to the site, shall be spread by means of self propelled mechanical paver with suitable screens capable of spreading, tamping and finishing the mix, true to specified grade, line and cross sections. The temperature of mix at the time of lying shall be in the range of 121' C.163' C.

Longitudinal joints and edges shall be constructed true to the delineating lines parallel to the centre line of the road; longitudinal joints shall be offset by at least 150mm from those in the binder course. All joints shall be cut vertical to the full thickness of the previously laid mix and the surface painted with hot bitumen before placing fresh material.

3.1 Rolling: Immediately after the spreading of mix, it shall be thoroughly compacted by rolling with a set of rollers moving at a speed not exceeding 5 Km per hour. The initial or breakdown rolling shall be with 8-12 tonne three wheeled rollers and the surface finished by final rolling with 8-10 tonne tender rollers, or suitable pneumatic rollers.

The roller wheelers shall be kept damp to prevent the mix adhering to them but in no case shall fuel-lubricating oil be used for this purpose. Rolling shall commence longitudinally from the edge and progress towards the centre except that at super elevated portions, it shall progress from the lower to upper edges parallel to the centre line of the payment. The roller should proceed on the fresh material with rear or fixed wheel leading so as to minimise the pushing of the mix and each pass of the roller shall uniformly overlap not less than one third of the track made in the preceding pass Rolling shall continue until the entire surface has been rolled to compaction and all the roller marks eliminated.

OPENING TO TRAFFIC: Traffic may be allowed immediately after completion of the final rolling when the mix has cooled down to the surrounding temperature.

SURFACE FINISH AND QUALITY CONTROL OF WORK: The surface finish of construction shall conform to the requirements of most specification Clause 901 Control on the material and works shall be exercised by the Engineer-in-charge in accordance with MOST Specification Clause 902.

ARRANGEMENT FOR TRAFFIC: The provision of MOST Specification Clause 105 shall apply as regards the flow to traffic during construction.

MEASUREMENT FOR PAYMENT: The payment shall be made on the tonnage basis of the weight of mix of aggregates and bitumen. For this purpose the contractor shall have to install a weight bridge of suitable capacity for the purpose of weighment of dumpers at suitable place at his cost as directed. Weight of empty dumper and weight of loaded dumper will be recorded in bound and numbered register on plant side.

Department will be free to get some loaded dumper test checked at other weighbridge. Weigh bridge will be periodically got calibrated and verified from weight and measured authorities.

For the purpose of application of tack coat if the theoretical area as per sanctioned estimate for basis of tonne differs with the actual area of work done in the field, then the reduction in or addition to payment shall have to be effected to the contractor on proportionate basis depending upon the area reduce or exceeded respectively.

Weight of mix materials will be done in presence of responsible person, not less than the rank of supervisor of Department, Deputy Executive Engineer or Assistant Engineer or Additional Assistant Engineer if so authorised. Record of each dumper will be maintained separately in bound and numbered register, which will be maintained by departmental representatives and signed by the contractor. Proper gate pass system shall be established for the vehicles coming to the plant site. The location of the kilometre, hectometre in which individual dumper are unloaded will be recorded carefully.

RATE: The contract unit rate for L.B.M shall be for payment in full for carrying out the required operations including full compensation listed in MOST Specification Clause 503.8.

ITEM 21 Providing and laying bituminous 37.5mm. thick lead lean bound macadam in one or two layers considering 0.66 Cu.m. per M.T. mix materials which machine

crushed stone aggregate and asphalt for tack coat @ the rate of 4 Kg./10 Sq.m. (on metalled surface)/2.5 Kg. Per 10 Sq.m. (on aggregate, heating the asphalt including mixing by continuous batching of hot mix plant and spreading the same by paver finisher and consolidation with power roller including providing all equipment by the contractor and flushing sand at the rate of 0.30 Cu.m./10 Sq.m.

DESCRIPTION: The work shall consist of construction in one layers each 37.5 mm thick LBM on previously prepared base, to the requirements of these specifications.

1. MATERIALS:

Binder: The binder shall be straight run bitumen of 60/70 or 80/100 grade satisfying the requirement of I.S.: 73 The actual grade of the binder to be used shall be decided by the Engineer-in-charge and it shall have to be brought by the contractor to the site of work at his own cost.

Coarse aggregates: The coarse aggregate shall consist of crushed stone or crushed gravel. These shall be clean, durable, of cubical shape, free disintegrated pieces, organic or other deleterious matter and adherent coatings. The aggregate shall preferably be hydrophobic and of low porosity and shall satisfy the physical requirements set forth in Table given Below:

2.2 Fine aggregate: The fine aggregates shall consist of crusher run screenings, natural sand or a mixture of both. These shall be clean, hard, durable, uncoated, dry and free from injurious, soft of flaky pieces and organic or deleterious substances.

Filler: The filler, where required, shall be an inert material the whole of which passes 600 micron sieve at least 90 percent passing 150 micron sieve and not less than 70 percent passing 75 micron sieve. The filler shall be cement, stone dust, hydrated lime, fly ash and other non-plastic mineral matter approved by the Engineer-in-charge.

Aggregate gradation: The mineral aggregates, including mineral filler, shall be so graded or combined as to conform to gradings set forth in tables below:

Table : Aggregate gradation for LBM

Sieve size	% By weight passing the Sieve		Sieve size	% By weight passing the Sieve	
	37.5	**75 mm**		**37.5**	**75 mm**
40 mm	-	100	-	-	-
25 mm	100	75-100	5.6 mm	20-40	15-35
20.0 mm	70-100	60-95	2.80 mm	5-20	5-20
10.0 mm	50-85	30-55	0.75 mm	0-5	0-5

Proportioning of materials: The binder content for premixing shall be 3.0 percent by weight of the total mix. The quantities of aggregate shall be sufficient to yield the specified thickness after compaction.

The contractor shall get the job-mix formula for the mix approved by the Engineer-in-charge before starting the work.

2.1 Variation in Proportioning of material: The Contractor shall have the responsibility of ensuring proper proportioning of materials in accordance with the approved job mix formula and producing a uniform mix. A variation in binder content of $\pm$ 0.3 percent by weight of total mix shall, however, be permissible in individual specimen taken for quality control tests vide MOST Specification Section 900.

CONSTRUCTION OPERATIONS:

Weather and seasonal limitation: Lean Bound Macadam shall not be laid during rainy weather or when the base course is damp or wet.

Preparation of base: The base on which LBM is to be laid shall be prepared shaped and conditioned to the specified, lines, grade and cross section accordance with MOST Specification Clause 601 as directed by the Engineer-in-charge. The surface shall be thoroughly swept and scraped clean and free of dust and foreign matter.

Tack coat: Application of binder: Binder shall be heated to the temperature appropriate to the grade of bitumen used and approved by the Engineer-in-charge and sprayed on the base at the rate specified hereafter. The rate of spread in terms of straight run bitumen shall be 5 Kg per 10 square meter area for an existing bitumen treated surface and 10 Kg per 10 square meter area for an untreated water bound macadam surface. The binder shall be applied uniformly with the aid of sprayers. At specified temperature, so as to provide uniformly rate and unbroken spread bitumen. The tack coat shall be applied just ahead of the oncoming bituminous construction.

Preparation of the mix: Hot mix plant of adequate capacity and capable of producing a proper and uniform quality shall be used for preparing the mix. The plant should be continuous type having a co-ordinate set of essential units such as dryer for heating the aggregates, device feeding by weight or volume the required quantities of aggregates, a binder heating and control unit for metering out the correct quantity of heated binder together with a paddle mixer for intimately mixing of the binder and aggregates. For details regarding hot mix plant the Annexure 'A' may be referred.

The temperature of binder at the time mixing of mixing shall be in the range of 150' C-177' C and aggregates in the range of 150' C - 163' C provided also that at no time shall the difference in temperature of the aggregates and the binder exceed 14' C.

Mixing shall be throughout to ensure that a homogeneous mixture is obtained in which all the particles of the mineral aggregates are coated uniformly.

The mix shall be transported from the mixing plant to the point of use in suitable vehicles. The vehicles employed for transport shall be clean and be covered over in the transit if so directed by the Engineer-in-charge.

Spreading: The mix, transported form the hot mix plant to the site, shall be spread by means of self propelled mechanical paver with suitable screens capable of spreading, tamping and finishing the mix, true to specified grade, line and cross sections. The temperature of mix at the time of lying shall be in the range of 121' C.163' C.

Longitudinal joints and edges shall be constructed true to the delineating lines parallel to the centre line of the road; longitudinal joints shall be offset by at least 150mm from those in the binder course. All joints shall be cut vertical to the full thickness of the previously laid mix and the surface painted with hot bitumen before placing fresh material.

3.1 Rolling: Immediately after the spreading of mix, it shall be thoroughly compacted by rolling with a set of rollers moving at a speed not exceeding 5 Km per hour. The initial or breakdown rolling shall be with 8-12 tonne three wheeled rollers and the surface finished by final rolling with 8-10 tonne tender rollers, or suitable pneumatic rollers.

The roller wheelers shall be kept damp to prevent the mix adhering to them but in no case shall fuel-lubricating oil be used for this purpose. Rolling shall commence longitudinally from the edge and progress towards the centre except that at super elevated portions, it shall progress from the lower to upper edges parallel to the centre line of the payment. The roller should proceed on the fresh material with rear or fixed wheel leading so as to minimise the pushing of the mix and each pass of the roller shall uniformly overlap not less than one third of the track made in the preceding pass Rolling shall continue until the entire surface has been rolled to compaction and all the roller marks eliminated.

OPENING TO TRAFFIC: Traffic may be allowed immediately after completion of the final rolling when the mix has cooled down to the surrounding temperature.

SURFACE FINISH AND QUALITY CONTROL OF WORK: The surface finish of construction shall conform to the requirements of most specification Clause 901 Control on the material and works shall be exercised by the Engineer-in-charge in accordance with MOST Specification Clause 902.

ARRANGEMENT FOR TRAFFIC: The provision of MOST Specification Clause 105 shall apply as regards the flow to traffic during construction.

MEASUREMENT FOR PAYMENT: The payment shall be made on the tonnage basis of the weight of mix of aggregates and bitumen. For this purpose the contractor shall have to install a weight bridge of suitable capacity for the purpose of weighment of dumpers at suitable place at his

cost as directed. Weight of empty dumper and weight of loaded dumper will be recorded in bound and numbered register on plant side.

Department will be free to get some loaded dumper test checked at other weighbridge. Weigh bridge will be periodically got calibrated and verified from weight and measured authorities.

For the purpose of application of tack coat if the theoretical area as per sanctioned estimate for basis of tonne differs with the actual area of work done in the field, then the reduction in or addition to payment shall have to be effected to the contractor on proportionate basis depending upon the area reduce or exceeded respectively.

Weight of mix materials will be done in presence of responsible person, not less than the rank of supervisor of Department, Deputy Executive Engineer or Assistant Engineer or Additional Assistant Engineer if so authorised. Record of each dumper will be maintained separately in bound and numbered register, which will be maintained by departmental representatives and signed by the contractor. Proper gate pass system shall be established for the vehicles coming to the plant site. The location of the kilometre, hectometre in which individual dumper are unloaded will be recorded carefully.

In case of LBM, DBM and asphalted concrete of thickness 50mm and above, initial levels before commencement of the work and final levels before commencement of the work and final levels after completion of the work will be taken as indicated below for working out the average thickness of pavement laid, also the actual area of work done will be measured and the quantity of the work actually done shall be computed in Cu.m. Basis. The actual tonnage of the mix shall then be worked out based on the designed density, for broad crosscheck on the actual tonnage of total mix used in the works.

Surface levels before and after laying the pavement course shall be taken as below:

For single lane: Levels at 15 centimetres & 75 centimetres from both the edges and centre point (Levels at 5 points)

For double lane: Levels at 15 centimetres & 75 centimetres 175 centimetres 275 centimetres from both the edges and the centre point (Levels at 9 points)

Widening single to double lane: Levels at 15 centimetres from both the edges and the centre Carriage way (Up to 2 meters widening) point (Levels at 3 points)

However, in special cases if necessary, the cross profiles may be taken at closer length up to 3 meters.

RATE: The contract unit rate for L.B.M shall be for payment in full for carrying out the required operations including full compensation listed in MOST Specification Clause 503.8.

ITEM 22 DBM – 50mm thick.

DESCRIPTION: The work shall consist of construction in one layers each 37.5 mm thick LBM on previously prepared base, to the requirements of these specifications.

1. MATERIALS:

2.1 Binder: The binder shall be straight run bitumen of 60/70 or 80/100 grade satisfying the requirement of I.S.: 73 The actual grade of the binder to be used shall be decided by the Engineer-in-charge and it shall have to be brought by the contractor to the site of work at his own cost.

2.2 Coarse aggregates: The coarse aggregate shall consist of crushed stone or crushed gravel. These shall be clean, durable, of cubical shape, free disintegrated pieces, organic or other deleterious matter and adherent coatings. The aggregate shall preferably be hydrophobic and of low porosity and shall satisfy the physical requirements set forth in Table given Below:

2.3 Fine aggregate: The fine aggregates shall consist of crusher run screenings, natural sand or a mixture of both. These shall be clean, hard, durable, uncoated, dry and free from injurious, soft of flaky pieces and organic or deleterious substances.

2.4 Filler: The filler, where required, shall be an inert material the whole of which passes 600 micron sieve at least 90 percent passing 150 micron sieve and not less than 70 percent passing 75 micron sieve. The filler shall be cement, stone dust, hydrated lime, fly ash and other non-plastic mineral matter approved by the Engineer-in-charge.

2.5 Aggregate gradation: The mineral aggregates, including mineral filler, shall be so graded or combined as to conform to gradings set forth in tables below:

Sieve size	% By weight passing the Sieve	Sieve size	% By weight passing the Sieve	
25 mm	100	10 mm	35 – 60	
20 mm	70 – 100	4.75 mm	15 – 35	
12.5 mm	55 – 80	2.60 mm	5 – 20	
		0.75 mm	0 – 5	5-20

Proportioning of materials: The binder content for premixing shall be 3.0 percent by weight of the total mix. The quantities of aggregate shall be sufficient to yield the specified thickness after compaction.

The contractor shall get the job-mix formula for the mix approved by the Engineer-in-charge before starting the work.

2.1 Variation in Proportioning of material: The Contractor shall have the responsibility of ensuring proper proportioning of materials in accordance with the approved job mix formula and producing a uniform mix. A variation in binder content of $\pm$ 0.3 percent by weight of total mix shall, however, be permissible in individual specimen taken for quality control tests vide MOST Specification Section 900.

CONSTRUCTION OPERATIONS:

3.1 Weather and seasonal limitation: Lean Bound Macadam shall not be laid during rainy weather or when the base course is damp or wet.

3.2 Preparation of base: The base on which LBM is to be laid shall be prepared shaped and conditioned to the specified, lines, grade and cross section accordance with MOST Specification Clause 601 as directed by the Engineer-in-charge. The surface shall be thoroughly swept and scraped clean and free of dust and foreign matter.

3.3 Tack coat: Application of binder: Binder shall be heated to the temperature appropriate to the grade of bitumen used and approved by the Engineer-in-charge and sprayed on the base at the rate specified hereafter. The rate of spread in terms of straight run bitumen shall be 5 Kg per 10 square meter area for an existing bitumen treated surface and 10 Kg per 10 square meter area for an untreated water bound macadam surface. The binder shall be applied uniformly with the aid of sprayers. At specified temperature, so as to provide uniformly rate and unbroken spread bitumen. The tack coat shall be applied just ahead of the oncoming bituminous construction.

3.4 Preparation of the mix: Hot mix plant of adequate capacity and capable of producing a proper and uniform quality shall be used for preparing the mix. The plant should be continuous type having a co-ordinate set of essential units such as dryer for heating the aggregates, device feeding by weight or volume the required quantities of aggregates, a binder heating and control unit for metering out the correct quantity of heated binder together with a paddle mixer for intimately mixing of the binder and aggregates. For details regarding hot mix plant the Annexure 'A' may be referred.

The temperature of binder at the time mixing of mixing shall be in the range of 150' C-177' C and aggregates in the range of 150' C - 163' C provided also that at no time shall the difference in temperature of the aggregates and the binder exceed 14' C.

Mixing shall be throughout to ensure that a homogeneous mixture is obtained in which all the particles of the mineral aggregates are coated uniformly.

The mix shall be transported from the mixing plant to the point of use in suitable vehicles. The vehicles employed for transport shall be clean and be covered over in the transit if so directed by the Engineer-in-charge.

Spreading: The mix, transported form the hot mix plant to the site, shall be spread by means of self propelled mechanical paver with suitable screens capable of spreading, tamping and

finishing the mix, true to specified grade, line and cross sections. The temperature of mix at the time of lying shall be in the range of 121' C.163' C.

Longitudinal joints and edges shall be constructed true to the delineating lines parallel to the centre line of the road; longitudinal joints shall be offset by at least 150mm from those in the binder course. All joints shall be cut vertical to the full thickness of the previously laid mix and the surface painted with hot bitumen before placing fresh material.

3.1 Rolling: Immediately after the spreading of mix, it shall be thoroughly compacted by rolling with a set of rollers moving at a speed not exceeding 5 Km per hour. The initial or breakdown rolling shall be with 8-12 tonne three wheeled rollers and the surface finished by final rolling with 8-10 tonne tender rollers, or suitable pneumatic rollers.

The roller wheelers shall be kept damp to prevent the mix adhering to them but in no case shall fuel-lubricating oil be used for this purpose. Rolling shall commence longitudinally from the edge and progress towards the centre except that at super elevated portions, it shall progress from the lower to upper edges parallel to the centre line of the payment. The roller should proceed on the fresh material with rear or fixed wheel leading so as to minimise the pushing of the mix and each pass of the roller shall uniformly overlap not less than one third of the track made in the preceding pass Rolling shall continue until the entire surface has been rolled to compaction and all the roller marks eliminated.

OPENING TO TRAFFIC: Traffic may be allowed immediately after completion of the final rolling when the mix has cooled down to the surrounding temperature.

SURFACE FINISH AND QUALITY CONTROL OF WORK: The surface finish of construction shall conform to the requirements of most specification Clause 901 Control on the material and works shall be exercised by the Engineer-in-charge in accordance with MOST Specification Clause 902.

ARRANGEMENT FOR TRAFFIC: The provision of MOST Specification Clause 105 shall apply as regards the flow to traffic during construction.

MEASUREMENT FOR PAYMENT: The payment shall be made on the tonnage basis of the weight of mix of aggregates and bitumen. For this purpose the contractor shall have to install a weight bridge of suitable capacity for the purpose of weighment of dumpers at suitable place at his cost as directed. Weight of empty dumper and weight of loaded dumper will be recorded in bound and numbered register on plant side.

Department will be free to get some loaded dumper test checked at other weighbridge. Weigh bridge will be periodically got calibrated and verified from weight and measured authorities.

For the purpose of application of tack coat if the theoretical area as per sanctioned estimate for basis of tonne differs with the actual area of work done in the field, then the reduction in or addition to payment shall have to be effected to the contractor on proportionate basis depending upon the area reduce or exceeded respectively.

Weight of mix materials will be done in presence of responsible person, not less than the rank of supervisor of Department, Deputy Executive Engineer or Assistant Engineer or Additional Assistant Engineer if so authorised. Record of each dumper will be maintained separately in bound and numbered register, which will be maintained by departmental representatives and signed by the contractor. Proper gate pass system shall be established for the vehicles coming to the plant site. The location of the kilometre, hectometre in which individual dumper are unloaded will be recorded carefully.

In case of LBM, DBM and asphalted concrete of thickness 50mm and above, initial levels before commencement of the work and final levels before commencement of the work and final levels after completion of the work will be taken as indicated below for working out the average thickness of pavement laid, also the actual area of work done will be measured and the quantity of the work actually done shall be computed in Cu.m. Basis. The actual tonnage of the mix shall then be worked out based on the designed density, for broad crosscheck on the actual tonnage of total mix used in the works.

Surface levels before and after laying the pavement course shall be taken as below:

For single lane: Levels at 15 centimetres & 75 centimetres from both the edges and centre point (Levels at 5 points)

For double lane: Levels at 15 centimetres & 75 centimetres 175 centimetres 275 centimetres from both the edges and the centre point (Levels at 9 points)

Widening single to double lane: Levels at 15 centimetres from both the edges and the centre Carriage way (Up to 2 meters widening) point (Levels at 3 points)

However, in special cases if necessary, the cross profiles may be taken at closer length up to 3 meters.

RATE: The contract unit rate for L.B.M shall be for payment in full for carrying out the required operations including full compensation listed in MOST Specification Clause 503.8.

ITEM 23 Providing and laying seal coat with 0.18 Cu.m. stone chips I.E. 0.2727 M.T. per 10 Sq.m. using 42.50 Kgs. of bitumen per M.T. (4.25% by weight) for mixing the aggregate, heating the asphalt including mixing by continuous batching of hot mix plant and spreading the same by paver finisher and consolidation with power roller including providing all equipments by the contractor and flushing sand at the rate of 0.30 Cu.m./100 Sq.m.

DESCRIPTION: The work shall consist of construction in a single course, of 40 mm thick-asphalted concrete as wearing surface, on previously prepared base to the requirements of these Specifications.

1. MATERIALS:

Binder: The binder shall be straight run bitumen of 60/70 or 80/100 grade satisfying the requirement of I.S.: 73 The actual grade of the binder to be used shall be decided by the Engineer-in-charge and it shall have to be brought by the contractor to the site of work at his own cost.

Coarse aggregates: The coarse aggregate shall consist of crushed stone or crushed gravel. These shall be clean, durable, of cubical shape, free disintegrated pieces, organic or other deleterious matter and adherent coatings. The aggregate shall preferably be hydrophobic and of low porosity and shall satisfy the physical requirements set forth in Table given Below:

2.2 Fine aggregate: The fine aggregates shall consist of crusher run screenings, natural sand or a mixture of both. These shall be clean, hard, durable, uncoated, dry and free from injurious, soft of flaky pieces and organic or deleterious substances.

Filler: The filler, where required, shall be an inert material the whole of which passes 600 micron sieve at least 90 percent passing 150 micron sieve and not less than 70 percent passing 75 micron sieve. The filler shall be cement, stone dust, hydrated lime, fly ash and other non-plastic mineral matter approved by the Engineer-in-charge.

Aggregate gradation: The mineral aggregates, including mineral filler, shall be so graded or combined as to conform to gradings set forth in tables below:

Sieve size	% By weight passing the Sieve	% By weight passing the Sieve
12.5 mm	-	100
10 mm	100	70 – 100
4.75 mm	40 – 85	20 – 40
2.35 mm	5 – 20	5 – 20
75 micron	0 – 4	0 – 4

Proportioning of materials: The binder content for premixing shall be 3.0 percent by weight of the total mix.

The quantities of aggregate shall be sufficient to yield the specified thickness after compaction. The contractor shall get the job-mix formula for the mix approved by the Engineer-in-charge before starting the work.

Variation in Proportioning of material: The Contractor shall have the responsibility of ensuring proper proportioning of materials in accordance with the approved job mix formula and producing a uniform mix. A variation in binder content of $\pm$ 0.3 percent by weight of

total mix shall, however, be permissible in individual specimen taken for quality control tests vide MOST Specification Section 900.

CONSTRUCTION OPERATIONS:

Weather and seasonal limitation: Lean Bound Macadam shall not be laid during rainy weather or when the base course is damp or wet.

Preparation of base: The base on which LBM is to be laid shall be prepared shaped and conditioned to the specified, lines, grade and cross section accordance with MOST Specification Clause 601 as directed by the Engineer-in-charge. The surface shall be thoroughly swept and scraped clean and free of dust and foreign matter.

Tack coat: Application of binder: Binder shall be heated to the temperature appropriate to the grade of bitumen used and approved by the Engineer-in-charge and sprayed on the base at the rate specified hereafter. The rate of spread in terms of straight run bitumen shall be 5 Kg per 10 square meter area for an existing bitumen treated surface and 10 Kg per 10 square meter area for an untreated water bound macadam surface. The binder shall be applied uniformly with the aid of sprayers. At specified temperature, so as to provide uniformly rate and unbroken spread bitumen. The tack coat shall be applied just ahead of the oncoming bituminous construction.

Preparation of the mix: Hot mix plant of adequate capacity and capable of producing a proper and uniform quality shall be used for preparing the mix. The plant should be continuous type having a co-ordinate set of essential units such as dryer for heating the aggregates, device feeding by weight or volume the required quantities of aggregates, a binder heating and control unit for metering out the correct quantity of heated binder together with a paddle mixer for intimately mixing of the binder and aggregates. For details regarding hot mix plant the Annexure 'A' may be referred.

The temperature of binder at the time mixing of mixing shall be in the range of 150' C-177' C and aggregates in the range of 150' C - 163' C provided also that at no time shall the difference in temperature of the aggregates and the binder exceed 14' C.

Mixing shall be throughout to ensure that a homogeneous mixture is obtained in which all the particles of the mineral aggregates are coated uniformly.

The mix shall be transported from the mixing plant to the point of use in suitable vehicles. The vehicles employed for transport shall be clean and be covered over in the transit if so directed by the Engineer-in-charge.

Spreading: The mix, transported form the hot mix plant to the site, shall be spread by means of self propelled mechanical paver with suitable screens capable of spreading, tamping and finishing the mix, true to specified grade, line and cross sections. The temperature of mix at the time of lying shall be in the range of 121' C.163' C.

Longitudinal joints and edges shall be constructed true to the delineating lines parallel to the centre line of the road; longitudinal joints shall be offset by at least 150mm from those in the binder course. All joints shall be cut vertical to the full thickness of the previously laid mix and the surface painted with hot bitumen before placing fresh material.

3.1 Rolling: Immediately after the spreading of mix, it shall be thoroughly compacted by rolling with a set of rollers moving at a speed not exceeding 5 Km per hour. The initial or breakdown rolling shall be with 8-12 tonne three wheeled rollers and the surface finished by final rolling with 8-10 tonne tender rollers, or suitable pneumatic rollers.

The roller wheelers shall be kept damp to prevent the mix adhering to them but in no case shall fuel-lubricating oil be used for this purpose. Rolling shall commence longitudinally from the edge and progress towards the centre except that at super elevated portions, it shall progress from the lower to upper edges parallel to the centre line of the payment. The roller should proceed on the fresh material with rear or fixed wheel leading so as to minimise the pushing of the mix and each pass of the roller shall uniformly overlap not less than one third of the track made in the preceding pass Rolling shall continue until the entire surface has been rolled to compaction and all the roller marks eliminated.

OPENING TO TRAFFIC: Traffic may be allowed immediately after completion of the final rolling when the mix has cooled down to the surrounding temperature.

SURFACE FINISH AND QUALITY CONTROL OF WORK: The surface finish of construction shall conform to the requirements of most specification Clause 901 Control on the material and works shall be exercised by the Engineer-in-charge in accordance with MOST Specification Clause 902.

ARRANGEMENT FOR TRAFFIC: The provision of MOST Specification Clause 105 shall apply as regards the flow to traffic during construction.

MEASUREMENT FOR PAYMENT: The payment shall be made on the tonnage basis of the weight of mix of aggregates and bitumen. For this purpose the contractor shall have to install a weight bridge of suitable capacity for the purpose of weighment of dumpers at suitable place at his cost as directed. Weight of empty dumper and weight of loaded dumper will be recorded in bound and numbered register on plant side.

Department will be free to get some loaded dumper test checked at other weighbridge. Weigh bridge will be periodically got calibrated and verified from weight and measured authorities.

For the purpose of application of tack coat if the theoretical area as per sanctioned estimate for basis of tonne differs with the actual area of work done in the field, then the reduction in or addition to payment shall have to be effected to the contractor on proportionate basis depending upon the area reduce or exceeded respectively.

Weight of mix materials will be done in presence of responsible person, not less than the rank of supervisor of Department, Deputy Executive Engineer or Assistant Engineer or Additional Assistant Engineer if so authorised. Record of each dumper will be maintained separately in bound and numbered register, which will be maintained by departmental representatives and signed by the contractor. Proper gate pass system shall be established for the vehicles coming to the plant site. The location of the kilometre, hectometre in which individual dumper are unloaded will be recorded carefully.

RATE: The contract unit rate for L.B.M shall be for payment in full for carrying out the required operations including full compensation listed in MOST Specification Clause 503.8.

ITEM 24 Special conditions for bituminous surface work use of hot mix plant & paver finisher.

Hot mix plant and the accessories to be used for the work shall be conformity with the specification prescribed vide Government of India. Ministry of Transport Circular No.RW/RMP/1613784 Date. 1-1-187. The plant shall be equipped with all unit and accessories as per latest I.S. 3066/1965, as amended from time to time. The contractors will have to modify their plants suitably within a period of six months from the date of issue of latest I.S. Specification or codes.

The work of laying aggregate mixed with bitumen shall start on site of work only after 8.00 hours in the morning and continue up to 17:00 hours is winter season and up to 18:30 hours in summer. No work shall be done except during the period mentioned above and also on Sundays and National holiday viz. 26th January, 15th August & 2nd October.

Quantity of bituminous aggregate mix to be laid shall be restricted to 250 tons per day for 30/40 capacity plants and may be more or less depending upon the rated capacity of the plant.

The work of laying asphalt mix shall start latest within 60 days from the date of issue of work order and will be completed as per time limit. Reasons for delay in starting of work after 60 days shall result into sufficient cause for levying compensation disproportionate progress. However, the period from 15th June to 15th October being monsoon shall not be counted for the purpose of disproportionate progress and consequent cause for levy of compensation. The contractors shall commence the work of laying pavement on or before the last date of the period mentioned above, failing which he shall pay compensation of not less than Rs. 500/- per day every day that he shall delay the commencement of the work as above in accordance with Clause-2 of the contract.

The contractor shall invariably get the job mix formula at his own cost for the mix approved by the Engineer-in-charge before staring the work.

These special conditions shall be applicable to the specifications of all the items included in this contractor where work is to be carried out with hot mix plant and paver finisher.

SCHEDULE OF WORK TO BE EXECUTED SHALL BE AS UNDER

Time Limit: -

Sr. No.	Period	Description of items
1.	Month … Month	Collection of Materials on site
2.	From Month 2 to 4 Month	Erection of Plant Machinery as required
3.	From Month … to … Month	Laying of asphalting work carpet & Seal coat & Flushing of sand over surface, side with filling with earth as required and directed.

ITEM 25 Dismantling [Road and bridge items].

This work shall consist of removing, as hereinafter set forth, existing culverts bridges, pavement, kerbs and other structures like guards-rails, fences utility poles, manholes, catch basin, inlets etc. which are in place but interfere with the new construction or not suitable to remain in place and of salvaging and disposing of the resulting materials and back filling the resulting trenches and pits.

Existing culverts, bridges, pavements and other structures which are within the highway and which are designated to be removed, shall be removed up to the limits and extent specified in the drawings or as indicated by the Engineer-in-charge.

Dismantling and removal operations shall be carried out with such equipment and such a manner as to leave undisturbed, adjacent pavement, structures and other work to be left in place.

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

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

Unless otherwise specified, the superstructure portion of culverts/bridges shall be entirely removed and other parts removed to below the ground level or as necessary depending upon the interference they cause to the new construction. Removal of overlaying 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 structures shall be removed as are necessary to provide a proper connection to the new work. The connecting edges shall be cut, chipped and trimmed to the required lines and grades without weakening or damaging any part of the structure to be retained. Reinforcing bars, which are to be left in place so as to project into new work as dowels or ties, shall not be injured during removal of concrete.

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 manner as to avoid damage to members thereof. If specified in the drawing or directed by the Engineer-in-charge that structure be 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, an pin hole and machined surfaces shall be painted with a mixture of white lead and tallow and all loose parts shall be securely wired to adjacent members or packed in boxes.

Timber structures shall be removed in such manner as to avoid damage to such timber or lumber as is designated by the Engineer-in-charge to be salvaged.

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

All concrete pavement base course in carriage way and shoulders etc. designated for removal shall be broken to pieces whose volumes shall not exceed 0.02 cubic meter and stock piled at designated locations if the materials is to be used later otherwise arranged for disposal as directed.

Where directed by the Engineer-in-charge hole and depressions caused by dismantling operations shall be backfilled with excavated or other approved material and thoroughly compacted in the line with surrounding area.

All materials obtained by dismantling shall be the property of Government. Unless otherwise specified, materials having any savage value shall be placed in neat stacks of like materials within the right-of-way as directed by the Engineer-in-charge, for which contractor will remain responsible for its safe custody and preservation for 60 days after recording measurements of the salvaged materials.

Pipe culverts that are removed shall be cleared and neatly piled on the right-of-way at points designated by the Engineer-in-charge.

Structural steel removed from old structures shall unless otherwise specified or directed, be stored in a neat and presentable manner on blocking in locations suitable for loading. Structures or portions thereof, which are specified in the contract for re-erections, shall be stored in separate piles.

Timber or lumber from old structures, which is designed by the Engineer-in-charge as materials to be salvaged, shall have all rails and bolts removed there from and shall be stored in neat piles in locations suitable for loading.

All the products of dismantling operations, which in the opinion of the Engineer-in-charge cannot be used or auctioned, shall be disposed as directed, within 100 meters.

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

Dismantling brick/concrete (Plain and Reinforced) masonry	Cubic Meter
Dismantling flexible and cement concrete pavement	Cubic Meter
Dismantling steel structure	Tonne
Dismantling timber structure	Cubic Meter
Dismantling pipes, guard rails kerbs, gutters and fencing	Linear Meter
Utility poles	Nos.

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

ITEM 26 Excavation for foundation up to 1.5 M. depth including sorting out and stacking of useful material and disposing stuff 50 metre lead. (A) In loose or soft soil (B) In dense or hard soil.

Excavation for structures shall consist of the removal of material for the construction of foundations for bridges, culverts, retaining walls, head walls, cut off walls, pipe culverts and other similar structures, in accordance with requirements, of these specifications and the lines and dimension shown on the drawings or as indicated by the Engineer-in-charge. The work shall be include all necessary sheeting, shoring, bracing, draining and pumping and the removal of all logs, stumps, shrubs and other deleterious matter and obstruction necessary for the foundations, trimming bottoms of excavations; back filling and clearing up the site and the disposal of all surplus material.

After the site has been cleared 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-in-charge. The contractor shall provide all labour, survey instruments and materials such as string, pegs nails bamboos, stones, lime, mortar, concrete, etc. required in connection with the setting out of works and the establishment of bench mark, centre line stones and other marks and stakes as long as in the opinion of the Engineer-in-charge, they are required for the work.

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

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 required changes, in which case the depth shall be as ordered by the Engineer-in-charge.

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

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

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

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 light to avoid accidents. The contractor shall take adequate protective measures to see that the excavation operations do not affect or damage adjoining structures.

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

All the excavated materials shall be the property of the Government where the excavated materials is to be used in the construction of embankment, it shall be directly deposited at the required location, within 100 meters lead.

All useful materials not intended for use in the bank, shall be stacked neatly on Government land as directed by the Engineer-in-charge within 100 meters lead. Unsuitable and surplus materials not intended for use shall be disposed off as directed by the Engineer-in-charge.

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

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

(i) Setting out and fixing bench marks and centre lines stones.

(ii) Construction of necessary shoring and bracing and their subsequent removal.

(iii) Removal of all logs, stumps, Grubs and other deleterious matter and obstructions for placing the foundations including trimming of bottoms of excavations.

(iv) Foundation sealing, dewatering including pumping.

(v) Back filling, clearing up the site and disposal of all surplus material within all lifts and lead up to 100 meters.

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

Excavation shall be for ordinary soil such as vegetation or organic soil, turf, sand, silt, loam, clay, mud, black cotton soil, soft shale or soft murrum, a mixture of these and similar material which yields to the ordinary application of pick and shovel, or other ordinary digging equipment. Removal of gravel or any other nodular material having diameter in any one direction not exceeding 75mm occurring in such strata shall be deemed to be covered under this category. The classification of excavation shall be decided by the Engineer-in-charge and his decision shall be final and binding on the contractor.

ITEM 27 –do– in hard murrum.

Para 1 to 13 of the item of excavation for foundation in all soft of soil shall apply.

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

ITEM 28 –do–in hard rock.

Para 1 to 13 of the item of excavation for foundation in all soft of soil shall apply.

14. Excavation shall be in soft rock such as limestone, sand stone leterite, conglomerate or other softer disintegrated rock which may be quarried or split with crow bars, boulders which do not requiring and any rock which in dry state may be hard, requiring blasting but which when wet becomes soft and manageable be means other than blasting. The classification of excavation shall be decided by the Engineer-in-charge and his decision shall be final and binding on the contractor.

ITEM 29 –do– in hard murrum.

Para 1 to 13 of the item of excavation for foundation in all soft of soil shall apply.

14. Excavation shall be in any rock or boulders having diameter in any one direction of more than 300mm for which the use of mechanical plant or blasting is required. The classification of excavation shall be decided by the Engineer-in-charge and his decision shall be final and binding on the contractor. Merely the use of explosive in excavation will not be considered as a reason for higher classification unless blasting is clearly necessary in the opinion of the Engineer-in-charge.

Where blasting is prohibited for any reason, chiselling shall carry out excavation, wedging or any other approved method.

Blasting shall be carried out only with the written permission of the Engineer-in-charge. All the statutory laws, regulation, rules, etc. pertaining to the acquisition, transport, storage, handling and use of explosives shall be strictly followed.

The contractor may adopt any method or methods of blasting consistent with the safety and job requirements, after approval from the Engineer-in-charge.

The magazine for storage of explosives shall be build to the design and specifications of the Explosives Department concerned and located at the approved site. No unauthorised person shall be admitted into the magazine which when not use shall be kept securely locked. No matches or inflammable material shall be allowed in the magazine. The magazine shall have any effective lightening conductor. The following shall be hung in the lobby of magazine.

(a) A copy of the relevant rules regarding safe storage both in English and in the language with which the workers concerned is familiar.

(b) A statement of up-to-date stock in the magazine.

(c) A certificate showing the last date of testing of the lightening conductor.

(d) A notice that smoking is strictly prohibited.

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

All the materials, tools and equipment used for blasting operations shall be of approved type. The Engineer-in-charge may specify the type of explosive to be allowed in special cases. The fuse to be used in wet locations shall be sufficiently water-resistant as to be unaffected when immersed in water for 30 minutes. The rate of burning of the fuse shall be uniform and definitely known to permit such a safe length being cut as will permit sufficient time to the firer to reach to place of safety before explosion takes place. Detonators shall be capable of giving effectives blasting of the explosives. The blasting powder, explosive detonators, fuses, etc., shall be fresh and not damaged due to damp, moisture or, any other cause. They shall be inspected totally and removed immediately, if found unsuitable.

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

The blasting shall be carried out during fixed hours of the day preferably during the mid-day luncheon hour or at the close of the work as ordered in writing by the Engineer-in-charge. The hours shall be made known to the people in the vicinity. The man in charge shall prepare all the charges only.

Red danger flags shall be displayed permanently in all directions during the blasting operations. People, except those who actually light the fuse, shall be prohibited from entering this area. The flags shall be planted 200 meters from the blasting site in all directions and all persons including workmen shall be excluded from the flagged area at least 10 minutes before the firing, a warning whistle being sounded for the purpose.

The charge holes shall be drilled in suitable places to required depths. Blasting should be as light as possible consistent with thorough breakage of the material necessary for economic loading and hauling. Any method of blasting which leads to over-shooting 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 in. the powder shall be gently tamped with copper rods with rounded ends. The explosive powder shall then be covered with tamping materials, which shall be tamped light but firmly.

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 $1/3^{rd}$ of copper tube exposed outside. The paper of the cartridges shall then be closed up and securely bound with wire, or twine. The primer shall be housed into the explosive. Bore holes shall be of such size that the cartridge can easily go down. The holes shall be cleared of all debris and explosive inserted. The space of about 20 cm above the charge shall then be gently packed with a wooden rammer.

At a time, not more than 10 such charges will be prepared and fired. The main in charge shall blow a whistle in a recognised manner of cautioning the people. All the people shall then be required to move to safe distance. The man in charge shall light the 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.

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

Sufficient time shall be allowed to account for the delayed blast. The main in charge shall inspect all the charges and determine the missed charges.

If it is the blasting powder charge it shall be completely flooded with water. A new hole shall be drilled at about 45 cm from the old hole and fired this should be repeated till the old charge is blasted.

In case of charges of gelatine, dynamite etc., the main in charge shall gently remove the tamping and the primer with the detonator. A fresh detonator and primer shall then be used to blast the charge alternatively; the hole may be cleared of 30 cm of tamping and the direction then ascertained by placing a stick in the hole. Another hole may than is drilled 15 cm away and parallel to it. This hole shall then be charged and fired when the misfired hole should explode at the same time. The man in charge shall at once report to the contractor's Officer and Engineer-in-charge all cases of misfire, the cause of 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-in-charge for inspection to ascertain whether all the remaining materials in the box are the also defective.

The contractor shall maintain a careful and day-to-day account of the explosive in an approved manner in a register, which shall be open to inspection by the Engineer-in-charge. At all times.

Excavation shall be measured after removal of over burden by taking cross-sections at suitable intervals in the original position before the work starts and after its completion and computing the volumes in cubic meters by the method of average areas. Where it is not feasible to compute volumes by this method because of erratic location of isolated deposits; the volumes shall be computed by other accepted method. At the option of the Engineer-in-charge, the contractor shall leave depth indicators during excavations of such shape and size, and in such positions as directed so as to indicate the original ground level as accurately as possible the contractor shall see that these remain intact till the final measurement are taken. 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 stacks of excavated rubble after making 40 percent deduction there from

ITEM 30 Providing and laying uncaused rubble masonry with hard stone of approved foundations and plinth in cement mortar 1:6 (1 cement: 6 course sand) including levelling up etc. complete.

1. Stone shall be hard, sound, free from cracks, decay and weathering and shall be freshly quarried from an approved quarry. Stone with round surface shall not be used. The stone when immersed in water for 24 hours shall not be absorb water by more than 5 percent of their dry weight when tested in accordance with IS: 1124. The length of stone shall not exceed three times its height and the breadth on base shall not be greater than three fourths of the thickness of wall nor less than 15 cm.

2. Cement and sand shall be mixed in proportion as specified in the item Cement and sand shall be proportioned by volume after making due allowance for bulking. The required quantity of water shall then be added and the mortar mixed to produce workable consistency.

3. The mixing shall be done intimately. The operation shall be carried out on a clean water tight platform, and cement and sand shall be first mixed dry in the required proportion to obtain a uniform colour and then the mortar shall be mixed for at least two minutes after addition of water. In case of cement mortar, that has stiffened because of evaporation of water the same shall be re-tempered by adding water as frequently as needed to restore the requisite consistency but this re-tempering shall be permitted only within thirty minutes from the time of addition of water at the time of initial mixing.

4. The dressing of stone shall conform to the general requirements for dressing of stone covered in IS 1129. Stones shall be sufficiently wetted before lying to prevent absorption of water from mortar. The bed, which is to receive the stone, shall be cleaned wetted and covered with a layer fresh mortar. All stones shall be laid full in mortar both in bed and in vertical joints and settled carefully in place with a wooden mallet immediately on placement so that it is solidity bedded in mortar before the same has set. Clean chips and spells are wedged into the mortar joints and beds wherever necessary to avoid thick beds or joints of mortar. Whenever foundation masonry is laid directly on rock, the face stones of the first course shall b e dressed to fit into the rock snugly when pressed down in the mortar bedding over the rock. No dry or hollow space shall be left anywhere in the masonry and each stone shall have all the embedded faces completely covered with mortar. Vertical joints shall be staggered as far as possible. Sufficient transverse bond shall be provided by the use of bond stones extending from the front to the back of the masonry. In case of thick walls bond stones shall overlap each other in their arrangements. Bell shaped bond stones or headers shall not be used.

5. At all angular junction stones at each alternate course shall be well bonded into the respective course of the adjacent wall. All connected masonry in structure shall be carried up to at one uniform level throughout as far as possible, but when breaks are unavoidable, the masonry shall be

raked in sufficient long steps to facilitate jointing of new work with old. The stepping of raking shall not be more than 45 degree with the horizontal wing walls. Abutments and piers, etc. shall be carried up truly plump of to the specified batter. Face work and hearting shall be brought up evenly. The top or each course. However shall not be levelled up by use of flat chips.

6. Stone shall be hammer dressed on the face, the sides and beds to enable it to come in proximity with the neighbouring stone. The bushing on the face shall not be more than 4cm on exposed face. Chips and spells of stone may be used wherever necessary to avoid thick mortar beds of joints and it shall also be ensured that no hollow spaces are left any where in the masonry. The chips shall not be used below hearing stone to bring these up to the level of face stone. Use of chips shall be restricted to filling of interstices between the adjacent stones in hearing and they shall not exceed 20 percent of the quantity of stone masonry.

7. The hearing or interior filling of wall face shall consist of rubble stones not less than 15 cm in any direction, carefully laid, hammered down with a wooden mallet into position and solidly bedded in mortar. The hearing should be laid, nearly level with facing and backing. Through bond stones shall be provided in masonry up to 60cm thickness a set of two or more bond stones overlapping each other at least by 15 cm shall be provided in a line from the face to back. In case of highly absorbent types of stone (porous lime stone and sand stones, etc.) the bond stone shall extend only about two-third into the wall, as through stone in such cases may give rise to penetration of dampness and, therefore, for all thickness of such masonry a set of two or more bond stone, overlapping each other by at least 15 cm shall be provided. One bond stone or a set of bond stones shall be provided for every 0.50 square meters of the masonry surface. Bond stones shall be stacked separately and marked to distinguish from the other stones. Masonry work shall be started after sufficient number of bond stones is collected on site as directed by the Engineer-in-charge.

8. The quoins shall be laid header and stretcher alternately. Every stone shall be fitted to the adjacent stone so as to form neat and close joint. Face stone shall extend and bond well in the back. These shall be arranged to break joints, as much as possible, and to avoid long vertical lines of joints.

9. The face joints shall not be less than 20mm thick, but shall be sufficiently thick to prevent stone to stone contact and shall be completely filled with mortar.

10. Green work shall be protected from rain by suitable covering. Masonry work in cement or composite mortar shall be kept constantly moist on all faces for a millennium period of seven days. The top of the masonry work shall be left flooded with water at the close of the day. During hot weather, all finished or partly completed work shall be covered or wetted in such manner as well as prevent rapid drying. The racking of joints where necessary shall be done at the end of day's work when mortar is green.

11. The scaffolding shall be sound and strong to withstand all loads likely to come upon it. The holes, which provide resting space for horizontal members, shall not be left in masonry under one meter in width or immediately near the skewbacks or arches. The holes left in the masonry work for supporting the scaffolding shall be filled and made good.

12. When fresh masonry is to be placed against existing surface of structures, these shall be cleaned of all loose material, roughened and wetted as directed by the Engineer-in-charge so as to affect a good bond with the new work.

13. Stone masonry shall be measured in cubic meters.

14. The contract unit for stone masonry work shall include the cost of labour, materials, tools and plants, scaffolding and other expenses incidental to the satisfactory completion of the work as described herein above.

ITEM 31 Providing and laying coursed rubble masonry hard stone of approved quality for super structure and plinth in cement mortar 1:5 (1 cement: 5 course sand).

Para 1 to 14 of the item of excavation for foundation in all soft of soil shall apply.

15. Masonry shall be laid with course; where there is variation is the height of course. Large courses shall be placed at lower levels with height of courses decreasing gradually towards the top.

16. In case of abutment and wing walls, weep holes shall be provided in the masonry to drain moisture from the back filling. Weep holes shall be 8-cm wide, 15cm diameters and shall extend through the full width of the masonry with slopes about 1 vertical to 20 horizontal towards the draining face.

The spacing of weep holes shall be generally one meter in either direction with lowest one at about 15 cm above the low water level or ground level whichever is higher or as directed by the Engineer-in-charge.

ITEM 32 Providing and laying brick work using common burnt clay building bricks having crushing strength not less then 35 Kg./Sq.m. in foundation and plinth in cement mortar 1:5 (1 cement: 5 fine sand).

Burnt clay bricks shall confirm to the requirements of IS: 1017, except that the minimum compressive strength when tested flat shall not be less than 35 kg/square cm and that the size may be according to local practice with a tolerance of 5 percent.

Cement and sand shall be mixed in proportion as specified in the item Cement and sand shall be proportioned by volume after making due allowance for bulking. The required quantity of water shall then be added and the mortar mixed to produce workable consistency.

The mixing shall be done intimately. The operation shall be carried out on a clean water tight platform, and cement and sand shall be first mixed dry in the required proportion to obtain a unit form colour and then the mortar shall be mixed for at least two minutes after addition of water. In case of cement mortar, that has stiffened because of evaporation of water the same shall be re-tempered by adding water as frequently as needed to restore the requisite consistency but this re-tempering shall be permitted only within thirty minutes from the time of addition of water at the time of initial mixing.

Bricks shall be socked in water for a minimum period of one hour before use. When bricks are soaked they shall be removed from the tank sufficiently in advance so that at the time of lying they are skin-dry. Such soaked bricks shall be stacked on a clean place where they are not spoilt by dirt, earth etc.

Bricks shall be laid in English bond, even and true to line, plump, level and all joints accurately kept. The bricks used on the face shall be selected whole ones of uniform size and with true rectangular face.

Bricks shall be laid frogs up, if any, on a full bed of mortar. When lying, bricks shall be slightly pressed so that the mortar gets into all the surface pores of bricks to ensure proper adhesion. All joints shall be properly flushed and packed with mortar so that no hollow spaces are left.

Before laying bricks in foundations, a layer of not less than 12mm of mortar shall be spread to make the surface on which the brickwork will be laid even.

The bricks shall be built in uniform layers; corners and other advanced work shall be raked back. Brickwork shall be done true to plump or in specified manner. No part of it, during construction, shall rise more than one meter above the general construction level, to avoid unequal settlement and improper joining.

Too thing may be done where future extension is contemplated but shall be used as an alternative to raking back.

The thickness of joints shall not exceed 12mm.

When fresh masonry is to be placed against existing surface of structures, these shall be cleaned of all loose material, roughened and wetted as directed by the Engineer-in-charge so as to affect a good bond with the new work.

Green work shall be protected from rain by suitable covering Masonry work in cement or composite mortar shall be kept constantly moist on all face for minimum period of seven days. The top of the masonry work shall be left flooded with water at the close of the day.

7.1 During hot weather, all finished or party completed work shall be covered or wetted in such manner as will prevent rapid drying of the brickwork.

The scaffolding shall be sound and strong to withstand all loads likely to come upon it. The holes, which provide resting space for horizontal members, shall not be left in masonry under one meter in width or immediately near the skew backs of arches. The holes left in the masonry work for supporting the scaffolding shall be filled and made good.

In case of abutment and wing walls, weep holes as shown on the drawings or directed by the Engineer-in-charge shall be provided in the masonry to drain moisture from the back filing. Weep holes shall be 1 cm wide, 15 cm high or circular of 5 cm diameter and shall extend through the full

width of the masonry with slope of about 1 vertical to 20 horizontal, towards the draining face. The space of weep holes shall be generally one m in either direction with the lowest one at about 15cm above the low water level or ground level whichever is higher or as directed by the Engineer-in-charge.

All brickwork shall be measured in cubic meters.

The contract unit for brick shall include the cost of all labour, materials, tools and plant, scaffolding and other expenses incident

ITEM 33 Supplying and fixing reinforced concrete heavy duty non – pressure pipes with collars for culverts carrying heavy traffic as per Indian railway standard specifications including setting the pipes in C.M. 1:2 watering and consolidation watering and laying (to level or slope) of class NP3 of following internal diameters. (I) 300mm. dia (II) 450mm. dia (III) 600mm. dia (IV) 750mm. dia (V) 900mm. dia (VI) 1050mm. dia (VII) 1200mm. dia.

1. The work shall consist of furnishing and installing reinforced cement concrete pipe of the type, diameter and length required at the location shown on the drawings or as ordered by the Engineer-in-charge.
2. Reinforced concrete pipes shall be of NP_3 type confirming to the requirements of IS: 458 and shall be of diameters as specified in the item Each consignment of cement concrete pipes shall be inspected, if necessary and approved by the Engineer-in-charge of the place of incorporation in the works.

NP3, NP2, NP1 pipes are used for R.C.C. Pipes. Where testing of pipes will not be feasible the contractors will have to produce a certificate from the manufactures on company's latter head the given hereinafter form.

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

FORM OF CERTIFICATE FOR NP 3, NP 2, NP 1 PIPES

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

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

Date: _____
Place: _____ Manufacturer's Sign.
_____

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

4. The pipes shall be jointed either by collar joint or by flush joint. In the former case, the collars shall be of R.C.C. 150 to 200 mm wide and having the same strength as the pipes to be jointed. Caulking space shall be between 13 to 20 mm according to the diameter of the pipes Caulking material shall be slightly wet mix of cement and sand in the ratio of 1:2 rammed with caulking irons. Before caulking the collar shall be so placed that its centre coincides with the joint and an even annular space is left between the collar and the pipes. Flush joint may be internal flush joint or external flush joint. In either case, ends of the pipes shall be specially shaped to form a self-centring joint with a jointing space 13 cm wide. The jointing space shall be filled with cement mortar. 1 cement to 2 sand, mixed sufficiently dry to remain in position when forced with a trowel or rammer. Care shall be taken to fit all voids and excess mortar shall be removed. All joints shall be made with care so that their interior surface is smooth and consistent with the interior surface of the pipes. After finishing the joints shall be kept covered and damp for at least four days.
5. R.C.C. pipes shall be measured along their centre between their inlet and outlet ends in linear meters.
6. The rate for the pipes will include the cost of pipe including, unloading, hauling, handling, storing, laying in position and jointing complete.

ITEM 34 Supplying and fixing reinforced concrete heavy duty non – pressure pipes with collars for culverts including setting and jointing the pipes in C.M. the pipes in C.M. 1:2 watering and laying (to level or slope) of I.S. class of NP2 of following internal diameter. (I) 300mm. dia (II) 450mm. dia (III) 600mm. dia (IV) 750mm. dia (V) 900mm. dia (VI) 1050mm. dia (VII) 1200mm. dia.

1. The work shall be carried out as per item of NP 3 pipes except that the pipes will be of NP 2 class instead of NP 3 class conforming to requirements of IS: 458 and of the dia. as specified in this item.

ITEM 35 Supplying and fixing NP1 class R.C.C. pipes.

1. The work shall be carried out as per item of NP 3 pipes except that the pipes will be ordinary irrigation pipes of NP 1 class instead of NP 3 class conforming to requirements of IS: 458 and of the dia. as specified in this item. Please see item no. 53 for detailed information.

ITEM 36 Filling arounds pipes with murrum including dressing, tampering etc. complete.

1. Area around pipes shall be filled with murrum, chhara or other gritty material immediately after the pipes have been laid and the jointing materials have hardened. The materials shall be clean free from boulders, large roots, excessive amount of sods or other vegetable matter, and lumps, and shall be approved by the Engineer-in-charge. Filling up to 0.3 meter above the top of the pipe shall be carefully and the soil thoroughly rammed, tamped or vibrated in layers not exceeding 150-mm particular care being taken to thoroughly consolidate the materials under the hunches of the pipes. Filling shall be carried out simultaneously on both sides of the pipe in such manner that unequal pressures do not occur. In case of high embankments, after filling up to the top of the above said manner a loose fill of a depth equal to external diameter of the pipe shall be placed over the pipe before furthers layers are added and compacted. Materials shall be filled in pharas 3m X 1.5 m X 0.5 m size and shall be measured in cubic meters. Unit rate includes cost of materials and spreading including labour and tools needed for the above operations.

ITEM 37 Providing and laying ordinary (unreinforced) concrete 1:2:4 (1 cement: 2 coarse sand: 4 crushed stone aggregate 20mm. nominal size) & curing complete including cost of formwork (without reinforcement).

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

In the designation of a concrete mix, letters 'M' refers to the mix and the number to the specified 28 days works cube compressive strength of that mix on 150 mm, cubes, expressed in kg. /Square Centimetres

The ordinary concrete mix shall generally be specified by volume. For element, which normally comes in bags and is used by weight, volume shall be worked out taking 50 kg. of cement as 0.035 cubic meter in volume. While measuring aggregate by volume, shaking, ramming or hammering shall not be done. Proportioning of sand shall be as per its dry volume. In case if is damp, allowance for 'bulking' shall be made as per IS. 2386 (Part iii).

Intergradient required for ordinary concrete one 50 kg. Bag of cement for different proportions of mix shall be as given in Table below:

TABLE

Grade of Concrete	**Mix by Volume**	**Total quantity of dry aggregate by volume per 50 Kg. of cement to be taken as sum of the individual vol. of fine & coarse aggregate max.**	**Proportion of the aggregate to coarse aggregate**	**Quantity of water per 50 kg. Of cement mix.**
		(1 Cubic Meter: 1000 Litres)		
		Litres		**Litres**
1	**2**	**3**	**4**	**5**
Ordinary M200	1:3:6	300	Generally 1:2 for fine agg. To coarse agg. by volume but sub. to a upper limit of 1:1.1/2 and A lower limit of 1:3 *	34
Ordinary M150	1:2:4	220		32
Ordinary M200	1:1.5:3	160		30
Ordinary M250	1:1:2	100		27

Note: The proportions of the aggregates shall be adjusted from upper limit to lower limit progressively as the grading of the final aggregate become larger.

Example: For an average grading of fine aggregate (that is Zone II of IS 383-1963) the proportions shall be 1:1.1/2, 1:2, and 1:3 for maximum size of aggregate 10mm 20mm and 40mm respectively.

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

Following shall be the maximum nominal size of course aggregate for the different items of work:

(i) Plain C. C. 63 mm
(ii) Solid type piers, abutments and wing walls, and their caps. 40 mm
(iii) C.C. wearing Coat M – 150 20 mm

Coarse aggregate of size up to 40 mm shall be machine crushed.

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

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

Cement shall be stored above the ground level in perfectly dry and watertight sheds and shall be stocked not more than eight bags high. Whenever bulk storage containers are used, their capacity should be sufficient to cater to the requirements at site and should be cleaned at least once every 3 to 4 month. Cement more 3 to 4 months old shall invariably be tested to ascertain that it satisfies the acceptability requirements. The aggregate shall be stored in such a way as to prevent admixture of foreign materials. Different size of fine or coarse aggregates shall be stored in separate stockpiles sufficiently removed from each other to prevent intermixing the materials at the edges of the piles.

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

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

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

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

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

If concreting is not started with 24 hours of the approval being given it shall have to be obtained again from the Engineer-in-charge. Concreting then shall be proceeding continuously over the area between construction joints. Fresh concrete shall not be placed against concrete which has been in position for more than 30 minutes unless a proper construction joint is formed, Concrete shall be compacted in its final position within 30 minutes of its discharge from the mixer unless carried in properly designed editors. Except where otherwise agreed to by the Engineer-in-charge concrete shall be deposited in horizontal layers to a compacted depth of not more than 0.45 meter when internals vibrators are used and not exceeding 0.30 meter in all other cases.

Unless otherwise agreed to by the Engineer-in-charge concrete shall not be dropped into place form a height exceeding 2 meters. When trucking of chutes are used they shall be kept clean and used in such a way as to avoid segregation. When concreting was to be resumed on a surface, which has hardened, it shall be roughened, swept clean, thoroughly wetted and covered with a 13 mm thick layer of mortar composed of cement and sand in the same ratio as in the concrete mix itself. This 13mm layer of mortar shall be freshly mixed and placed immediately before placing of new concrete. Where concrete has no fully hardened, all laitance shall be removed by scrubbing the wet surface with wire or bristle brushes, care being taken to avoid dislodgement of any particles of coarse aggregate. The surface shall then be thoroughly wetted all free water removed and then coated with neat cement grout. The first layer of concrete to be placed on this surface shall not exceed 150mm in thickness. And shall be well rammed against old work, particular attention being given to corners and close spots.

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

Immediately after compaction, concrete shall be protected against harmful effects of weather, including rain, running water, shocks, vibration traffic, rapid temperature changes, fast and drying

out process. It shall be covered with wet sacking Hessian or other similar absorbent material approved by the Engineer-in-charge soon after the initial set. It shall b e kept continuously wet for a period of not less than 14 days from the date of placement. Masonry work over the foundation concrete may be started after 48 hours of it's laying but the curing of concrete shall be continued for a minimum period of 14 days.

Formwork shall include all temporary or permanent forms required for forming the concrete, together with all temporary construction required for their support. Forms for concrete shall be constructed of metal or timber suitably lined and is of substantial and rigid construction true to shape and dimensions shown on the drawings. Where metal forms are used, all blots and rivets shall be counter sunk and well ground to provide a smooth, plane surface. Where timber is used it shall be well seasoned, free from loose knots, projecting nail, splits or other defects that may-mark the cement surface concrete. For exposed concrete faces, timber for shuttering shall be wrought on all faces in contact with concrete.

Forms shall be mortar tight and shall be made sufficiently rigid by the use ties and bracings to prevent any displacement or sagging between supports. They shall be strong enough to withstand all pressure, ramming and vibration, without deflection from the prescribed lines occurring during and after placing the concrete. Screw jacks or hardwood wedges where required shall be provided to make up any settlement in the framework either before or during the placing of concrete. Suitable camber shall be provided in horizontal members of structure, especially in long spans to counteract the effects of any deflection. The formwork shall be so fixed as to provide for such camber. Forms shall be so constructed as to be removable in sections in the desired sequence. Without damaging the surface of concrete or disturbing other sections. Unless otherwise specified or directed, chambers or fillets of sizes 25 mm X 25 mm shall be provided at all angles of form work to avoid sharp corners.

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

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

The contractor of his intention to strike any formwork shall inform the Engineer-in-charge in advance. While fixing the time for removal of form work, due consideration shall be given to local conditions, character of the structure, the weather and other conditions that influence the setting of concrete and of the materials used in mix. Where field operations are controlled by strength tests of concrete, the removal of the load-supporting of soffit forms may commence when concrete has attained strength equal to at least twice the stress to which the concrete will be subjected at the time of striking props including the effect of any further addition of loads. When field operations are not controlled by strength tests of concrete the vertical forms of beams, columns and walls may be removed after 2 days. The props of slabs and beams may be removed after 14 days and 21 days respectively. All formwork shall be removed without causing any damage

to the concrete. Cantering shall be gradually and uniformly lowered in such a manner as to avoid any shock of vibrations. Supports shall be removed in such manner as to permit the concrete to take stresses due to its own weight uniformly and gradually. Where internal metal ties are permitted they or they removable parts shall be extract without causing any damage to the concrete and remaining holes filled with mortar. No permanently embedded metal parts shall have less than 25 mm cover to the finished concrete surface. Where it is intended to reuse the formwork it shall be cleaned and made good to the satisfaction of the Engineer-in-charge.

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

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

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

ITEM 38 Providing and laying ordinary (reinforced) concrete 1:2:4 (1 cement: 2 coarse sand: 4 crushed stone aggregate 20mm. nominal size) & curing complete (excluding cost of reinforcement).

Para 1 to 25 of ordinary concrete [without reinforcement] shall apply.

In the case of reinforced concrete work workability shall be such that the concrete surrounds and properly grips all reinforcement. The degree of the consistency, which must depend upon, the nature of work and methods of vibration of concrete shall determined by regular slump tests. Following slump test shall be adopted for different types of work:

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

Maximum nominal size of the concrete aggregate shall be 20mm and shall be machine crushed.

Works strength tests shall be made in accordance with IS: 516. Each test shall be conducted on ten specimens; five of which shall be tested at seven days and the remaining five at 28 days. The samples of concrete shall be taken on each day of concreting and cubes shall be made at the rate of

one for every five cubic meter of concrete or a part there of. However, if concreting done in a day is less than 15 cubic meter, in minimum number of cube scan be reduced to 6, with the specific permission of Engineer-in-charge. Similar works tests shall be carried out whenever the quantity and gradation of materials is charged irrespective of the quality of concrete poured. The number of specimens may be suitably increased as deemed necessary by the Engineer-in-charge when procedure of tests given above reveals a poor quality of concrete and in other special cases.

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

The average strength of the group of cubes cast for each day shall not be less than the specified works cube strength. 20 % of the cubes cast for each day may have values less than the specified strength provided the lowest values is not less than 85 percent of the specified strength.

R.C.C. works shall have exposed concrete surface. Deputy Engineer-in-charge shall approve cantering design and its erection. One carpenter with helper will invariably be kept present through the period of concreting; movement of labour and other persons shall be totally prohibited over reinforcement laid in position. For access different parts, suitable platforms shall be provided so that steel reinforcement in position is no disturbed. For ensuring proper cover, mortar blocks of suitable size shall be cast tied to the reinforcement. Timber, Kapachi or metal pieces shall not be used for this purpose. Concreting of important structural members shall always be done in the presence and under the supervision of departmental persons not below the rank of Junior Engineer/Supervisor/Overseer. After removal of form work and shuttering the Executive Engineer shall inspect the work and satisfy by random checks that concrete produced is of good quality. Plastering shall not be allowed to the exposed faces of concrete.

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

ITEM 39 Providing steel reinforcement (a) providing and placing in position in mild steel bar reinforcement including cutting, bending, hooking & tying complete as per details. (b) high yield strength deformed bars reinforcement.

1. The work shall consist of furnishing and placing reinforcement to the shape and dimensions shown as on the drawings or as directed.

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

3. Reinforcing steel shall conform accurately to the dimension given in the bar bending schedules shown on relevant drawings. Bars shall be bend cold to specified shape and dimensions or as directed using a proper bar bender, operated by hand or power to attain proper radius of bends. Bars shall not be bent or straightened in a manner that will injure the material. Bars bent during transport or handling shall be straightened before being used on the work. They shall not be heated to facilitate bending. Unless otherwise specified, a 'U' type hook at the end of each bar shall invariably be provided to main reinforcement. The radius of the bend shall not be less than twice the diameter of the round bar and the length of the straight part of the bar beyond the end of the curve shall be at least four times the diameter of the round bar. In case of bars, which are not round, and in case of deformed bars, the diameter shall be taken as the diameter of circle having an equivalent effective area. The hooks shall be suitably encased to prevent any splitting of the concrete.

4. All the reinforcement bars shall be accurately placed in exact position shown on the drawings and shall be securely held in position during placing of concrete by annealed binding wire not less than 1 mm size, and by using stay blocks or metal chair spacers, metal hangers, supporting wires or other approved devices at sufficiently close intervals. Bars shall not be allowed to sag between supports nor displaced during concreting or any other operations of the work. All devices used for positioning shall be non-corrodible material. Wooden and metal supports shall not extend to the surface of concrete, except where shown on drawings. Placing bars on layers of freshly lay concrete, as the work progresses for adjusting bar spacing shall not allow. Pieces of broken stone or brick and wooden blocks shall not be used. Spacer bars, pre-cast mortar blocks or other

approved devices, shall separate layers of bars. Reinforcement after being placed in position shall be maintained in a clean condition until completely embedded in concrete. Special care shall be exercised to prevent any displacement of reinforcement in concrete already placed. To prevent reinforcement from corrosion, concrete cover shall be provided as indicated on drawings. All the bars protruding from concrete and to which other bars are to be spliced and which are likely to be exposed for a period exceeding 10 days shall be protected by a thick coat of neat cement grout.

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

6. As far as possible, bars of full length shall be used, In case this is not possible, overlapping of bars shall be done as directed. When practicable, overlapping bars shall not touch each other, but be kept apart by 25mm or 1.25 times the maximum size of the coarse aggregate whichever is greater by concrete between them Where not feasible, overlapping bars shall be bound with annealed wires not less than 1 mm thick twisted highlight The overlaps shall be staggered for deferent bears and located at points along the span where neither shear nor bending moment is maximum

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

8. When permitted or specified on the drawings, joints of reinforcement bars shall be butt-welded so as to transmit their full stresses. Welded joints shall preferably be located at points when steel will not be subject to more than 75 percent of the maximum permissible stresses and welds so staggered that at any one section not more than 20 percent of the rods are welded. Only electric arc welding using a process, which excludes air, forms the molten metal and conforms to any or all other special provisions for the work shall be accepted. Suitable means shall be provided for holding bars securely in position during welding. It shall be ensure that no voids are left in welding and when welding is done in two or three stages previous surface shall be cleaned properly. Ends of the bars shall be cleaned of all loose scale, rust, grease, paint and other foreign matter before welding. Only competent welders shall be employed on the work. The MS. electrodes used for welding shall conform to I. S. 814. Welded pieces of reinforcement shall be tested. Specimen shall be taken from the actual site and their number and frequency of test shall be as directed.

9. Wastage shall be permitted up to 5 percent maximum Useful pieces of steel, as may be decided by the Engineer-in-charge shall be taken back by the Government as issue rate and at P.W.D. store from where the steel was supplied. All the expenses of loading, carting, unloading and returning the waste will be borne by the contractor.

10. Reinforcement shall be measured in length separately for different diameters as actually used in the work. From the length so measured the weight of reinforcement shall be calculated in tonnes on the same basis of IS: 1732 even-though steel is supplied to the contractor by the authority department on actual weights. Length shall include hooks at ends. Wastage and annealed steel wire for binding shall not be measured and the cost of these items shall be deemed to be included in the rate for reinforcement.

11. Rate for reinforcement shall include cost of all steel, it's carting from P.W.D. Store to work site. It's bending, placing, binding and fixing in position as shown on the drawings and as directed by the Engineer-in-charge. It shall also include cost of all devices for keeping reinforcement in approved position, cost of joining as per approved method and all wastage and spacer bars, and also returning the useful wastage to the Department

ITEM 40 Providing cement pointing on uncoursed/coursed stone brick wall masonry with cement mortar 1:3 (1 cement: 3 sand) (A) Flush pointing (B) Ruled pointing.

For a surface, which is to be subsequently pointed, the joints shall be squarely raked to a depth of 15 mm while the mortar is steel green. The ranked joints shall be well brushed to remove dust and lose particles and the surface shall be thoroughly washed with the water, cleaned and wetted.

Cement and sand shall be mixed in proportions as specified in the item Cement and sand shall be proportioned by volume after making due allowance for bulking. The required quantity of water shall then be added and the mortar mixed to produce workable consistency.

The mixing shall be done intimately by hand mixing. The operation shall be carried out on a clean watertight platform, and cement and sand shall be first mixed dry in the required proportion to obtain a uniform colour and then the mortar shall be mixed for at least two minutes after addition of water. In case of cement mortar that has stiffened because of evaporation of water, the same shall be re-tempered by adding water as frequently as needed to restore the requisite consistency but this re-tempering shall be permitted only within thirty minutes from the time of addition of water at the time of initial mixing.

For pointing, the mortar shall be filled and pressed in to the raked out joints before giving the required finish. The pointing shall then be finished to proper type given on the drawings. If type of pointing is not, mentioned on the drawing the same shall be ruled pointing. For ruled pointing after the mortar has been filled and pressed in to the joints and finished off level with the edges of the bricks, it shall while steel green be ruled along the centre with a half round tool of such width as may be specified by the Engineer-in-charge. The superfluous mortar shall then be cut off the edges of the lines and the surface of the masonry shall also be cleaned of all mortar.

Curing shall be started as soon as the mortar used for finished has hardened sufficiently not to be damaged when watered. It shall be kept wet for a period of at least 7 days. During this period it shall be suitably protected from all damages.

Stage scaffolding shall be approved for the work. This shall be independent of the structure.

The work of pointing shall be measured in square meters of the surface treated.

The rate for pointing shall include erecting and removal of scaffolding, all labour, materials and equipment incidental to complete the pointing, raking out joints, cleaning, wetting, filling with mortar, trawling, pointing and watering.

ITEM 41 Providing and laying 22.50 Cms. thick rubble stone pitching including preparing surface, laying 15 Cms. thick murrum layer over prepared surface and arranging rubbles on it by hand packing and in level & lined surface in slope camber including the filling the interstices between adjacent stone by spauls of proper size & wedged for right packing as directed etc. complete without cement pointing.

The work shall consist of covering the slopes of guide banks, training works and road embankment with stone or boulder over a layer of murrum bedding.

Stone subject to marked deterioration by water of weather will not be accepted. The stone shall be sound, hard, durable and fairly regular in shape and its thickness in any one direction shall not be less than the thickness of pitching as specified in the item and thickness of the stone at any place shall not be less by 15 % of the thickness specified. The largest stones procurable shall be supplied on site. The sizes of spell shall be minimum 25mm and shall be suitable to fit the voids in the pitching. Thickness of the pitching shall be as specified in the item (G. C. No. SSR/2080/IB 547/28/C dated 6th March, 1982)

Before laying the pitching the sides of blanks shall be ermined to the required slope and profiles put up by means of line and pegs at intervals of 3 meters to ensure regular straight work and uniform slope throughout. Depressions shall be filled and thoroughly compacted.

Murrum for bedding shall be laid over the prepared base and suitably compacted to a thickness of 150 mm Quantity of murrum as will be as per its relevant specification.

The stone pitching shall commence in a trench below the top of the slope. Stone shall be placed by derrick or by hand to the required length, thickness and depth conforming to the drawings. Stones shall be set normal to the slope and placed so that the largest dimensions is perpendicular to the face of slope, unless such dimensions is greater than the specified thickness of pitching. The largest stones shall be placed in the bottom courses and for use as headers for subsequent courses. When full depth of pitching can be formed with a single stone, the stone shall be laid breaking joints and all interstices between adjacent stones shall be filled in with spells of the proper size and wedged in

with hammers to ensure tight packing. Pitching shall be done in panels of 3.0 M X 3.0 M with a 30 CM deeper band, around.

Payment shall be made on Square Meter basis of the finished work. If directed by the Engineer-in-charge for measurement the materials may have to be stacked at site before lying and nothing extra will be paid to the contractor for this stacking. Preparation of base for laying bedding shall be deemed incidental to the work.

The rate shall include the cost preparing the bases, putting to the profiles, laying and compacting the murrum bedding and stone pitching to dry rubble as per embankment slopes to specified thickness, lines curves, slopes and levels & labour and materials as well as tools and plant required for the work.

ITEM 42 Providing 12mm. thick remoulded asphalt filler joints as per drawings.

1. Open joints shall be constructed at the location as directed by the Engineer-in-charge using a wood strip metal plate or other suitable material, which is subsequently removed. When removing the materials, care shall be exercised to avoid chipping or breaking the corners of the concrete. The edges of the concrete at the joint shall be edge finished. Reinforced shall not extend across and open joint.
2. When performed filler is to be provided the filler shall be placed in correct position before concrete is placed against the filler. The filler material shall from part of the joint and while concreting the slab; care shall be taken to prevent the former from being displaced. After the work is completed, the exposed face of the joint shall be cleaned of all loose material sticking to it.
3. The material used for filling expansion joint shall be bitumen. Impregnated felt shall conform to the requirements of IS.1838, and shall be got approved from the Engineer-in-charge. The joint shall consist of large pieces and assembly of small pieces to make up the required size shall be avoided.
4. The expansion joint shall be measured in running meters Thickness of the expansion joint will be 20 to 25 mm Width of the expansion joint shall be equal to full depth of the slab.
5. The rate shall include the cost of all materials, labours, equipments and other incidental charges for fixing the joint complete in all respects as per these specifications and shown on the drawings.

ITEM 43 Providing parapet of controlled cement concrete M–150 as per detailed drawing with necessary reinforcement including shuttering laying, vibrating and finishing to line level complete precast consistency.

Railings shall not be placed until the cantering or false work for the span has been released, and the span is self-supporting. The type of railing to be constructed shall be as shown on the drawing. The railing shall be carefully erected true to the line and grade. Posts shall be vertical within the tolerance not be exceed 6 mm in 3 meters.

The portion of the railing or parapet, which is to be cast in place, shall be constructed in accordance with the relevant specifications for reinforced cement concrete. Forms shall either be of single width boards or shall be lined with suitable material duly approved by the Engineer-in-charge. Form joints in plane surfaces will not be permitted. All mouldings, panel work and level strips shall be constructed according to the details shown on the drawings. All corners in the finished work shall be true, sharp and clean cut and shall be free from cracks, spell or other defects.

Railing shall be measured in running meters.

The rate of railing shall include the cost of all labour, materials, tools and plant required, for doing the work complete in all respects in accordance with these specifications, and as shown on the drawing.

ITEM 44 Providing 15mm. thick cement plaster in single coat on brick/concrete wall for interior plastering up to floor two level finished even and smooth in (I) Cement mortar 1:3 (1 cement: 3 sand) (II) Cement mortar 1:4 (1 cement: 4 sand) (III) Cement mortar 1:6 (1 cement: 6 sand)

For surface, which is to be subsequently pointed, the joints shall be squarely raked to a depth of 15 mm while the mortar is steel green. The ranked joints shall be well brushed to remove dust and lose particles and the surface shall be thoroughly washed with the water, cleaned and wetted.

Cement and sand shall be mixed in proportions as specified in the item Cement and sand shall be proportioned by volume after making due allowance for bulking. The required quantity of water shall then be added and the mortar mixed to produce workable consistency.

The mixing shall be done intimately by hand mixing. The operation shall be carried out on a clean watertight platform, and cement and sand shall be first mixed dry in the required proportion to obtain a uniform colour and then the mortar shall be mixed for at least two minutes after addition of water. In case of cement mortar that has stiffened because of evaporation of water, the same shall be re-tempered by adding water as frequently as needed to restore the requisite consistency but this re-tempering shall be permitted only within thirty minutes from the time of addition of water at the time of initial mixing.

Plastering shall be started from the top and worked down. All put log holes shall be properly filled in advance of the plastering as the scaffolding is being taken down. Wooden screeds 75mm wide and of the thickness of the plaster shall be fixed vertically 2.5 meters to 4 meters apart to act as gauges and guides in applying the plaster. The mortar shall be laid on the wall between the screeds using the plaster's float and pressing the mortar so that the racked joints are properly filled. The plaster shall then be finished off with a wooden straight edge reaching across the screeds. The straight edge shall be worked on the screeds with a small upward and sideways motion 50 mm or 75 mm at a time. Finally, the surface shall be finished off with a plaster's wooden float. Metal floats shall not be used.

When recommending the plastering beyond the work suspended earlier the edges of the old plaster shall be scrapped, cleaned and wetted before plaster is applied to the adjacent areas. No portion of the surface shall be left out initially to be patched up later on. The plaster shall be finished to a true and plumb surface and to the proper degree of smoothness as required by the Engineer-in-charge. The average thickness of plaster shall not be less than the thickness specified in the item with a tolerance of 3 mm Any cracks which appear in the surface and all portions, which sound hollow when tapped, or are found to be soft or otherwise defective shall be cut out in rectangular shape and re-done as directed by the Engineer-in-charge.

Curing shall be started as soon as the mortar used for finished has hardened sufficiently not to be damaged when watered. It shall be kept wet for a period of at least 7 days. During this period it shall be suitably protected from all damages.

Stage scaffolding shall be approved for the work. This shall be independent of the structure.

The work of pointing shall be measured in square meters of the surface treated.

The rate for pointing shall include erecting and removal of scaffolding and all incidental expenses as described here in above.

ITEM 45 Box cutting of the road surface to proper, slope and camber for making a base of road work including removing the excavated stuff and deposition the road side as directed up to 50 M. lead etc. complete.

Specification No. 162 and 553 of P.W.D. Hand book volume II and the following additional specification shall be applicable here.

Cutting shall be done in proper grade & camber as per measurement given. Care must be taken that all slopes are evenly and truly dressed. Cutting shall be done to the exact depth required and shall be as per formation level in proper grade and the camber. If extra depth of cutting is done due to negligence of contractor the same shall be refilled with approved quality of materials duly consolidated to the satisfaction of the Engineer-in-charge (without extra cost) Box cutting for soling and medalling in required width the depth shall be done.

The stuff received from the cutting shall be utilised for filling cuts and correcting side slopes of bank with all lead and lift as directed. Useful stuff shall be carefully stacked separately as directed.

The measurement shall be taken as per cross section measurement of the cutting based on length, breadth; depth measured with tape every 25 meters interval.

The payment shall be made on Centimetre Basis.

ITEM 46 Providing open graded, carpet with premix H.MP. & P.F.

The work shall consist of construction in a single course of 20 mm thick open graded carpet on previously prepared base. Single course shall also include additional material @ 20 % to remove unevenness of the existing surface.

The work shall consist of construction in a single course of 20/25 mm thick semi-dense carpet as course, on previously prepared base. Single course shall also include additional thickness if any to remove unevenness of the existing surface.

The coarse aggregate shall consist of crushed stone only. These shall be clean, strong, and durable, of fairly cubical shape, free of disintegrated pieces organic or other deleterious matter and adherent coatings. The aggregates shall preferably be hydrophobic and of low propensity and shall satisfy the physical requirements set forth as under:

Physical Requirements of B.T. Aggregates For Bituminous Macadam

Sr. No.	Test	Test Method	Requirements
1.	Los Angeles Abrasion Value*	IS: 2386 (Part-IV)	35 % Maximum
2.	Aggregate Impact Value*	IS: 2386 (Part-IV)	30 % Maximum
3.	Flakiness Index	IS: 2386 (Part-I)	30 % Maximum
4.	Stripping Value	IS: 6241	25 % Maximum
5.	Water Absorption	IS: 2386 (Part-II)	2 % Maximum

***** Aggregates may satisfy requirements of either of the two tests.

Fine aggregates shall consist of crusher run screenings, natural and or mixture of both. These shall be clean, hard, durable uncoated, dry and free from injurious, soft or flaky pieces and organic or deleterious substances.

The filter, where required shall be an inert material, the whole of which passes 600 micron sieve, at least 20 percent passing 150 micron sieve and not less than 70 percent passing 75 micron sieve. The filter shall be cement, stone dust hydrated lime or fly ash approved by the Engineer-in-charge.

Proportioning of materials: The material shall be proportioned as quantities given below:

Stone chippings 12 mm size-and retained on 10 mm sieve 67 %

Stone chippings 10 mm size-passing 12.5 mm sieve and Retained on 6.3 mm sieve. 33 %

The samples of aggregate of required grindings for the work shall be got approved from the Engineer-in-charge prior to transportation and collection on plant site. Only approved material shall be transported and stacked as per requirement inferior materials shall have to be removed from the plant it by the contractor at his own cost. If contractor fails to remove the inferior type of materials from the plant site, the Department at the cost of the contractor will remove the same. Collection of aggregate shall be in different stacks according to various size of aggregate.

For the purpose of collection of materials, plant site shall be established at suitable places. Where hot mix plant shall be installed, Department will extend all necessary co-operation in helping contractor to get nearby Government land for establishing plant site. However department is not responsible if no such land is made available to the contractor and in that case, the contractor will have to make his own arrangement for the same. Incoming materials shall be recorded in a register for the purpose of record.

The binder shall be straight run bitumen of a suitable grade satisfying the requirements of IS: 73. Bitumen shall be 80/100 grade and shall be supplied by the Department at the rate and the place as mentioned in Schedule 'A' of the tender and it shall have to be carted by the Contractor to the site of work at his own cost. Empty asphalt drums shall have to be returned free of cost to P.W.D. store from where they are issued or as directed, if so provided in Schedule 'A'. Any damage caused to the asphalt drums or loss of asphalt after issue from store shall be responsibility of the contractor. Drums of asphalt shall be stored so as to allow easy inspection and in such place as will not damage the drums and cause leakage or allow water and other foreign matter to enter. For the

purpose of calculating consumption, wastage will not be allowed beyond 2.5 percent. Excess consumption over 2.5 percent will be charged at a panel rate.

In case bitumen is to be issued by Department in bulk, at the rate & place as shown in Schedule 'A', Contractor shall have to make adequate arrangement for stacking bulk asphalt as plant site according to requirement.

The asphalt should not be used as a fuel. If however contractor is found to be using asphalt as fuel, the quantity of asphalt utilised shall be assessed by the Executive Engineer whose decision will be final and binding to the contractor who will be charged at double the rate provided in Schedule 'A' of the agreement even though the total consumption of asphalt may be within the theoretical consumption.

Department shall keep a day account of the supply and consumption of bitumen in a separate bound register having numbered pages and the proformas prescribed by the Department. Day to day signature of the Contractor's representative shall be obtained in this register. Issue rate of bitumen includes

Obtaining asphalt from Department's store,
Transporting to site,
Storing and stacking,
Keeping records of supply and construction and
Returning the empty drums in good condition to the Department.

Open graded carpet shall not be laid during rainy weather or when the base course is damp or wet.

The base on which open graded carpet is to be thoroughly swept and scraped clean and free of dust and foreign matter.

The work shall consist of application of single coat of bituminous material to an existing road surface preparatory to bituminous construction. The temperature of bitumen at the time of application shall be in the range of 160 degree centigrade to 175 degree centigrade.

Binder shall be heated to the temperature appropriate to the grade of bitumen used and approved by the Engineer-in-charge and sprayed at the rate specified below. The rate of spread of straight run bitumen for tack coat shall be 10 Kg/10 Sq. meter areas for an existing W.B.M surface. The binder shall be applied uniformly. The tack coat shall be applied, just ahead of the coming bituminous constructions.

The binder content for premixing shall b e 3.50 percent by weight of the total mix unless otherwise specified. The quantities of aggregate shall be sufficient to yield the specified thickness after compaction.

The contractor shall get the job-mix formula for the mix approved by the Engineer-in-charge before starting the work. In order to obtain the required type of mix, the department may change the proportion and grading of aggregate and contractor shall have to collect materials accordingly. In case of increase or decrease in proportion of bitumen the increased or decreased quantity will be adjusted at the rate provided in Schedule 'A'. The contractor shall have the responsibility of ensuring proper proportioning of materials in accordance with the approved job-mix formula and producing a uniform mix.

Hot mix plant of adequate capacity and capable of producing a proper and uniform quality shall be used for preparing the mix. The plant may be either a batch type or continuous one, having a co-ordinated set of essential units such as dryer for heating the aggregates, device for batching, feeding by weight or volume the required quantities of aggregate, a binder heating and control unit for metering out of the correct quantity of heated binder together with a paddle mixer for intimate mixing of the binder aggregates.

The temperature of binder at the time of mixing shall be in the range of 150-165 degree centigrade and of aggregate in the range 250-165 degree centigrade. Provided also that at no time shall the difference in temperature between the aggregates and the binder exceed 14 degree centigrade.

Mixing shall be through to ensure that a homogenous mixture is obtained in which all the particles of the mineral aggregates are coated uniformly.

The mix shall be transported from the mixing plant to the point of use in suitable vehicles. The vehicles employed for transport shall be clean and be covered over transit if so directed by the Engineer-in-charge.

The mix, transported from the hot mix plant to the site shall be spread by means of a self propelled mechanical paver with suitable screeds capable of spreading, tempting and finishing the mixture to specified grade lines and cross sections. The temperature of mix at the time of lying shall be in the range 121-163 degree centigrade.

Longitudinal joints and edges shall be constructed true to the delineating lines parallel to the centre line of the road. Longitudinal joints shall be offset by at least 150mm from those in the binder course. All joints shall be cut vertical to the full thickness of the previously laid mix and the surface painted with hot bitumen before placing fresh materials.

Immediately after the spreading of hot mix, it shall be thoroughly compacted by 8-10 tones 3 wheels roller moving at a speed not exceeding 5 Km per hour. Rolling temperature shall not be less than 100 degrees centigrade. In any case the rolling shall be completed before the temperature of mix falls to above 80 degree centigrade. The work of semi carpet shall be started before 8.00 A.M and shall not be continued after 6.30 P.M in summer and 4-30 P.M in winter, because required necessary temperature is not minted except during this period. Moreover consolidation of spreaded material is also not done well. Every day Tonnage of Hot mix materials shall not be increase more than 240 MT. When work is going on, two rollers in a working position shall be kept for consolidation on the site work.

The roller wheels shall be kept damp to prevent the mix from adhering to them but in no case shall fuel-lubricating oil be used for this purpose. Rolling shall commence longitudinally from the edge and progress towards the centre line of the pavement. The roller should proceed on the fresh material with rear or fixed wheel leading so as to minimise the pushing of the mix and each pass of the roller shall uniformly overlap not less than one third of the track made in the preceding pass. Rolling shall continue until the entire surface has been rolled to compaction and all the roller marks eliminated.

Sand or stone dust flushing at the rate of 0.03 centimetre /square metre shall be done on asphalt surface for which no separate payment will be made.

Traffic may be allowed immediately after completion of the final rolling when the mix has cooled down to the surrounding temperature.

Surface finish and quality control of work: Control of the quality of material and work shall be exercised by the Engineer-in-charge by carrying out the following test at the frequencies shown against each:

Sr. No.	Type of Construction	Test	Frequency
1.	Tack Coat	Binder temperature for application Rate of spread of binder	At regular close intervals Two test per day
2.	Semi-Dense Carpet	(i) Aggregate Impact Value Flakiness Index of aggregate (i) Stripping Value (ii) Mix grading	One test per 100 Cubic Meter of Aggregate One test per 100 Cubic Meter of Aggregate One test per 100 Cubic Meter of Aggregate One set of tests on individual constituents and

			mixed aggregates from the dryer for each 100 tonnes of mix subject to a minimum of two tests per plant per day
		(iii) Control temperature of binder in boiler, aggregate in the dryer and mix at the time of laying & rolling	At regular close intervals
		(iv) Control of binder content and gradation in the mix (Binder content test vide ASTM-2172)	One test for each 100 tonnes of mix subject to a minimum of two tests per day per plant
		(v) Rate of spread of mixed material	Regular control through checks on layer thickness

The Contractor shall at all times carry out work on the highway in a manner creating least interference to the flow of traffic while consistent with the satisfactory execution of the same. For all works involving improvements to the existing highway, the contractor shall in accordance with the directions of the Engineer-in-charge, provide the maintain, during the execution of the work, a passage for traffic either along apart of the existing carriage way under improvement.

1. In case of the improvement works, namely widening, strengthening of the existing payment or reconstruction, repairs to cross-drainage works, where such works could be carried out on part widths at a time and the traffic could simultaneously be passed without undue delay and difficulty on the other part, the road shoulder shall be dressed and brought in the line with the pavement and maintained throughout the duration of the work to the satisfaction of the Engineer-in-charge. Where work is in continuous long stretches, passing places at least 20 meter long and 6 meter wide inclusive of the width of the existing carriageway shall be provided at half to one kilometre intervals as directed by the Engineer-in-charge. Extra treatment to shoulders where necessary, shall be given as ordered by the Engineer-in-charge.

2. The contractor shall take all necessary measured for the safety of traffic during construction and provide, erect and maintain such barricades including signs, marking, lights and flagman as may be required by the Engineer-in-charge for the information and protection of traffic approaching or passing through the section of the highway under improvement. Before taking up any construction an agreed programme for the control of traffic on the highway shall be drawn up in consultation with the Engineer-in-charge.

3. The barricades erected on either side of the carriage way/portion of the carriageway closed to traffic shall be strong to resist violation and painted with alternate black and white stripes. Red lanterns or warning lights of similar type shall be mounted on the barricades at night and kept lit throughout from sunset to sunrise. At the points where traffic is to deviate from its normal path, the channel for traffic shall be clearly marked with the aid of pavement marking, painted drums or a similar device to the direction of the Engineer-in-charge. At night the passages shall be delineated with lanterns or other suitable light source.

4. One-way traffic operation shall be established whenever the traffic is to be passed over part of the carriageway inadequate for two-lane traffic. This shall be done with the help of flagmen kept positioned on opposite sides during all hours. For regulation of traffic, the flagmen shall be equipped with red and green flags and lanterns highlight on both sides, suitable regulatory/warning signs shall be installed for the guidance of road users. On each approach at least two signs shall be put up, on close to the point where transition of carriageway begins and other 120 meters away. The signs shall be of approved design and of refectory type if so directed.

5. The payment shall be made on the tonnage basis of the weight of mix aggregate and bitumen. For this purpose the contractor shall have to install a weigh of bridge of suitable capacity for the purpose of weighment of dumpers at suitable place at his own cost as directed. Weight of empty dumper and weight of loaded dumper and weight of loaded dumper will be recorded in bound and numbered register on plant site. Department will be free get some loaded will be free to get some loaded dumpers test checked at other weight bridges. Weight Bridge will be periodically got calibrated and verified from weight and measure authorities. For the purpose of application of tack if the theoretical area as per sanctioned estimate for basis of tonne differs with the actual area of work done in the field then, the reduction in, or addition to payment shall have to be effected to the contractor on pro-rata basis depending upon the area reduced or exceed respectively.

6. Weight of mix materials will be done in presence of responsible person, not less than the rank of Supervisor of Department and the measurements shall be recorded by the Deputy Engineer or Junior Engineer or Supervisor, if so authorised. Record of each dumper will be maintained separately in bound and numbered register, which will be maintained by the departmental representatives and signed by the contractor. Proper gate pass system shall be established for the vehicles coming to the plants site and out going from the plant site. The location of the hectometre in which individual dumpers are unloaded shall be recorded carefully.

7. The contract unit rate of open graded carpet shall be paid in full for carrying out the required operations including full compensation for-

Making arrangement of control and safety of traffic.
Preparation of base.
Providing all materials to be incorporated in the works with all lead and lift.
All labours, tools, equipments and incidental to complete the works to the specification.

ITEM 47 Providing and laying bituminous mix seal coat surfacing considering 0.66 Cmt./1 M.T. with m/c stone chippings as per gradation and asphalt of 4.25 % by wt. of mixing by heating asphalt & mixing by continuous batching of hot mix plant and spreading by paver finisher consolidation by power roller & providing & operating plant machineries with cost of fuel, oil, lubricants etc., with sand/dust flushing at 0.30 Cmt./100 Smt.

The work shall consist of construction in a single course of mix seal surfacing as course on previously prepared base of carpet. Single course shall also include additional thickness if any, to remove unevenness of the existing surface.

1. Fine aggregates shall consist of crusher run screenings, natural and or mixture of both. These shall be clean, hard, durable uncoated, dry and free from injurious, soft or flaky pieces and organic or deleterious substances.

The filter, where required shall be an inert material, the whole of which passes 600 micron sieve, at least 20 percent passing 150 micron sieve and not less than 70 percent passing 75 micron sieve. The filter shall be cement, stone dust hydrated lime or fly ash approved by the Engineer-in-charge.

The aggregates shall be so graded or combined as to confirm to the grading as under:

Sieve Designation	Percent by weight passing sieve for type 'A' mix-seal surfacing.
10 mm	100
7.75 mm	40 - 85
7.36 mm	5 - 10
75 micron	0 - 4

The samples of aggregate of required grindings for the work shall be got approved from the Engineer-in-charge prior to transportation and collection on plant site. Only approved material shall be transported and stacked as per requirement inferior materials shall have to be removed from the plant it by the contractor at his own cost. If contractor fails to remove the inferior type of

materials from the plant site, the Department at the cost of the contractor will remove the same. Collection of aggregate shall be in different stacks according to various size of aggregate.

1. For the purpose of collection of materials, plant site shall be established at suitable places. Where hot mix plant shall be installed, Department will extend all necessary co-operation in helping contractor to get nearby Government land for establishing plant site. However department is not responsible if no such land is made available to the contractor and in that case, the contractor will have to make his own arrangement for the same. Incoming materials shall be recorded in a register for the purpose of record.

2. The binder shall be straight run bitumen of a suitable grade satisfying the requirements of IS: 73. Bitumen shall be 80/100 grade and shall be supplied by the Department at the rate and the place as mentioned in Schedule 'A' of the tender and it shall have to be carted by the Contractor to the site of work at his own cost. Empty asphalt drums shall have to be returned free of cost to P.W.D. store from where they are issued or as directed, if so provided in Schedule 'A'. Any damage caused to the asphalt drums or loss of asphalt after issue from store shall be responsibility of the contractor. Drums of asphalt shall be stored so as to allow easy inspection and in such place as will not damage the drums and cause leakage or allow water and other foreign matter to enter. For the purpose of calculating consumption, wastage will not be allowed beyond 2.5 percent. Excess consumption over 2.5 percent will be charged at a panel rate.

3. In case bitumen is to be issued by Department in bulk, at the rate & place as shown in Schedule 'A', Contractor shall have to make adequate arrangement for stacking bulk asphalt as plant site according to requirement.

4. The asphalt should not be used as a fuel. If however contractor is found to be using asphalt as fuel, the quantity of asphalt utilised shall be assessed by the Executive Engineer whose decision will be final and binding to the contractor who will be charged at double the rate provided in Schedule 'A' of the agreement even though the total consumption of asphalt may be within the theoretical consumption

5. Department shall keep a day account of the supply and consumption of bitumen in a separate bound register having numbered pages and the proformas prescribed by the Department. Day to day signature of the Contractor's representative shall be obtained in this register. Issue rate of bitumen includes (i) obtaining asphalt from Department's store, (ii) Transporting to site, (iii) Storing and stacking, (iv) Keeping records of supply and construction and (v) Returning the empty drums in good condition to the Department.

Mix seal surfacing shall not be laid during rainy weather or when the base course is damp or wet.

The base on which mix seal surfacing is to be thoroughly cleaned and free of dust and foreign matter.

The work shall consist of application of mix seal surfacing of single coat of bituminous material to an existing carpet surface preparatory to bituminous construction. The temperature of bitumen at the time of application shall b e in the range of 160 degree centigrade 175 degree centigrade.

Tack coat for mix seal surfacing shall be applied as the work of laying mix seal surfacing as being proceeded by a bituminous open graded carpet.

The binder content for pre mixing shall 4 % by weight of the total mix unless otherwise specified in item of schedule B of the work. Quantity of aggregate shall be sufficient to yield the specified thickness after compaction.

11. Hot mix plant of adequate capacity and capable of producing a proper and uniform quality shall be used for preparing the mix. The plant may be either a batch type or continuous one, having a co-ordinated set of essential units such as dryer for heating the aggregates, device for batching, feeding by weight or volume the required quantities of aggregate, a binder heating and control unit for metering out of the correct quantity of heated binder together with a paddle mixer for intimate mixing of the binder aggregates.

12. The temperature of binder at the time of mixing shall be in the range of 150-165 degree centigrade and of aggregate in the range 250-165 degree centigrade. Provided also that at no time shall the difference in temperature between the aggregates and the binder exceed 14 degree centigrade.

13. Mixing shall be through to ensure that a homogenous mixture is obtained in which all the particles of the mineral aggregates are coated uniformly.

14. The mix shall be transported from the mixing plant to the point of use in suitable vehicles. The vehicles employed for transport shall be clean and be covered over transit if so directed by the Engineer-in-charge.

15. The mix, transported from the hot mix plant to the site shall be spread by means of a self propelled mechanical paver with suitable screeds capable of spreading, tempting and finishing the mixture to specified grade lines and cross sections. The temperature of mix at the time of lying shall be in the range 121-163 degree centigrade.

16. Longitudinal joints and edges shall be constructed true to the delineating lines parallel to the centre line of the road. Longitudinal joints shall be offset by at least 150mm from those in the binder course. All joints shall be cut vertical to the full thickness of the previously laid mix and the surface painted with hot bitumen before placing fresh materials.

17. Immediately after the spreading of hot mix, it shall be thoroughly compacted by 8-10 tones 3 wheels roller moving at a speed not exceeding 5 Km per hour. Rolling temperature shall not be less than 100 degrees centigrade. In any case the rolling shall be completed before the temperature of mix falls to above 80 degree centigrade. The work of semi carpet shall be started before 8.00 A.M and shall not be continued after 6.30 P.M in summer and 4-30 P.M in winter, because required necessary temperature is not minted except during this period. Moreover consolidation of spreaded material is also not done well. Every day Tonnage of Hot mix materials shall not be increase more than 240 MT. When work is going on, two rollers in a working position shall be kept for consolidation on the site work.

18. The roller wheels shall be kept damp to prevent the mix from adhering to them but in no case shall fuel-lubricating oil be used for this purpose. Rolling shall commence longitudinally from the edge and progress towards the centre line of the pavement. The roller should proceed on the fresh material with rear or fixed wheel leading so as to minimise the pushing of the mix and each pass of the roller shall uniformly overlap not less than one third of the track made in the preceding pass. Rolling shall continue until the entire surface has been rolled to compaction and all the roller marks eliminated.

19. Sand or stone dust flushing at the rate of 0.03-centimetre/square metres shall be done on asphalt surface for which no separate payment will be made.

20. Traffic may be allowed immediately after completion of the final rolling when the mix has cooled down to the surrounding temperature.

21. Surface finish and quality control of work: Control of the quality of material and work shall be exercised by the Engineer-in-charge by carrying out the following test at the frequencies shown against each:

Sr. No.	Type of Construction	Test	Frequency
1.	Tack Coat	Binder temperature for application Rate of spread of binder	At regular close intervals Two test per day
2.	Semi-Dense Carpet	(i) Aggregate Impact Value Flakiness Index of aggregate (i) Stripping Value	One test per 100 Cubic Meter of Aggregate One test per 100 Cubic Meter of Aggregate One test per 100 Cubic Meter of Aggregate

		(ii) Mix grading	One set of tests on individual constituents and mixed aggregates from the dryer for each 100 tonnes of mix subject to a minimum of two tests per plant per day
		(iii) Control temperature of binder in boiler, aggregate in the dryer and mix at the time of laying & rolling	At regular close intervals
		(iv) Control of binder content and gradation in the mix (Binder content test vide ASTM-2172)	One test for each 100 tonnes of mix subject to a minimum of two tests per day per plant
		(v) Rate of spread of mixed material	Regular control through checks on layer thickness

The Contractor shall at all times carry out work on the highway in a manner creating least interference to the flow of traffic while consistent with the satisfactory execution of the same. For all works involving improvements to the existing highway, the contractor shall in accordance with the directions of the Engineer-in-charge, provide the maintain, during the execution of the work, a passage for traffic either along apart of the existing carriage way under improvement.

1. In case of the improvement works, namely widening, strengthening of the existing payment or reconstruction, repairs to cross-drainage works, where such works could be carried out on part widths at a time and the traffic could simultaneously be passed without undue delay and difficulty on the other part, the road shoulder shall be dressed and brought in the line with the pavement and maintained throughout the duration of the work to the satisfaction of the Engineer-in-charge. Where work is in continuous long stretches, passing places at least 20 meter long and 6 meter wide inclusive of the width of the existing carriageway shall be provided at half to one kilometre intervals as directed by the Engineer-in-charge. Extra treatment to shoulders where necessary, shall be given as ordered by the Engineer-in-charge.

2. The contractor shall take all necessary measured for the safety of traffic during construction and provide, erect and maintain such barricades including signs, marking, lights and flagman as may be required by the Engineer-in-charge for the information and protection of traffic approaching or passing through the section of the highway under improvement. Before taking up any construction an agreed programme for the control of traffic on the highway shall be drawn up in consultation with the Engineer-in-charge.

3. The barricades erected on either side of the carriage way/portion of the carriageway closed to traffic shall be strong to resist violation and painted with alternate black and white stripes. Red lanterns or warning lights of similar type shall be mounted on the barricades at night and kept lit throughout from sunset to sunrise. At the points where traffic is to deviate from its normal path, the channel for traffic shall be clearly marked with the aid of pavement marking, painted drums or a similar device to the direction of the Engineer-in-charge. At night the passages shall be delineated with lanterns or other suitable light source.

4. One-way traffic operation shall be established whenever the traffic is to be passed over part of the carriageway inadequate for two-lane traffic. This shall be done with the help of flagmen kept positioned on opposite sides during all hours. For regulation of traffic, the flagmen shall be equipped with red and green flags and lanterns highlight on both sides, suitable regulatory/warning signs shall be installed for the guidance of road users. On each approach at least two signs shall be put up, on close to the point where transition of carriageway begins and other 120 meters away. The signs shall be of approved design and of refectory type if so directed.

5. The payment shall be made on the tonnage basis of the weight of mix aggregate and bitumen. For this purpose the contractor shall have to install a weigh of bridge of suitable capacity for the purpose of weighment of dumpers at suitable place at his own cost as directed. Weight of empty dumper and weight of loaded dumper and weight of loaded dumper will be recorded in bound and numbered register on plant site. Department will be free get some loaded will be free to get some loaded dumpers test checked at other weight bridges. Weight Bridge will be periodically got calibrated and verified from weight and measure authorities. For the purpose of application of tack if the theoretical area as per sanctioned estimate for basis of tonne differs with the actual area of work done in the field then, the reduction in, or addition to payment shall have to be effected to the contractor on pro-rata basis depending upon the area reduced or exceed respectively.

6. Weight of mix materials will be done in presence of responsible person, not less than the rank of Supervisor of Department and the measurements shall be recorded by the Deputy Engineer or Junior Engineer or Supervisor, if so authorised. Record of each dumper will be maintained separately in bound and numbered register, which will be maintained by the departmental representatives and signed by the contractor. Proper gate pass system shall be established for the vehicles coming to the plants site and out going from the plant site. The location of the hectometre in which individual dumpers are unloaded shall be recorded carefully.

7. The contract unit rate for mix seal surfacing shall be paid in full for carrying out the required operations including full compaction for:

Making arrangements of control and safety of traffic.
Preparation of base.
Providing all materials to be incorporated in the works with all leads and lifts.
All labour, tools, equipments and incidental to complete the work to the specification.

ITEM 48 A Providing and laying 20/25mm. thick (compacted) premixed asphalt carpet using asphalt for tack coat at the rate of 5 – 10 Kg./10 Sq.m. using crushed stone aggregates as per the gradation and bitumen at the rate of 3.28 % by Wt. of total mix for plant and laid by paver finisher including consolidation by power road roller and consolidation and operating plant, machineries and equipment, cost of fuel, oil, lubricant and labour charges, etc. complete.

The specification of this item shall be the same as per item No 18 except for aggregate gradation and weather and seasonal limitation which shall be as below and the binder shall be as specified.

DESCRIPTION: This work shall consist of construction in a single course of 20/25mm thick premixed asphalt carpet.

MATERIALS:

Binder: The binder shall be straight run bitumen 60/70 or 80/100 grade satisfying the requirement of IS: 73 the actual grade of the binder to be used shall be decided by the Engineer-in-charge.

Coarse aggregates: The coarse aggregate shall consist of crushed stone or crushed gravel. These shall be clean, durable, of cubical shape, free of disintegrated pieces, organic or other deleterious matter and adherent coatings, The aggregates shall preferably be hydrophobic and of law porosity and shall satisfy the physical requirements set forth in Annexure-B except that flakiness index shall be 30 & water absorption 1.

Aggregate gradation: The mineral aggregates, shall be so graded or combined as to conform to gradients set forth in table below

Table Aggregate gradation.

Sieve Size	**% By weight passing the sieve**	
	For 25mm thickness	**For 25mm thickness**
20.0 mm	100	100
12.5 mm	70-100	100
10.0 mm	20-40	70-100

4.75 mm	0-5	20-40
2.36 mm	-	0-5

Proportion of materials: The binder content for premixing shall be 3.28 percent by weight of the total mix.

The quantities of aggregate shall be sufficient to yield the specified thickness after compaction. The contractor shall have the responsibility of ensuring proper proportioning of materials in accordance with the approved job mix formula and producing a uniform mix. A variation in binder content of $\pm$ 0.3 percent by weight of total mix shall, however, be permissible in individual specimens taken of quality control test vide M O. S. T. Specification Section 900.

CONSTRUCTION OPERATIONS:

Weather and seasonal limitation: Carpet shall not be laid during rainy weather when base course is damp or wet.

Para 37 of open graded carpet shall apply.

ITEM 49 1 Surface dressing one coat with paving bitumen using 18 Kg. bitumen per 10 Sq.m. with 0.15 Cu.m. of stone chipping 12mm. nominal size per 10.0 Sq.m. of road surface excluding rolling and consolidation (stone chipping and bitumen shall be paid separately).

2 Surface dressing in two coats with bitumen using 18 Kg. per 10 Sq.m. with 0.15 Cu.m. of stone chipping 12mm. nominal size per 10.0 Sq.m. of road surface excluding consolidation (stone chipping and bitumen shall be paid separately).

DESCRIPTION: This work shall consist of the application of one coat of surface dressing, consisting of a layer of bituminous binder sprayed on a base prepared previously followed by a cover of stone clippings properly rolled to form a wearing course to the requirements of these specifications.

MATERIALS:

Stone clippings: The machine crushed B.T. stone chipping shall consist of fairly cubical fragments of clean, hard, tough and durable rock of uniform quality throughout. Crushing B.T. stone shall obtain these. The chipping shall be free of elongated of flaky pieces, soft or disintegrated stone, salt, alkali, vegetable matter, dust and adherent coatings.

Binder: The binder shall be straight run bitumen 80/100 or 70/60 penetration and satisfying the requirements of I.S. 73 or the Department may approve other type of bitumen as.

Necessary, storage arrangements i.e. provisions of tanks etc. for bulk asphalt shall be done by the contractor without any extra charges.

In the case of bitumen is to be supplied by Department in bulk at the rate and place shown in Schedule "A" for bulk asphalt, contractor shall have to make adequate arrangement for stacking bulk asphalt at plant site, according to requirement. If the asphalt is supplied in bulk on plant site, the rate of conveyance for lead difference from store to plant site shall be recovered at S.O.R. for Qty. of asphalt supplied.

Keeping Records: The Department shall keep a day-to-day account of the supply and use of the asphalt in separate bound register having numbered pages in the proforma prescribed by the Department. Day to day signature of the responsible contractor of his representative as may be directed by Engineer-in-charge shall be obtained in the register. The register shall be maintained by the Department and shall be produced with each bill.

TABLE: Physical Requirements of Aggregates

Sr. No.	Test	Test Method	Requirements
1.	Loss Angeles Abrasion	IS: 2386 (Part-IV)	40 % Maximum
2.	Value *		30 % Maximum
3.	Aggregate Impact	IS: 2386 (Part-V)	30 % Maximum
4.	Value	IS: 6241	25 % Maximum
5.	Flakiness Index		12 %

6.	Stripping Value Soundness Loss with Sodium Sulphate 5 cycles Loss with Magnesium Water absorption	IS: 2386 (Part-III)	18 % 1 % Maximum

***** Aggregate may satisfy requirement of either of the two tests.
Note: If crushed slag is used, Clause 404.2.3. Shall apply.

Requirements of stone chippings and binder content for surface dressing for 10 Square metres

Sr. No.	Type of Construction	Nominal size of stone chippings	Specifications percent passing through sieve and retained on sieve	Quantity of materials	Binder content
1.	Single coat Surface dressing of first Coating of two coat surface dressing	12 mm	Pressing 20 mm sieve & retained on 10 mm sieve	0.15 cm	18 kg
2.	Second coat of two coat surface dressing	10 mm	Pressing 12 mm sieve & retained on 4.5 mm sieve	0.10 cm	11 kg

CONSTRUCTION OPERATIONS:

3.1 Weather and seasonal limitation: The surface dressing work shall be carried on only when the atmospheric temperature in shade is above 15*****C No. Bituminous shall normally be applied when the surface of cover material is damp, when the weather is foggy or rainy or during dust storms.

3.2 Preparation of base: The base on which carpet to be laid shall be prepared, shaped and conditioned to the specified, lines, grade and cross section in accordance as directed by the Engineer-in-charge.

The surface shall be thoroughly swept and scraped clean and free of dust and foreign matter before the spraying of binder. If necessary the cleaning shall be done first with hard brushes, and finally by blowing with sacks or gunny bags.

3.3 Application of binder: Binder shall be heated to 163*****C to 177*****C and sprayed on the dry surface in a uniform manner with the help of self-propelled mechanical sprayers having, self-heating arrangement and bitumen pressure pump and spray nozzle bar capable of spraying bitumen uniformly at specified rate as given in above table. Excessive deposits of binder of binder caused by stopping or starting of the sprayer or thought leakage or any other reasons shall be suitably corrected before the stone chippings are spread.

3.4 Application of stone chippings: The cover material i.e. machine crushed B.T. chips of 11.2 mm nominal size shall be stocked on road side by filling standard boxes of 2.0 m X 1.50 m X 0.50m the measurement shall be recorded in the measurement book after collection in two kilometre length is complete. The material shall be crosschecked by another D.E.E. as per rules. Thereafter, the spreading shall be allowed. The permission of Engineer-in-charge shall be obtained before spreading.

Immediately after the application of binder, stone chippings in a dry and clean state shall be spread uniformly on the surface, preferably by means of mechanical grittier, otherwise, manually so as to cover the surface completely. If necessary, the surface shall be boomed to ensure uniform spread of chippings.

3.5 Rolling: Immediately after the application of the cover material, the entire surface shall be rolled with an 8-10 tones three-wheeled roller. Rolling shall commence at the edges and progress towards the centre except in super elevated portions, where it shall proceed from

the inner edge to the other. Each pass of the roller shall over5lap not less than one third of the track made in the preceding pass. While rolling is in progress, additional chippings shall be spread by hand in whatever quantities required making up irregularities. Rolling shall continue until aggregate particles are firmly bedded in the binder and present a uniform closed surface.

3.6 Application of second coat of surface dressing: Where surface dressing in two coats is specified the second coat shall be applied immediately after laying the first coat. The construction operation shall be the same as described in para 8.3.3 to 8.3.5.

Opening to traffic: Traffic shall not be permitted to run on any newly surface dressed until the following day. In circumstances, however, the Engineer-in-charge may open to the road to traffic immediately after rolling, but in such cases its speed shall be limited to 16 Kim per hour till the following day.

Surface and finish and Quality Control of work: The surface shall conform to requirements of MO.S.T. No. 902 Specification. Control on the quality of materials and works shall be exercised by the Engineer-in-charge in accordance with section 900.

1. **Arrangements of Traffic:** During the Period of construction flow of traffic shall be maintained as per clause-112.
2. **Measurement for Payment:** Surface dressing shall be measured as finished work in square meters.
3. **RATE:** The contract unit rate for surface dressing shall be payment in full for carrying out the required operations including full compensation for all components listed in item No. 1 Para 2.8

ITEM 50 Providing and laying built up spray grout (B.S.G.) in one layer/two layer over untreated water bound macadam existing asphalt road surface with asphalt coat 5/10 Kg./10 Sq.m. and then first layer of coarse aggregates at the rate of 0.50 Cu.m./10 Sq.m. with dry consolidation dry rolling and spraying bitumen over it at the rate 15 Kg./10 Sq.m. and then laying 2nd layer of coarse aggregate at the rate 0.50 centimetre/10 Sq.m. with dry rolling and spraying bitumen at the rate 15 Kg./ 10 Sq.m. then spraying over it key aggregate at the rate of 0.13 centimetre/10 Sq.m. including rolling fuel, kerosene etc. complete.

DESCRIPTION: This work shall consist of a two layer composite construction of compacted crushed coarse aggregates with application of bituminous binder after each layer an key aggregates on the top of the second layer, in accordance with requirements of these specification and in conformity with the lines, grades and cross-section shown on the drawing or directed by the Engineer-in-charge.

MATERIALS:

Binder: The binder shall be straight run bitumen of a suitable grade 60/70 or 80/100 as directed by the Engineer-in-charge, satisfying the requirements of IS 73, or an approved cutback.

Aggregate: The aggregates shall consist or crushed stone, crushed gravel (single) or other stones. They shall be clean, strong, durable, of fairly cubical shape and free of disintegrated pipes, organic or other deleterious matter and adherent coating. The aggregates shall preferably be hydrophobic and of low porosity.

The aggregates shall satisfy the physical requirements set forth in Annexure-B except that the upper limit for Los Angeles Abrasion Value of Aggregate Impact Value shall be 50 and 40 respectively. The coarse and key aggregates for built-up spray grout shall conform to the gradings given below.

Gradings requirements of coarse aggregate and key aggregates for built-up spray group.

Sieve Designation	Percent by Weight passing the sieve.	
	Coarse Aggregate	Key Aggregate
50.0 mm	100	-
25.0 mm	35.70	-

20.0 mm	-	100.00
12.5 mm	0.15	35.70
4.75 mm	-	0.15
2.36 mm	0.5	0.5

CONSTRUCTION OPERATIONS:

Weather and seasonal limitations: Built-up spray grout shall not be constructed during rainy weather, when the base is damp or wet or when the atmospheric temperature in shade is 16 C or below.

Preparation of base: The base on which built-up spray grout is to be constructed shall be prepared, shaped and continued to the specified lines, grades and cross-sections as directed by the Engineer-in-charge. The surface shall be thoroughly swept and scrapped clean of dust and other foreign matter.

Tack Coat: A tack coat as per item No. 1 para 2.3.2. Shall be applied over the base preparatory to construction of the spray grout course.

Spreading and rolling coarse aggregates: Immediately after the application of tack coat the coarse aggregates in dry and clean form shall be spread uniformly, and evenly at the rate of 0.5 m_3 per 10_2 m area. The surface of the layer shall be carefully checked with templates and all high and low spots remedied by removing or adding aggregates as may be required.

Immediately after spreading of the coarse aggregate, dry rolling shall be done with an 8-10 tonne smooth wheeled roller. Rolling shall commence at the edge and progress towards the centre except in super-elevated portions where it shall proceed from the inner edge to the outer. Each pass of the roller shall uniformly overlap not less than one third of the track made in the preceding pass.

After initial rolling the surface shall be checked transversely and longitudinally with templates and any irregularities corrected by loosening the surface, adding or removing necessary amounts of aggregate followed by rolling.

Rolling shall be stopped before voids in the aggregate layer are closed to such an extent as to prevent free and uniform penetration of the binder.

Application of binder - first spray: The binder shall be heated to the temperature appropriate to grade of bitumen approved by the Engineer-in-charge and sprayed on layer at the rate of 15 Kg/$10m_2$ (in terms of straight-run bitumen) in a uniform manner with the help of mechanical sprayers. Excessive deposits of binder caused by stopping or starting of the sprayers or through leakage or any other reason shall be corrected promptly.

Spreading and rolling for coarse aggregate for the second layer: The binder shall be heated to the temperature appropriate to grade of bitumen approved by the Engineer-in-charge and sprayed on aggregate layer at the rate of 15-kg/10 m_2 (in terms of straight-run bitumen) in a uniform manner with the help of mechanical sprayers. Excessive deposits of binder caused by stopping or starting of the sprayers or through leakage or any other reason shall be corrected promptly.

Application of binder-Second spray: The second aggregate layer shall then be given a binder spray at the rate of 15-kg/10 m_2 (in terms of straight run bitumen) to 9.3.5 above.

Application of key aggregate: Immediately after second application of the binder key aggregate in a clean and dry state shall be spread uniformly at the rate of 0.13-m3/10 m_2 so as to cover the surface completely. If necessary, the surface shall be boomed to ensure uniform application of the key aggregates. The entire surface shall than be rolled with an 8-10 tonne smooth wheeled roller. While rolling is in progress, additional key aggregates where required shall be spread by hand. Rolling continue until the entire course is thoroughly compacted and the key aggregates are firmly in position.

Surface and finish and Quality Control of work: The surface finish of construction shall confirm to the requirements of 902 of MO.S.T.

The built-up spray grout shall be provided with final surfacing without any delay.

2. **Arrangements of Traffic:** During the Period of construction, arrangements of traffic shall be done as per para 112 of MO.S.T. Specification.

3. **Measurements for Payment:** Built-up spray grout shall measure as finished work in square meters.
4. **RATE:** The contract unit rate for built-up spray grout shall be payment in full for carrying out the required operations including full compensation for all components as follows:
   Providing all materials to be used in the work including royalty charges, fees, rent where necessary with all lead & lift.
   All labours, tools, plants, equipments and incidentals to complete the work to the specification.
   Providing and maintaining diversion and controlling traffic.
   Asphalt if used less than as specified on account of deviation in tack coat or modification in rate of asphalt consumption in the item, it will be recovered at the rates as mentioned in Schedule "A" for used less quality.

ITEM 51 Providing & Laying L.C.C. from working foundation & plinth. (A) Providing and laying C.C. 1:5:10 (1 Cement: 5 Coarse sand: 10 Graded brick bats of 40mm. to 50mm. nominal size) & curing complete excluding cost of formwork in foundation & plinth.

The bricks bats shall be of 40 mm to 50 mm size or specified, roughly cubical in shape clean and free from dirt or any other foreign material.
Sand shall be natural sand, clean, well, graded, hard, durable and free from dirt or any other impurities.
Cement shall be ordinary Portland cement of approved quality.
Water shall be clean and potable.
The cement, sand and bricks bats shall be mixed in proportion of 1:5:10. They shall be mixed dry and water shall be added in required quantity. The mixing will be thorough so that brickbats are coated with cement slurry.
The mix shall be carried to the site of lying within 15 minutes and placed gently in layers of appropriate thickness and not thrown or dumped.
The layers shall be compacted with rammers as required and shall be cured thereafter till it covered by masonry etc.
The measurement shall be on centimetre basis.
The rate includes cost of all materials, labour, tools and plants and incidentals and is for completed item

ITEM 52 White washing: White washing with lime on wall surface two coat to give an even shade including thoroughly brooming the surface to remove all dirt, and mortar drops and other foreign matter.

General: Lime shall be hydraulic lime of approved quality.
The slaked lime, if stored, shall be kept in a weather proof and damp roof shed with impervious floor and sides to protect it against rain, moisture, weather and extraneous materials mixing with it. All lime that has been damaged in any way shall be rejected materials shall be removed from site of work.
Workmanship: The fat lime shall be slaked at site and shall be mixed and stirred with about five litres of water and 1 kg on unlaced lime to make a thin cream This shall be allowed to stand for a period of 24 hours and then shall be added to each cubic meter of lime cream Small quality of ultra marine blue shall also be added to the last two coat of white wash solution and the whole solution shall b e stirred thoroughly before use.
Preparation of surface: The surface shall be thoroughly cleaned of all dust, dirt mortar dropping and other foreign matter before white wash is to be applied. Suitable chemicals shall remove oil or grease spots and smooth, surface shall be rubbed with wire brushed.
All unsound portion of the surface plaster shall be removed to full depth of plaster in rectangular patches and plastered again after raking the masonry joints properly.
Application of white wash: On the surface so prepared the white wash shall be applied with brush. The first stroke of the brush shall be from top down wards and another from bottom upwards over the first stroke and similarly one stroke from the right and another from the left over the first stroke before it dries.

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

Mode of measurements & Payments: All work shall be measured in the decimal system i.e. in Sq. meters. Deduction for pipe opening shall be made fully for both sides of openings. The rates shall include the cost of all materials, labour, scaffoldings protective etc. involved in all the operations described. The rate shall be for a unit of one Sq. meter.

ITEM 53 Providing and fixing 4" (100mm.) dia G.I. water spouts 2'6" long in C.M. necessary iron gratting as per design etc. complete (10 Cm. dia. pipe).

The galvanized water spouts of the size 10 cm dia. and the Galvanised iron grating shall be of the approved quality and type, and shall be first got approved from the Engineer-in-charge before actual use. The G.I. pipe shall be of sufficient length projecting out, beyond the concrete surface for sufficient discharge. Iron grating shall be fixed rigidly into the concrete. The galvanised pipe iron as well as grating shall be painted with two coats of anti corrosive paint.

The measurement shall be recorded and paid on the basis of each No. Of pipe fixed in position.

ITEM 54 Providing year plate: providing and fixing 30 Cmt. X 22 Cmt. X 2.5 Cmt. No and year plate of marble and of standard lettering with leads or paint including finishing etc. complete.

Marble plate shall be white and of approved quality and shall be 25 mm thick and of standard size as directed by the Engineer-in-charge of the work.

Lettering shall be dobby U-shape engraving and shall be filled with paint of approved quality. Lettering shall be done as directed by the Engineer-in-charge. The marble plate shall be fixed in neat cement at a place as directed by the Engineer-in-charge. Cement shall conform to relevant I.S. specification.

Measurement shall be per number of marble plate fixed.

Unit rate includes cost of all materials, labour etc. for complete work.

ITEM 55 Numbering the C.D. works with approved paint including all materials for painting, etc.

Numbering the C.D. Works shall be carried out as per relevant I.R.C. specification. Oil paint of approved quality and make shall be used for the purpose. Numbering shall be very neat and clean. Arrow shall be marked on the Head wall in the correct direction of flow of water. Payment shall be made on the number basis. Unit rate includes the cost of all materials, labours for painting & lettering as directed by Engineer-in-in-charge.

ITEM 56 Providing and fixing junction board of R.C.C. precast as per standard design of I.R.S. including fixing in C.C. block of 1:4:8 with necessary excavation enamel painting lettering figuring etc. complete.

These board should be fixed at a distance of 120 metres from the centre line of the crossing and they should be located on the left hand side of the road in the direction of the traffic and the facing the traffic.

The board will be located in such a way that the edge of the board towards the centre of the road will be at a distance of 4.57 metres from the centre of a National Highway and 3.66 metres from the centre of State Highway or major District Road.

The bottom of the board should be 1 metre above the road surface and the board shall be at right angle to the centre line of the road facing the direction of traffic.

The board shall be of the size of 107 C.M in length and 91 C.M in height for "T" and "Y" junctions; shall be 145 C.M in length and 91 C.M in height for cross roads.

The board shall be painted by two coats the board and posts shall be R.C.C. as shown in the type design.

The post shall be fixed in concrete and the projection of this above the road level shall be 45m X 45cm And a height of 24 centimetres Above the road level and the top is to be finished in plaster from the height of 15 C.M.

The size of letters and figures shall be 8 cm for English and 10 C.M for Devanagari and Gujarati Scripts.

The post shall be painted in black and white reflective strips 23 centimetres In highlight.

The board tablet shall be painted in white with border 2 C.M wide.

On this board tablets shall be painted in yellow with black and the tablet shall have 5 m clear distance from the board.

Each such tablets shall be 61 cm in length and 33 cm in height, arrow lines indicating the direction of the road at the junctions shall be painted in black and shall have a thickness of ……. C.M for national Highway and 4 C.M on a state highway and a ……. C.M for a Major district road.

All letters and figures shall be painted in black.

The work shall b e carried out as per design as per the instructions of the Engineer-in-charge. The measurements shall be recorded and paid on number basis for board fixed in position.

ITEM 57 Providing and fixing boundary stone of 20 Cms. X 15 Cms. X 75 Cms. in earth incl., carving words – painting etc. complete.

Boundary stones shall be of the size 20 X 15 X 15 centimetres True to all the faces.

Boundary stones shall be neatly finished & shall be chisel dressed on all the sides and at top.

Boundary stones shall be fixed at the borderline of acquired length so that the land width is properly demarcated. The width between boundary stones shall be fixed at a distance of 330 feet (100 meter) a part in the direction of the length of the road.

The letter B.B. of (Border) as directed by the Engineer-in-charge shall be carved on the face of the boundary stone & letters shall be painted with black Japan.

The stone shall be fixed in the earth as details given in the specifications of guard stone fixed in earth.

The measurements shall be recorder per No. of boundary stone fixed in position and paid accordingly.

ITEM 58 Clearing the site before commencement and after completion of the work.

Before starting the work, the site shown on plans shall be cleared of all obstructions, loose stones and materials, rubbish of all kinds, as well as all trees and brush woods except those marked for preservation, the roots being entirely grubbed up. No trees are to be cut down before obtaining the instruction from Engineer-in-charge.

The stuff obtained from clearance shall be stacked in such a place and in such a manner as ordered by the Engineer-in-charge and the ground shall be left in a perfectly clean condition.

In jungle clearing, all trees, not specifically marked for preservation, bamboos, jungle wood and brush wood shall be cut down, their roots rubbed up. All wood and material made available as directed by the Engineer-in-charge.

All holes or hollows, whether originally or produced by digging up roots shall be carefully filled up with earth.

After completion of the work, but before its acceptance, the site shall be cleared of all scaffolding, surplus materials and rubbish etc. as per contract. No extra payment shall be made for site.

The rate for this item of work shall be for the complete job and shall be paid at the lump sum rate tendered for the work on completion of the entire work.

ITEM 59 Supplying and fixing rough kota stone 60mm. to 80mm. size including fixing in line and level etc. complete.

The stone to be used shall be approved quality kota stone. It shall be sound, hard, durable and fairly regular in shape and its thickness in any one direction shall not be less than the thickness of stone as specified in the item and thickness of the stone at any place shall not be less by 15 % of the thickness specified.

The stone shall be laid in line and level with camber as directed as directed and set properly in sand. The whole work shall be generally carried out to the entire satisfaction of Engineer-in-charge of the work.

The rate shall include the cost of all materials and labour involved in all the operations described above. The kota stone flooring shall be measured in square metre correct to two places of decimal. Length and breadth shall be measured correct to a centimetre and between the finished faces of skirting or dado and no deduction shall be neither made nor extra paid for any opening in floor of a unit of one Sq.m

ITEM 60 Providing and laying kota stone for kerbing on both sides of stone paving including fixing kota stone kerbing in 0.30 Mts. depth (kerbing stone of 60mm. to 80mm. thick size) … etc. complete.

The stone shall be of approved quality kola stone. Specifications for the materials & lying as per Item No. 59 above. The rate shall be per unit of one Meter

ITEM 61 Supplying hard murrum.

Hard murrum should be of approved quality. Any materials, which are found inferior, shall be rejected and contractor shall remove such rejected material from the site at his own cost. The material of hard murrum shall be collect from quarries approved by the Executive Engineer.

The material shall be got approved by the Executive Engineer prior to collection on site and shall be free from all rubbish, dust and any organic materials as well as clods of black cotton soil. Material shall not be allowed to be collected from within the road boundary.

For roadwork complete stacking of materials as per requirement shall be carried out in 2 K.M lengths before spreading. Other Deputy Executive Engineer as per Rules shall be crosschecked the materials stacks before spreading. The collection shall always commence at one end of K.M and carried continuously towards the other end.

The materials shall be stacked by filling standard boxes of size 2 m X 1.5 m on a fairly level ground. It shall be stacked on road land beyond the top of the bank and on a level ground. The rate includes supplying the hard murrum with all lead and lift on road site and stacking the same in regular pharas of the required dimensions. Materials shall be collected in required quantity only at required site of work. The payment shall be made on cubic metre basis.

ITEM 62 White stone bela masonry in C.M. 1:5 including curing etc. complete.

The stone shall be fine dressed chisel draft one including the drafts on all beds and joints.

The stone shall be laid in regular course. The height of the course shall be as approved by the Executive Engineer. The entire course shall be of same height unless otherwise ordered but no course will be thicker than any course below it. No stone shall be less in breadth than in height and less in length than twice in highlight

The stone shall be break the joints in each course and carried out in cement mortar 1:6 and thickness of the joints shall not be more than 10mm The side joints and beds of all stone shall be vertical and horizontal respectively and all stones shall be rough, tooled, true, and square.

The work shall be measured and paid for cubic measurements of the work carried out as per approved drawing as directed by the Engineer-in-charge.

ITEM 63 40mm. thick asphalt carpets.

This work shall consist of lying and open graded carpet of cm thickness in a single course and seal coat (excluding cost of asphalt stone chips) composed of suitable small sized aggregates premixed with a bituminous binder on a previously prepared basis.

The materials shall be proportioned as per quantities given within the following table.

Quantities of material required for 10 Square metre of road surface for 5 cm thick open graded premix carpet with seal coat.

Aggregate for Carpet:

Stone chippings 20mm Size	0.27 Cu.m.
Stone chippings 12mm Size	0.24 Cu.m.

Stone chippings 10mm Size 0.06 Cu.m.

Aggregate for Seal Coat:

Stone Chippings 6mm Size. 0.09 Cu.m.

Binder for premixing (quantity in terms of strength ness bitumen)

(1) For Carpet:

For 0.27 Cu.m. of 20mm size stone chippings at 48 Kg./Cu.m.	12.96 Kg.
For 0.24 Cu.m. of 12mm size stone chippings at 52 Kg./Cu.m.	12.48 Kg.
For 0.06 Cu.m. of 10mm size stone chippings at 56 Kg./Cu.m.	3.36 Kg.

Seal Coat:

For 0.09 Cu.m. of 6mm size stone chippings at 80 Kg./Cu.m.	7.20 Kg.
	36.00 Kg.

Carpet shall not be laid during rainy weather or when the base course is damp or wet or when the atmospheric temperature in shade is 16 % degree centigrade or below.

The under laying base on which the bituminous carpet is to be laid shall be prepared, shaped and conditioned to the specified line grade and cross-section as directed by the Engineer-in-charge. The surface shall be well cleaned with brushes. Swiping with brooms and final dusting with sacks as necessary.

Tack Coat: This work shall consist of application of a single coat of bituminous material to an existing road surface preparatory to another bituminous construction. The temperature of bitumen at the time of application shall be in the range of 160.0 deg. centigrade to 175.0 deg. centigrade.

Binder shall be heated to the temperature appropriate to the grade of bitumen used and approved by the Engineer-in-charge at the rate specified below. The rate of spread in terms of straight run bitumen shall be 9.75 kgs. Per 10 square metre area for surface untreated water bound macadam surface. The binder shall be applied uniformly. The tack coat shall be applied just ahead of the oncoming bituminous construction. For the purpose of calculating consumption wastage of bitumen will not be permitted beyond 2.5 % Excess consumption over 2.5 % will be charged at penal rate.

Mixers of approved type shall be employed for mixing the aggregates with the bituminous binder. The binder shall be heated to the temperature approved by the Engineer-in-charge, avoiding local overheating and ensuring a continuous supply. The aggregates shall be dry before they are placed in the mixer. After about 15 seconds of dry mixing the heated binder shall be distributed over the aggregates at the rate specified. The contractor according to the requirement at the contractor's cost shall provide kerosene to an extent of 4 % to 6 % of asphalt. The mixing of binder with chipping shall be continued until the chippings are thoroughly coated with the binder. The mix shall be immediately transported from the mixer to the point of use in suitable vehicles or wheel borrows. The vehicle employed for transport shall be clean and be covered over in transit if so directed.

The premixed material shall be spread on the road surface with rakes to the required thickness and camber or distributed evenly with the help of a drag spreader, without any undue loss of time. The camber shall be checked by means of camber boards and inequalities evened out. As soon as sufficient length of bituminous material has been laid, rolling shall commence (rolling shall be done departmentally). When the roller has passed over the holy area once removing or adding premixed materials shall correct any night, stops or depressions, which become apparent. The contractor shall provide necessary labour for keeping the roller wheels damp during rolling so as to prevent the premix from adhering to the wheels and being packed up. The edges as long and transverse of the carpet laid and compacted earlier shall be cut to their full depth so as to expose fresh surface which shall be painted with thin surface coat of appropriate binder before the new mix is placed against.

Seal coat for preparation of premix and spreading etc. Para 7 & 8 above shall apply. The coat shall be applied immediately after the laying of bituminous course of carpet. Before application of seal coat materials surface shall be cleaned free of nay dust or other extraneous matter.

Coarse sand or stone dust flush in at the rate of 0.03 Centimetre/10 Square metre shall be done on asphalt surface, at the contractor's own cost.

Traffic may be allowed soon after final rolling when the premixed material had cooled down to surrounding temperature.

Control on quality of works shall be exercised by the engineer-in-charge by carrying out the following tests at the shown against each.

Sr. No.	Type of Construction	Test	Frequency
1.	Tack Coat	1. Binder temperature for application	At regular close interval
		2. Rate of two tests spread of per day binder	
2.	Opening graded premix carpet with seal coat.	Temperature of binder at application	At regular close intervals
		Binder Content (vide AS/TM-D-2172)	Two tests per day for work of every 3 Km length in one lane.
		Rate of spread of mixed material	Regular control through checks on materials and layer thickness

13. Para 13 to 17: - as regards arrangements for traffic par 29 to 33 of semi dense carpet shall apply.

18. Open graded carpet and seal coat shall be measured in cubic metres on the basis of stone chips actually used.

19. The contract unit rate for open grade carpet and seal coat, (excluding cost of asphalt, stone chip and rolling) shall be payment in full for carrying out the required operation including full compensation.

(1) Preparation of base.

(2) Providing all material like fuel, lubricants, kerosene and coarse sand or stone dust for flushing with all lead and lift.

(3) All labour, tools, equipment and incidentals.

(4) Making arrangements for control and safety of traffic.

ITEM 64 Providing 75mm. thick premix asphalt macadam using 611.00 Kg. Asphalt 10.80 Cu.m. chips for 100 Sq.m.

This work shall consist of lying and open graded carpet of cm thickness in a single course and seal coat (excluding cost of asphalt stone chip) composed of suitable small sized aggregated premixed with a bituminous binder on a previously prepared basis.

The materials shall be proportioned as per quantities given in the table.

Quantities of material required for 100 Square metre of road surface for 75 cm thick open graded premixed carpet.

	Aggregate for Carpet:	
Stone chippings 20mm Size	40 to 50mm size.	4.80 Kg.
Stone chippings 12mm Size	25 to 40mm size.	3.60 Kg.
Stone chippings 10mm Size	12 to 20mm size.	2.40 Kg.
Asphalt	611.00 Kg. Per 100 Square metre	10.80 Kg.

Carpet shall not be laid during rainy weather or when the base course is damp or whether or when the atmospheric temperature in shade is 16 % degree centigrade or below.

Sr. No.	Size of Chip	Quality of Chip	Rate of Asphalt	Total Quality of asphalt
1.	Tack Coat	--	73.40	73.40
2.	50 to 40mm	4.8	48.0 Kg/cm	230.40
3.	40 to 20mm	3.60	58.8 Kg/cm	172.80
4.	20 to 10mm	2.40	56.0 Kg/cm	134.40
				611.00 Kg.
		I.e. 0.611 Tones	Per 100 Sc. meter	

The under laying base on which the bituminous carpet is to be laid shall be prepared, shaped and conditioned to the specified line grade and cross-section as directed by the Engineer-in-charge. The surface shall be well cleaned with brushes. Swiping with brooms and final dusting with sacks as necessary.

Tack Coat: This work shall consist of application of a single coat of bituminous material to an existing road surface preparatory to another bituminous construction. The temperature of bitumen at the time of application shall be in the range of 160.0 deg. centigrade to 175.0 deg. centigrade.

Binder shall be heated to the appropriate to the grade of bitumen used and approved by the Engineer-in-charge at the rate specified below. The rate of spread in terms of straight run bitumen shall be 980 Kgs. per 10 Square metre area. The binder shall be applied uniformly. Wastage of bitumen will not be permitted beyond 2.5 %.

Mixers of approved type shall be employed for mixing the aggregates with the bitumen's binder. The binders shall be heated to the temperature approved by the Engineer-in-charge avoiding local overheating and ensuring a continuous supply. The aggregates shall be dried before they are placed in the mixture. After about 15 seconds of dry mixing, the heated binder shall be distributed over the aggregates at the rate specified. The contractor according to the requirement at the contractors cost shall provide kerosene to an extent of 4 % to 6 % of asphalt.

The premixed material shall be spread on the road surface with rakes to the required thickness and camber or distributed evenly with the help of a drag spreader, without any undue loss of time. The camber shall be checked by means of camber boards and inequalities evened out. As soon as sufficient length of bituminous material has been laid, rolling shall commence (rolling shall be done departmentally). When the roller has passed over the whole area once any neigh, spot or depression, which become apparent shall be corrected by removing or adding premixed materials the contractor shall provide necessary labour for keeping the roller wheels clean during rolling so as to prevent the premix from adhering to the wheels and being packed up. The edge along transverse of carpet laid and compacted earlier shall be cut to their full depth so as to expose fresh surface which shall be pointed with a thin surface coat of appropriate binder before the new mix is placed against.

Control on quality of the works shall be exercised by the Engineer-in-charge by carrying out the following tests at the frequencies shown against each.

Sr. No.	Type of Construction	Test	Frequency
1.	Tack Coat	Binder temperature for application Rate of spread binder	At regular close interval
2.	Opening graded premix carpet with seal coat.	Temperature of binder at application Binder Content (vide AS/TM-D-2172) Rate of spread of mixed material	At regular close intervals Two tests per day for work of every 3 Km length in one lane. Regular control through checks on materials and layer thickness

13. Para 13 to 17: - As regards arrangements for traffic par 29 to 33 of semi dense carpet shall apply.

18. The payment for the work shall be done on the square meter basis.

19. The contract unit rate for open grade carpet and seal coat, (excluding cost of asphalt, stone chip and rolling) shall be payment in full for carrying out the required operation including full compensation.

Preparation of base.

Providing all material like fuel, lubricants, kerosene and coarse sand or stone dust for flushing with all lead and lift.

All labour, tools, equipment and incidentals.

Making arrangements for control and safety of traffic.

ITEM 65 Earthwork in cutting in hard murrum & builders.

Earth work in cutting shall be made in hard soil such as stiff heavy clay, hard shale or compact murrum, requiring grafting tool or pick or both and shovel, closely applied and gravel and rubble stone having maximum diameter direction between 75 and 300mm and soft conglomerate. The classification of cutting shall be decided by the Engineer-in-charge and his decision shall be final and binding on the Contractor. Mode of measurement shall be measured after removal of over burden by tucking cross section at suitable intervals in the original position before the work starts and after its completion and areas. Payment shall be made on CMT basic. The rate shall include the cost of labour tools to complete the job.

ITEM 66 U.C.R. masonry for superstructure in C.M.

Para 1 to 14 Item No. 30 of the roads specifications booklet shall apply for the work of this item

ITEM 67 Earthwork in cutting in soft rock.

Earth work in cutting shall be in soft rock such as lime stone, sand stone, late rite, hard conglomerate or other soft rock which may be quarried or split with crow bars, boulders which do not require blasting and any rock which in dry state may be hard, requiring blasting but which when wet becomes soft and manageable by means other than blasting. The classification shall be decided by the Engineer-in-charge and his decision shall be final and binding on the Contractor.

Mode of measurement shall be measured after removal of over burden by tacking cross sections at suitable intervals in the original position before the work starts and after its completion and computing the volumes in cubic meter by method of average and areas. Payment shall be made on CMT basis. The rate shall include the cost of labour, tools to complete the job.

ITEM 68 Supplying and stacking hardstone.

The stone shall be hard, sound free from cracks decay the weathering and shall be fleshing quarried from an approved quarry stone with round surface shall be used. The stone when immersed in water for 24 hour shall not absorb water by more than 5 percent of their dry weight when tested in accordance with I.S. 1124. The length of stone shall not exceed three times its height and the breadth on base shall not be greater then three-fourth of the thickness of wall not less than 15 cm

Stacking shall be done as pre the instruction given by Engineer-in-charge. No deduction for voids shall be made from the gross measurements. The payment shall be made on cubic meter basis.

ITEM 69 Carting and stacking of scarity hand broken metal on site with all leads including filling the boxes.

The stone metal shall be obtained from stacking of scarcity metal, which is broken in previously scarcity period. Carting shall be done as per instruction of Engineer-in-charge.

Stacking hall be done by filling in the standard steel boxes of 2m X 1.5m X 0.5m size which shall be supplied by the Department, if available, on rent otherwise contractor shall make his own arrangement and no deduction for voids shall be made from the gross measurements. Where any doubt exists as to weather the quantity of stacks of metal in any hectometre is not confirming the cubical content of the standard pharas (2m X 1.5m X 0.5m) it shall be got corrected by the contractor, if so ordered by the

Engineer-in-charge, for which no extra payment shall be claimed by the contractor. If the quantity of metal in any stack in a particular Hectometre is found to be less than the standard measurement wiz 1.5 cm the entire collection in the Hectometre shall be paid on the basis of the quantity so found. The contractor on a fairly level ground shall do regular stacks. Stacking of the metal shall be done in a manner as directed by the Engineer-in-charge. The standard size box measurement for aggregate will be recorded, as final and no subsequent change will be permitted.

The payment shall be made on cubic meter basis without deduction for voids. The contractor shall maintain all stacks in regular and proper size till the whole material are collected, measured and finally accepted by the Department. The rate includes conveyance to the site with all lead and lift and filling the boxes including all labour, tools, equipment and other incidental expenses.

ITEM 70 Providing and laying thick compacted bituminous macadam with tack coat at 5 Kg./1 – Sq.m. using stone aggregate as per M.O.S.T. gradation specification and asphalt mixing at the rate of 4 % (40 Kg/M.T.) using hot mixes plant and spreading the same with paver finished including consolidation with power Rollers including fuel, labour charges, and equipment etc. complete.

DESCRIPTION: The work shall consist of construction, in a single course, of 50mm/75mm thickness of compacted crushed aggregates premixed with a bituminous binder, laid immediately after mixing, an base prepared previously in accordance with the requirements of these specification and in conformity with lines, grades and cross sections shown on the drawings or as directed by the engineer-in-charge.

MATERIALS:

Binder: The binder shall be straight run between of a suitable grade as directed by the Engineer-in-charge complying with IS: 73.

Aggregates: The aggregates shall consist of crushed stone, crushed gravel (single) or other stones. They shall be clean, strong durable of fairly cubical shape and free disintegrated pieces, organic and other deleterious matters and adherent coatings. The aggregates shall preferably be hydrophobic and of low porosity.

The aggregates shall satisfy the physical requirements set forth in Table hereafter.

Table – 1 PHYSICAL REQUIREMENT OF AGGREGATES FOR BITUMINOUS MACADAM

Sr. No.	Test	Test Method	Requirements
1	Los Angeles Abrasion Value*	IS: 2386 (Part IV)	35 % Maximum
2	Aggregates Impact Value*	IS: 2386 (Part IV)	30 % Maximum
3	Flakiness Index	IS: 2386 (Part I)	30 % Maximum
4	Stripping Value	IS: 6241	25 % Maximum
5	Water Absorption	IS: 2386 (Part III)	2 % Maximum

* Aggregates may satisfy requirements of either of the two tests.

The aggregates for bituminous macadam for different thicknesses shall conform to the Grading A or B given in Tables 2 and 3 the actual grading to be used shall be specified in the contract.

Table – 2 AGGREGATES GRADING FOR 75MM COMPACTED THICKNESS OF BITUMINOUS MACADAM

Sieve Designation	Percentage by wt. Passing For Type 'A'	Through Sieve For Type 'B'
63 mm	100	–
50 mm	90 – 100	–
40 mm	35 – 65	100
25 mm	20 – 40	70 – 100

20 mm	–	50 – 80
12.5 mm	5 – 20	–
4.75 mm	–	10 – 30
2.36 mm	–	5 – 20
75 micron	0 – 5	0 – 4

Table – 3 AGGREGATES GRADING FOR 50MM COMPACTED THICKNESS OF BITUMINOUS MACADAM

Sieve Designation	Percentage by wt. Passing For Type 'A'	Through Sieve For Type 'B'
50 mm	100	–
40 mm	90 – 100	–
25 mm	50 – 80	100
20 mm	–	70 – 100
12.5 mm	10 – 30	–
10 mm	–	35 – 60
4.75 mm	–	15 – 35
2.36 mm	–	5 – 20
75 micron	0 – 5	0 – 4

Proportioning of materials: The binder content for pre-mixing shall be 3.5 and 4.0 percent by weight of the total mix for aggregate grading A and B respectively, except when otherwise directed by the Engineer-in-charge.

Variation in proportioning of Material: The contractor shall have the responsibility for ensuing proper proportioning of material and producing a uniform mix. A variation in binder content of $\pm$ 0.3percent by weight of total mix shall, however, be permissible for individual specimens taken for quality control tests vide section 900*.

CONSTRUCTION OPERATION:

Weather and seasonal limitation: Bituminous macadam shall not be laid during rainy weather or when the base course is damp or wet.

Preparation of the base: The base on which bituminous macadam is to be laid shall be prepared, shaped and conditioned to the specified lines, grades, and cross sections in accordance with Clause 501*, as directed by the Engineer-in-charge. The surface shall be thoroughly swept and scraped clean and free from dust and foreign matter.

Tack Coat: A tack coat as per clause 503* shall be applied over the base except when the laying of bituminous macadam is being proceeded by a bituminous levelling course.

Preparation and transport of mix: Hot mix plant of adequate capacity shall be used for preparing the mix.

The temperature of binder at the time of mixing shall be in the range of 150° to 165° C, Provided that the different in temperature between the binders and aggregate at no time exceeds 25° C.

Mixing shall be thorough to ensure that a homogeneous mixture is obtained in which all particles of the aggregates are coated uniformly.

The mixture shall be transported from mixing plant to the point of use in suitable vehicles. The vehicles employed for transport shall be clean and be covered over in transit if so directed by the Engineer-in-charge.

Spreading: The mix shall be spread immediately after mixing by means of self propelled mechanical paver with suitable screeds capable of spreading, tamping and finishing the mix true to the specified lines, grade and cross sections. However, in restricted and in narrow widths, where the available plants cannot operate in the opinion of the Engineer-in-charge, he may permit manual laying of the mix.

The temperature of the mix at the time of lying shall be in the range of 110° to 135° C. In multi layer construction the longitudinal joint in one layer shall offset that in the layer below

by about 150 mm. However, the joint in the most layers shall be at the centre line of the pavement.

Longitudinal joint and edges shall be constructed true to the delineating line parallel to the centre line of the road. All joints shall be cut vertical to the full thickness of the previously laid mix and the surface painted with hot bitumen placing fresh material.

Rolling: After the spreading of mix, rolling shall be done by 8 to 10 tonne power rollers or other approved plant. Rolling should start as soon as possible after the material has been spread. Rolling should be done with care to keep from unduly roughening the pavement surface.

Rolling of the longitudinal joints shall be done immediately being the paving operation. After this the rolling shall commence at the edge and the progress towards the centre longitudinally except that on super elevated portions it shall progress from the lower to the upper edge parallel to the centre line of the pavement.

The initial or break down rolling shall be done, as soon as it is possible to roll the mixture without cracking the surface or having the mix pick up on the roller wheels. The second or intermediate rolling shall follow the break down rolling as loosely as possible and be done while the paving mix is still at a temperature that will result in maximum density. The final rolling shall be done while material is still workable enough for removal of roller marks.

Removing or adding fresh material shall correct when the roller has passed over the whole area once, any high spots or depressions, which become apparent. The rolling shall than be continued till the entire surface has been rolled to compaction, there is no crushing of aggregates and all roller marks have been eliminated. Each pass of the roller marks has been eliminated. Each pass of the roller shall uniformly overlap not less than one-third of the track made in the preceding pass. The roller wheel shall be kept damp if necessary to avoid bituminous material from sticking to the wheels and being picked up. In no case shall fuel-lubricating oil be used for the purpose

Rolling operation shall be completed in every respect the temperature of the mix falls below 80° C.

Rollers shall not stand on newly laid material while there is a risk that it will be deformed thereby. The edges along the transverse of the bituminous macadam laid and compacted earlier shall be cut to their full depth so as to expose fresh surface which shall be painted with a thin surface coat of appropriate binder before the new mix is placed against it.

SURFACE FINISH AND QUALITY CONTROL OF WORK: The surface finish of construction shall conform to the requirements of Clause 901.

Control on the quality of materials and works shall be exercised by the Engineer-in-charge in accordance with Clause 902*.

The bituminous macadam shall be provided with final surfacing without any delay. If there is to be any delay, the course shall be covered by a seal coat to the requirement of Clause 511 before allowing any traffic over it.

ARRANGEMENTS OF TRAFFIC: The provision of Clause 105 shall apply as regards the flow of traffic during construction.

MEASUREMENT FOR PAYMENT: Bituminous macadam shall be measured as finished work in cubic metres.

RATE: The contract unit rate for bituminous macadam shall be payment in full for carrying out the required operations including full compensation for:

(i) Making arrangements for traffic to clause 105 except for initial treatment to shoulders and construction of diversions.

(ii) Preparation of base except for laying of levelling course but including filling of potholes;

(iii) Providing all materials to be incorporate in the work, including all royalties, frees rents where necessary all leads and lifts.

(iv) All labour, tools, equipments and incidentals to complete the work to the specifications; and

(v) Carrying out the work in par widths where directed.

ITEM 71 Providing and laying C.C. 1:5:10 (1 cement: 5 coarse sand: 10 graded stone aggregate of 40mm. nominal size) and curing etc. complete excluding cost of formwork in foundation and plinth.

1.0 MATERIAL:

1 Water:

Waters shall not be salty or brackish and be clean, reasonably clear and free from objectionable qualitative of slit and injurious alkalis, slats organic matter and other deleterious material which will either weaken the mortar or concrete or our cause efflorescence or attack the steel in R.C.C. container for transport storage and handling of water shall be clear water shall conform to the standard specifications in I.S. 456 – 1979.

If required by the Engineer-in-charge it shall be tested by comparison with distilled water. Compression shall be and means of standard cement tests for soundness, time of setting and mortar strength as specified in I.S. 269 – 1976. Any indication on unsoundness change in time of setting by 30 minutes or more of decrease or more than 10 percentage of mortar prepared with water sample when compared with the results obtained with mortar prepared with distilled water shall be sufficient cause for rejection of water under test.

Water for curing mortar, concrete or masonry should not be too acidic or too alkaline. It shall be free of elements, which significantly effect the hydration reaction or otherwise interface with the hardening of mortar, or concrete during curing or those which produce objectionable stains or other unsightly deposits on concrete or concrete during curing or those which produce objectionable stains or other unsightly deposits on concrete or mortar surfaces.

Hard and bitter water shall not be used for curing.

Portable water will generally be found for suitable for curing mortar or concrete.

2 Sand:

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

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

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

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

I.S. Sieve Designation	% by wt. passing
4.75 mm.	100
2.36 mm.	100
1.18 mm.	70 to 100
600 MC	40 to 85
300 MC	05 to 85
150 MC	00 to 10

3 **Cement:** Cement shall be ordinary Portland slab cement as per I.S. 1975 per portal alga cement as per I.S. 455 – 1976.

4 **Stone coarse Aggregate for nominal Mix Concrete:** Coarse aggregate shall be or machine crushed stone of black trap of equivalent and hand, strong, dense, durable, clean and free from skin and coating likely to prevent proper adhesion of mortar.

The aggregate shall be generally be cubical in shape unless special stone of particular quarries are mentioned aggregate shall be machine crushed from the best black trap or equivalent hard stone as approved. Aggregate shall have deleterious reaction with cement. The size of the coarse aggregate for plain cement concrete and ordinary reinforced cement. The concrete shall generally be as per the table given below. However in case of reinforced cement concrete the minimum limit may be restricted to 6 mm. less than the minimum lateral clear distance between bars or 6 mm. less than the cover whichever is smaller.

The grading test shall be taken in the beginning and at the change of source of material. The is necessary that indicated in I.S. 383 – 1970 and I.S. 456 – 1978 shall have to be carried pit to insure the acceptability. Aggregate shall be stored separately and handled in such a member as to prevent the intermixing diff. Aggregate if the aggregate are covered with dust, they shall be washed with water to make them clean.

2 **Workmanship:**

General: Before starting concreting the bed of foundation trenches shall be cleared of all loose materials level, watered and rammed as directed.

Proportion of mix: The proportion of cement sand and coarse aggregate shall be one part of cement 5 parts of sand and 10 parts of brick bats aggregate and shall be measured by volume.

Mixing: The concrete shall be mixed in a mechanical mixer at the site of hand mixing may however be allowed for collar quantity work if approved by the Engineer-in-charge when hand mixing is permitted by Engineer-in-charge in case of break down of machineries and in the interest of work is shall be carried out on water tight platform and care shall be taken to ensure that mixing is continued until the mass is uniform in colour and consistency. However in such cases 10 % more cement extra case. One mixing in mechanical mixer shall be done period of 1.5 to 2 minutes and the quantity of water shall be just sufficient to provide a dense concrete of required workability for the purpose.

Transporting and placing the concrete:

The concrete shall be handled from the place of mixing to the final position in not more than 15 minutes by the method as directed and shall be placed in to its final position, completed and finished within 30 minutes of mixing with water i.e. before the setting commences.

The concrete shall be laid in layer of 15 Cms. to 20 Cms.

Compacting: The concrete shall be rammed with heavy iron rammed and rapidly to gat to the require compaction and to allow all the interstices to be filled with mortar.

Curing: After final set be concrete shall be kept continuously wet of required by pending a period of not less than 7 days the date of placement.

Mode of measurement and payments:

The concrete shall be measured for its length, breadth and depth limiting dimensions to those specified on plan or as directed.

The rate shall be for a unit of one cubic meter

ITEM 72 Supplying and stacking unscrewing gravel on site of work etc. as directed.

The unscreened gravel shall be obtained from quarries approved by Executive Engineer prior to collection. The material shall be of approved quality with all lead and lift. The material shall be clear and free from organic material, site, clay etc. and shall be got approved from Engineer-in-charge.

Wherever any doubt exists as to whether the above requirement are satisfied is work or any part of the collection, it shall be rectified by the contractor at his own cost, if so ordered by Engineer-in-charge.

Stacking shall be done by filling in the standard steel boxes of 2 mt. X 1.5 mt. X 0.5 mt. Size which shall be supplied by the department if available on rant otherwise constrictor shall make his own arrangements. No deduction for voids shall be made from the gross measurements. Where any doubt exists as to whether the quantity of stacks of material in any hectometre is not confirming with the cubical content of the standard pharas (2 mt. X 1.5 mt. X 0.5 mt.) shall be got corrected by the contractor if so ordered by the Engineer-in-charge for which no extra payment shall be claimed by the contractor. If the quantity of material if any stack in a particular Hectometre os found to be less than the standard measurement viz. 1.5 Cmt. The entire collection in the hectometre shall be paid on the basis of the quantity so found. Regular stacks shall be done by the contractor on fairly level ground. Stacking of material shall done in a manner as directed by the Engineer-in-charge.

For road work complete stacking of material s per requirements shall be carried out in 2 K.M. length before spreading. The materials stacks shall be measured and recorded and got cross checked by the other Deputy Executive Engineer as per rules before spreading. The collection shall be always commence at one end of the K.M. and be carried out continuously towards the other end unless the Engineer-in-charge direct otherwise.

The payment shall be made on cubic metre basis without deduction for voids/The contractor shall maintain all stacks in regular and proper size till the whole materials shall not measured and finally accepted by the Department. The spreading of materials shall not be allowed till the materials are fully stacked and completed kilometre wise.

The rate includes cost of collection, conveyance to the site with all lead and lift and filling the boxes including all labour, tools, equipments and other incidental expenses. The rates quoted are inclusive of all such tools, duties, fees, royalties, taxes etc.

ITEM 73 Filling available excavate earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20 cm. in depth consolidating each deposited layer by ramming and watering.

The earth to be used for filling shall be free from salts, organic or other foreign matter. All clods of earth shall be broken.

As soon as the work in foundation has been completed and measured, the site of foundation shall be cleared of all debris, stone, mortar droppings etc. and filled with earth in layers not exceeding 20 Cms. each layer shall be adequately watered. Rammed and consolidated before the succeeding layers is laid. The earth shall be rammed with iron rammers where feasible and with the butt ends of crow – bars, where rammer cannot be used. With iron rammers finished level, the surface shall be flooded with water for at least 24 hours and allowed to dry and then rammed and consolidated.

The excavated stuff of the selected type shall be allowed to be used in the filling the trenches and plinth under no circumstances black cotton soil be used for filling.

The payment shall be made for filling in trenches and plinth. No deduction shall be made for shrinkage or voids, if consolidated as instructed above.

The rate shall be unit of one cubic metre.

ITEM 74 Providing and fixing junction board of M.S. plate and angle as per standard I.R.C. design including fixing in C.C. 1:4:8 with necessary excavation, painting, lettering, figuring and lettering on board etc. complete.

The boards shall be fixed at a distance of 120 Mt. From the centre line of the crossing and they should be located on the left hand side of the road in the direction of the traffic and facing the traffic.

The board will be located in such a way that the edges of the board towards the centre line of the road will be at a distance of 4.57 Mt. From the centre of a N.H. and 3.66 Mt. From the centre of a S.H. or M.D.R. or as directed by the Engineer-in-charge.

The bottom of the board shall be 1 Mt. above the road surface and the board shall be at right angles of the centre line of the road facing the direction of the traffic.

The size for the junction board M.S. plate and angles shall be as per standard confirming to I.R.S. type design.

The board shall be fixed in the concrete and the projection of this above the road level shall be 4 Cms. X 45 Cms. and a height of 24 Cms. above the road level and the top is to be finished tapering from to the height of 15 Cms.

The board shall be supported by the angle iron parts of M.S. angle as shown in the standard type design.

The size of letters and figures shall be 8 Cm. for English and 10 Cms. for Devnagri and Gujarati scripts.

The post shall be maintained in black and white alternative strips of 23 Cms. in height.

The board shall be painted in white with blackboard 2 Cm. wide.

On this board tablets shall be painted in yellow with a black border and the tablets shall have 5 Cms. clear distances from the board.

Each such tablet shall be 61 Cms. in length and 33 Cms. in height arrow lines indicating the direction of the road at a junction shall be painted in black and shall have a thickness of 5 Cms. for N.H. and 4 Cms. of S.H. and 2.5 cms. for M.D.R.

All letters and figures shall be painted in black.

The work shall be carried out as per design and as per the instructions of the Engineer-in-charge.

ITEM 75 Scarifying gravelled macadam of bitumen macadam surface 6 cm. to 10 cm. depth including stacking useful materials on road side and depositing or remaining stuff.

The layer of the existing layer medalling shall be excavated and shall be screened on site of work. Stacking of 75 % of metal obtained from screening shall be done by filling in the standard steel boxes of 2 m X 1.5 m X 0.5 mt. Size which shall be supplied by department if available on rent, otherwise contractor shall make his own arrangements. No deduction for avoid shall be made from the gross measurements. Where any doubt exist as to whether the quantity of stacks metal in any hectometre is not conforming with cubical content of the standard pharas (2 m X 1.5 m X 0.5 m) shall be got corrected by the contractor if so ordered by the Engineer-in-charge for which no extra payment shall be claimed by the contractor. If the quantity of metal in any stack in a particular hectometre is found to be less then the standard measurement viz. 1.5 cmt. The entire collection in the hectometre shall be paid on the basis of the quantity so found. Regular stacks shall be done by the contractor on a fairly level ground. Stacking of the metal shall be done in a manner as directed by the Engineer-in-charge.

The remaining material except 75 % of metal obtained from screening process shall be used in embankment with all lead and lift. It shall be directly deposited at the required location in specified layers. No handling or conveyance charges shall be paid if the materials is temporarily deposited else where and subsequently convey to site of deposition. The sequence of operations should be arranged properly. Material not required for any use whatsoever may be disposed off by the contractor at his own cost in manner approved by the Engineer-in-charge. The material utilised in the embankment will be deducted from the net quantity of earthwork in embankment arrived at within the chain age measured.

The payment shall be made on sq. mt. Basis, the contractor shall maintain all stacks in regular and proper size till the whole materials shall not be measured and finally accepted by the department. The spreading of materials shall not be allowed till the material are fully stacked and completed kilometre wise.

The rate includes the cost of scarifying macadam, depositing, conveyance with all lead and lift, filling the boxes including all labour, tools, equipment and all other incidental expenses.

ITEM 76 Extra for dewatering in foundation etc. complete.

Where water in met within excavation due to stream flow. Seepage, springs, rain or other reasons, the contractor shall take adequate measures such as bailing, pumping, to keep the foundation trenches dry when so required and protect green concrete/masonry against damage by erosion or sudden rising of water level. The methods to be adopted in this regard and other details thereof shall be left to the choice of the contractor but subject to approval of Engineer-in-charge shall,

however, not relieve the contractor of the responsibility for the adequacy of dewatering and protection arrangements and of the quality and safely of the work.

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

The measurement shall be paid on cubic meter basis for each class of materials encountered.

The rate includes the cost of dewatering including pumping.

ITEM 77 Supplying and stacking of rubble including rubble dumping as and where required as directed.

1. Stone shall be hard, stone, sound, free from cracks, decay and weathering and shall be freshly quarried from an approved quarry. Stone with round surface shall not be used. The length of stone shall not exceed three times its height and the breadth on base shall not be greater then the three fourth of the thickness of wall not less than 15 cm. the rubble shall be stacked in chhattas manner on fairly levelled ground as and where directed as per the instruction of the Engineer-in-charge. 16 % for void shall be deducted from gross measured quantity. The rate includes all labours, material, tools and equipment, dumping the rubble and all other incidental expenses occurred. The payment shall be made on cmt. Basis.

ITEM 78 Jungle cutting for road side clearance on road site as directed.

The land width shall be cleared i.e. cutting of tress of any diameter, grass, vegetation etc. as per the instruction of the Engineer-in-charge. The wood obtained if any by clearing of the jungle shall be the properly of department and the same shall be casted and stacked to the place and hand over the same to the Deputy Executive Engineer as per the instruction laid by him.

CONTRACTOR'S SIGNATURE **EXECUTIVE ENGINEER**

SCHEDULE FOR TESTING OF MATERIALS

For Ensuring quality control and workmanship, various test prescribed below corresponding to materials concerned shall be taken at periodical intervals as stipulated below:

The materials shall be got tested at Government recognised Laboratory (R & B) or field laboratory of GERI (R & B) for which 1 % of the estimated amount per to tender shall be recovered from the contractor from the R. A. Bills and final bills and the testing charges shall be paid to the GERI by the Government. However, if the charges increase over 1 % no excess recovery shall be made from the Contractor. Rates as per resolution of B & C Department vide No. TNC/1085 (4) s dated 10th May 1985.

Item No. As per Schedule B.	Materials to be tested. Brief description of them	Qty. of Materials	Prescribed	Frequency @ which test shall be carried out	Total N.: of test to be taken M/c stone
1.	40mm to 63mm metal	Centimetre	Gradation test	1/100 cmt	

	HMS/MG		P.L. Test P.I. Value Impact Value I Value	1/200 cmt 1/200 cmt	
2.	Supplying approved	Centimetre			
3.	Bricks	5000 No.	Impact/coater absorption	1/5000 Nos.	
4.	Tack coat	Centimetre	Binder temperature for application.	Regular close in	
			Rate of spread of Tender	Intervals two test per day.	
5.	Carpet and seal	Centimetre	Aggregate impact value.	One test per 100 cubic Metre of aggregate	
			Flakiness index of aggregate.	-Do-	
	Striping value.	One test on individual			
			Mix grading.	Constituent and mixed aggregated from the dryer for each 100 tonnes of mix subject to min. of two tests per plant per day.	
			Control temperature of binder in boiler aggregates in the dryer and mix at the time of laying and rolling.		
			Control of binder content & gradation in the mix	One test for each 100 tons of mix subject to minimum of	

			(binder content test vide 45 IMD 2172).	two tests per day plant.	
			Rate of spreaded mix materials.	Regular control through checks on layer thickness.	

The contractor shall have to pay 1 % of the estimated cost put to tender towards all testing of materials & the 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. the contractor and Govt.

Testing charges of GERI be by Govt. to refund be made or extra charges over 1 % shall be recoverable from the contractor.

SIGNATURE OF CONTRACTOR **EXECUTIVE ENGINEER**