



**GOVERNMENT  
OF  
MADHYA PRADESH  
PUBLIC WORKS DEPARTMENT**

**SCHEDULE OF RATES  
*FOR*  
ROAD & BRIDGE WORKS**

**IN FORCE FROM NOVEMBER' 3<sup>RD</sup> 2014**

*ISSUED BY -*

**ENGINEER-IN-CHIEF  
PUBLIC WORKS DEPARTMENT  
M.P. BHOPAL**

Price : Rs. 1000/-

(Excluding Postage and forwarding Charges etc.)

# FOREWORD

"Schedule of Rates" for Road and Bridges works are Published by the Public works Department from time to time. The Public works Department since its inception has revised Schedule of Rates for Road and Bridge works on various occasions.

The last Schedule of Rates for Road and Bridge works was published on Feb 1<sup>st</sup> 2013. Since then the prices of labour and material have registered substantial increase. The Ministry of Road Transport and Highway, Government of India has also revised the "Specification for Road and Bridge works" (Vth Revision) in Feb'2013. Accordingly this Schedule of Rates has been prepared, keeping in view the latest specifications thereby incorporating new items and omitting obsolete/un-useful items.

While some new items like Micro Surfacing, Tack coat with VG 10 grade bitumen have been introduced, some other items like Semi Dense Bituminous Concrete, Bituminous Penetration Macadam have been deleted in consonance with the "Specifications for Road and Bridge works" (Vth Revision) Published by IRC. Nomenclature and description of some items has been modified as per the requirements.

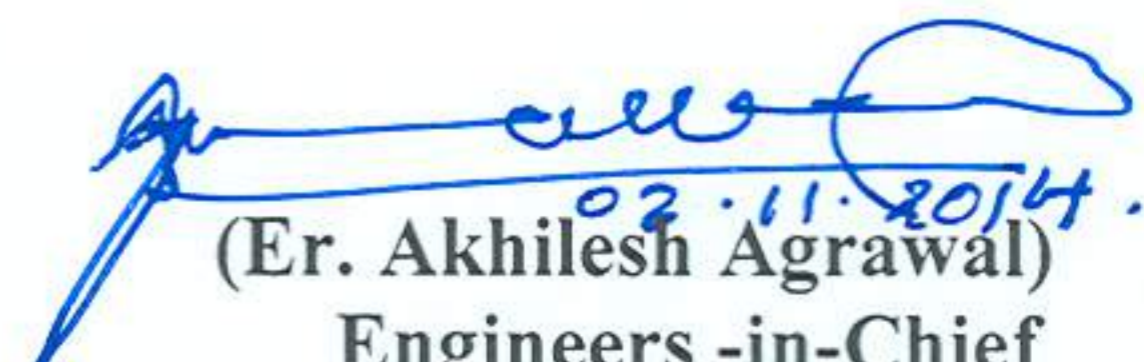
Standard Tables given in the specifications have been annexed with the SOR, so as to facilitate easy reference to the specification during execution. List of the IRC Publications available for Sale is also Annexed with the S.O.R.

I would like to extend my gratitude and thanks to **Mr. A.K. Pandey, Chief Engineer, Mr. Akhilesh Upadhyay, Superintending Engineer, Mr. K.P.S. Rana, Superintending Engineer, Mr. Ajay Joshi, Superintending Engineer, Mr. Ajay Anand Likhar, Executive Engineer, Mr. Javed Shakil, Executive Engineer Mr. Deepak Sharma, Sr. Account Officer and Mr. Rajiv Kuruvilla**, who have contributed considerably towards bringing out this Schedule of Rates into effect. I would like to make a **special mention of Mr. Javed Shakil, Executive Engineer** for his meticulous and methodical Contribution to bring out this document.

Although due care has been taken to frame the Schedule of Rates, however, suggestions, if any towards further improvement of this document shall be highly appreciated.

This SOR is available on the Departmental web site [www.mppwd.gov.in](http://www.mppwd.gov.in) and shall be applicable **w.e.f. Nov. 3<sup>rd</sup>, 2014**

Bhopal.  
November 3<sup>rd</sup>, 2014

  
(Er. Akhilesh Agrawal)  
02.11.2014  
Engineers-in-Chief  
M.P. Public works Department

# INDEX

<b>Chapter No.</b>	<b>Description</b>	<b>Page No.</b>
	<b>General Notes (Road works)</b>	<b>1-2</b>
	<b>General Notes (Bridge works)</b>	<b>3-8</b>
<b>Chapter-1</b>	<b>Carriage &amp; Supply of Materials</b>	<b>9-11</b>
<b>Chapter-2</b>	<b>Site Clearance</b>	<b>12-15</b>
<b>Chapter-3</b>	<b>Earth work, Erosion Control and Drainage</b>	<b>16-19</b>
<b>Chapter-4</b>	<b>Sub Bases, Bases (Non Bituminous) and Shoulders</b>	<b>20-23</b>
<b>Chapter-5</b>	<b>Bases and Surface Courses (Bituminous)</b>	<b>24-31</b>
<b>Chapter-6</b>	<b>Cement Concrete Pavements</b>	<b>32-36</b>
<b>Chapter-7</b>	<b>Geosynthetics and Reinforced Earth</b>	<b>37-39</b>
<b>Chapter-8</b>	<b>Traffic Signs, Markings &amp; Other Road Appurtenaances</b>	<b>40-48</b>
<b>Chapter-9</b>	<b>Pipe Culverts</b>	<b>49-51</b>
<b>Chapter-10</b>	<b>Maintenance of Roads</b>	<b>52-54</b>
<b>Chapter-11</b>	<b>Horticulture</b>	<b>55-56</b>
<b>Chapter-12</b>	<b>Foundations</b>	<b>57-63</b>
<b>Chapter-13</b>	<b>Sub Structure</b>	<b>64-67</b>
<b>Chapter-14</b>	<b>Super Structure</b>	<b>68-73</b>
<b>Chapter-15</b>	<b>River Training and Protection works</b>	<b>74-76</b>
<b>Chapter-16</b>	<b>Repair and Rehabilitation</b>	<b>77-79</b>
<b>Chapter-17</b>	<b>Survey &amp; Investigation, Preparation of D.P.R.</b>	<b>80-81</b>
<b>Chapter-18</b>	<b>Video Photography</b>	<b>82-83</b>
	<b>Standard Tables of Specifications</b>	<b>84-125</b>

This SOR is based on Standard Data book for analysis of Rates for Road and Bridge Works.

# GENERAL NOTES

## ROAD WORKS

- 1)
  - (i) "Specifications" would refer to the "Specifications for road and bridge works" (5th Revision) published by the Indian Roads Congress April'2013, on behalf of the Government of India, Ministry of Road Transport & Highway (Roads Wing).
  - (ii) "Clause" would refer to clauses of the specifications referred to in note (i) above.
  - (iii) "Engineer-in-charge" would refer to the Executive Engineer of the division or any other person like Supervision Consultant etc., so authorised by the Department.
  - (iv) "Table" would refer to the table of the aforesaid specifications.
- 2) The rates have been normally analysed for items being executed through mechanical means. However, for certain items rates have been derived for execution through manual means also. These items (using manual means) should be incorporated in the estimates only after site inspection by the S.E. and after getting written permission from the C.E.
- 3) The rates for any items shall include all such activities which are described in the corresponding items of "Specifications for road and bridge works" (5th Revision). In addition to these activities the rates shall be deemed to include charges for lease of borrow areas/ mines, royalty of material consumed in the works, any other taxes/toll imposed etc. if any, unless otherwise provided in the contract.
- 4) Mode of measurements shall be as per provisions contained in the relevant clauses of the specifications, unless specified otherwise.
- 5) The rates considered for bitumen and emulsion are :

(i) Bitumen (80/100 Grade) VG-10	Rs.51625/- per tonne
(i) Bitumen (60/70 Grade) VG-30	Rs.52000/- per tonne
(ii) Bitumen emulsion	Rs.42099/- per tonne
(iii) Bitumen (cut back)	Rs.50625/- per tonne
(iv) C.R.M.B. - 60	Rs.53600/- per tonne
(v) P.M.B. - 40	Rs.53000/- per tonne

**The above rates are inclusive of transportation charges, all taxes, cess etc.**

- NOTE:
- (i) Bitumen to be used in the works shall be as provided in IS -73 while the modified bitumen should comply with Clause 501.2.1 or as otherwise specified in the contract.
  - (ii) In case the bitumen is supplied by the department in packed drums, the cost of drums would be charged extra @Rs.150/- per drum and Rs.300/- per drum for bitumen & emulsion respectively.
  - (iii) The use/ provision in the estimate of PMB-40/NRMB/CRMB is only permitted to be done with prior written permission of Chief Engineer.
- 6) For the purpose of quality assurance, the contractor is required to establish a field laboratory, in accordance with clause 120 of the specifications. All charges for testing, as per the defined frequency, whether done in field laboratory or otherwise required/directed to be done in any other laboratories, (Like NABL/Engineering colleges etc.) shall be treated as incidental to the execution of works and no separate payment for the same shall be permissible, unless otherwise provided in the contract.

- 7) The section 903 of the specification provides for minimum frequency of test to be carried out. In certain items table 900-3 mentions "as required" against frequency. To avoid ambiguity the following frequencies are hereby specified :-
- (i) Deleterious material. One test per 500 Cum. or part thereof.
  - (ii) C.B.R. One test per 500 Cum. or part thereof.
- 8) If any work is found to be sub-standard, but the Engineer-in-charge is of the opinion that the same can be accepted at a reduced rate, then the Engineer-in-charge shall submit proposals for the same, supported by an analysis i.e. justification of such reduction, through a D.O. letter to the Superintending Engineer concerned, to obtain his approval expeditiously (ordinarily within 15 days). The approved analysis along with orders of the Superintending Engineer should be appended to the final bill of the contractor. It is hereby clarified that the acceptability of the sub standard work should be necessarily supported by a logical engineering conclusion considering the structural safety and functionality of the item.
- 9) a) Rates for transportation in Chapter No. 1 of "Carriage of Material" include :-
- (i) Loading and unloading into transport vehicle with incidental leads upto 100 M. at each place and all lifts.
  - (ii) Stacking at suitable places as directed by the Engineer-in-charge.
- 10) Rubble available from excavation of hard rock, shall be deemed to have been used for conversion into coarse aggregates or for other construction work and shall be issued to the contractor @ Rs.250 per cubic meter of rock excavated.
- 11) Wherever an existing boulder soling or WBM pavement is required to be excavated, it shall be presumed that the material so obtained is used in the construction works, and shall be issued to the contractor @ specified below :-
- a) Rubble :- For every cubic meter of boulder soling excavated @Rs.200 per cubic meter.
  - b) Coarse Aggregate :- For every cubic meter of WBM excavated @ Rs. 250 per Cubic meter (Excavated WBM should be screened to segregate metal from moorum before re-use).
- 12) In case of any contradiction in the provisions of the specifications and this schedule of rates, the provisions of the later would take precedence.
- 13) The actual quantities of materials shall be as per job mix formula for bituminous works. Job mix design shall be approved by Engineer-in-charge prior execution of work.
- 14) The measurement of bituminous works shall be cross checked by the actual weight of the mix, used at the site. The contractor shall submit the weigh slips in support of the bituminous work.
- 15) The girth of trees shall be measured at 1.00 Metre (One Metre) above ground level.
- 16) All wood obtained from the tree shall be property of the government and shall be deposited at P.W.D. store or as per direction of Engineer-in-Charge.
- 17) The following over head charges have been taken in deriving the rates :-
- a) For Road works 10%
  - b) For Bridge works 25%

# GENERAL NOTES

## BRIDGE WORKS

### 1) FOUNDATION

- i) All works below ground level or lowest water level ( LWL) , whichever is higher shall be termed as foundation work.
- ii) LWL shall be the average water level met with at the time of doing the foundation work. The maximum and minimum water levels should be recorded by the Assistant Engineer, just before starting the particular foundation and within a reasonable time at the close of that foundation work, the average of these two levels will be the L.W.L. for that foundation work. In case of major bridges such records will be taken by the Executive Engineer.

### 2) SUB-STRUCTURE

- : The part of the bridge structure below the a)Soffit level of the deck slab/beams and or b)Springing level for arch spans, but above the ground level or L.W.L. which ever is higher, shall be taken as sub structure of the bridge part. Complete RCC box section will also be considered as sub-structure.

### 3) SUPER-STRUCTURE

- i) The work above (a)Soffit level for deck slabs/beams and (b)Springing level for arch span, including kerbs, railing, expansion joints, beams, slabs etc. shall be termed as super structure of the bridge part.

### 4) DEFINITIONS

- a) Major Bridge : Having total length between abutments at cap level 60 M. and above.
- b) Minor Bridge : Having total length between faces of abutments at cap level, 6 M. and above but less than 60 M.
- c) Culverts : Having total length less than 6 M.

### 5) SPECIFICATIONS

- i) The specifications of works shall be in accordance with 5<sup>th</sup> revision of "Specifications for Road and Bridge works" (Ministry of Road Transport & Highway) unless otherwise provided in the contract.

### 6) CONCRETE

- a) All concrete work shall be done as provided in section 1700 of "Specifications for Road and Bridge works" (Ministry of Road Transport & Highway) 5<sup>th</sup> Revision unless otherwise provided in the contract.
- b) Finishing of concrete by plastering the surface shall not be done without obtaining written permission from the Executive Engineer. No extra for plastering shall be payable. Light touching up and rubbing the uneven surfaces by carborandum stone shall be done within the specified rates.

### 7) STEEL

- ii) TMT Steel conforming to IS-1786 can be used in place of Tor Steel.
- iii) Steel used as reinforcement steel shall be measured as per clause 1608 of Specifications of Road and Bridge works, MORT&H.

## 8) CEMENT

- i) If the cement is brought by the contractor, the contractor shall be responsible for ensuring the quality of cement and would be bound to conduct any or all tests at his cost for ensuring its quality as per directions of the Engineer-in-Charge. The theoretical consumption of cement shall be worked out at regular intervals and shall be verified with actual cement brought to the site

## 9) MASONRY WORK

- i) All the stone masonry work shall be strictly as per "Specification for Road & Bridge works" of MORT&H (5<sup>th</sup> Revision).
- ii) In place of stone headers, precast (M-15 Concrete) shall be used. Cast-in-situ concrete headers are not permitted.
- iii) Generally for all stone masonry subjected to exposure of water flow (e.g. piers, abutments, returns etc.) C.R. Masonry first sort shall be used unless otherwise provided in the approved drawing.
- iv) In case where width of stone masonry is more than one meter, the central portion of stone masonry (Hearting) shall be done with uncoursed random rubble masonry. Payment for the C.R. Masonry will be limited to 1/2 meter width on either faces and the balance will be paid as uncoursed Random Rubble Masonry.

## 10) BASIC RATES OF MATERIALS

- i) The basic rates at site for important materials considered in this S.O.R. are as follows :-

a) Cement	Rs.5800/- Per M.T.
b) HYSD Bars	Rs.55000/- Per M.T.
c) Mild Steel Bars	Rs.50000/- Per M.T.
d) Structural Steel	Rs.51000/- Per M.T.
e) High Tensile Steel	Rs.70000/- Per M.T.
- ii) Cost of Transportation of all materials from the place of delivery upto site of work is included in the rates of the item of this Schedule of Rates.
- iii) Materials, as may be required to be issued to the contractor by department shall be specified in the N.I.T. with place of delivery and their issue rates.

## 11) LEAD AND LIFTS

- i) The rates in all items of this S.O.R. are inclusive of all lead, lift and transportation of material except otherwise specified in the item. No extra on this account is payable unless otherwise specifically mentioned in any particular item.

## 12) ROYALTY AND OTHER TAXES

- i) Royalty, Octroi duty and all other taxes are included in the rates. No extra on this account shall be payable.

## 13) DISMANTLING

- i) The rates include the complete cost of dismantling and shifting away the dismantled material to place at site of work as directed by Engineer-in-Charge and the rates also include the serviceable dismantled material to be properly stacked at river bank at a location directed by the Engineer-in-Charge.

## 14) MODE OF MEASUREMENTS

- i) The mode of measurements shall be as per provisions contained in the relevant clauses of the specifications unless specified otherwise.

- ii) The rates include all such activities as are described in the relevant clauses of the Specifications, unless specified otherwise.
- iii) Rates include provisions of necessary precautionary devices and other arrangements etc. for traffic control, e.g. provision of caution boards, red lights, watchmen flags and flagmen but do not include construction of temporary diversion.
- iv) The rates do not include the work of trial pits, which are to be measured and paid separately.
- v) The contractor is bound to install at the site of work a testing laboratory as provided in the specifications.
- vi) Detailed measurements for steel and concrete for items of R.C.C. approach slab, R.C.C. Railing and R.C.C. wearing coat shall also be recorded in M.B. However the payment shall be regulated as per the item and rates given in the S.O.R.
- viii) The measurement of rock excavation are to be done as per the relevant clause of "Specification of Road and Bridge works" of MORT&H 5th Revision. All serviceable rock excavated shall be issued to the contractor at the rate of Rs.250/- per Cum.



## **CHAPTER WISE NOTES**

### **CHAPTER – 12**

#### **FOUNDATION**

**NOTES :-**

- 1) Back filling upto original bed level shall be done as per clause 304.3.7 of "Specification for Road and Bridges". No extra shall be payable on this account.
- 2) The concrete mix used in bottom plug of wells shall have a minimum cement content of 330 kg/cum.
- 3) The rates of well sinking include the charges of labour, plant, cost of P.O.L. and other materials and accessories. The rates also include the cost of diversion of channel, making of island, if required to be done for laying the cutting edge, kerb and staining. the permissible tilt and shift in well in its final position shall be as per IRC-78-1983. The rates include the cost of rectification of tilt and shift in excess of permissible limit. No extra over these rates are payable for sinking of well.
- 4) For the purpose of the computation of the volume in well sinking, the cubic content of well shall be measured by the portion contained in outer diameter of well staining. Projection of R.C.C. kerb, if any shall not be measured.

## **CHAPTER – 13**

### **SUB-STRUCTURE**

#### **NOTES :-**

- 1) The rates of bearing are inclusive of the charges required for testing of bearing, procurement, transport, if required greasing while storing and at the time of fixing etc. all complete.
- 2) The use of A.C. Pipes for weep holes is permitted only in PCC/RCC/Brick masonry sub-structure. In stone masonry inbuilt weep holes of size 80mm x 150mm shall be constructed and no extra for this work is payable. No deduction for the recess or for pipes due to weep holes shall be made in the measurement of stone/brick masonry, PCC and RCC.
- 3) For elastomeric bearing pads the concrete surface shall be leveled such that the variation is not more than 1.5mm from the straight edge placed in any direction across the area.
- 4) The bearings should be procured only from those manufactures who have not been disqualified by MORT&H.
- 5) Only finished weight of bearings as brought to the site and fixed in position shall be taken into account for measurement.
- 6) For Hume pipe culverts, Hume pipes shall be ISI marked or DGS&D certified only and a certificate should invariably be produced to the satisfaction of Engineer-in-Charge before getting the pipes fixed at site.

## **CHAPTER – 14**

### **SUPER STRUCTURE**

#### **NOTES :-**

- 1) Properly designed form work shall be used for super structure. In case of steel form work the thickness of steel plate shall not be less than 3 mm. The form work shall be adequately stiffened by brackets and angles not more than 15 cm. apart in such a manner that it does not get distorted during handling and placing/vibration of concrete.
- 2) Centering made up of steel trusses below soffit shall not be supported in recess made in sub-structure. The contractor may provide steel trusses supported on suitably designed bracket, anchored to the pier/pier-cap. Providing safe centering shall be solely contractor's responsibility. The contractor shall remove all bolts, anchors protruding beyond the pier/pier-cap after removal of centering.
- 3) Contractor shall have the option to adopt launching of super-structure but in such cases prior permission of the department should be obtained by getting launching arrangement initially approved. No deduction in the rate of concrete would be done nor any extra would be paid in case the launching is resorted to.
- 4) The rate of prestressing of H.T. steel is complete rate including hire and running expenses of plant and machineries, labour involved in stressing operations, anchorages and ducts or sheathing etc., complete including grouting.
- 5) The rates of wearing coat are inclusive of reinforcement provided, construction joints between panels and the form work at the panels. Construction joints in panel shall be 10 mm. wide and shall be filled with premoulded joint filler. Filling of expansion joints between span over piers/abutment or at articulation is not included in the rate.
- 6) The payment of railing includes the construction of required intermediate posts and end posts. The length of railing for payment purposes on each side separately, shall be measured from the outer edges of end posts.
- 7) New type expansion joints may be obtained from prequalified suppliers by MORT&H and the firm will have to give warranty of 10 years of trouble free performance.

**CHAPTER : 1.0**  
**CARRIAGE & SUPPLY**  
**OF**  
**MATERIALS**

S.No.	Materials	Unit	Rate (Rs.)					Add extra for			Remarks
			Upto 1 km	Upto 2 km	Upto 3 km	Upto 4 km	Upto 5 km	Beyond 5 km upto 10 km per km	Beyond 10 km upto 20 km per km	Beyond 20 km per Km.	
1	2	3	4	5	6	7	8	9	10	11	12
1.1	<b>Transportation By Mechanical Transport including loading , unloading and stacking.</b>										
1.1.1	Loose moorum/sand/earth/ surkhi/ cement/stone dust/hot mix asphalt material.	cum	73.00	80.00	84.00	88.00	93.00	4.40	3.25	2.70	The rates will be applicable to net quantities after deduction of prescribed percentage for voids mentioned in the Table at the bottom of the Chapter
1.1.2	Excavated/compacted ordinary & other soil.	cum	89.00	99.00	104.00	108.00	115.00	5.40	4.00	3.25	
1.1.3	Boulders.	cum	144.00	158.00	166.00	173.00	184.00	8.50	6.40	5.25	
1.1.4	Stone aggregate (Metal)	cum	78.00	86.00	90.00	94.00	100.00	4.70	3.50	2.85	
1.1.5	Masonry stones.	cum	65.00	72.00	75.00	78.00	83.00	3.90	2.90	2.40	
1.1.6	Coal/Fuel wood/iron work/steel/G.I. Sheets/pipes/lime/machinery etc.	tonne	64.00	70.00	74.00	77.00	82.00	3.85	2.85	2.30	
1.1.7	Steel	tonne	64.00	70.00	74.00	77.00	82.00	3.85	2.85	2.30	
1.1.8	timber	cum	82.00	90.00	95.00	99.00	105.00	4.90	3.65	3.00	
1.1.9	Tar/Paint/Bitumen etc.	M.T.	73.00	80.00	84.00	88.00	93.00	4.40	3.25	2.70	

**Table**

S.No.	Standard size of Aggregate	Percentage reduction in volume computed by stack measurements to arrive at the volume to be paid for		
1.	75mm and 63mm	12.50		
2.	45 mm and 26.5mm	10.00		
3.	22.4mm, 13.2 mm 11.2mm and 6.7mm	5.00		
4.	Fine aggregate	5.00		
1.2	Supply of mineral aggregate like broken stone/crushed stone (crushed in mechanical crusher) at road site including all lead and stacking etc. complete.			
i)	75mm standard size broken stone	cum	415.00	
ii)	63mm standard size broken stone	cum	474.00	
iii)	45mm standard size broken stone	cum	522.00	
iv)	45mm standard size crushed stone	cum	713.00	
v)	26.5mm standard size crushed stone	cum	899.00	
vi)	22.4mm standard size crushed stone	cum	899.00	
vii)	13.2mm standard size crushed stone	cum	1027.00	
viii)	11.2mm standard size crushed stone	cum	769.00	
ix)	6.7mm standard size crushed stone	cum	642.00	
1.3	Supply of following material including all lead and stacking etc. complete.			
i)	Crusher stone dust	cum	298.00	
ii)	Sand/Shingle/Kanker/Laterite	cum	298.00	
iii)	Moorum with CBR not less than 20 and P.I. Not exceeding 6.	cum	239.00	

**CHAPTER : 2.0**  
**SITE CLEARANCE**

Item No.	Descriptions	Unit	Rate
2.1	<b>Cutting of Trees, including Cutting of Trunks, Branches and Removal</b> Cutting of trees, including cutting of trunks, branches and removal of stumps, roots, stacking of serviceable material with all lifts and up to a lead of 1000 mtrs and earth filling in the depression/pit..		
	(i) Girth from 300 mm to 600 mm	each	238.00
	(ii) Girth from 600 mm to 900 mm	each	430.00
	(iii) Girth from 900 mm to 1800 mm	each	829.00
	(iv) Girth above 1800 mm	each	1564.00
2.2	<b>Clearing and Grubbing Road Land</b> Clearing and grubbing road land including uprooting rank vegetation, grass, bushes, shrubs, saplings and trees girth up to 300 mm, removal of stumps of trees cut earlier and disposal of unserviceable materials and stacking of serviceable material to be used or auctioned up to a lead of 1000 metres including removal and disposal of top organic soil not exceeding 150 mm in thickness.		
	A In area of light jungle	hectare	48602.00
	B In area of thorny jungle	hectare	65114.00
2.3	<b>Dismantling of Structures</b> Dismantling of existing structures like culverts, bridges, retaining walls and other structure comprising of masonry, cement concrete, wood work, steel work, including T&P and scaffolding wherever necessary, sorting the dismantled material, disposal of unserviceable material and stacking the serviceable material with all lifts and lead of 1000 metres.		
	(i) Lime /Cement Concrete		
	A Lime Concrete, cement concrete grade M-10 and below	cum	358.00
	B Cement Concrete Grade M-15 & M-20	cum	422.00
	C Prestressed / Reinforced cement concrete grade M-20 & above	cum	1093.00
	(ii) Dismantling Brick / Tile work		
	A In lime mortar	cum	229.00
	B In cement mortar	cum	294.00
	C In mud mortar	cum	204.00
	D Dry brick pitching or brick soling	cum	191.00
	(iii) Dismantling Stone Masonry		
	A Rubble stone masonry in lime mortar	cum	255.00
	B Rubble stone masonry in cement mortar.	cum	294.00
	C Rubble Stone Masonry in mud mortar.	cum	229.00
	D Dry rubble masonry	cum	217.00
	E Dismantling stone pitching/ dry stone spalls.	cum	204.00
	F Dismantling boulders laid in wire crates including opening of crates and stacking dismantled materials.	cum	229.00
	(iv) Wood work wrought framed and fixed in frames of trusses upto a height of 5 m above plinth level	cum	544.00
	(v) Steel work in all types of sections upto a height of 5 m above plinth level excluding cutting of rivet.		



Item No.	Descriptions	Unit	Rate
A	Including dismembering	tonne	1380.00
B	Excluding dismembering.	tonne	1014.00
C	Extra over item No( V ) A and( V ) B for cutting rivets.	tonne	10.00
(vi)	Scraping of bricks dismantled from brick work including stacking.		
A	In lime/Cement mortar	1000 numbers	1123.00
B	In mud mortar	1000 numbers	401.00
(vii)	Scraping of Stone from dismantled stone masonry		
A	In cement and lime mortar	cum	450.00
B	In Mud mortar	cum	96.00
(viii)	Scarping plaster in lime or cement mortar from brick/ stone masonry	sqm	14.00
(ix)	Removing all type of hume pipes and stacking within a lead of 1000 metres including earthwork and dismantling of masonry works.		
A	Up to 600 mm dia	metre	167.00
B	Above 600 mm to 900 mm dia	metre	225.00
C	Above 900 mm	metre	386.00
2.4	<b>Dismantling of Flexible Pavements</b> Dismantling of flexible pavements and disposal of dismantled materials up to a lead of 1000 metres, stacking serviceable and unserviceable materials separately.	cum	281.00
2.5	<b>Dismantling of Cement Concrete Pavement</b> Dismantling of cement concrete pavement by mechanical means using pneumatic tools, breaking to pieces not exceeding 0.02 cum in volume and stock piling at designated locations and disposal of dismantled materials up to a lead of 1000 metres, stacking serviceable and unserviceable materials separately	cum	1195.00
2.6	<b>Dismantling Guard Rails</b> Dismantling guard rails by manual means and disposal of dismantled material with all lifts and up to a lead of 1000 metres, stacking serviceable materials and unserviceable materials separately.	metre	72.00
2.7	<b>Dismantling Kerb Stone</b> Dismantling kerb stone by manual means and disposal of dismantled material with all lifts and up to a lead of 1000 metre	metre	14.00
2.8	<b>Dismantling Kerb Stone channel</b> Dismantling kerb stone channel by manual means and disposal of dismantled material with all lifts and up to a lead of 1000 metre	metre	21.00
2.9	<b>Dismantling Kilometre Stone</b> Dismantling of kilometre stone including cutting of earth, foundation and disposal of dismantled material with all lifts and lead upto 1000 m and back filling of pit.		
A	5th KM stone	each	342.00
B	Ordinary KM Stone	each	207.00
C	Hectometre Stone	each	41.00
D	Boundary Stone	each	40.00

Item No.	Descriptions	Unit	Rate
2.10	<b>Dismantling of Fencing</b> Dismantling of barbed wire fencing/ wire mesh fencing including posts, foundation concrete, back filling of pit by manual means including disposal of dismantled material with all lifts and up to a lead of 1000 metres, stacking serviceable material and unserviceable material separately.	metre	46.00
2.11	<b>Dismantling of CI Water Pipe Line</b> Dismantling of CI water pipe line upto 600 mm dia including disposal with all lifts and lead upto 1000 metres and stacking of serviceable material and unserviceable material separately under supervision of concerned department.	metre	114.00
2.12	<b>Removal of Cement Concrete Pipe of Sewer Gutter</b> Removal of cement concrete pipe of sewer gutter upto 1500 mm dia under the supervision of concerned department including disposal with all lifts and up to a lead of 1000 metres and stacking of serviceable and unserviceable material separately but excluding earth excavation and dismantling of masonry works.	metre	142.00
2.13	<b>Removal of Telephone / Electric Poles and Lines</b> Removal of telephone / Electric poles including excavation and dismantling of foundation concrete and lines under the supervision of concerned department, disposal with all lifts and up to a lead of 1000 metres and stacking the serviceable and unserviceable material separately.	each	161.00

**CHAPTER : 3.0**

**EARTH WORK,  
EROSION CONTROL  
AND DRAINAGE**

Item No.	Descriptions	Unit	Rate
3.1	<b>Excavation in Soil by Manual Means</b> Excavation for roadway in soil including loading in truck for carrying of cut earth to embankment site with all lifts and lead upto 1000 metres as per clauses of section-300.	cum	159.00
3.2	<b>Excavation in ordinary rock by Manual Means</b> Excavation in ordinary rock including loading in a truck and carrying of excavated material to embankment site with all lifts and leads upto 1000 metres as per relevant clauses of section-300	cum	226.00
<b>Note:-</b>	<b>Item No.3.1 &amp; 3.2 can be executed only after prior written approval by C.E.</b>		
3.3	<b>Excavation in Hard Rock (requiring blasting) with disposal upto 1000 metres</b> Excavation for roadway in hard rock (requiring blasting) by drilling, blasting and breaking, trimming of bottom and side slopes in accordance with requirements of lines, grades and cross sections, loading and disposal of cut road with all lifts and leads upto 1000 metres as per relevant clauses of section-300	cum	198.00
3.4	<b>Excavation in Soil using Hydraulic Excavator and Tippers with disposal upto 1000 metres.</b> Excavation for roadway in soil with hydraulic excavator including cutting and loading in tippers, trimming bottom and side slopes, in accordance with requirements of lines, grades and cross sections, and transporting to the embankment location with all lifts and lead upto 1000m as per relevant clauses of section-300 of specification.	cum	55.00
3.5	<b>Excavation in Ordinary Rock using Hydraulic Excavator and Tippers with disposal upto 1000 metres.</b> Excavation for roadway in ordinary rock with hydraulic excavator including cutting and loading in tippers, transporting to embankment site with in all lifts and lead upto 1000 m, trimming bottom and side slopes in accordance with requirements of lines, grades and cross sections as per relevant clauses of section-300 of specification.	cum	70.00
3.6	<b>Excavation in Hard Rock (blasting prohibited)</b> Excavation for roadway in hard rock (blasting prohibited) with rock breakers including breaking rock, loading in tippers and disposal with all lifts and lead upto 1000 metres, trimming bottom and side slopes in accordance with requirements of lines, grades and cross sections and as per relevant clauses of section-300 of specification.	cum	405.00
3.7	<b>Excavation in Hard Rock (controlled blasting) with disposal upto 1000 metres</b> Excavation for roadway in hard rock with controlled blasting by drilling, blasting and breaking, trimming of bottom and side slopes in accordance with requirements of lines, grades and cross sections, loading and disposal of cut road with all lifts and leads upto 1000 metres and as per relevant clauses of section-300 of specification.	cum	202.00
<b>Note:-</b>	<b>Item No.3.6 &amp; 3.7 can be executed only after prior written approval by C.E.</b>		

Item No.	Descriptions	Unit	Rate
3.8	<b>Excavation in Marshy Soil</b> Excavation for roadway in marshy soil with hydraulic excavator including cutting and loading in tippers and disposal with all lifts and lead upto 1000 metres, trimming of bottom and side slopes in accordance with requirements of lines, grades and cross sections and as per relevent clauses of section-300 of specification.	cum	62.00
3.9	<b>Removal of Unserviceable Soil with Disposal upto 1000 metres</b> Removal of unserviceable soil including excavation, loading and disposal upto 1000 metres lead but excluding replacement by suitable soil which shall be paid separately as per clause 305.	cum	56.00
3.10	<b>Scarifying Existing Granular Surface to a 50 mm by Manual Means</b> Scarifying the existing granular road surface to a depth of 50 mm and disposal of scarified material within all lifts and leads upto 1000 metres. (refer clause two of General Notes) <b>Note:- Item No.3.10 can be executed only after prior written approval by C.E.</b>	cum	281.00
3.11	<b>Scarifying existing bituminous surface to a depth of 50 mm by mechanical means</b> Scarifying the existing bituminous road surface to a depth of 50 mm and disposal of scarified material with in all lifts and lead upto 1000 metres.	sqm	5.00
3.12	<b>Embankment Construction with Material Obtained from Borrow Pits</b> Construction of embankment with approved material having CBR>5 obtained from borrow pits with all lifts and leads, transporting to site, spreading, grading to required slope and compacting to meet requirement of table 300-1, 300-2 and as per relevent clauses of section-300.	cum	168.00
3.13	<b>Embankment Construction with Material Obtained from Borrow Pits</b> Construction of embankment with approved material having CBR>7 obtained from borrow pits with all lifts and leads, transporting to site, spreading, grading to required slope and compacting to meet requirement of table 300-1, 300-2 and as per relevent clauses of section-300.	cum	178.00
<b>Note :-</b>	<b>If Select Soil (CBR &gt; 7) is available within a lead of 250 meters , rate of Item 3.12 will be payable</b>		
3.14	<b>Construction of Embankment with Material Deposited from Roadway Cutting</b> Construction of embankment with approved materials CBR>5 deposited at site from roadway cutting and excavation from drain and foundation of other structures graded and compacted to meet requirement of table 300-1, 300-2 and as per relevent clauses of section-300.	cum	80.00
3.15	Deduct for item No.3.12 and 3.13 if vibratory roller / motor grader is not used with prior written approval of C.E.:		
3.15.1	If static roller is used in place of vibratory roller.	cum	30.00
3.15.2	If motor grader is not used.	cum	30.00

Item No.	Descriptions	Unit	Rate
3.16	<b>Surface Drains in Soil</b> Construction of unlined surface drains of average cross sectional area 0.40 sqm in soil to specified lines, grades, levels and dimensions to the requirement of clause 301 and 309. Excavated material to be used in embankment within a lead of 50 metres as per relevent clauses of section-300.	metre	64.00
3.17	<b>Sub Surface Drains with Perforated Pipe</b> Construction of subsurface drain with perforated pipe of 100 mm internal diameter of metal/ asbestos cement/ cement concrete/PVC, closely jointed, perforations ranging from 3 mm to 6 mm depending upon size of material surrounding the pipe, with 150 mm bedding below the pipe and 300 mm cushion above the pipe, cross section of excavation 450 x 550 mm. Excavated material to be utilised in roadway at site	metre	375.00
3.18	<b>Aggregate Sub- Surface Drains</b> Construction of aggregate sub surface drain 300 mm x 450 mm with aggregates conforming to table 300-4, excavated material to be utilised in roadway.	metre	141.00
3.19	<b>Construction of Rock fill Embankment</b> Construction of rock fill embankment with broken hard rock fragments of size not exceeding 300 mm laid in layers not exceeding 500 mm thick including filling of surface voids with stone spalls, blinding top layer with granular material, rolled with vibratory road roller, all complete as per clause 313	cum	48.00
3.20	<b>Excavation in Hill Area in Soil by Mechanical Means</b> Excavation in soil in hilly area by mechanical means including cutting and trimming of side slopes and disposing of excavated earth with all lifts and lead upto 1000 metres	cum	122.00
3.21	<b>Excavation in Hilly Area in Ordinary Rock by Mechanical Means not Requiring Blasting.</b> Excavation in hilly area in ordinary rock not requiring ballasting by mechanical means including cutting and trimming of slopes and disposal of cut material with all lift and lead upto 1000 metres.	cum	180.00
3.22	<b>Excavation in Hilly Areas in Hard Rock Requiring Blasting</b> Excavation in hilly areas in hard rock requiring blasting, by mechanical means including trimming of slopes and disposal of cut material with all lifts and lead upto 1000 metres.	cum	244.00
3.23	<b>Embankment Construction with Fly ash/Pond ash available from coal or lignite burning Thermal Plants as waste material.</b> Construction of embankment with fly ash conforming to table 1 of IRC: SP: 58 - 2001 obtained from coal or lignite burning thermal power stations as waste material, spread and compacted in layer of 200mm thickness each at OMC, all as specified in IRC: SP: 58-2001 and as per approved plans.	cum	161.00

**CHAPTER : 4.0**

**SUB-BASES, BASES  
(NON-BITUMINOUS)  
AND SHOULDERS**

Item No.	Descriptions	Unit	Rate
4.1	<p><b>Granular Sub-base with Well Graded Material (CBR&gt;30 or more) (Table:- 400-1 &amp; Table 400-2)</b>  Construction of granular sub-base by providing well graded material like natural sand crushed gravel or crushed stone having CBR &gt;30, spreading in uniform layers with motor grader on prepared surface, mixing by mix in place method with rotavator or plant mix method at OMC, and compacting with vibratory rollers of 80 to 100 kN static weight to achieve the desired density, complete as per Clause 401 of Specification.</p> <p><b>Note :- This item can be executed only after prior written approval by C.E.</b></p>	cum	943.00
4.2	<p><b>Lime Stabilisation for Improving Subgrade</b>  Laying and spreading available soil in the subgrade on a prepared surface, pulverising, as per requirement of Table 400-3 mixing the spread soil in place with rotavator with 3 % slaked lime having minimum content of 70% of CaO, grading with motor grader and compacting with the road roller at OMC to the desired density to form a layer of improved sub grade as per clause 402 of specification.</p> <p>A By Mechanical Means</p> <p>B By Manual Means</p>	cum cum	475.00 484.00
4.3	<p><b>Lime Treated Soil for Sub-Base</b>  Providing, laying and spreading soil on a prepared sub grade, pulverising, as per requirement of Table 400-3 mixing the spread soil in place with rotavator with 4 % slaked lime with minimum content of 70% of CaO, to achieve CBR&gt;30 grading with motor grader and compacting with the road roller at OMC to achieve at least 98% of the max dry density to form a layer of sub base as per clause 402 of specification.</p>	cum	569.00
4.4	<p><b>Cement Treated Soil Sub Base/ Base</b>  Providing, laying and spreading soil on a prepared sub grade, pulverising, adding the designed quantity of cement to the spread soil, mixing in place with rotavator, grading with the motor grader and compacting with the road roller at OMC to achieve the desired unconfined compressive strength and to form a layer of sub-base/base as per clause 403 of specification.</p>	cum	711.00
4.5	<p><b>Cement Treated Crushed Rock or combination as per clause 403.2 and table 400.4 in Sub base/ Base</b>  Providing, laying and spreading Material on a prepared sub grade, adding the designed quantity of cement to the spread Material, mixing in place with rotavator, grading with the motor grader and compacting with the road roller at OMC to achieve the desired unconfined compressive strength and to form a layer of sub-base/base as per clause 403 of specification.</p> <p>(i) For Sub-Base course</p> <p>(ii) For Base course</p>	cum cum	1557.00 1489.00
4.6	<p><b>Lime, Fly ash stabilised soil sub-base</b>  Construction of Sub-base using lime - fly ash admixture with granular soil, free from organic matter/ deleterious material or clayey silts and low plasticity clays having PI between 5 and 20 and liquid limit less than 25 and commercial dry lime, slaked at site or pre-slaked with CaO content not less than 50%, fly ash to</p>	cum	564.00



Item No.	Descriptions	Unit	Rate
	conform to gradation as per clause 4.3 of IRC: 88-1984, lime + fly ash content ranging between 10 to 30%, the minimum unconfined compressive strength and CBR value after 28 days curing and 4 days soaking to be 7.5kg/sq, cm and 25% respectively, all as specified in IRC: 88-1984.		
4.7	<b>Making 50 mm x 50 mm Furrows</b> Making 50 mm x 50 mm furrows, 25mm deep, 450 to the center line of the road and at one metre interval in the existing thin bituminous wearing coarse including sweeping and disposal of excavated material within 1000 metres lead		
	a) 25mm deep furrow cutting	sqm	4.00
	b) 50mm deep furrow cutting	sqm	7.00
4.8	<b>Water Bound Macadam</b> Providing, laying, spreading and compacting stone aggregates of specific sizes to water bound macadam specification including spreading in uniform thickness, hand packing, rolling with vibratory roller 8-10 tonnes in stages to proper grade and camber, applying and brooming requisite type of screening/ binding Materials to fill up the interstices of coarse aggregate, watering and compacting to the required density as per clause 404 of specification.		
	(i) Grading- I (63 to 45mm)		
	(a) Using Screening Type-A (13.2mm Agg.)	cum	1253.00
	(b) Using Screening Type-B (11.2mm Agg.)	cum	1322.00
	(ii) Grading- II (63 to 22.4mm)		
	(a) Using Screening Type-B (11.2mm Agg.)	cum	1400.00
4.9	Deduction for item No.4.1, 4.2, 4.3, 4.4, 4.5, 4.6 & 4.8 if vibratory roller / motor grader is not used with prior written approval by C.E. :		
	i) If static roller is used in place of vibratory roller.	cum	50.00
	ii) If motor grader is not used.	cum	50.00
4.10	<b>Crushed Cement Concrete Sub-base / Base</b> Breaking and crushing of material obtained by breaking damaged cement concrete slabs to size range not exceeding 75 mm as specified in table 400-9 transporting the aggregates obtained from breaking of cement concrete slabs at a lead of 1.0 km., laying and compacting the same as sub base/ base course, constructed as per clause 405 of specification.	cum	213.00
4.11	<b>Wet Mix Macadam</b> Providing, laying, spreading and compacting graded stone aggregate to wet mix macadam specification including premixing the Material with water at OMC in mechanical mix plant carriage of mixed Material by tipper to site, laying in uniform layers with paver in sub- base / base course on well prepared surface and compacting with vibratory roller to achieve the desired density in accordance to Table No. 400-12, 400-13 and as per clause of section 406 of specifications.	cum	1557.00

Item No.	Descriptions	Unit	Rate
4.12	<b>Crusher Run Macadam Sub Base/Base Course</b> Providing crushed stone aggregate, depositing on a prepared surface by hauling vehicles, spreading and mixing with a motor grader, watering and compacting with a vibratory roller to clause 410 to form a layer of sub-base/Base in accordance to Table No. 400-14, 400-15 and as per clause of section 407 of specifications.		
	(i) For 53 mm maximum size	cum	1181.00
	(ii) For 37.5 mm maximum size	cum	1171.00
4.13	Construction of Shoulders with approved material/selected soil i/c excavation all lifts & leads i/c grading to required slope & camber of 4% and compacting using vibratory roller of 80 to 100 kN static weight to meet requirement as per relevant clause of 400.		
	A Earthen Shoulders (CBR value >7)	cum	186.00
	B Hard Shoulders (CBR value >12)	cum	223.00
	C Paved shoulders  The rate may be adopted as applicable for different layers of pavement depending upon approved design of paved shoulders.		
4.14	<b>Construction of Median and Island with Soil Taken from Roadway Cutting</b> Construction of Median and Island above road level with approved material deposited at site from roadway cutting and excavation for drain and foundation of other structures, spread, graded and compacted as per clause 408 of specification	cum	134.00
4.15	<b>Construction of Median and Island with Soil Taken from Borrow Areas</b> Construction of median and Island above road level with approved material brought from borrow pits, spread, sloped and compacted as per clause 408 of specification.	cum	168.00
4.16	Deduction for item No.4.13 if vibratory roller / motor grader is not used with prior written approval by C.E. :		
	i) If static roller is used in place of vibratory roller.	cum	50.00
	ii) If motor grader is not used.	cum	50.00
4.17	<b>Footpaths and Separators</b> Construction of footpath/ separator by providing a 150 mm compacted granular sub base as per clause 401 and 25 mm thick cement concrete grade M15, over laid with precast concrete tiles in cement mortar 1:3 including provision of all drainage arrangements but excluding kerb channel.	sqm	532.00

**CHAPTER : 5.0**  
**BASES AND SURFACE**  
**COURSES**  
**(BITUMINOUS)**

Item No.	Descriptions	Unit	Rate
5.1	<b>Prime coat</b> Providing and applying primer coat with bitumen emulsion on prepared surface of granular Base including clearing of road surface and spraying primer at the rate of 0.75 kg/sqm using mechanical means as per clause 502 of specifications.	sqm	40.00
5.2	Providing and applying tack coat with cationic bitumen emulsion (RS-1) using emulsion pressure distributor on the prepared bituminous/granular surface cleaned with mechanical broom and as per relevant clauses of section-503 of specifications.		
(i)	@ 0.25 kg per sqm (normal bituminous surfaces)	sqm	14.00
(ii)	@0.30 kg per sqm (dry & hungry bituminous surfaces /granular surfaces treated with primer)	sqm	17.00
(iii)	@ 0.35 kg per sqm (Non-bituminous surfaces) cement concrete pavement.	sqm	19.00
(iv)	@ 0.40 kg per sqm (Non-bituminous surfaces) granular base not primed.	sqm	22.00
5.3	Providing and applying tack coat with low viscosity bitumen of VG 10 grade using bitumen pressure sprayer on the prepared bituminous/granular surface cleaned with mechanical broom and as per relevant clauses of section-503 of specifications.		
(i)	@ 0.25 kg per sqm (normal bituminous surfaces)	sqm	17.00
(ii)	@0.30 kg per sqm (dry & hungry bituminous surfaces /granular surfaces treated with primer)	sqm	20.00
(iii)	@ 0.35 kg per sqm (Non-bituminous surfaces) cement concrete pavement.	sqm	23.00
(iv)	@ 0.40 kg per sqm (Non-bituminous surfaces) granular base not primed.	sqm	24.00
<b>Note :-</b>	<b>This item can be executed only after prior written approval by C.E.</b>		
5.4	<b>Bituminous Macadam</b> Providing and laying bituminous macadam using crushed aggregates of specified grading premixed with bituminous binder, transported to site, laid over a previously prepared surface with paver finisher to the required grade, level and alignment and rolled as per clauses 501.6 and 501.7 to achieve the desired compaction and as per clause 504 of specifications.		
a)	Using 100-120 TPH Batch mix Plant and Paver Finisher Hydraustatic with Sensor control.		
(i)	for Grading I(40 mm nominal size ) bitumen content 3.4%	cum	6944.00
(ii)	for GradingII(19 mm nominal size) bitumen content 3.5%	cum	6937.00
b)	Using 40-60 TPH Batch mix Plant and Paver Finisher Hydraustatic with Sensor control.		
(i)	for Grading I(40 mm nominal size ) bitumen content 3.4%	cum	6267.00
(ii)	for GradingII(19 mm nominal size) bitumen content 3.5%	cum	6260.00
c)	Using 100-120 TPH Hot mix Plant .		

Item No.	Descriptions	Unit	Rate
(i)	for Grading I(40 mm nominal size ) bitumen content 3.4%	cum	6611.00
(ii)	for GradingII(19 mm nominal size) bitumen content 3.5%	cum	6604.00
d)	Using 40-60 TPH Hot mix Plant		
(i)	for Grading I(40 mm nominal size ) bitumen content 3.4%	cum	6178.00
(ii)	for GradingII(19 mm nominal size) bitumen content 3.5%	cum	6171.00
5.5	<b>Dense Graded Bituminous Macadam</b> Providing and laying dense bituminous macadam using crushed aggregates of specified grading, premixed with bituminous binder @ 4.0 to 4.5% by weight of total mix of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per clause 505 of specification complete in all respects.		
a)	Using 100-120 TPH Batch mix Plant and Paver Finisher Hydraustatic with Sensor control.		
(i)	for Grading I ( 40 mm nominal size )	cum	8593.00
(ii)	for GradingII(19 mm nominal size)	cum	8621.00
a)	Using 40-60 TPH Batch mix Plant and Paver Finisher Hydraustatic with Sensor control.		
(i)	for Grading I ( 40 mm nominal size )	cum	8169.00
(ii)	for GradingII(19 mm nominal size)	cum	8198.00
c)	Using 100-120 TPH Hot mix Plant		
(i)	for Grading I ( 40 mm nominal size )	cum	8350.00
(ii)	for GradingII(19 mm nominal size)	cum	8379.00
d)	Using 40-60 TPH Hot mix Plant		
(i)	for Grading I ( 40 mm nominal size )	cum	8069.00
(ii)	for GradingII(19 mm nominal size)	cum	8096.00
5.6	<b>Bituminous Concrete</b> Providing and laying bituminous concrete using crushed aggregates of specified grading, premixed with bituminous binder @ 5.4 to 5.6 % of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per clause 507 of specification.		
a)	Using 100-120 TPH Batch mix Plant and Paver Finisher Hydraustatic with Sensor control.		
(i)	for Grading-I ( 50-65 mm thickness ) with 60/70 bitumen (VG-30)	cum	9915.00
(ii)	for Grading I ( 50-65 mm thickness ) with CRBM-60	cum	10143.00
(iii)	for Grading I ( 50-65 mm thickness ) with PMB-40/NRMB	cum	10058.00

Item No.	Descriptions	Unit	Rate
(iv)	for Grading-II ( 30-45 mm thickness ) with 60/70 bitumen(VG-30)	cum	9901.00
(v)	for Grading II ( 30-45 mm thickness ) with CRBM-60	cum	10129.00
(vi)	for Grading II ( 30-45 mm thickness ) with PMB-40/NRMB	cum	10044.00
a)	Using 40-60 TPH Batch mix Plant and Paver Finisher Hydraustatic with Sensor control.		
(i)	for Grading-I ( 50-65 mm thickness ) with 60/70 bitumen (VG-30)	cum	9483.00
(ii)	for Grading I ( 50-65 mm thickness ) with CRBM-60	cum	9711.00
(iii)	for Grading I ( 50-65 mm thickness ) with PMB-40/NRMB	cum	9625.00
(iv)	for Grading-II ( 30-45 mm thickness ) with 60/70 bitumen(VG-30)	cum	9468.00
(v)	for Grading II ( 30-45 mm thickness ) with CRBM-60	cum	9696.00
(vi)	for Grading II ( 30-45 mm thickness ) with PMB-40/NRMB	cum	9611.00
a)	Using 100-120 TPH Hot mix Plant		
(i)	for Grading-I ( 50-65 mm thickness ) with 60/70 bitumen (VG-30)	cum	9667.00
(ii)	for Grading I ( 50-65 mm thickness ) with CRBM-60	cum	10103.00
(iii)	for Grading I ( 50-65 mm thickness ) with PMB-40/NRMB	cum	10018.00
(iv)	for Grading-II ( 30-45 mm thickness ) with 60/70 bitumen(VG-30)	cum	9653.00
(v)	for Grading II ( 30-45 mm thickness ) with CRBM-60	cum	10089.00
(vi)	for Grading II ( 30-45 mm thickness ) with PMB-40/NRMB	cum	10003.00
b)	Using 40-60 TPH Hot mix Plant		
(i)	for Grading-I ( 50-65 mm thickness ) with 60/70 bitumen (VG-30)	cum	9119.00
(ii)	for Grading I ( 50-65 mm thickness ) with CRBM-60	cum	9527.00
(iii)	for Grading I ( 50-65 mm thickness ) with PMB-40/NRMB	cum	9450.00
(iv)	for Grading-II ( 30-45 mm thickness ) with 60/70 bitumen(VG-30)	cum	9106.00
(v)	for Grading II ( 30-45 mm thickness ) with CRBM-60	cum	9514.00
(vi)	for Grading II ( 30-45 mm thickness ) with PMB-40/NRMB	cum	9437.00

Item No.	Descriptions	Unit	Rate
5.7	<b>Surface Dressing</b> Providing and laying surface dressing as wearing course in single coat using crushed stone aggregates of specified size on a layer of bituminous binder laid on prepared surface and rolling with 8-10 tonne smooth wheeled steel roller all complete as per clause 509 of specification.		
I	with 19 mm nominal chipping size & bitumen @1.2kg per sqm.	sqm	96.00
II	with 13 mm nominal chipping size & bitumen @ 1.0 kg per sqm.	sqm	77.00
	<b>NOTE :- Normally 13mm chipping size should be used. second coat, if specified, should be provided as per clause 509.3.6 of specifications.</b>		
5.8	<b>Open - Graded Premix Surfacing</b> Providing, laying and rolling of open - graded premix surfacing of 20 mm thickness composed of 13.2 mm to 5.6 mm aggregates either using penetration grade bitumen or cut-back or emulsion to required line, grade and level to serve as wearing course on a previously prepared base, including mixing in a suitable plant, laying and rolling with a smooth wheeled roller 8-10 tonne capacity, finished to required level and grades all complete as per clause 510 of specification.		
(i)	Case - I: Mechanical method using Penetration grade Bitumen and HMP of appropriate capacity not less than 75 tonnes/hour.	sqm	136.00
(ii)	Case - II: Open-Graded Premix Surfacing using cationic Bitumen Emulsion	sqm	142.00
5.9	<b>Close Graded Premix Surfacing/Mixed Seal Surfacing</b> (Mechanical means using HMP of appropriate capacity not less than 75 tonnes /hour.) Providing, laying and rolling of close-graded premix surfacing material of 20 mm thickness composed of 11.2 mm to 0.09 mm (Type-A) or 13.2 mm to 0.09 mm (Type-B) aggregates using penetration grade bitumen to the required line, grade and level to serve as wearing course on a previously prepared base, including mixing in a suitable plant, laying and rolling with a Smooth wheeled roller 8-10 tonne capacity & finishing to required level and grade all complete as per clause 508 of specifications.		
a)	with 60/70 butumen (VG-30)	sqm	182.00
b)	with CRMB-60	sqm	186.00
c)	with PMB-50/NRMB	sqm	185.00
5.10	<b>Seal Coat</b> Providing and laying seal coat sealing the voids in a bituminous surface laid to the specified levels, grade and cross fall using Type A and B seal coats all complete as per clause 511 of specification.		
(i)	Case - I : Type A Providing and laying of liquid seal coat comprising of an application of layer of bitumen binder followed by a caver of story chips. All complete as per clause 511 of specification.	sqm	72.00

Item No.	Descriptions	Unit	Rate
	(ii) Case - II : Type B (Providing and laying of premix sand seal coat with HMP of appropriate capacity not less than 75 tonnes/ hours using crushed stone chipping 6.7 mm size and penetration bitumen of suitable grade. all complete as per clause 511 of specification.	sqm	55.00
5.11	<b>Mastic Asphalt</b> Providing and laying 25 mm thick mastic asphalt wearing course with paving grade bitumen meeting the requirements given in table 500-39, prepared by using mastic cooker and laid to required level and slope after cleaning the surface, including providing antiskid surface with bitumen precoated fine-grained hard stone chipping of 13.2 mm nominal size at the rate of 0.005cum per 10 sqm and at an approximate spacing of 10 cm center to center in both directions, pressed into surface when the temperature of surfaces not less than 1000C, protruding 1 mm to 4 mm over mastic surface, all complete as per clause 516 of specification.	sqm	670.00
5.12	<b>Slurry Seal</b> Providing and laying slurry seal consisting of a mixture of fine aggregates, portland cement filler, bituminous emulsion and water on road surface including cleaning of surface, mixing of slurry seal in a suitable mobile plant, laying and compacting to provide even riding surface all complete as per clause 512 of specifications.		
	(i) 5.0 mm thickness Type-III (6-8)	sqm	70.00
	(ii) 3.0 mm thickness Type-II (4-6)	sqm	49.00
	(iii) 1.5 mm thickness Type-I (2-3)	sqm	30.00
5.13	<b>Recycling of Bituminous Pavement with Central Recycling Plant</b> Recycling pavement by cold milling of exiting bituminous layers, planning the surface after cold milling, reclaiming excavated material to the extent of 30 % of the required quantity, hauling and stock piling the reclaimed material near the central recycling plant after carrying out necessary checks and evaluation, adding fresh material including rejuvenators as required, mixing in a hot mix plant, transporting and laying at site and compacting to the required grade, level and thickness, all as specified in clause 519 of specification.	cum	7350.00
5.14	<b>Sand Asphalt Base Course</b> Providing, laying and rolling sand-asphalt base course composed of sand, mineral filler and bituminous binder on a prepared sub-grade or sub-base to the lines, levels, grades and cross sections as per the drawings including mixing in a plant of suitable type and capacity, transporting, laying, compacting and finishing complete as per clause 506 of specification.	cum	9956.00
5.15	<b>Crack Prevention Courses</b>		
	(i) Stress Absorbing Membrane (SAM) crack width less than 6 mm Providing and laying of a stress absorbing membrane over a cracked road surface, with crack width below 6 mm after cleaning with a mechanical broom, using modified binder complying with clause 517, sprayed at	sqm	69.00



Item No.	Descriptions	Unit	Rate
	the rate of 9 kg per 10 sqm and spreading 5.6 mm crushed stone aggregates @ 0.11 cum per 10 sqm with hydraulic chip spreader, sweeping the surface for uniform spread of aggregates and surface finished to conform to clause 903 of specification all complete as per clause 517 of specification.		
(ii)	Stress Absorbing Membrane (SAM) with crack width 6 mm to 9 mm Providing and laying of a stress absorbing membrane over a cracked road surface, with crack width 6 to 9 mm after cleaning with a mechanical broom, using modified binder complying with clause 521, sprayed at the rate of 11 kg per 10 sqm and spreading 11.2 mm crushed stone aggregates @ 0.12 cum per 10 sqm, sweeping the surface for uniform spread of aggregates and surface finished to conform to clause 902.	sqm	83.00
(iii)	Stress Absorbing Membrane (SAM) crack width above 9 mm and cracked area above 50 % Providing and laying a single coat of a stress absorbing membrane over a cracked road surface, with crack width above 9 mm and cracked area above 50 % after cleaning with a mechanical broom, using modified binder complying with clause 521, sprayed at the rate of 15 kg per 10 sqm and spreading 11.2 mm crushed stone aggregates @ 0.12 cum per 10 sqm, sweeping the surface for uniform spread of aggregates and surface finished to conform to clause 902.	sqm	111.00
(iv)	Case - IV : Bitumen Impregnated Geotextile Providing and laying a bitumen impregnated geotextile layer after cleaning the road surface, geotextile conforming to requirements of clause 704.3, laid over a tack coat with 1.05 kg per sqm of paving grade bitumen 80 - 100 penetration and constructed to the requirement of clause 704.4.5	sqm	269.00
5.16	labour only for Laying and rolling of Bituminous courses i/c primer and tack coat (excluding cost of bitumen & metal) with a smooth wheeled roller 8-10 tonne capacity i/c hire charges & running expenses, finished to required level and grades and as per relevant clauses of section-500.		
i)	20mm Open Graded Premix Carpet	sqm	25.00
ii)	75mm Built-up Spray Grout	sqm	30.00
5.17	Providing, laying and rolling of open - graded premix surfacing of 20 mm thickness composed of 13.2 mm to 5.6 mm aggregates using 60/70 grade bitumen, including PCC as a integral part of it, to required line, grade and level to serve as wearing course on a previously prepared base, including mixing in hot mix plant, laying with paver finisher and rolling with a smooth wheeled roller 8-10 tonne capacity, finished to required level and grades excluding primer and tack coat and as per relevant clauses of section-500. <b>NOTE This item shall be executed only after prior approval of the C.E.</b>	Cum.	6850.00

Item No.	Descriptions	Unit	Rate
5.18	Providing, laying and rolling of close-graded premix surfacing / mixed seal surfacing material of 20 mm thickness composed of 13.2 mm to 0.09 mm (Type-b) aggregates using penetration grade bitumen, including PCC as a integral part of it, to the required line, grade and level to serve as wearing course on a previously prepared base, including mixing in a suitable plant, laying and rolling with a Smooth wheeled roller 8-10 tonne capacity, and finishing to required level and grade and as per relevant clauses of section-500.		
	(i) Type-B aggregate A with 60/70 butumen	Cum.	9100.00
	<b>NOTE This item shall be executed only after prior approval of the C.E.</b>		
5.19	<b>Micro Surfacing</b> Providing and laying Micro surfacing to the bituminous surface as per clause 514 of specification.		
	i) Type II grading	Sqm	160.00
	ii) Type III grading	Sqm	180.00
	<b>NOTE This item shall be executed only after prior approval of the C.E.</b>		

## **CHAPTER : 6.0**

# **CEMENT CONCRETE PAVEMENTS**

Item No.	Descriptions	Unit	Rate
6.1	<p><b>Dry Lean Cement Concrete Sub- base</b> Construction of dry lean cement concrete Sub- base over a prepared sub-grade with coarse and fine aggregate conforming to IS: 383, the size of coarse aggregate not exceeding 25 mm, aggregate cement ratio not to exceed 15:1, aggregate gradation after blending to be as per table 600-1, cement content not to be less than 150 kg/ cum, optimum moisture content to be determined during trial length construction, concrete strength not to be less than 10 Mpa at 7 days, mixed in a batching plant, transported to site, laid with a paver with electronic sensor, compacting with 8-10 tonnes vibratory roller, finishing and curing as per clause 601 of specification complete in all respect.</p>	cum	2714.00
6.2	<p>Deduct from Item No.6.1 above if paver with electronic sensor, vibratory roller are not used and laying, compaction is done by any other method. (The acceptance criteria regarding level, thickness, surface regularity, texture finish, strength of concrete and all other quality control measures shall be the same as in case of machine laid work.) .</p> <p><b>Note:- This item is to be executed with prior written permission from the C.E.</b></p>	cum	150.00
6.3	<p><b>Cement Concrete Pavement</b> Construction of un-reinforced, dowel jointed, plain cement concrete pavement M-40 grade concrete over a prepared sub base with cement , coarse and fine aggregate conforming to IS 383, maximum size of coarse aggregate not exceeding 25 mm, mixed in a batching and mixing plant as per approved mix design, transported to site, laid with a fixed form or slip form paver, spread, compacted and finished in a continuous operation including provision of contraction, expansion, construction and longitudinal joints, joint filler, separation membrane, sealant primer, joint sealant, debonding strip, admixtures as approved, curing compound, finishing to lines and grades as per drawing as per IRC 15 2011 and as per relevant clauses of section 602 of specifications complete but excluding cost of steel in dowel bar and tie rods etc.</p>	cum	6362.00
6.4	<p><b>Cement Concrete Pavement</b> Construction of un-reinforced, dowel jointed, plain cement concrete pavement M-30 grade concrete over a prepared sub base with cement , coarse and fine aggregate conforming to IS 383, maximum size of coarse aggregate not exceeding 25 mm, mixed in a batching and mixing plant as per approved mix design, transported to site, laid with a fixed form or slip form paver, spread, compacted and finished in a continuous operation including provision of contraction, expansion, construction and longitudinal joints, joint filler, separation membrane, sealant primer, joint sealant, debonding strip, admixtures as approved, curing compound, finishing to lines and grades as per drawing as per IRC 15 2011 and as per relevant clauses of section 602 of specifications complete but excluding cost of steel in dowel bar and tie rods etc.</p>	cum	5977.00

Item No.	Descriptions	Unit	Rate
6.5	<p>Deduct from Item No.6.3 &amp; 6.4 above if paver with electronic sensor is not used and laying, compaction is done by any other method (The acceptance criteria regarding level, thickness, surface regularity, texture finish, strength of concrete and all other quality control measures shall be the same as in case of machine laid work.)</p> <p><b>Note:- This item is to be executed with prior written permission from the C.E.</b></p>	cum	350.00
6.6	<p><b>Rolled Cement Concrete Base</b> Construction of rolled cement concrete base course with coarse and fine aggregate conforming to IS:383, the size of coarse aggregate not exceeding 25 mm with minimum, aggregate cement ratio 15:1 and minimum cement content of 200 kg/cum, aggregate gradation to be as per table 600-3 after blending, mixing in batching plant at optimum moisture content, transporting to site, laying with a paver with electronic sensor, compacting with 8-10 tonnes smooth wheeled vibratory roller to achieve, the designed flexural strength, finishing and curing) excluding cost of steel in dowel bar and tie rod etc.</p>	cum	3067.00
6.7	<p>Deduct from Item No.6.6 above if paver with electronic sensor, vibratory roller are not used and laying, compaction is done by any other method. (The acceptance criteria regarding level, thickness, surface regularity, texture finish, strength of concrete and all other quality control measures shall be the same as in case of machine laid work.) .</p> <p><b>Note:- This item is to be executed with prior written permission from the C.E.</b></p>	cum	140.00
6.8	<p><b>Construction of Base/Sub-base of pavement with lean concrete - fly ash.</b> Construction of Base/sub-base using cement, sand, fly ash and coarse aggregates proportioned as per table 4 of IRC: 74/1979 and with water content ratio, slump and compressive strength as defined in the said table, mix prepared in a batching and mixing plant and compacted with a vibratory roller 8-10 tonnes capacity within the time limit laid down vide clause 7.6.3 of IRC: 74-1979, construction joints properly formed at the end of day's work, cured for 14 days, all as specified in IRC: 74-1979 and as per approved plans.</p>	cum	2604.00
6.9	<p>Deduct from Item No.6.8 above if paver with electronic sensor, vibratory roller are not used and laying, compaction is done by any other method. (The acceptance criteria regarding level, thickness, surface regularity, texture finish, strength of concrete and all other quality control measures shall be the same as in case of machine laid work.) .</p> <p><b>Note:- This item is to be executed with prior written permission from the C.E.</b></p>	cum	140.00

Item No.	Descriptions	Unit	Rate
6.10	<b>Cement - Fly ash concrete pavement.</b> Construction reinforced-reinforced, dowel jointed, plain cement concrete pavement over a prepared sub base with cement, coarse and fine aggregate conforming to IS 383, maximum size of coarse aggregate not exceeding 25 mm, replacing cement by fly ash to the extent of 15% and sand by 10%, mixed in a batching and mixing plant as per approved mix design, transported to site, laid with a fixed form or slip form paver, spread, compacted and finished in a continuous operation including provision of contraction, expansion, construction and longitudinal joints, joint filler, separation membrane, sealant primer, joint sealant, debonding strip, admixtures as approved, curing compound, finishing to lines and grades as per drawing ) excluding cost of steel in dowel bar and tie rod etc.	cum	5979.00
6.11	Deduct from Item No.6.10 above if paver with electronic sensor is not used and laying, compaction is done by any other method (The acceptance criteria regarding level, thickness, surface regularity, texture finish, strength of concrete and all other quality control measures shall be the same as in case of machine laid work.) <b>Note:- This item is to be executed with prior written permission from the C.E.</b>	cum	320.00
6.12	Add extra in Item No.6.3, 6.4, 6.6 & 6.10 above for the cost of steel in dowel bar and tie rod including cradle, laps etc. complete required as per design.		
	i) Mild steel	MT	61069.00
	ii) Tor steel	MT	63561.00
6.13	Providing and laying reinforced cement concrete pipe 300mm dia NP-4 for service ducts below concrete pavement.	RM	880.00
6.14	<b>Providing and Laying Half round Reinforced Cement Concrete Pipe as per design in Single Row</b> Providing and laying half round reinforced cement concrete pipe Np2 type conforming to IS 458-2003 for drains in single row including joint filling with cement mortar 1:2 but excluding excavation, bedding, protection works, backfilling etc. complete.		
	i) NP2 Pipes 600 mm dia	Metre	637.00
	ii) NP2 Pipes 500 mm dia	Metre	456.00
	iii) NP2 Pipes 300 mm dia	Metre	283.00
6.15	Providing, fixing and lowering, laying and jointing Double Walled Corrugated (DWC) Pipes of HDPE in 6m. length bar with IS-14930-II in prepared trenches in grade and level including cost of couplers and testing of pipes at factory as per the stipulation in relevant IS codes etc. complete.		
	i) 145mm outer diameter / 123mm inner diameter	RM	448.00
	ii) 200mm outer diameter / 174mm inner diameter	RM	685.00

Item No.	Descriptions	Unit	Rate
6.16	Providing and laying factory made coloured chamfered edge Cement Concrete paver blocks of required strength, thickness and size/shape, made by table vibratory method using PU mould, laid in required colour and pattern over 50mm thick compacted bed of stone dust, compacting and proper embedding/laying of inter locking paver blocks into the bedding layer through vibratory compaction by using plate vibrator, filling the joints with sand and cutting of paver blocks as per required size and pattern, finishing and sweeping extra sand including locking edges with M 15 cement concrete in footpath, light traffic parking etc. complete as per direction of Engineer-in-Charge.		
i)	100mm thick C.C. paver block of M-35 grade with approved colour, design and pattern.	sqm	940.00
ii)	80mm thick C.C. paver block of M-35 grade with approved colour, design and pattern.	sqm	840.00

## **CHAPTER : 7.0**

# **GEOSYNTHETICS AND REINFORCED EARTH**



Item No.	Descriptions	Unit	Rate
7.1	<b>Sub- Surface Drain with Geotextiles</b> Construction of sub surface drain 200 mm dia using geotextiles treated with carbon black with physical properties as given in clause 702.2.3 formed in to a stable network and a planar geocomposite structure, joints wrapped with geotextile to prevent ingress of soil, all as per clause 702 and approved drawings including excavation and backfilling.	metre	861.00
7.2	<b>Narrow Filter Sub- Surface Drain</b> Construction of a narrow filter sub- surface drain consisting of porous or perforated pipe laid in narrow trench surrounded by a geotextile filter fabric, with a minimum of 450 mm overlap of fabric and installed as per clause 702.3 and 309.3.5 including excavation and backfilling	metre	583.00
7.3	<b>Laying Paving Fabric Beneath a Pavement Overlay</b> Providing and laying paving fabric with physical requirements as per table 700-16 over a tack coat of paving grade Bitumen VG 10 penetration, laid at the rate of 1 kg per sqm over thoroughly cleaned and repaired surface to provide a water resistant membrane and crack retarding layer. Paving fabric to be free of wrinkling and folding and to be laid before cooling of tack coat, brooming and rolling of surface with pneumatic roller to maximise paving fabric contact with pavement surface	sqm	155.00
7.4	<b>Laying Boulder Apron in Crates of Synthetic Geogrids</b> Providing, preparing and laying of geogrid crated apron 1 m x 5 m, 600 mm thick including excavation and backfilling with baffles at 1 metre interval, made with geogrids having characteristics as per clause 704.2, joining sides with connectors/ring staples, top corners to be tie tensioned, placing of suitable cross interval ties in layers of 300 mm connecting opposite side with lateral braces and tied with polymer braids to avoid bulging, constructed as per clause 704.3. filled with stone with minimum size of 200 mm and specific gravity not less than 2.65, packed with stone spalls, keyed to the foundation recess in case of sloping ground and laid over a layer of geotextile to prevent migration of fines, all as per clause 704 and laid as per clause 2503.3 and approved design.	cum	3680.00
7.5	<b>Reinforced Earth Retaining Wall</b> Reinforced earth retaining walls have four main components as under: a) Excavation for foundation, foundation concrete and cement concrete grooved seating in the foundation for facing elements (facia material). b) Facia material and its placement. c) Assembling, joining with facing elements and laying of the reinforcing elements. d) Earthfill with granular material which is to be retained by the wall. (Back filling behind the facing element shall be paid separately as per Chapter 3.12)		
	(i) Facing elements of RCC	sqm	1330.00
	(ii) Assembling, joining and laying of reinforcing elements.		

Item No.	Descriptions	Unit	Rate
A	With reinforcing element of steel / Aluminium strips / polymeric strips.		
Type 1	1.Galvanised carbon steel strips	metre	336.00
Type 2	2.Copper Strips	metre	323.00
Type 3	3.Aluminium Strips	metre	284.00
Type 4	4.Stainless steel strips	metre	310.00
Type 5	5.Glass reinforced polymer/fibre reinforced polymer/ polymeric strips	metre	402.00
B	With reinforcing elements of synthetic geogrids	sqm	209.00

## **CHAPTER : 8.0**

# **TRAFFIC SIGNS, MARKINGS & OTHER ROAD APPURTENANCES**

Item No.	Descriptions	Unit	Rate
8.1	<b>Cast in Situ Cement Concrete M20 kerb</b> Construction of cement concrete kerb with top and bottom width 115 and 165 mm respectively, 250 mm high in M 20 grade PCC on M-10 grade foundation 150 mm thick, foundation having 50 mm projection beyond kerb stone, kerb stone laid with kerb laying machine, foundation concrete laid manually, all complete as per clause 409		
	A Using Concrete Mixer	metre	260.00
	B Using Concrete Batching and Mixing Plant	metre	254.00
8.2	<b>Cast in Situ Cement Concrete M 20 Kerb with Channel</b> Construction of cement concrete kerb with channel with top and bottom width 115 and 165 mm respectively, 250 mm high in M 20 grade PCC on M10 grade foundation 150 mm thick, kerb channel 300 mm wide, 50 mm thick in PCC M20 grade, sloped towards the kerb, kerb stone with channel laid with kerb laying machine, foundation concrete laid manually, all complete as per clause 409		
	A Using Concrete Mixer	metre	482.00
	B Using Concrete Batching and Mixing Plant	metre	478.00
8.3	<b>Retro- reflectorised Traffic signs</b> Providing and fixing of retro-reflectorised cautionary, mandatory and informatory sign board as per IRC 67-2010 made of high intensity Micro-Prismatic Grade Sheeting (TypeIV) vide clause 801.3.3 fixed over Aluminium composite material sheet with thermoplastic core of Low density polyethylene (LDPE) between two thick skins/sheets of aluminium with overall thickness of 4mm and aluminium skin of thickness 0.3 on both side, the ACM shall conform to Table 800-1 of specification and High Intensity Micro Prismatic Grade Sheeting shall conform to Table 800-3 of specification. The printing on the high intensity grade sheeting shall conform to Clause 801.3.7 with water based latex optimized transparent ink as specified by the sheeting manufacturer, supported on composite sign post of size 75mmx33.55mmx34.99 mm (5mm thick) made of Aluminium composite material in accordance to IRC 67-2010 fixed to ground by means of properly designed foundation with M15 grade concrete 4500x4500x600 The ACM sheet shall be fixed to the post with four minimum four number breakaway bolts.		
	i) 90 cm equilateral triangle	Each	4063.00
	ii) 60 cm equilateral triangle	Each	2889.00
	iii) 60 cm circular	Each	3657.00
	iv) 80 mm x 60 mm rectangular	Each	4849.00
	v) 60 cm x 45 cm rectangular	Each	3579.00
	vi) 60 cm x 60 cm square	Each	4123.00
	vii) 90 cm high octagon	Each	6011.00

Item No.	Descriptions	Unit	Rate
8.4	<p><b>Retro- reflectorised Traffic signs</b>  Providing and fixing of retro-reflectorised cautionary, mandatory and inforatory sign board as per IRC 67-2010 made of high intensity Micro-Prismatic Grade Sheeting (Type XI) vide clause 801.3.3 fixed over Aluminium composite material sheet with thermoplastic core of Low density polyethylene (LDPE) between two thick skins/sheets of aluminium with overall thickness of 4mm and aluminium skin of thickness 0.3 on both side, the ACM shall conform to Table 800-1 of specification and High Intensity Micro Prismatic Grade Sheeting shall conform to Table 800-3 of specification. The printing on the high intensity grade sheeting shall conform to Clause 801.3.7 with water based latex optimized transparent ink as specified by the sheeting manufacturer, supported on a mild steel angle iron post 75 mm x 75 mm x 6 mm firmly fixed to ground by means of properly designed foundation with M15 grade concrete 4500x4500x600 The ACM sheet shall be fixed to the post with four minimum four number breakaway bolts.</p>		
	i) 90 cm equilateral triangle	Each	3863.00
	ii) 60 cm equilateral triangle	Each	2689.00
	iii) 60 cm circular	Each	3457.00
	iv) 80 mm x 60 mm rectangular	Each	4649.00
	v) 60 cm x 45 cm rectangular	Each	3379.00
	vi) 60 cm x 60 cm square	Each	3923.00
	vii) 90 cm high octagon	Each	5811.00
8.5	<p><b>Direction and Place Identification signs upto 0.9 sqm size board.</b>  (Providing and erecting direction and place identification retro-reflectorised sign asper IRC:67 made of high intensity Micro-Prismatic Grade Sheeting (Type XI) vide clause 801.3.3 fixed over Aluminium composite material sheet with thermoplastic core of Low density polyethylene (LDPE) between two thick skins/sheets of aluminium with overall thickness of 4mm and aluminium skin of thickness 0.3 on both side, the ACM shall conform to Table 800-1 of specification and High Intensity Micro Prismatic Grade Sheeting shall conform to Table 800-3 of specification. The printing on the high intensity grade sheeting shall conform to Clause 801.3.7 with water based latex optimized transparent ink as specified by the sheeting manufacturer, supported on composite sign post of size 75mmx33.55mmx34.99 mm (5mm thick) made of Aluminium composite material in accordance to IRC 67-2010 fixed to ground by means of properly designed foundation with M15 grade concrete 4500x4500x600 The ACM sheet shall be fixed to the post with minimum two number breakaway bolts.</p>	Sqm.	8199.00
8.6	<p><b>Direction and Place Identification signs upto 0.9 sqm size board.</b>  Providing and fixing of retro-reflectorised cautionary, mandatory and inforatory sign board as per IRC 67-2010 made of high intensity Micro-Prismatic Grade Sheeting (Type XI) vide clause 801.3.3 fixed over Aluminium composite material sheet with</p>	Sqm.	7999.00

Item No.	Descriptions	Unit	Rate
8.7	<p>thermoplastic core of Low density polyethylene (LDPE) between two thick skins/sheets of aluminium with overall thickness of 4mm and aluminium skin of thickness 0.3 on both side, the ACM shall conform to Table 800-1 of specification and High Intensity Micro Prismatic Grade Sheeting shall conform to Table 800-3 of specification. The printing on the high intensity grade sheeting shall conform to Clause 801.3.7 with water based latex optimized transparent ink as specified by the sheeting manufacturer, supported on a mild steel angle iron post 75 mm x 75 mm x 6 mm firmly fixed to ground by means of properly designed foundation with M15 grade concrete 4500x4500x600 The ACM sheet shall be fixed to the post with four minimum four number breakaway bolts.</p> <p><b>Direction and Place Identification signs with size more than 0.9 sqm size board.</b></p> <p>(Providing and erecting direction and place identification retro-reflectorised sign as per IRC:67 made of high intensity Micro-Prismatic Grade Sheeting (Type XI) vide clause 801.3.3 fixed over Aluminium composite material sheet with thermoplastic core of Low density polyethylene (LDPE) between two thick skins/sheets of aluminium with overall thickness of 4mm and aluminium skin of thickness 0.3 on both side, the ACM shall conform to Table 800-1 of specification and High Intensity Micro Prismatic Grade Sheeting shall conform to Table 800-3 of specification. The printing on the high intensity grade sheeting shall conform to Clause 801.3.7 with water based latex optimized transparent ink as specified by the sheeting manufacturer, supported on composite sign post of size 75mmx33.55mmx34.99 mm (5mm thick) made of Aluminium composite material in accordance to IRC 67-2010 fixed to ground by means of properly designed foundation with M15 grade concrete 4500x4500x600 The ACM sheet shall be fixed to the post with minimum two number breakaway bolts.</p>	Sqm.	14324.00
8.8	<p><b>Direction and Place Identification signs with size more than 0.9 sqm size board.</b></p> <p>Providing and fixing of retro-reflectorised cautionary, mandatory and informatory sign board as per IRC 67-2010 made of high intensity Micro-Prismatic Grade Sheeting (Type XI) vide clause 801.3.3 fixed over Aluminium composite material sheet with thermoplastic core of Low density polyethylene (LDPE) between two thick skins/sheets of aluminium with overall thickness of 4mm and aluminium skin of thickness 0.3 on both side, the ACM shall conform to Table 800-1 of specification and High Intensity Micro Prismatic Grade Sheeting shall conform to Table 800-3 of specification. The printing on the high intensity grade sheeting shall conform to Clause 801.3.7 with water based latex optimized transparent ink as specified by the sheeting manufacturer, supported on a mild steel angle iron post 75 mm x 75 mm x 6 mm firmly fixed to ground by means of properly designed foundation with M15 grade concrete 4500x4500x600 The ACM sheet shall be fixed to the post with four minimum four number breakaway bolts.</p>	Sqm.	14124.00

Item No.	Descriptions	Unit	Rate
8.9	Providing and pasting on existing informatory boards high intensity Micro-Prismatic Grade Sheeting (Type XI) vide clause 801.3.3 duly printed message with water based latex optimized transparent ink as directed by Engineer-in-Charge. Sheet shall be fixed on the existing board by de-greasing either by acid or hot alkaline etching and all scale/ dirt removed to obtain smooth plain surface before application of high intensity grade retro reflective sheeting all complete.	Sqm.	6510.00
8.10	<b>Printing new letter and figures of any shade</b> Printing new letter and figures of any shade with synthetic enamel paint black or any other approved colour to give an even shade		
	(i) Hindi ( Matras commas and the like not to be measured and paid for Half letter shall be counted as half )	cm height per letter	0.80
	(ii) English and Roman	cm height per letter	0.50
8.11	<b>Painting Two Coats on New Concrete Surfaces</b> Painting two coats after filling the surface with synthetic enamel paint in all shades on new plastered concrete surfaces	sqm	59.00
8.12	<b>Painting on Steel Surfaces</b> Providing and applying two coats of ready mix paint of approved brand on steel surface after through cleaning of surface to give an even shade	sqm	56.00
8.13	<b>Painting Lines, Dashes, Arrows etc on Roads in Two Coats on New Work</b> Painting lines, dashes, arrows etc on roads in two coats on new work with ready mixed road Grade-I marking paint concrete surface (cold applied reflective paint) conforming to IS:164 on bituminous surface, including cleaning the surface of all dirt, dust and other foreign matter, demarcation at site and traffic control.		
	(i) Over 10 cm in width	sqm	99.00
	(ii) Up to 10 cm in width	sqm	84.00
8.14	<b>Painting Lines, Dashes, Arrows etc on Roads in Two Coats on Old Work</b> Painting lines, dashes, arrows etc on roads in two coats on old work with ready mixed Grade-I road marking paint (cold applied reflective paint) confirming to IS: 164 on bituminous surface, concrete including cleaning the surface of all dirt, dust and other foreign matter, demarcation at site and traffic control.		
	(i) Over 10 cm in width	sqm	69.00
	(ii) Up to 10 cm in width	sqm	74.00
8.15	<b>Road Marking with Hot Applied Thermoplastic Compound with Reflectorising Glass Beads on Bituminous Surface</b> Providing and laying of hot applied thermoplastic compound 2.5 mm thick including reflectorising glass beads @ 250 gms per sqm area, thickness of 2.5 mm is exclusive of surface applied glass beads as per IRC:35 .The finished surface to be level, uniform and free from streaks and holes all complete as per clause 803 of specifications.	sqm	637.00

Item No.	Descriptions	Unit	Rate
8.16	<b>Kilo Metre Stone</b> Reinforced cement concrete M15 grade kilometre stone of standard design as per IRC:8-1980, fixing in position including painting and printing etc		
	(i) 5th kilometre stone (precast)	each	3446.00
	(ii) Ordinary Kilometer stone (Precast)	each	2076.00
	(iii) Hectometer stone (Precast)	each	611.00
8.17	<b>Road Delineators</b> Supplying and installation of delineators (road way indicators, hazard markers, object markers), 80-100 cm high above ground level, painted black and white in 15 cm wide stripes, fitted with 80 x 100 mm rectangular or 75 mm dia circular reflectorised panels at the top, buried or pressed into the ground and conforming to IRC-79 and the drawings.	each	277.00
8.18	<b>Boundary pillar</b> Reinforced cement concrete M15 grade boundary pillars of standard design as per IRC:25-1967, fixed in position including finishing and lettering but excluding painting.	each	553.00
8.19	<b>G.I Barbed wire Fencing 1.2 metre high</b> Providing and fixing 1.2 metres high GI barbed wire (weighing 9.38 kg per 100 mts.) fencing with 1.8 m angle iron posts 40 mm x 40 mm x 6 mm placed every 3 metres center to center founded in M15 grade cement concrete, 0.6 metre below ground level, every 15th post, last but one end post and corner post shall be strutted on both sides and end post on one side only and provided with 9 horizontal lines and 2 diagonals interwoven with horizontal wires, fixed with GI staples, turn buckles etc complete as per clause 808	metre	300.00
8.20	<b>G.I Barbed wire Fencing 1.8 metre high</b> Providing and fixing 1.8 metres high GI barbed wire (weighing 9.38 kg per 100 mts.) fencing with 2.4 m angle iron posts 50 mm x 50 mm x 6 mm placed every 3 metres center to center founded in M15 grade cement concrete, 0.6 metre below ground level, every 15th post, last but one end post and corner post shall be strutted on both sides and end post on one side only and provided with 12 horizontal lines and 2 diagonals interwoven with horizontal wires, fixed with GI staples, turn buckles etc complete as per clause 808	metre	489.00
8.21	<b>Fencing with welded steel wire Fabric (weighing 4 kg per sqm.) 75 mm x 50 mm (Suggestive)</b> Providing 1.20 metre high fencing with angle iron posts 50mmx 50mmx6mm at 3 metre center to center with 0.40 metre embedded in M15 grade cement concrete, corner, end and every 10th post to be strutted, provided with welded steel wire fabric of 75 mm x 50 mm mesh or 75 mm x 25 mm mesh and fixed to iron posts by flat iron 50 x 5 mm and bolts etc. complete in all respects.	metre	659.00
8.22	<b>Tubular Steel Railing on Medium Weight steel channel (ISMC series) 100 mm x 50 mm</b> Providing, fixing and erecting 50 mm dia steel pipe (weighing 3.56 kg per mts.) railing in 3 rows duly painted on medium weight steel channels (ISMC series) 100 mm x 50 mm, 1.2 metres high above ground, 2 m centre to centre, complete as per approved drawings.	metre	1960.00



Item No.	Descriptions	Unit	Rate
8.23	<p><b>Tubular Steel Railing on Precast RCC posts, 1.2 m high above ground level</b>  Providing, fencing and erecting 50 mm dia (<b>weighing 3.56 kg per mts.</b>) painted steel pipe railing in 3 rows on precast M20 grade RCC vertical posts 1.8 metres high (1.2 m above GL) with 3 holes 50 mm dia for pipe, fixed 2 metres centre to, complete as per approved drawing.</p>	metre	1453.00
8.24	<p><b>Reinforced Cement Concrete Crash Barrier</b>  Provision of an Reinforced cement concrete crash barrier at the edges of the road, approaches to bridge structures and medians, constructed with M-20 grade concrete with HYSD reinforcement conforming to IRC:21 and dowel bars 25 mm dia, 450 mm long at expansion joints filled with pre-moulded asphalt filler board, keyed to the structure on which it is built and installed as per design given in the enclosure to MOST circular No. RW/NH - 33022/1/94-DO III dated 24 June 1994 as per dimensions in the approved drawing and at locations directed by the Engineer, all as specified.</p> <p>(i) M 20 grade concrete</p>	metre	3782.00
8.25	<p><b>Metal Beam Crash Barrier</b></p> <p>A Type - A, "W" : Metal Beam Crash Barrier (Providing and erecting a "W" metal beam crash barrier comprising of 3 mm thick corrugated sheet metal beam rail, 70 cm above road/ground level, fixed on ISMC series channel vertical post, 150 x 75 x 5 mm spaced 2 m centre to centre, 1.8 m high, 1.1 m below ground/road level, all steel parts and fitments to be galvanised by hot dip process, all fittings to conform to IS:1367 and IS:1364, metal beam rail to be fixed on the vertical post with a spacer of channel section 150 x 75 x 5 mm, 330 mm long complete as per clause 811)</p> <p>B Type - B, "THRIE" : Metal Beam Crash Barrier (Providing and erecting a "Thrie" metal beam crash barrier comprising of 3 mm thick corrugated sheet metal beam rail, 85 cm above road/ground level, fixed on ISMC series channel vertical post, 150 x 75 x 5 mm spaced 2 m centre to centre, 2 m high with 1.15 m below ground level, all steel parts and fitments to be galvanised by hot dip process, all fittings to conform to IS:1367 and IS:1364, metal beam rail to be fixed on the vertical post with a space of channel section 150 x 75 x 5 mm, 546 mm long complete as per clause 811)</p>	metre	4348.00
		metre	5996.00

Item No.	Descriptions	Unit	Rate
8.26	<p><b>Flexible Crash Barrier, Wire Rope Safety Barrier</b>  Providing and erecting a wire rope safety barrier with vertical posts of medium weight RS Joist (ISMB series) 100 mm x 75 mm (11.50 kg/m), 1.50 m long 0.85 m above ground and 0.65 m below ground level, split at the bottom for better grip, embedded in M 15 grade cement concrete 450 x 450 x 450 mm, 1.50 m center to center and with 4 horizontal steel wire rope 40 mm dia and anchored at terminal posts 15 m apart. Terminal post to be embedded in M 15 grade cement concrete foundation 2400 x 450 x 900 mm (depth), strengthened by a strut of RS joist 100 x 75 mm, 2 m long at 450 inclination and a tie 100 x 8 mm, 1.50 m long at the bottom, all embedded in foundation concrete as per approved design and drawing, rate excluding excavation and cement concrete.</p>	metre	3240.00
8.27	<p><b>Cable Duct Across the Road</b>  Providing and laying of a reinforced cement concrete pipe duct, 300 mm dia, across the road (new construction), extending from drain to drain in cuts and toe of slope to toe of slope in fills, constructing head walls at both ends, providing a minimum fill of granular material over top and sides of RCC pipe as per IRC:98-1997, bedded on a 0.3 m thick layer of granular material free of rock pieces, outer to outer distance of pipe at least half dia of pipe subject to minimum 450 mm in case of double and triple row ducts, joints to be made leak proof, invert level of duct to be above higher than ground level to prevent entry of water and dirt, all as per IRC: 98 - 1997 and approved drawings.</p>		
	(i) Single Row for one utility service	metre	1798.00
	(ii) Double Row for two utility services	metre	3273.00
	(iii) Triple Row for three utility services	metre	4760.00
8.28	<p><b>Road Markers/Road Stud with Lense Reflector</b>  Providing and fixing of road stud 100x 100 mm, die cast in aluminium, resistant to corrosive effect of salt and grit, fitted with lense reflectors, installed in concrete or asphaltic surface by drilling hole 30 mm upto a depth of 60 mm and bedded in a suitable bituminous grout or epoxy mortar, all as per BS 873 part 4:1973</p>	each	672.00
8.29	<p><b>Traffic Cone</b>  Provision of red fluorescent with white reflective sleeve traffic cone made of low density polyethylene (LDPE) material with a square base of 390 x 390 x 35 mm and a height of 770 mm, 4 kg in weight, placed at 1.5 m interval, all as per BS 873</p>	each	197.00
8.30	<p><b>Portable Barricade in Construction Zone</b>  Installation of a steel portable barricade with horizontal rail 300 mm wide, 2.5 m in length fitted on a 'A' frame made with 45 x 45 x 5 mm angle iron section, 1.5 m in height, horizontal rail painted (2 coats) with yellow and white stripes, 150 mm in width at an angle of 450, 'A' frame painted with 2 coats of yellow paint, complete as per IRC:SP:55-2001</p>	each	3017.00

Item No.	Descriptions	Unit	Rate
8.31	<b>Permanent Type Barricade in Construction Zone</b>		
A	With Steel Components (Construction of a permanent type barricade made of steel components, 1.5 m high from road level, fitted with 3 horizontal rails 200 mm wide and 4 m long on 50 x 50 x 5 mm angle iron vertical support, painted with yellow and white strips, 150 mm in width at an angle of 45°, complete as per IRC:SP:55-2001 )	each	4783.00
B	With Wooden Components (Construction of a permanent type barricade made of wooden components, 1.5 m high from road level, fitted with 3 horizontal planks 200 mm wide and 3.66 m long on 100 x 100 mm wooden vertical post, painted with yellow and white strips, 150 mm in width at an angle of 45°, complete as per IRC:SP:55-2001 )	each	5016.00
C	With Bricks (Construction of a permanent type barricade made with brick work in mud mortar, 1.5 m high, 4 m long, 600 mm thick, plastered with cement mortar 1:6, painted with yellow and white strips)	each	19185.00
8.32	<b>Drum Delineator in Construction Zone</b> Provision of metal drum/empty bitumen drum delineator, 300 mm in diameter, 800 mm high, filled with earth for stability, painted in circumferential strips of alternate black and white 100 mm wide fitted with reflectors 3 Nos of 7.5 cm dia, all as per IRC:SP:55-2001	each	469.00
8.33	<b>Flagman</b> Positioning of a smart flagman with a yellow vest and a yellow cap and a red flag 600 x 600 mm securely fastened to a staff 1 m in length for guiding the traffic.	each	539.00
8.34	Providing and fixing guard stones 220x220x1000mm made of hammer dressed stones and fixed 400mm into the ground in moorum and broken aggregates block of size 500x500x500 mm and given two coats of paints with white and black bands i/c excavation etc. complete.	each	368.00

**CHAPTER : 9.0**  
**PIPE CULVERTS**

Item No.	Descriptions	Unit	Rate
9.1	<b>PCC M-15 in Foundation</b> Plain cement concrete M-15 mix with crushed stone aggregate 40 mm nominal size mechanically mixed, placed in foundation and compacted by vibration including curing for 14 days. as per MORT&H Specification 409.	cum	4209.00
9.2	<b>Laying Reinforced Cement Concrete Pipe NP4/prestrssed concrete pipe on first class bedding in single row.</b> Providing and Laying Reinforced cement concrete pipe NP4/prestrssed concrete pipe for culverts on first class bedding of granular material (cost of bedding included) in single row including fixing collar with cement mortar 1:2 but excluding excavation, protection works, backfilling, concrete and masonry works in head walls and parapets.		
	A 1000 mm dia	metre	6998.00
	B 1200 mm dia	metre	9522.00
9.3	<b>Laying Reinforced Cement Concrete Pipe NP 4 /prestrssed concrete pipe on first class bedding in double row.</b> Providing and Laying Reinforced cement concrete pipe NP4 /prestrssed concrete pipe for culverts on first class bedding of granular material (cost of bedding included) in double row including fixing collar with cement mortar 1:2 but excluding excavation, protection works, backfilling, concrete and masonry works in head walls and parapets.		
	A 1000 mm dia	metre	14139.00
	B 1200 mm dia	metre	19198.00
9.4	Providing and Laying Reinforced cement concrete pipe NP4 / prestrssed concrete pipe for culverts on first class bedding of granular material (cost of bedding included) in triple row including fixing collar with cement mortar 1:2 but excluding excavation, protection works, backfilling, concrete and masonry works in head walls and parapets and as per relevant clauses of section-2900.		
	a) 1000 mm dia	metre	28253.00
	b) 1200 mm dia	metre	28565.00
9.5	Add for every additional row in item 9.4 above		
	a) 1000 mm dia	metre	6919.00
	b) 1200 mm dia	metre	9420.00
9.6	Providing concrete craddle bedding in M-15 grade concrete as per clause 2900 and as per section 1700 and 2900.	cum	5080.00
9.7	Deduction for not providing the first class bedding (in case sand is available in the bed or the concrete craddle is provided as per item 9.6 above) in item No.9.2., 9.3, 9.4 & 9.5 above.	Cum	514.00

Item No.	Descriptions	Unit	Rate
9.8	Providing P.C.C. M-15 Nominal mix for hume pipe culverts in foundation and sub structure etc. as per drawing and as per relevant clauses of section 1500, 1700, 2100 and 2900.	cum	5374.00

## **CHAPTER : 10.0**

# **MAINTENANCE OF ROADS**

Item No.	Descriptions	Unit	Rate
10.1	<b>Filling Pot- holes and Patch Repairs with open - graded Premix surfacing, 20mm.</b> Removal of all failed material, trimming of completed excavation to provide firm vertical faces, cleaning of surface, painting of tack coat on the sides and base of excavation as per clause 503, back filling the pot holes with hot bituminous material as per clause 510, compacting, trimming and finishing the surface to form a smooth continuous surface, all as per clause 3004.2	sqm	153.00
10.2	<b>Built-Up-Spray Grout</b> Providing, laying and rolling of built-up-spray grout layer over prepared base consisting of a two layer composite construction of compacted crushed coarse aggregates using motor grader for aggregates. key stone chips spreader may be used with application of bituminous binder after each layer, and with key aggregates placed on top of the second layer to serve as a Base conforming to the line, grades and cross-section specified, the compacted layer thickness being 75 mm.	Sqm	308.00
10.3	<b>Repair of Pot Holes, Patch Repair</b> Providing, laying and rolling of built-up-spray grout layer over prepared base consisting of composite construction of compacted crushed coarse aggregates and key stone chips with application of bituminous binder after each layer, and with key aggregates placed on top of the subsequent layer to serve as a Base conforming to the line, grades and cross-section specified, (number of layers of coarse aggregate shall be as per site requirement).	cum	4113.00
10.4	<b>Repair of joint Grooves with Epoxy Mortar</b> Repair of spalled joint grooves of contraction joints, longitudinal joints and expansion joints in concrete pavements using epoxy mortar or epoxy concrete.	metre	1760.00
10.5	<b>Repair of old Joints Sealant</b> Removal of existing sealant and re sealing of contraction, longitudinal or expansion joints in concrete pavement with fresh sealant material	metre	33.00
10.6	<b>Land Slide Clearance in soil</b> Clearance of land slides in soil and ordinary rock by a bull-dozer D 80 A-12, 180 HP and disposal of the same on the valley side	cum	49.00
10.7	<b>Land slide Clearance in Hard Rock Requiring Blasting</b> Clearing of land slide in hard rock requiring blasting for 50% of the boulders and disposal of the same on the valley side.	cum	101.00
10.8	Providing painting, figuring and numbering as per IRC specifications complete with Synthetic Enamel Paint for 5th Km. Stone.		
	(i) Two coats on new work.	Each	385.00
	(ii) One coat on old work.	Each	293.00



Item No.	Descriptions	Unit	Rate
10.9	Providing painting, figuring and numbering as per IRC specifications complete with Synthetic Enamel Paint for ordinary Km. Stone.		
	(i) Two coats on new work.	Each	154.00
	(ii) One coat on old work.	Each	99.00
10.10	Providing painting, figuring and numbering as per IRC specifications complete with Synthetic Enamel Paint for 0.2 Km. Stones or Boundary Stones.		
	(i) Two coats on new work.	Each	39.00
	(ii) One coat on old work.	Each	25.00
10.11	Providing painting, figuring and numbering to culvert upto 6m. Span complete with Synthetic Enamel Paint.		
	(i) Two coats on new work.	Each	123.00
	(ii) One coat on old work.	Each	94.00
10.12	Providing painting, figuring and numbering to minor bridges upto 30m. Linear water-way complete with Synthetic Enamel Paint .		
	(i) Two coats on new work.	Each	163.00
	(ii) One coat on old work.	Each	141.00
10.13	Providing painting, figuring & numbering to major bridges, linear water-way exceeding 30m.Complete with Synthetic Enamel Paint.		
	(i) Two coats on new work.	Each	268.00
	(ii) One coat on old work.	Each	214.00
10.14	Providing painting to angle Iron posts of road sign boards complete with Synthetic Enamel Paint.		
	(i) Two coats on new work.	Each	114.00
	(ii) One coat on old work.	Each	105.00
10.15	Providing painting and figuring of road sign boards (excluding posts/kerbs)		
	(i) Two coats on new board.	sqm	339.00
	(ii) One coat on old board.	sqm	295.00

**CHAPTER : 11.0**  
**HORTICULTURE**

Item No.	Descriptions	Unit	Rate
11.1	<b>Planting Permanent Hedges including Digging of Trenches</b> Planting permanent hedges including digging of trenches, 60 cm wide and 45 cm deep, refilling the excavated earth mixed with farmyard manure, supplied at the rate of 4.65 cum per 100 metres and supplying and planting hedge plants at 30 cm apart.	metre	191.00
11.2	<b>Planting of Trees and their Maintenance for one Year</b> Planting of trees by the road side (Avenue trees) in 0.60 m dia holes, 1 m deep dug in the ground, mixing the soil with decayed farm yard/sludge manure, planting the saplings, backfilling the trench, watering, and maintaining the plants for one year.	each	703.00
11.3	<b>Half Brick Circular Tree Guard, in 2nd class Brick, internal diametre 1.25 metres, and height 1.2 metres, above ground and 0.20 metre below ground</b> Half brick circular tree guard, in 2nd class brick, internal diametre 1.25 metres, and height 1.2 metres, above ground and 0.20 metre below ground, bottom two courses laid dry, and top three courses in cement mortar 1:6 ( 1 cement 6 sand) and the intermediate courses being in dry honey comb masonry, as per design complete.	each	2395.00
11.4	<b>Edging with 2nd class Bricks, laid dry lengthwise</b> Edging with 2nd class bricks, laid dry lengthwise, including excavation, refilling, consolidation, with a hand packing and spreading nearly surplus earth within a lead of 50 metres.	metre	49.00
11.5	<b>Tree Guard with MS Angle Iron and Steel Wire</b> Providing and fixing tree guard 0.60 metre square, 2.00 metre high fabricated with MS angle iron 30 x 30 x 3 mm, MS iron 25 x 3 mm and steel wire 3 mm dia welded and fabricated as per design in two halves bolted together.	each tree guard	2764.00
11.6	Transplantation of Trees including trimming the branches of full grown tree as per the requirement, giving a wax treatment of the trimmed area of branches, uprooting the tree i/c trimming and transporting the uprooted tree to the specified site of transplantation as directed by the engineer-in-Charge up to 12 Kms. lead including all lifts, transplanting, the uprooted tree by digging a required size of pit, filling it with fresh garden soil and manure as per the requirement & maintaining it for a period of 4 months by watering, weeding, manuring etc complete.		
A	Trees having trunk girth upto 1.00 M.	Per Tree	5236.00
B	Trees having trunk girth more than 1.00 M. upto 1.5 M.	Per Tree	7854.00
C	Trees having trunk girth more than 1.5 M. to 2.00 M.	Per Tree	10472.00
D	Trees having trunk girth more than 2.00 M.	Per Tree	12566.00

**Note:- 60% of the above rates may be paid after the transplantation of tree. If the tree does not survive after maintenance period, remaining 40% shall not be payable. The remaining 40% shall be paid after the expiry of maintenance period i.e. 4 months.**

**CHAPTER : 12.0**

**FOUNDATIONS**

Item No.	Descriptions	Unit	Rate
12.1	<b>Excavation for Structures</b> Earth work in excavation of foundation of structures as per drawing and technical specification, including setting out, construction of shoring and bracing, removal of stumps and other deleterious matter, dressing of sides and bottom and backfilling with approved material. as per relevant clauses of section 300 & 2100 in		
	I Ordinary soil		
	A Manual Means		
	(i) upto 3 m depth	cum	128.00
	(ii) 3 m to 6 m depth	cum	164.00
	(iii) Above 6 m depth	cum	219.00
	B Mechanical Means		
	(i) Depth upto 3 m	cum	58.00
	(ii) Depth 3 m to 6 m	cum	66.00
	(iii) Depth above 6m	cum	81.00
	II Ordinary rock (not requiring blasting)		
	A Manual Means		
	(i) Depth upto 3 m	cum	182.00
	(ii) 3 m to 6 m depth	cum	365.00
	(iii) Above 6 m depth	cum	547.00
	B Mechanical Means	cum	
	(ii) Depth upto 3 m	cum	73.00
	(ii) 3 m to 6 m depth	cum	115.00
	(iii) Above 6 m depth	cum	158.00
	III Hard rock ( requiring blasting )Manual Means	cum	471.00
	IV Hard rock ( blasting prohibited )Mechanical Means	cum	593.00
	V Marshy soil		
	(i) upto 3 m depth	cum	135.00
	A Manual means	cum	507.00
	B Mechanical Means	cum	135.00
	VI Back Filling in Marshy Foundation Pits	cum	360.00
12.2	Add extra as follows in the rates of the above items if dewatering is resorted to		
	a) upto 3 m depth		50% extra
	b) beyond 3 m to 6 m depth		75% extra
	c) Above 6 m depth		100% extra
12.3	Providing Plain cement concrete M-15 nominal mix in foundation as per relevant clauses of sections 1500, 1700 and 2100.	Cum	4777.00

Item No.	Descriptions	Unit	Rate
12.4	Sand Filling in Foundation Trenches as per Drawing & Technical Specification.	cum	2089.00
12.5	Providing & Filling Annular Space Around Footing in Rock with Lean cement concrete M-15 nominal mix in foundation with crushed stone aggregate 40 mm nominal size and as per relevant clauses of sections 1500, 1700 and 2100.	cum	4777.00
12.6	Brick masonry work in cement mortar 1:3 in foundation complete excluding pointing and plastering, as per drawing and technical specifications.	Cum	7635.00
12.7	Stone masonry work in cement mortar 1:3 in foundation complete as drawing and Technical Specification		
	(a) Square Rubble Coursed rubble masonry(first sort )	cum	5297.00
	(b) Random Rubble Masonry	cum	5201.00
12.8	Providing and laying Plain/Reinforced cement concrete in open foundation including form work shuttering etc. complete as per drawing and technical specifications and as per relevant clauses of sections 1500, 1700 & 2100 with .		
	A PCC Grade M15	cum	5080.00
	B PCC Grade M20	cum	5583.00
	C RCC Grade M20	cum	5465.00
	D PCC Grade M25	cum	5887.00
	E RCC Grade M25	cum	5915.00
	F PCC Grade M30	cum	5917.00
	G RCC Grade M30	cum	5930.00
	H RCC Grade M35	cum	6027.00
12.9	Providing and laying cutting edge of mild steel weighing 40 kg per metre for well foundation complete as per drawing and technical specification.	tonne	96658.00
12.10	Plain/Reinforced cement concrete, in well foundation complete as per drawing and technical specification		
	A Well curb		
	(i) RCC M20 Grade	cum	6311.00
	(ii) RCC M25 Grade	cum	7009.00
	(iii) RCC M35 Grade	cum	7187.00
	B Well steining		
	(I) PCC M15 Grade	cum	5374.00
	(ii) PCC M20 Grade	cum	5906.00
	(iii) RCC M20 Grade	cum	5785.00
	(iv) PCC M25 Grade	cum	6213.00
	(v) RCC M25 Grade	cum	6425.00
	(vi) PCC M30 Grade	cum	6260.00
	(vii) RCC M30 Grade	cum	6307.00
	(viii) RCC M35 Grade	cum	6588.00
	(ix) RCC M40 Grade	cum	6767.00
	C Bottom Plug		
	(i) PCC Grade M20	cum	5853.00

Item No.	Descriptions	Unit	Rate
(ii)	PCC Grade M25	cum	6125.00
(iii)	PCC Grade M30	cum	6178.00
(iv)	PCC Grade M35	cum	6292.00
D	Intermediate plug		
(I)	Grade M20 PCC	cum	5611.00
(ii)	Grade M25 PCC	cum	5870.00
(iii)	Grade M30 PCC	cum	5921.00
E	Top plug		
(i)	Grade M15 PCC	cum	4885.00
(ii)	Grade M20 PCC	cum	5369.00
(iii)	Grade M25 PCC	cum	5649.00
(iv)	Grade M30 PCC	cum	5691.00
F	Well cap		
(i)	RCC Grade M20	cum	5414.00
(ii)	RCC Grade M25	cum	5917.00
(iii)	RCC Grade M30	cum	5929.00
(iv)	RCC Grade M35	cum	6027.00
(v)	RCC M40 Grade	cum	6377.00
12.11	Sinking well for foundation to levels as per drawing including dredging, dewatering and drop chiselling as may be necessary, including sinking by loading with necessary kentledges and other usual means for the type of work i/c all the needed plant and machinery etc. complete as directed and removal of boulders or tree trunks etc. complete as per drawing and technical specifications. (Note : Depth of sinking shall be reckoned from bed level)		
A	Sandy soil		
(i)	Depth below bed level upto 3.0 M	Cum.	297.00
(ii)	Beyond 3m upto 10m depth	Cum.	427.00
(iii)	Beyond 10m upto 20m		
a)	Add for every additional meter depth of sinking over the rate of sinking for the previous meter	Cum.	563.00
(iv)	Beyond 20m upto 30 m		
a)	Add for every additional meter depth of sinking over the rate of sinking for the previous meter	Cum.	1057.00
b)	Add cost for Kentledge including supports, loading arrangement and Labour .	Cum.	1268.00
(v)	Beyond 30m upto 40 m		
a)	Add for every additional meter depth of sinking over the rate of sinking for the previous meter	Cum.	2510.00
b)	Add cost for Kentledge including supports, loading arrangement and Labour.	Cum.	3012.00
B	Clayey soil		
(i)	Depth below bed level upto 3.0 M	Cum.	431.00
(ii)	Beyond 3m upto 10m depth	Cum.	899.00
(iii)	Beyond 10 m upto 20 m		

Item No.	Descriptions	Unit	Rate
a)	Add for every additional meter depth of sinking over the rate of sinking for the previous meter	Cum.	1188.00
b)	Add for dewatering, if required.	Cum.	1247.00
(iv)	Beyond 20m upto 30 m		
a)	Add for every additional meter depth of sinking over the rate of sinking for the previous meter	Cum.	2228.00
b)	Add for dewatering, if required	Cum.	2924.00
c)	Add for Kentledge including supports, loading arrangement and Labour	Cum.	2785.00
(v)	Beyond 30m upto 40 m		
a)	Add for every additional meter depth of sinking over the rate of sinking for the previous meter	Cum.	5294.00
b)	Add for dewatering, if required	Cum.	6670.00
c)	Add for Kentledge including supports, loading arrangement and Labour).	Cum.	6352.00
C	Soft rock		
(i)	Depth of soft rock strata upto 3m	Cum.	1074.00
D	Hard rock		
(i)	Depth of soft rock strata upto 3m	Cum.	1081.00
12.12	Sand filling in wells complete as per drawing and technical specifications as per clause 1210.	Cum.	2089.00
12.13	Providing steel liner 10 mm thick for curbs and 6mm thick for steining of wells including fabricating and setting out as per detailed drawing as per section 1200 & 1900.	tonne	88679.00
12.14	Bored cast-in-situ M35 grade R.C.C. pile excluding reinforcement complete as per drawing and technical specifications and removal of excavated earth with all lifts and lead upto 1000 m. (Pile diameter-750 mm) as per specification 1100, 1600 and 1700.	metre	7261.00
12.15	Bored cast-in-situ M35 grade R.C.C. pile excluding reinforcement complete as per drawing and technical specifications and removal of excavated earth with all lifts and lead upto 1000 m. (Pile diameter-1000 mm) as per specification 1100, 1600 and 1700.	metre	11724.00
12.16	Bored cast-in-situ M35 grade R.C.C. pile excluding reinforcement complete as per drawing and technical specifications and removal of excavated earth with all lifts and lead upto 1000 m. (Pile diameter-1200 mm)as per specification 1100, 1600 and 1700.	metre	14707.00
12.17	Driven cast-in-place vertical M35 grade R.C.C. pile excluding reinforcement complete as per drawing and & Technical Specification (Pile diameter - 750 mm)as per specification 1100, 1600 and 1700.	metre	6161.00
12.18	Driven cast-in-place vertical M35 grade R.C.C. piles excluding reinforcement complete as per drawing and & Technical Specification (Pile diameter - 1000 mm)as per specification 1100, 1600 and 1700.	metre	8992.00



Item No.	Descriptions	Unit	Rate
12.19	Driven cast-in-place vertical M35 grade R.C.C. piles excluding reinforcement complete as per drawing and & Technical Specification (Pile diameter - 1200 mm)as per specification 1100, 1600 and 1700.	metre	11760.00
12.20	Driven precast vertical M35 grade R.C.C. piles excluding reinforcement complete as per drawing and & Technical Specification (Pile Diameter=500 mm)as per specification 1100, 1600 and 1700.	metre	5574.00
12.21	Driven precast vertical M35 grade R.C.C. piles excluding reinforcement complete as per drawing and & Technical Specification (Pile Diameter=750 mm)as per specification 1100, 1600 and 1700.	metre	6267.00
12.22	Driven precast vertical M35 grade R.C.C. piles excluding reinforcement complete as per drawing and & Technical Specification (Pile Diameter=1000 mm)as per specification 1100, 1600 and 1700.	metre	8738.00
12.23	Driven precast vertical M35 grade R.C.C. piles excluding reinforcement complete as per drawing and & Technical Specification (Size of pile - 300 mm x 300 mm)as per specification 1100, 1600 and 1700. as per specification 1100, 1600 and 1700.	metre	4650.00
12.24	Driven precast vertical M35 grade R.C.C. piles excluding reinforcement complete as per drawing and & Technical Specification (Size of pile - 500 mm x 500 mm)as per specification 1100, 1600 and 1700. as per specification 1100, 1600 and 1700.	metre	5024.00
12.25	Driven precast vertical M35 grade R.C.C. piles excluding reinforcement complete as per drawing and & Technical Specification (Size of pile - 750 mm x 750 mm)as per specification 1100, 1600 and 1700.	metre	6956.00
12.26	Driven vertical steel piles complete as per drawing and & Technical Specification (Section of the pile - H Section steel column 400 x 250 mm (ISHB Series) ) as per specification 1100, 1600 and 1700.	metre	6255.00
12.27	Driven vertical steel piles complete as per drawing and & Technical Specification (Section of the pile - H Section steel column 450 x 250 mm (ISHB Series) )as per specification 1100, 1600 and 1700.	metre	7054.00
12.28	Pile load test on single vertical pile in accordance with IS:2911(Part-IV)	tonne	482.00
12.29	Cement concrete for reinforced concrete in pile cap complete as per drawing and Technical Specification and as per relevant clauses of sections 1100, 1500 & 1700.		
	A RCC Grade M20	cum	5454.00
	B RCC Grade M25	cum	5935.00
	C RCC Grade M30	cum	5996.00
	D RCC Grade M35	cum	6123.00
12.30	Levelling course for Pile cap PCC in M-15 below Pile cap as per drawing and as per section 1100 and 1700.	cum	4814.00
12.31	Supplying, fitting and placing un-coated HYSD bar reinforcement in foundation complete as per drawing and technical specifications and as per relevant clauses of section 1600.	tonne	75306.00

Item No.	Descriptions	Unit	Rate
12.32	Supplying, fitting and placing un-coated Mild steel reinforcement complete in foundation as per drawing and technical specification and as per relevant clauses of section 1600.	Tone	74115.00
12.33	Taking, exploratory boring 100mm dia at the location of piers and abutments or for high embankments in approaches in all types of strata as per IRC-78-1983 and section 2400 of specifications.		
	a) Upto 1.0 m below bed level	metre	2722.00
	b) Beyond 1.0 m depth upto 5.0 m	metre	2847.00
	c) Beyond 5.0 m depth	metre	2970.00
12.34	Providing and laying 1.5 m deep in rock and 1.5 m above rock 25mm dia tor steel dowel bar in foundation including drilling 65mm dia bore hole in rock necessary bending, hooking tying reinforcement in position and grouting etc. complete as per drawing and specifications.	each	1167.00

**CHAPTER : 13.0**

**SUB-STRUCTURE**

Item No.	Descriptions	Unit	Rate
13.1	Brick masonry work in 1:3 in sub-structure complete excluding pointing and plastering, as per drawing and technical specifications	cum	7708.00
13.2	Add extra to item 13.1 above if fly ash bricks are used.	cum	303.00
13.3	Pointing with cement mortar (1:3 ) on brick work in substructure as per Technical specifications	sqm	63.00
13.4	Plastering with cement mortar (1:3 ) on brick work in sub-structure as per Technical specifications	sqm	133.00
13.5	Stone masonry work in cement mortar 1:3 for substructure complete as per drawing and Technical Specifications.		
A	Random Rubble Masonry	cum	5187.00
B	Coursed rubble masonry (first sort)	cum	5447.00
C	Ashlar masonry (first sort)	cum	6597.00
13.6	Plain/Reinforced cement concrete in sub-structure complete as per drawing and technical specifications		
A	PCC Grade M15		
(i)	Height upto 5m	cum	5374.00
(ii)	Height beyond 5m and upto 10m	cum	5464.00
B	PCC Grade M20		
(i)	Height upto 5m	cum	5906.00
(ii)	Height beyond 5m and upto 10m	cum	5996.00
C	PCC Grade M25		
(i)	Height upto 5m	cum	6213.00
(ii)	Height 5m to 10m	cum	6439.00
(iii)	Height above 10m	cum	6722.00
D	PCC Grade M30		
(i)	Height upto 5m	cum	6260.00
(ii)	Height 5m to 10m	cum	6488.00
(iii)	Height above 10m	cum	6772.00
E	RCC Grade M20		
(i)	Height upto 5m	cum	5785.00
(ii)	Height 5m to 10m	cum	5996.00
(iii)	Height above 10m	cum	6259.00
F	RCC Grade M25		
(i)	Height upto 5m	cum	6425.00
(ii)	Height 5m to 10m	cum	6635.00
(iii)	Height above 10m	cum	6951.00
G	RCC Grade M30		

Item No.	Descriptions	Unit	Rate
	(i) Height upto 5m	cum	6307.00
	(ii) Height 5m to 10m	cum	6485.00
	(iii) Height above 10m	cum	6737.00
	H RCC Grade M35		
	(i) Height upto 5m	cum	6588.00
	(ii) Height 5m to 10m	cum	6732.00
	(iii) Height above 10m	cum	6948.00
13.7	Supplying, fitting and placing HYSD bar reinforcement in sub-structure complete as per drawing and technical specifications and as per relevant clause of section 1600.	tonne	75415.00
13.8	Supplying, fitting and placing Mild steel reinforcement complete in sub-structure as per drawing and technical specification and as per relevant clause of section 1600.	tonne	73463.00
13.9	Providing weep holes in Brick masonry/Plain/Reinforced concrete abutment, wing wall/return wall with 100 mm dia AC/PVC pipe, extending through the full width of the structure with slope of 1V :20H towards drawing face. Complete as per drawing and Technical specifications	metre	192.00
13.10	Back filling behind abutment, wing wall and return wall complete as per drawing and Technical specification and as per relevant clauses 305 of specifications and as per appendix 6 of IRC-78.		
	A Granular material	cum	978.00
	B Sandy material	cum	2257.00
13.11	Providing and laying of Filter media with granular materials/stone crushed aggregates satisfying the requirements laid down in clause 2504.2.2 of MoRTH specifications to a thickness of not less than 600 mm with smaller size towards the soil and bigger size towards the wall and provided over the entire surface behind abutment, wing wall and return wall to the full height compacted to a firm condition complete as per drawing and technical specification.	cum	1241.00
13.12	Supplying, fitting and fixing in position true to line and level sliding plate bearing with PTFE surface sliding on stainless steel complete including all accessories as per drawing and Technical Specifications and BS: 5400, section 9.1 & 9.2 (for PTFE) and clause 2004 of MoRTH Specifications.	tonne capacity	276.00
13.13	Supplying, fitting and fixing in position true to line and level elastomeric bearing conforming to IRC: 83 (Part-II) section IX and clause 2005 of MoRTH specifications complete including all accessories as per drawing and Technical Specifications.	cubic centimetre	0.86
13.14	Supplying, fitting and fixing in position true to line and level sliding plate bearing with stainless steel plate sliding on stainless steel plate with mild steel matrix complete including all accessories as per drawing and Technical Specifications.	tonne capacity	265.00

Item No.	Descriptions	Unit	Rate
13.15	Supplying, fitting and fixing in position true to line and level POT-PTFE bearing consisting of a metal piston supported by a disc or unreinforced elastomer confined within a metal cylinder, sealing rings, dust seals, PTFE surface sliding against stainless steel mating surface, complete assembly to be of cast steel/fabricated structural steel, metal and elastomer elements to be as per IRC: 83 part-I & II respectively and other parts conforming to BS: 5400, section 9.1 & 9.2 and clause 2006 of MoRTH Specifications complete as per drawing and approved technical specifications.	tonne capacity	92.00
13.16	Providing and fixing in position bituminous paper bearing for slabs as per approved drawing and confirming to IS:1398.	sqm	48.00

**CHAPTER : 14.0**

**SUPER-STRUCTURE**

Item No.	Descriptions	Unit	Rate
14.1	Furnishing and Placing Reinforced/Prestressed cement concrete in super-structure as per drawing and Technical Specification and as per relevant clauses of sections 1500, 1700 and 2300 in		
A	RCC Grade M20		
(i)	For solid slab super-structure		
(a)	Height upto 5m	cum	6247.00
(b)	Height 5m to 10m	cum	6507.00
(c)	Height above 10m	cum	6767.00
(ii)	For T-beam & slab		
(a)	Height upto 5m	cum	6507.00
(b)	Height 5m to 10m	cum	6767.00
(c)	Height above 10m	cum	7028.00
B	RCC Grade M25		
(i)	For solid slab super-structure		
(a)	Height upto 5m	cum	6811.00
(b)	Height 5m to 10m	cum	7095.00
(c)	Height above 10m	cum	7378.00
(ii)	For T-beam & slab		
(a)	Height upto 5m	cum	7095.00
(b)	Height 5m to 10m	cum	7378.00
(c)	Height above 10m	cum	7662.00
C	RCC Grade M 30		
(i)	For solid slab super-structure		
(a)	Height upto 5m	cum	6888.00
(b)	Height 5m to 10m	cum	7175.00
(c)	Height above 10m	cum	7462.00
(ii)	For T-beam & slab		
(a)	Height upto 5m	cum	7175.00
(b)	Height 5m to 10m	cum	7462.00
(c)	Height above 10m	cum	7749.00
D	RCC/PSC Grade M35		
(i)	For solid slab super-structure		
(a)	Height upto 5m	cum	6909.00
(b)	Height 5m to 10m	cum	7201.00
(c)	Height above 10m	cum	7494.00
(ii)	For T-beam & slab		
(a)	Height upto 5m	cum	7201.00
(b)	Height 5m to 10m	cum	7494.00
(c)	Height above 10m	cum	7787.00
(iii)	For box girder and balanced cantilever		
(a)	Height upto 5m	cum	8080.00
(b)	Height 5m to 10m	cum	8665.00
(c)	Height above 10m	cum	9250.00
E	PSC Grade M-40		
(i)	For solid slab super-structure		
(a)	Height upto 5m	cum	7627.00
(b)	Height 5m to 10m	cum	7945.00



Item No.	Descriptions	Unit	Rate
	(c) Height above 10m	cum	8263.00
	(ii) For T-beam & slab		
	(a) Height upto 5m	cum	7945.00
	(b) Height 5m to 10m	cum	8263.00
	(c) Height above 10m	cum	8581.00
	(iii) For box girder and balanced cantilever		
	(a) Height upto 5m	cum	8501.00
	(b) Height 5m to 10m	cum	9117.00
	(c) Height above 10m	cum	9733.00
F	PSC Grade M-45		
	(i) For solid slab/voided slab super-structure		
	(a) Height upto 5m	cum	7492.00
	(b) Height 5m to 10m	cum	7815.00
	(c) Height above 10m	cum	8138.00
	(ii) For I-beam & slab including launching of precast girders by launching truss upto 40 m span		
	(a) Height upto 5m	cum	7815.00
	(b) Height 5m to 10m	cum	8138.00
	(c) Height above 10m	cum	8461.00
	(iii) For cast-in-situ box girder, segmental construction and balanced cantilever		
	(a) Height upto 5m	cum	8784.00
	(b) Height 5m to 10m	cum	9430.00
	(c) Height above 10m	cum	10075.00
G	PSC Grade M-50		
	(i) For cast-in-situ box girder, segmental construction and balanced cantilever		
	(a) Height upto 5m	cum	9007.00
	(b) Height 5m to 10m	cum	9674.00
	(c) Height above 10m	cum	10341.00
H	PSC Grade M- 55		
	(i) For cast-in-situ box girder, segmental construction and balanced cantilever		
	(a) Height upto 5m	cum	9458.00
	(b) Height 5m to 10m	cum	10158.00
	(c) Height above 10m	cum	10859.00
14.2	Supplying, fitting and placing HYSD bar reinforcement in super-structure complete as per drawing and technical specifications as per relevant clauses of section 1600	tonne	76480.00
14.3	High tensile steel wires/strands including all accessories for stressing, stressing operations and grouting complete as per drawing and Technical Specifications and as per relevant clauses of section 1800.	tonne	112142.00
14.4	Providing and laying Cement concrete wearing coat M-30 grade including reinforcement complete as per drawing and Technical Specifications and as per relevant clauses of sections 1500, 1700 and Clause 2702 of specifications..	cum	12147.00

Item No.	Descriptions	Unit	Rate
14.5	Mastic Asphalt (Providing and laying 12 mm thick mastic asphalt wearing course on top of deck slab excluding prime coat with paving grade bitumen meeting the requirements given in table 500-29, prepared by using mastic cooker and laid to required level and slope after cleaning the surface, including providing antiskid surface with bitumen precoated fine grained hard stone chipping of 9.5 mm nominal size at the rate of 0.005cum per 10 sqm and at an approximate spacing of 10 cm center to center in both directions, pressed into surface when the temperature of surfaces not less than 100 deg. C, protruding 1 mm to 4 mm over mastic surface, all complete as per clause 515 and 2702 of specifications.)	sqm	375.00
14.6	Construction of precast RCC railing of M30 Grade, aggregate size not exceeding 12 mm, true to line and grade, tolerance of vertical RCC post not to exceed 1 in 500, centre to centre spacing between vertical post not to exceed 2000 mm, leaving adequate space between vertical post for expansion, complete as per approved drawings and technical and as per relevant clauses of sections 1500, 1600, 1700 and clause 2703 of specifications (as per MoST specification drawing SD/202 or SD/305)	metre	2142.00
14.7	Construction of RCC railing of M30 Grade in-situ with 20 mm nominal size aggregate, true to line and grade, tolerance of vertical RCC post not to exceed 1 in 500, centre to centre spacing between vertical post not to exceed 2000 mm, leaving adequate space between vertical post for expansion, complete as per approved drawings and technical specifications and as per relevant clauses of sections 1500, 1600, 1700 and clause 2703 of specifications (as per MoST specification drawing SD/201 or SD/304)	metre	2074.00
14.8	Providing, fitting and fixing mild steel railing complete as per drawing and Technical Specification and as per relevant clauses of section 1900 and 2700.	metre	3426.00
14.9	Drainage Spouts complete as per drawing and Technical specification and as per clause 2705 of specifications.	each	1327.00
14.10	PCC M15 Grade leveling course below approach slab complete as per drawing and Technical specification and as per relevant clauses of section 1700.	cum	4885.00
14.11	Reinforced cement concrete approach slab (Grade of concrete M 30) including reinforcement and formwork complete as per drawing and Technical specification and as per relevant clauses of section 1500, 1600, 1700 and clause 2704 of specifications.	cum	10083.00
14.12	Providing anti-corrosive treatment to HYSD reinforcement with Fusion Bonded Epoxy Coating (FBEC) (To be taken as per the prevailing market rates.)	tonne	26280.00
14.13	<b>Precast - pretensioned Girders</b> Providing, precasting, transportation and placing in position precast pretensioned concrete girders as per drawing and technical specifications	cum	26280.00
14.14	Providing and fixing Helical pipes of 600mm dia in voided concrete slabs including 20mm dia tie rod and sealing joints etc. as per section 1700 and 1800.	metre	338.00

Item No.	Descriptions	Unit	Rate
14.15	<b>Painting on concrete surface</b> Providing and applying 2 coats of water based cement paint to unplastered concrete surface after cleaning the surface of dirt, dust, oil, grease, efflorescence and applying paint @ of 1 litre for 2 Sq.m.	metre	75.00
14.16	<b>Burried Joint</b> Providing and laying a burried expansion joint, expansion gap being 20 mm, covered with 12 mm thick, 200 mm wide galvanised weldable structural steel plate as per IS: 2062, placed symmetrical to centre line of the joint, resting freely over the top surface of the deck concrete, welding of 8 mm dia. 100 mm long galvanised nails spaced 300 mm c/c along the centre line of the plate, all as specified in clause 2604.	metre	6890.00
14.17	<b>Filler joint</b>		
	(i) Providing & fixing 2 mm thick corrugated copper plate in expansion joint complete as per drawing & Technical Specification.	metre	3812.00
	(ii) Providing & fixing 20 mm thick compressible fibre board in expansion joint complete as per drawing & Technical Specification.	metre	419.00
	(iii) Providing and fixing in position 20 mm thick premoulded joint filler in expansion joint for fixed ends of simply supported spans not exceeding 10 m to cater for a horizontal movement upto 20 mm, covered with sealant complete as per drawing and technical specifications.	metre	153.00
	(iv) Providing and filling joint sealing compound as per drawings and technical specifications with coarse sand and 6% bitumen by weight	metre	26.00
14.18	<b>Asphaltic Plug joint</b> Providing and laying of asphaltic plug joint to provide for horizontal movement of 25 mm and vertical movement of 2 mm, depth of joint varying from 75 mm to 100 mm, width varying from 500 mm to 750 mm (in traffic direction), covered with a closure plate of 200mm x 6mm of weldable structural steel conforming to IS: 2062, asphaltic plug to consist of polymer modified bitumen binder, carefully selected single size aggregate of 12.5 mm nominal size and a heat resistant foam caulking/backer rod, all as per approved drawings and specifications.	metre	1345.00
14.19	<b>Elastomeric Slab Steel Expansion Joint</b> Providing and laying of an elastomeric slab steel expansion joint, catering to right or skew (less than 20 deg., moderately curved with maximum horizontal movement upto 50 mm, complete as per approved drawings and standard specifications to be installed by the manufacturer/supplier or their authorised representative ensuring compliance to the manufacturer's instructions for installation and clause 2606 of MoRTH specifications for road & bridge works.	metre	14483.00
14.20	<b>Compression Seal Joint</b> Providing and laying of compression seal joint consisting of steel armoured nosing at two edges of the joint gap suitably anchored to the deck concrete and a preformed chloroprene elastomer or closed cell foam joint sealer compressed and fixed into the joint gap with special adhesive binder to cater for a horizontal movement upto 40 mm and vertical movement of 3 mm.	metre	8535.00

Item No.	Descriptions	Unit	Rate
14.21	<b>Strip Seal Expansion Joint</b> Providing and laying of a strip seal expansion joint catering to maximum horizontal movement upto 70 mm, complete as per approved drawings and standard specifications to be installed by the manufacturer/supplier or their authorised representative ensuring compliance to the manufacturer's instructions for installation.	metre	11590.00
14.22	<b>Modular Strip / Box Seal Joint</b> Providing and laying of a modular strip Box steel expansion joint including anchorage catering to a horizontal movement beyond 70 mm and upto 140mm, complete as per approved drawings and standard specifications to be installed by the manufacturer/supplier or their authorised representative ensuring compliance to the manufacturer's instructions for installation.	metre	68793.00
14.23	<b>Modular Strip / Box Seal Joint</b> Providing and laying of a modular strip box seal expansion joint catering to a horizontal movement beyond 140mm and upto 210mm, complete as per approved drawings and standard specifications to be installed by the manufacturer/supplier or their authorised representative ensuring compliance to the manufacturer's instructions for installation.	metre	103178.00
14.24	Testing of span of bridge for deflection due to live load with platforms for loading arrangements apparatus for measurement including unloading etc. complete as per approved drawing.	tonne	905.00
14.25	Providing and fixing in position structural steel work for the superstructure of bridges including cutting, rivetting, bolting or welding as per the approved design and including hoisting in position etc. complete as per section 1900 of specifications.	MT	72880.00
14.26	Providing and fixing in position Marble Plates of size 0.9 m. x 1.2 m. with inscribed details as per detailed drawings.	each	1521.00
14.27	Providing and fixing and erecting 40mm dia steel pipe (medium weight) railing in 3 rows on steel channel ISMC-100mmx50mm and 0.95 in height and fixed at 1.8m. center to center and duly painted etc. complete as per standard drawing No.STD-33R, dtd.11.05.1987 of MP Rajya Setu Nirman Nigam Bhopal.	RM	1520.00

## **CHAPTER : 15.0**

# **RIVER TRAINING AND PROTECTION WORKS**

Item No.	Descriptions	Unit	Rate
15.1	Providing and laying boulders apron on river bed for protection against scour with stone boulders weighing not less than 40 kg each complete as per drawing and Technical specification.		
A	Boulder laid dry without wire crates.	cum	2259.00
15.2	Boulder apron laid in wire crates (Providing and laying of boulder apron laid in wire crates made with 4mm dia GI wire conforming to IS: 280 & IS:4826 in 100mm x 100mm mesh (weaved diagonally) including 10% extra for laps and joints laid with stone boulders weighing not less than 40 kg each.)	cum	2469.00
15.3	Cement concrete blocks (size 0.5 x 0.5 x 0.5 m) (Providing and laying of apron with cement concrete blocks of size 0.5x0.5x0.5 m cast in-situ and made with nominal mix of M-15 grade cement concrete with a minimum cement content of 250 kg/cum as per IRC: 21-2000.)	cum	5182.00
15.4	Providing and laying Pitching on slopes laid over prepared filter media including boulder apron laid dry in front of toe of embankment complete as per drawing and Technical specifications		
A	Stone/Boulder	cum	2259.00
B	Cement Concrete blocks of size 0.3x0.3 x0.3 m cast in cement concrete of Grade M15	cum	5182.00
15.5	Providing and laying Filter material underneath pitching in slopes complete as per drawing and Technical specification	cum	1405.00
15.6	Geotextile Filter (Laying of a geotextile filter between pitching and embankment slopes on which pitching is laid to prevent escape of the embankment material through the voids of the stone pitching/cement concrete blocks as well as to allow free movement of water without creating any uplift head on the pitching.)	sqm	242.00
15.7	Toe protection (A toe wall for toe protection can either be in dry rubble masonry in case of dry rubble pitching or pitching with stones in wire crates or it can be in PCC M15 nominal mix if cement concrete block have been used for pitching . Rates for toe wall can be adopted from respective clauses depending upon approved design. The rate for excavation for foundation, dry rubble masonry and PCC M15 have been analysed and given in respective chapters.)		
15.8	Providing and laying Flooring complete as per drawing and Technical specifications laid over cement concrete bedding.		
A	Rubble stone laid in cement mortar 1:3	cum	5835.00
B	Cement Concrete blocks Grade M15	cum	6824.00
C	Cement Concrete Grade M15	cum	5080.00
15.9	Dry rubble Flooring	cum	2628.00
15.10	Curtain wall complete as per drawing and Technical specification		
A	Stone masonry in cement mortar (1:3)	cum	5297.00
B	Cement concrete Grade M15	cum	5080.00

Item No.	Descriptions	Unit	Rate
15.11	Flexible Apron :Construction of flexible apron 1 m thick comprising of loose stone boulders weighing not less than 40 kg beyond curtain wall.	cum	2321.00
15.12	Gabian Structure for Retaining Earth (Providing and construction of a gabain structure for retaining earth with segments of wire crates of size 7 m x 3 m x 0.6 m each divided into 1.5 m compartments by cross netting, made from 4 mm galvanised steel wire @ 32 kg per 10 sqm having minimum tensile strength of 300 Mpa conforming to IS:280 and galvanizing coating conforming to IS:4826, woven into mesh with double twist, mesh size not exceeding 100 x 100 mm, filled with boulders with least dimension of 200 mm, all loose ends to be tied with 4 mm galvanised steel wire)	cum	2470.00
15.13	Gabian Structure for Erosion Control, River Training Works and Protection works (Providing and constructing gabain structures for erosion control, river training works and protection works with wire crates of size 2 m x 1 m x 0.3 m each divided into 1m compartments by cross netting, made from 4 mm galvanised steel wire @ 32 kg per 10 sqm having minimum tensile strength of 300 Mpa conforming to IS:280 and galvanizing coating conforming to IS:4826, woven into mesh with double twist, mesh size not exceeding 100 mm x 100 mm, filled with boulders with least dimension of 200 mm, all loose ends to be securely tied with 4 mm galvanised steel wire.)	cum	3057.00

## **CHAPTER : 16.0**

# **REPAIR AND REHABILITATION**



Item No.	Descriptions	Unit	Rate
16.1	Removal of existing cement concrete wearing coat including its disposal complete as per Technical specification without causing any detrimental effect to any part of the bridge structure and removal of dismantled material with all lifts and lead upto 1000m (Thickness 75 mm)	sqm	137.00
16.2	Removal of existing asphaltic wearing coat comprising of 50 mm thick asphaltic concrete laid over 12 mm thick mastic asphalt including disposal with all lift and lead upto 1000m.	sqm	104.00
16.3	Guniting concrete surface with cement mortar applied with compressor after cleaning surface and spraying with epoxy complete as per Technical specification	sqm	1734.00
16.4	Providing and inserting nipples with approved fixing compound after drilling holes for grouting as per Technical specifications including subsequent cutting/removal and sealing of the hole as necessary of nipples after completion of grouting with Cement/Epoxy	each	109.00
16.5	Sealing of cracks/porous concrete by injection process through nipples/Grouting complete as per Technical specification.		
	A Cement Grout	kg	70.00
	B Cement mortar (1:1) Grouting	kg	144.00
16.6	Patching of damaged concrete surface with polymer concrete and curing compounds, initiator and promoter, available in present formulations, to be applied as per instructions of manufacturer and as approved by the Engineer.	sqm	1930.00
16.7	Sealing of crack / porous concrete with Epoxy Grout by injection through nipples complete as per clause 2803.1.	kg	2009.00
16.8	Applying epoxy mortar over leached, honey combed and spalled concrete surface and exposed steel reinforcement complete as per Technical specification	sqm	1025.00
16.9	Removal of defective concrete, cleaning the surface thoroughly, applying the shotcrete mixture mechanically with compressed air under pressure, comprising of cement, sand, coarse aggregates, water and quick setting compound in the proportion as per clause 2807.1., sand and coarse aggregates conforming to IS: 383 and table 1 of IS: 9012 respectively, water cement ratio ranging from 0.35 to 0.50, density of gunite not less than 2000 kg/cum, strength not less than 25 Mpa and workmanship conforming to clause 2807.6.	sqm	384.00
16.10	Applying pre-packed cement based polymer mortar of strength 45 Mpa at 28 days for replacement of spalled concrete	sqm	140.00
16.11	Epoxy bonding of new concrete to old concrete	sqm	1216.00
16.12	Providing external prestressing with high tensile steel wires/strands including drilling for passage of prestressing steel, all accessories for stressing and stressing operation and grouting complete as per drawing and Technical specification	tonne	371903.00

Item No.	Descriptions	Unit	Rate
16.13	Lifting of super-structure of bridge for resetting if required/refixing of new bearings including removal of old bearings and including all higher and running expenses of all plants, jacks, machines and equipments temporary supports, required for keeping the super-structure in lifted position for completing the operation, lowering of super-structure on bearings, without causing any detrimental effect to any part of the bridge structure complete but excluding cost of replaced bearings.		
	a) Span upto 20m	Per Span	67599.00
	b) Span beyond 20m and upto 30m	Per Span	81899.00
	c) Span beyond 30m	Per Span	96199.00
16.14	Providing and fixing collapsable M.S. railing of channel of size 75x40x6mm length 2.50 m. at bottom and two nos. vertical post height 0.90 m. with top angle size 50x50x6mm and cross flat size 40x06mm diagonally fixed and braced with nut and bolts dully painted in two coats with synthetic enamel paint and grouted on existing kerbs i/c necessary construction of RCC M-20 block of size 0.50x0.45x0.20 m. complete as per approved drawings	RM	3082.00

## **CHAPTER : 17.0**

# **SURVEY INVESTIGATION AND PREPRATION OF DPR**

Item No.	Descriptions	Unit	Rate
17.1	<p>Survey and investigation and preparation of DPR for road work with chain and compass, auto level, theodolite or total station i/c fixing of permanent benchmark and also fixing of bench mark on all the permanent structures, along the alignment, like boundary wall, electrical poles etc. Also marking of locations of boundary wall, electric poles, telephone poles trees etc. in the road boundary, collection and submission of existing inventory of the road all along the alignment conducting survey @ 20 metre interval for L-section and for single lane X-section interval will be @ 0.75, 1.25, 1.875, 2.60, 3.75, 4.50, 5.50 and 6.50 metre on both side of centre line for two lane four lane interval for x-section shall be as specified in MORT&amp;H Specifications.</p> <p>Data collected as specified above are required to be submitted in both hard and soft copies, L-section, X-section and plan is required to be submitted in the shape of drawing sheets drawn with the help of auto plotter.</p> <p>Soil samples @ every 500 metre or wherever soil appears to change its properties are required to be collected and soil investigation for LL, PL, swelling index and CBR are to be conducted and result too be submitted along with the project report.</p> <p>Job also includes collection of data for traffic census fixing of RTL getting it approved from Engineer-in-Charge and accordingly submission of pavement design in accordance with relevant clauses of IRC. Preparation of estimate complete and submission of same in eight copies duly spiral binded.</p>		
	i) For single lane road	Km.	6600.00
	ii) For two lane road	Km.	7300.00
	iii) For four lane road	Km.	8200.00
17.2	<p>Performing details survey and investigation and collection of hydraulic data (essential design data as per IRC special publication No.13 guidelines for small bridges and culvert) regarding catchment area, L-section of road and nalla, cross-section of nalla at the point of crossing at upstream and down stream as well as T.P. section result ascertaining and making of HFL/OFL transferring and fixing of pucca bench mark at site etc. complete i/c of all necessary material and labour required for survey work after collection of all data prepare all drawing estimate with computer in eight copies, duly spiral binded.</p>		
	a) For catchment area less than 1.25 Sq.Km.	Each	3124.00
	b) For catchment area 1.25 to 2.50 Sq.Km.	Each	3806.00
	c) For catchment area beyond then 2.50 Sq.Km.	Each	4598.00

## **CHAPTER : 18.0**

# **VIDEO PHOTOGRAPHY**

Item No.	Descriptions	Unit	Rate
18.1	Providing and carrying out video shooting of roads, bridges, buildings, other programmes including hiring of vehicle equipments for video shooting, titling, lightening, mixing, lettering, editing, including cost of two colour CDs of approved makes and quality etc. complete.		
	i) Within 50 Kms.	Per day	2500.00
	ii) Beyond 50 kms.	Per day	2700.00
	iii) Work upto 5 hours per day only.	Per day	1500.00
18.2	Shooting of still photographs outdoor and indoor of construction and other works of building, bridges, roads etc. at any distances.		
	i) Post Card size	3 Nos.	60.00
	ii) 4"x6" size	3 Nos.	85.00
	iii) 5"x7" size	3 Nos.	135.00
	iv) 8"x12" Size (A-4 Size)	3 Nos.	250.00
	v) 20"x30" size (Banner Size)	1 No.	600.00
	Extra Copies :		
	Post Card size	1 No.	8.00
	4"x6" size	1 No.	12.00
	5"x7" size	1 No.	15.00
	8"x12" Size (A-4 Size)	1 No.	50.00
	20'x30' size (Banner Size)	1 No.	450.00

# **APPENDICES**

## EARTH WORK, EROSION CONTROL AND DRAINAGE

**Table 300-1, Density Requirements of Embankment and Sub-Grade Materials.**

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

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

**Table 300-2, Compaction Requirements for Embankment and Sub-grade.**

S.No.	Type of work	Relative compaction as percentage of Max. laboratory dry density as per IS:2720 (Part 8)
1	Sub-grade and earthen shoulders.	Not less than 97%
2	Embankments.	Not less than 95 %
3.	Expansive clays.	
	(a) Sub-grade and 500mm portion just below the sub-grade.	Not allowed
	(b) Remaining portion of embankment.	90 -95%

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

1. The values of maximum dry density and Optimum Moisture Content obtained in accordance with IS:2720 (Part 8), appropriate for each of the fill materials he intends to use.
2. A graph of density plotted against moisture content from which each of the values in “1” above of maximum dry density and Optimum Moisture Content were determined.
3. The maximum dry density and optimum moisture content approved by engineer-in charge shall form the basis for compaction.



## EARTH WORK, EROSION CONTROL AND DRAINAGE

**Table 300-3, Grading requirement for filter material.**

Sieve Designation	Percentage passing by weight		
	Class I	Class II	Class III
53 mm	-	-	100
45 mm	-	-	97-100
26.5 mm	-	100	-
22.4 mm	-	95-100	58-100
11.2 mm	100	48-100	20-60
5.6 mm	92-100	28-54	4-32
2.8 mm	83-100	20-35	0-10
1.4 mm	59-96	-	0-5
710 micron	35-80	6-18	-
355 micron	14-40	2-9	-
180 micron	3-15	-	-
90 micron	0-5	0-4	0-3

**Table 300-4, Grading Requirements for Aggregate Drains.**

Sieve Designation	Percent Passing by Weight	
	Type A	Type B
63 mm	-	100
37.5 mm	100	85-100
19 mm	-	0-20
9.5 mm	45-100	0-5
3.35 mm	25-80	-
600 micron	8-45	-
150 micron	0-10	-
75 micron	0-5	-

## SUB-BASE, BASES (NON-BITUMINOUS) AND SHOULDERS

**Table 400-1, Grading for Granular Sub-base Materials**

IS Sieve Designation	Percent by Weight Passing the IS Sieve					
	Grading I	Grading II	Grading III	Grading IV	Grading V	Grading VI
75.0 mm	100	-	-	-	100	-
53.0 mm	80-100	100	100	100	80-100	100
26.5 mm	55-90	70-100	55-75	50-80	55-90	75-100
9.50 mm	35-65	50-80	-	-	35-65	55-75
4.75 mm	25-25	40-65	10-30	15-35	25-50	30-55
2.36 mm	20-40	30-50	-	-	10-20	10-25
0.85 mm	-	-	-	-	2-10	-
0.425mm	10-15	10-15	-	-	0-5	0-8
0.025mm	<5	<5	<5	<5	-	0-3

**Table 400-2, Physical Requirements for Materials for Granular Sub-base**

Aggregate impact Value (AIV)	IS:2386 (Part 4) or IS : 5640	40 maximum
Liquid Limit	IS : 2720 (Part 5)	Maximum 25
Plasticity Index	IS : 2720 (Part 5)	Maximum 6
CBR at 98% dry density (at IS :2720- Part 8)	IS : 2720 (Part 5)	Minimum 30 unless otherwise specified in the Contract

## SUB-BASE, BASES (NON-BITUMINOUS) AND SHOULDERS

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

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

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

**Table 400-9, Grading requirement of Coarse Aggregate.**

Grading No.	Size Range	IS Sieve Designation	Percent by weight passing
Grading I	63 mm to 45 mm	75 mm	100
		63 mm	90-100
		53 mm	25-75
		45 mm	0-15
		22.4 mm	0-5
Grading II	53 mm to 22.4 mm	63 mm	100
		53 mm	95-100
		45 mm	65-90
		22.4 mm	0-10
		11.2 mm	0-5

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

## SUB-BASE, BASES (NON-BITUMINOUS) AND SHOULDERS

**Table 400-10, Grading for Screenings.**

IS Sieve Designation	Size Range	IS Sieve Designation	Percent by weight passing
A.	13.2 mm	13.2 mm	100
		11.2 mm	95-100
		5.6 mm	15-35
		180 micron	0-10
B.	11.2 mm	11.2 mm	100
		9.5 mm	80-100
		5-6 mm	50-70
		180 micron	5-25

**Table 400-11, Approximate Quantities of Coarse Aggregate and Screenings Required for 75 mm compacted thickness of Water Bound Macadam (WBM) sub-base/ base course for 10 m<sup>2</sup> area.**

Classification	Size Range	Compacted thickness	Loose Quantity	Screenings			
				Stone Screenings		Crushable type such as Moorum or Gravel.	
				Grading Classification & size	For WBM sub-base/ base course (Loose Qty.)	Grading Classification & size	Loose Qty.
Grading- I	63mm to 45mm	75mm	0.91 to 1.07 m <sup>3</sup>	Type A 13.2 mm	0.12 to 0.15 m <sup>3</sup>	Not uniform	0.22 to 0.24 m <sup>3</sup>
-do-	-do-	-do-	-do-	Type B 11.2 mm	0.20 to 0.22 m <sup>3</sup>	-do-	-do-
Grading- II	53mm to 22.4 mm	75mm	-do-	-do-	0.18 to 0.21 m <sup>3</sup>	-do-	-do-

## SUB-BASE, BASES (NON-BITUMINOUS) AND SHOULDERS

**Table 400-12 Physical requirements of coarse aggregate wet mix macadam for sub-base/base course.**

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

\* To determine this combined proportion, the flaky stone from a representative sample should first be separated out. Flakiness index is weight of flaky stone metal divided by weight of stone sample. Only the elongated particles be separated out from the remaining (non-flaky) stone metal. Elongation index is weight of elongated particles divided by total non-flaky particles. The values of flakiness index and elongation index so found are added up.

**Table 400-13, Grading Requirements of Aggregate for Wet Mix Macadam.**

IS Sieve Designation	Percent by weight passing the IS Sieve
53.00 mm	100
45.00 mm	95-100
26.50 mm	-
22.40 mm	60-80
11.20 mm	40-60
4.75 mm	25-40
2.36 mm	15-30
600 micron	8-22
75 micron	0-5

## SUB-BASE, BASES (NON-BITUMINOUS) AND SHOULDERS

### CRUSHER- RUN MACADAM BASE

**Table 400-14 : Aggregate Grading Requirements**

Sieve Size	Percent passing by weight	
	53 mm max. size	37.5 mm max. size
63 mm	100	-
45 mm	87-100	100
22.4 mm	50-85	90-100
5.6 mm	25-45	35-55
710 mm	10-25	10-30
90 mm	2-5	2-5

**Table 400-15 : Physical Requirements of Coarse Aggregates for Crusher-Run Macadam Base**

	Test	Test Method	Requirements
1)	Los Angles Abrasion Value or Aggregate Impact Value	IS : 2386 (Part 4)  IS : 2386 (Part 4) or IS : 5640	40 percent  30 percent
2)	Combined Flakiness and Elongation Indices (Total)	IS : 2386 (Part 1)	35 percent**
3)	*Water absorption	IS : 2386 (Part 3)	2 percent maximum
4)	Liquid Limit of material passing 425 micron	IS : 2720 (Part 5)	25 maximum
5)	Plasticity Index of material passing 425 micron	IS : 2720 (Part 5)	6 maximum

\* If the water absorption is more than 2 percent, soundness test shall be carried out as per IS : 2386 (Part-5)

\* To determine this combined proportion, the flaky stone from a representative sample should first be separated out. Flakiness index is weight of flaky stone metal divided by weight of stone sample. Only the elongated particles be separated out from the remaining (non-flaky) stone metal. Elongation index is weight of elongated particles divided by total non-flaky particles. The values of flakiness index and elongation index so found are added up.

## SUB-BASE, BASES (NON-BITUMINOUS) AND SHOULDERS

**Table 400-16**

IS Sieve Size	Percent Passing
9.52 mm	100
4.75 mm	95-100
2.36 mm	80-100
1.18 mm	50-95
600 micron	25-60
300 micron	10-30
150 micron	0-15
75 micron	0-10

**Table 400-17**

IS Sieve Size	Percent Passing
2.36 mm	100
1.18 mm	90-100
600 micron	60-90
300 micron	30-60
150 micron	15-30
75 micron	0-10

## BASE AND SURFACE COURSES (BITUMINOUS)

**Table 500-2, Manufacturing and Rolling Temperatures.**

Bitumen Penetration	Bitumen Mixing (°C)	Aggregate Mixing (°C)	Mixed Material (°C)	Laying (°C)	Rolling (°C)
VG-40	160-170	160-175	160-170	150 Minimum	100 Minimum
VG-30	150-165	150-170	150-165	140 Minimum	90 Minimum
VG-20	145-165	145-170	145-165	135 Minimum	85 Minimum
VG-10	140-160	140-165	140-160	130 Minimum	80 Minimum

\* **Rolling must be completed before the mat cools to these minimum temperatures.**

**Table 500-5, Rate of Application of Tack Coat**

Type of Surface	Rate of Spray of Binder in Kg per Sq.m
Bituminous surfaces	0.20 - 0.30
Granular surfaces treated with primer	0.25 - 0.30
Cement concrete pavement	0.30 - 0.35

**Table 500-6, Physical Properties of Coarse Aggregate (BM)**

Property	Test	Requirement	Test Method
Cleanliness	Grain size analysis	Max. 5% passing 0.075 micron	IS:2386 Part I
Particle shape	Combined Flakiness and Elongation Indices	Max. 35%	IS:2386 Part I
Strength	Los Angeles Abrasion Value or Aggregate Impact Value	Max. 40%	IS:2386 Part IV
		Max. 30%	IS:2386 Part IV
Durability	Soundness (Sodium or Magnesium) Sodium Sulphate Magnesium Sulphate	5 cycles	
		Max. 12%	IS:2386 Part V
		Max.18%	IS:2386 Part V
Water absorption	Water absorption	Max 2%	IS:2386 Part III
Stripping	Coating and Stripping of Bitumen Aggregate	Min. Retained Coating 95%	IS : 6241
Water sensitivity	Retained Tensile strength*	Min. 80%	AASHTO 283

\* If the minimum retained tensile strength falls below 80 percent, use of anti stripping agent is recommended to meet the minimum requirements.



## BASE AND SURFACE COURSES (BITUMINOUS)

**Table 500-7, Composition of Bituminous Macadam.**

Grading Mix designation nominal aggregate size layer thickness IS Sieve size (mm)	Grade - I 40mm 80-100 mm	Grade - II 19mm 50-75 mm
	Cumulative % by Weight of total aggregate passing	
45	100	-
37.5	90 - 100	-
26.5	75 - 100	100
19	-	90 - 100
13.2	35 - 61	56 - 88
4.75	13 - 22	16 - 36
2.36	4 - 19	4 - 19
0.3	2 - 10	2 - 10
0.075	0 - 8	0 - 8
Bitumen content** % by mass of total mix	3.3**	3.4**
Bitumen Grade	35 - 90	35 - 90

- \* Nominal maximum aggregate size is the largest specified sieve size upon which any of the aggregate material is retained.
- \*\* Corresponds to specific gravity of the Aggregate being 2.7 in case aggregates have specific gravity more than 2.7 bitumen content can be reduced proportionately. Further for regions where highest daily mean air temperature is 30°C or lower and lowest daily mean air temperature is -10°C or lower, the bitumen content may be increased by 0.5 percent.

## BASE AND SURFACE COURSES (BITUMINOUS)

**Table 500-8, Physical Requirements for Coarse Aggregate for Dense Bituminous Macadam**

Property	Test	Specification	Method of Test
Cleanliness (dust)	Grain size analysis	Max. 5% passing 0.075 micron	IS:2386 Part I
Particle shape	Combined Flakiness and Elongation Indices	Max. 35%	IS:2386 Part I
Strength	Los Angeles Abrasion Value	Max. 35%	IS:2386 Part IV
	or Aggregate Impact Value	Max. 27%	
Durability	Soundness (Sodium or Magnesium)	Max. 12%	IS:2386 Part V
	Sodium Sulphate Magnesium Sulphate	Max.18%	
Water absorption	Water absorption	Max 2%	IS:2386 Part III
Stripping	Coating and Stripping of Bitumen Aggregate Mix	Min. Retained Coating 95%	IS : 6241
Water sensitivity	Retained Tensile strength*	Min. 80%	AASHTO 283

- \* To determine this combined proportion, the flaky stone from a representative sample should first be separated out. Flakiness index is weight of flaky stone metal divided by weight of stone sample. Only the elongated particles be separated out from the remaining (non-flaky) stone metal. Elongation index is weight of elongated particles divided by total non-flaky particles. The values of flakiness index and elongation index so found are added up.
- \* If the minimum retained tensile test strength falls below 80 percent, use of anti stripping agent is recommended to meet the minimum requirements.

## BASE AND SURFACE COURSES (BITUMINOUS)

**Table 500-10, Composition of Dense Graded Bituminous Macadam Pavement Layers.**

Grading	1	2
Nominal Aggregate size	40 mm	25 mm
Layer Thickness	80 - 100 mm	50 - 75 mm
IS Sieve <sup>1</sup> (mm)	Cumulative % by weight of total aggregate passing	
45	100	-
37.5	95 - 100	100
26.5	63 - 93	90 - 100
19	-	71 - 95
13.2	55 - 75	56 - 80
9.5	-	-
4.75	38 - 54	38 - 54
2.36	28 - 42	28 - 42
1.18	-	-
0.6	-	-
0.3	7 - 21	7 - 21
0.15	-	-
0.075	2 - 8	2 - 8
Bitumen content % by mass of total mix <sup>2</sup>	Min 4.0**	Min 4.5**

\* The nominal maximum aggregate size is the largest specified sieve size upon which any of the aggregate material is retained.

\*\* Corresponds to specific gravity of the Aggregate being 2.7 in case aggregates have specific gravity more than 2.7 bitumen content can be reduced proportionately. Further for regions where highest daily mean air temperature is 30°C or lower and lowest daily mean air temperature is -10°C or lower, the bitumen content may be increased by 0.5 percent.

## BASE AND SURFACE COURSES (BITUMINOUS)

**Table 500-11, Requirements for Dense Graded Bituminous Macadam**

Properties	Viscosity Grade paving Bitumen	Modified bitumen		Test Method
		Hot climate	Cold climate	
Compaction level	75 blows on each face of the specimen			
Minimum stability (KN at 600C)	9.0	12.0	10.0	AASHTO T 245
Marshall flow (mm)	2-4	2.5-4	3.5-5	AASHTO T 245
Marshall Quotient (Stability/Flow)	2-5	2.5-5		MS-2 and ASTM D2041
% air voids	3-5			
% Voids Filled with Bitumen (VFB)	65-75			
Coating of aggregate particle	95% minimum			IS :6241
Tensile Strength ratio	80% minimum			AASHTO T 283
% Voids in Mineral Aggregate (VMA)	Minimum percent voids in mineral aggregate (VMA) are set out in Table 500-13			

**Table 500-12, Minimum percent Voids in Mineral Aggregate (VMA)**

Nominal Maximum Particle size <sup>1</sup> (mm)	Minimum VMA, percent related to Design Air Voids, Percent <sup>2</sup>		
	3.0	4.0	5.0
26.5	11.0	12.0	13.0
37.5	10.0	11.0	12.0

\* Interpolate minimum voids in the mineral aggregate (VMA) for design air voids values between those listed.

**Table 500-13, Permissible variations in the Actual Mix from the Job Mix Formula.**

Description	Base/Binder course
Aggregate passing 19mm sieve or larger	± 8%
Aggregate passing 13.2 mm, 9.5 mm	± 7%
Aggregate passing 4.75 mm	± 6%
Aggregate passing 2.36mm, 1.18mm, 0.6mm	± 5%
Aggregate passing 0.3mm, 0.15mm	± 4%
Aggregate passing 0.075mm	± 2%
Binder content	± 0.3%
Mixing temperature	± 10°C

## BASE AND SURFACE COURSES (BITUMINOUS)

**Table 500-14, Sand Grading and Physical Requirements.**

Sieve size (mm)	Cumulative percentage by weight of total aggregate passing
9.5	100
4.75	85 - 100
2.36	80 - 100
1.18	70 - 98
0.60	55 - 95
0.30	30 - 75
0.15	10 - 40
0.075	4 - 10
Plasticity Index (%)	6 max.
Sand equivalent (IS:2386, part 37)	30 min.
Loss Angles Abrasion Value (IS:2386 part 4)	40 max.

Note : Maximum thickness for sand asphalt is 80 mm

**Table 500-15, Requirements for Sand Asphalt Base Course.**

Parameter	Requirement
Minimum stability (kN at 60°C)	2.0
Minimum flow (mm)	2
Compaction level (Number of blows)	2 x 75
Percent air voids	3 - 5
Percent voids in mineral aggregate (VMA)	> 16
Percent voids filled with bitumen (VFB)	65 - 75

## BASE AND SURFACE COURSES (BITUMINOUS)

**Table 500-16, Physical Requirements for Coarse Aggregate for Bituminous Concrete**

Property	Test	Specification	Method of Test
Cleanliness (dust)	Grain size analysis	Max. 5% passing 0.075 micron	IS:2386 Part I
Particle shape	Combined Flakiness and Elongation Indices	Max. 35%	IS:2386 Part I
Strength	Los Angeles Abrasion Value	Max. 30%	IS:2386 Part IV
	or Aggregate Impact Value	Max. 24%	
Durability	Soundness (Sodium or Magnesium)	Max. 12%	IS:2386 Part V
	Sodium Sulphate Magnesium Sulphate	Max.18%	
Polishing	Polished Stone Value	Min 55	BS : 812-114
Water absorption	Water absorption	Max 2%	IS:2386 Part III
Stripping	Coating and Stripping of Bitumen Aggregate Mix	Min. Retained Coating 95%	IS : 6241
Water sensitivity	Retained Tensile strength*	Min. 80%	AASHTO 283

\* If the minimum retained tensile test strength falls below 80 percent, use of anti stripping agent is recommended to meet the minimum requirements.

## BASE AND SURFACE COURSES (BITUMINOUS)

**Table 500-17, Composition of Bituminous Concrete Pavement Layers.**

Grading	1	2
Nominal Aggregate size	19 mm	13 mm
Layer Thickness	50 mm	30 - 40 mm
IS Sieve <sup>1</sup> (mm)	Cumulative % by weight of total aggregate passing	
45	-	-
37.5	-	-
26.5	100	-
19	90 - 100	90 - 100
13.2	59 - 79	70 - 88
9.5	52 - 72	70 - 88
4.75	35 - 55	53 - 71
2.36	28 - 44	42 - 58
1.18	20 - 34	34 - 48
0.6	15 - 27	26 - 38
0.3	10 - 20	18 - 28
0.15	5 - 13	12 - 20
0.075	2 - 8	4 - 10
Bitumen content % by mass of total mix <sup>2</sup>	Minimum 5.2*	Minimum 5.4**

\* The nominal maximum aggregate size is the largest specified sieve size upon which any of the aggregate material is retained.

\*\* Corresponds to specific gravity of the Aggregate being 2.7 in case aggregates have specific gravity more than 2.7 bitumen content can be reduced proportionately. Further for regions where highest daily mean air temperature is 30°C or lower and lowest daily mean air temperature is -10°C or lower, the bitumen content may be increased by 0.5 percent.

## BASE AND SURFACE COURSES (BITUMINOUS)

**Table 500-18, Permissible variations in the Actual Mix from the Job Mix Formula for Bituminous Concrete**

Description	Base/Binder course
Aggregate passing 19mm sieve or larger	± 7%
Aggregate passing 13.2 mm, 9.5 mm	± 6%
Aggregate passing 4.75 mm	± 5%
Aggregate passing 2.36mm, 1.18mm, 0.6mm	± 4%
Aggregate passing 0.3mm, 0.15mm	± 3%
Aggregate passing 0.075mm	± 1.5%
Binder content	± 0.3%
Mixing temperature	± 10°C

**Table 500-19, Aggregate Gradation for Close graded premix surfacing/mixed seal surfacing**

IS Sieve Designation (mm)	Cumulative percent by weight of total aggregate passing	
	Type A	Type B
13.2 mm	-	100
11.2 mm	100	88 - 100
5.6 mm	52 - 88	31 - 52
2.8 mm	14 - 38	5 - 25
0.090 mm	0 - 5	0 - 5



## BASE AND SURFACE COURSES (BITUMINOUS)

**Table 500-21, Grading requirements for Chips for Surface Dressing.**

IS Sieve Designation (mm)	Cumulative percent by weight of total aggregate passing for the following nominal sizes (mm)			
	19	13	10	6
26.5	100	-	-	-
19.0	85 - 100	100	-	-
13	0 - 40	85 - 100	100	-
9.5	0 - 7	0 - 40	85 - 100	100
6.3	-	0 - 7	0 - 35	85 - 100
4.75	-	-	0 - 10	-
3.35	-	-	-	0 - 35
2.36	0 - 2	0 - 2	0 - 2	0 - 10
0.60	-	-	-	0 - 2
0.075	0 - 1.5	0 - 1.5	0 - 1.5	0 - 1.5
Minimum 65% by weight of aggregate	Passing 19 mm retained 13.2mm	Passing 13.2 mm retained 9.5 mm	Passing 9.5 mm retained 6.3 mm	Passing 6.3 mm retained 3.35mm

**Table 500-22, Approximate Rate of Application of Binder and Aggregates**

Nominal Aggregate Size mm	Binder (Kg/m <sup>2</sup> )			Aggregates Cu.m/m <sup>2</sup>
	Uncoated Aggregates		Coated Aggregates	
	Bitumen	Emulsion	Bitumen	
19	1.2	1.8	1.0	0.014-0.015
13	1.0	1.5	0.8	0.009-0.011
10	0.9	1.3	0.7	0.007-0.009
6	0.75	1.1	0.6	0.003-0.005

\* Bitumen for coated aggregates excludes quantity of bitumen required for coating.

### Spraying Temperatures for Binders (Clause 509.3.3)

Binder grades	Whirling spray jets		Slot jets	
	Min. °C	Max. °C	Min. °C	Max. °C
Penetration grades				
80/100	180	200	165	175

## BASE AND SURFACE COURSES (BITUMINOUS)

**Table 500-23, Quantities of materials Required for 10 Sqm. of Road surface for 20mm Thick open- graded premix surfacing using penetration bitumen or cutback.**

<b>Aggregates</b>		
(a)	Nominal Stone size 13.2mm (passing 22.4mm sieve and retained on 11.2mm sieve)	0.18 m <sup>3</sup>
(b)	Nominal Stone size 11.2mm (passing 13.2mm sieve and retained on 5.6mm sieve)	0.09 m <sup>3</sup>
	Total:	0.27 m <sup>3</sup>
<b>Binder</b>		
(a)	For 0.18 m <sup>3</sup> of 13.2mm nominal size stone at 52 kg bitumen per m <sup>3</sup>	9.5 kg.
(b)	For 0.09 m <sup>3</sup> of 11.2mm nominal size stone at 56 kg bitumen per m <sup>3</sup>	5.1 kg.
	Total:	14.6 kg.

**Table 500-24, Quantities of aggregates for 10m<sup>2</sup> area.  
(OGPC using cationic bitumen emulsion)**

<b>Aggregates</b>		
a)	Coarse aggregate nominal 13.2mm size, passing IS 22.4mm sieve and retained on IS 11.2mm sieve	0.18 m <sup>3</sup>
b)	Coarse aggregate nominal 11.2mm size, passing IS 13.2mm sieve and retained on IS 5.6mm size.	0.09 m <sup>3</sup>
	Binder	20 to 23 kg

## BASE AND SURFACE COURSES (BITUMINOUS)

**Table 500-27, Aggregate Grading**

Sieve Size (mm)	Percentage by Mass Passing (Minimum Layer Thickness)		
	Type I (2-3 mm)	Type II (4-6 mm)	Type III (6-8 mm)
9.5	-	-	100
6.3	-	100	90-100
4.75	100	90-100	70-90
2.36	90-100	65-90	45-70
1.18	65-90	45-70	28-50
0.600	40-65	30-50	19-34
0.300	25-42	18-30	12-25
0.150	15-30	10-21	7-18
0.075	10-20	5-15	5-15

**Table 500-31, Types of Micro-Surfacing and Rate of Application**

Items	Type II (4 to 6mm)**	Type III (6 to 8mm)**
Application	Preventive and Renewal Treatment for Roads Carrying <1500 CVPD	Preventive and Renewal Treatment for Roads Carrying <1500 to 4500 CVPD
Quantity of mix* (kg/m <sup>2</sup> )	8.4to 10.8	11.1 to 16.3
Residual binder (percentage by weight of dry aggregate)	6.5 to 10.5	5.5 to 10.5

\* By weight of dry aggregate.

\*\* Indicative only

## BASE AND SURFACE COURSES (BITUMINOUS)

**Table 500-32, Requirement of Modified Bitumen Emulsion for Micro-Surfacing**

Requirements	Specifications	Method of test
Residue on 600 micron IS sieve (percent by mass), maximum	0.05	IS : 8887
Viscosity by Say bolt Furol Viscometre, at 25°C, in second	20-100	IS : 8887
Coagulation of emulsion at low temperature	Nil	IS : 8887
Storage stability after 24 h (168 h), % maximum	2 (4)	IS : 8887
Particle charge, + ve/-ve	+ ve	IS : 8887
Tests on residue :		
a) Residue by evaporation, % minimum	60	IS : 8887
b) Penetration at 25°C/100g/5s	40-100	IS : 1203
c) Ductility at 27°C, cm, minimum	50	IS : 1208
d) Softening point, in °C, minimum	57	IS : 1205
e) Elastic recovery*, % minimum	50	IS : 15462
f) Solubility in tri-chloroethylene, % minimum	97	IS :1216

\* In case, elastic recovery is tested for Torsional Elasticity Recovery as per Appendix-8 of IRC :81 the minimum value shall be 20 percent.

**Table 500-33, Mix Design Criteria for Micro-Surfacing Mix**

Requirements	Specifications	Method of test as given in IRC :SP:81
Mix time, minimum	120s	Appendix-1
Consistency, maximum	3 cm	Appendix-3
Wet Cohesion, within 30min, minimum	12 kg cm	Appendix-4
Wet Cohesion, within 60min, minimum	20 kg cm	Appendix-4
Wet Stripping, pass % minimum	90	Appendix-5
Wet track abrasion loss (one hour soak), maximum	538 g/m <sup>2</sup>	Appendix-6

## BASE AND SURFACE COURSES (BITUMINOUS)

**Table 500-34, Indicative ingredients in mix**

Ingredients	Limits (Percent Weight of Aggregate)
Residual bitumen	6.5 to 10.5 for type II and 5.5 to 10.5 for Type III
Mineral filler	0.5 to 3.0
Additive	As needed
Water	As needed

**Table 500-39, Requirement for Physical Properties of Binder.**

Property	Test method	Requirement	
Penetration at 25 °C	IS 1203	15 ± 5*	
Softening point, °C	IS 1205	65 ± 10	
Loss on heating for 5h at 163°C, % of mass	Max.	IS 1212	2.0
Solubility in Trichloroethylene, % by mass	Min.	IS 1216	95
Ash (mineral matter), % by mass	Max	IS 1217	1.0

\* In cold climatic regions (temperature  $\leq 10^{\circ}\text{C}$ ), a softer penetration grade of 30/40 may be used.

**Table 500-40, Grade and Thickness of Mastic Asphalt paving and Grading of Coarse Aggregate.**

Application	Thickness range (mm)	Nominal size of coarse aggregate (mm)	Coarse aggregate content, % by mass of total mix
Roads and carriageways	25 - 50	13	40 ± 10
Heavily stressed areas i.e. junctions and toll plaza.	40 - 50	13	45 ± 10
Nominal size of coarse aggregate	13 mm		
IS Sieve (mm)	Cumulative % passing by weight		
19	100		
13.2	88 - 96		
2.36	0 - 5		

## BASE AND SURFACE COURSES (BITUMINOUS)

**Table 500-41, Grading of Fine Aggregates (Inclusive Filler)**

S.No.	IS Sieve	Percentage by weight of aggregate
1.	Passing 2.36 mm but retained on 0.60 mm	0 - 25
2.	Passing 0.600 mm but retained on 0.212 mm	10 - 30
3.	Passing 0.212 mm but retained on 0.075 mm	10 - 30
4.	Passing 0.075 mm	30 - 55

**Table 500-42, Composition of Mastic Asphalt Blocks without Coarse Aggregates.**

S.No.	IS Sieve	Percentage by weight of aggregate	
		Minimum	Maximum
1.	Passing 2.36 mm but retained on 0.60 mm	0	22
2.	Passing 0.600 mm but retained on 0.212 mm	4	30
3.	Passing 0.212 mm but retained on 0.075 mm	8	18
4.	Passing 0.075 mm	25	45
5.	Bitumen content	14	17

## QUALITY CONTROL FOR ROAD WORKS

**Table 900-1, Tolerances in Surface Levels.**

1.	Sub-Grade	$\pm 20\text{mm}$
2.	Sub-base a) Flexible pavement b) Concrete Pavement	$\pm 10\text{mm}$ $\pm 6\text{mm}$
3.	Base Course for flexible pavement. a) Bituminous Course b) Granular i) Machine laid ii) Manually laid.	$\pm 6\text{mm}$ $\pm 10\text{mm}$ $\pm 15\text{mm}$
4.	Wearing course for flexible pavement. i) Machine laid ii) Manually laid.	$\pm 6\text{mm}$ $\pm 10\text{mm}$
5.	Cement Concrete Pavement.	$\pm 5\text{mm}$

## QUALITY CONTROL FOR ROAD WORKS

**Table 900-2, Maximum Permitted Number of Surface Irregularities.**

Irregularity	Surface of carriageways and paved shoulders				Surface of laybys, service areas and all bituminous base course			
	4 mm		7 mm		4 mm		7 mm	
Length (m)	300	75	300	75	300	75	300	75
Number of Surface irregularities on National Highways/ Expressway*	15	9	2	1	40	18	4	2
Number of Surface irregularities on Roads of Lower category*	40	18	4	2	60	27	6	3

\* Category of each section of road as described in the contract.

The maximum allowable difference between the rod surface and underside of a 3m straight edge when placed parallel with, or at right angles to the center line of the road at points decided by the Engineer shall be for :

(i)	Pavement surface (bituminous and cement concrete)	3mm
(ii)	Bituminous base courses.	6mm
(iii)	Granular sub-base/base courses.	8mm
(iv)	Sub base under concrete pavements	10mm
(v)	For sub grade	15mm



## QUALITY CONTROL FOR ROAD WORKS

**Table 900-3, Control tests and their Minimum Frequency for Sub-Bases and Bases  
(Excluding bitumen Bound Bases)**

S. No.	Type of Construction	Test	Frequency (Min.)
1.	Granular	(i) Gradation (ii) Atterberg Limits (iii) Moisture content prior to compaction (iv) Density of compacted layer (v) Deleterious constituents (vi) CBR	One test per 400 m <sup>3</sup> One test per 400 m <sup>3</sup> One test per 400 m <sup>2</sup>  One test per 1000 m <sup>3</sup> As required As required
2.	Lime/Cement Stabilised Soil Sub-base.	(i) Quality of Lime/Cement	One test for each consignment subject to a minimum of one test per 5 tonnes.
		(ii) Lime/Cement Content	Regularly through procedural checks.
		(iii) Degree of pulverisation	Periodically as considered necessary
		(iv) CBR or unconfined compressive strength test on a set of three specimens.	As required.
		(v) Moisture content prior to compaction	One test per 500 m <sup>2</sup>
		(vi) Density of compacted layer	One test per 500 m <sup>2</sup>
		(vii) Deleterious constituents.	As required.
3.	Water Bound Macadam.	(i) Aggregate impact value	One test per 1000 m <sup>3</sup> of aggregate.
		(ii) Grading	One test per 250 m <sup>3</sup>
		(iii) Flakiness index and Elongation index.	One test per 500 m <sup>3</sup> of aggregate.
		(iv) Atterberg limits of binding material	One test per 50 m <sup>3</sup> of binding material.
		(v) Atterberg limits of portion of aggregate passing 425 micron sieve.	One test per 100 m <sup>3</sup> of aggregate.
4.	Wet Mix Macadam.	(i) Aggregate impact value	One test per 1000 m <sup>3</sup>
		(ii) Grading	One test per 200 m <sup>3</sup>
		(iii) Flakiness index and Elongation index	One test per 500 m <sup>3</sup>
		(iv) Atterberg limits of portion of aggregate passing 425 micron sieve	One test per 200 m <sup>3</sup>
		(v) Density of compacted layer	One test per 1000 m <sup>2</sup>

## QUALITY CONTROL FOR ROAD WORKS

**Table 900-4, Control tests and their Minimum Frequency for Sub-Bases and Bases  
(Excluding bitumen Bound Bases)**

S. No.	Type of Construction	Test	Frequency (Min.)
1.	Primer Coat/ Tack Coat/For spray	(i) Quality of binder.	No. of samples per lot to be and tests as per IS:73, IS:217 and IS:8887 as applicable.
		(ii) Binder temperature for application.	At regular close intervals.
		(iii) Rate of spread of binder	Three test per day.
2.	Seal coat/surface dressing.	(i) Quality of binder	Same as mentioned under serial No.1
		(ii) Aggregate Impact value or los angeles abrasion value	One test per 200 m <sup>3</sup> of each source and wherever there is change in the quality of aggregate.
		(iii) Combined Flakiness Index or Elongation Index	One test per 100 m <sup>3</sup> of each source and wherever there is change in the quality of aggregate.
		(iv) Stripping value of aggregate (Immersion tray test)	One test of each source and wherever there is change in the quality of aggregate.
		(v) Water absorption of aggregate.	One test of each source and wherever there is change in the quality of aggregate.
		(vi) Water sensitivity of mix	One test of each source and wherever there is change in the quality of aggregate.
		(vii) Grading of aggregates.	Two test per day.
		(viii) Soundness (Magnesium Sulphate/Sodium Sulphate)	One test of each source and wherever there is change in the quality of aggregate.
		(ix) Polished stone Value (Not applicable for SAM/SAMI)	One test of each source and wherever there is change in the quality of aggregate.

S. No.	Type of Construction	Test	Frequency (Min.)
		(x) Temperature of binder in boiler, aggregate in dryer and mix at the time of laying and compaction	At regular intervals.
		(xi) Rate of spread of materials.	Three test per day.
		(xii) Percentage of fractured faces (When gravel is used)	One test per 100 cum of aggregate.

S. No.	Type of Construction	Test	Frequency (Min.)
3.	Open-graded premix carpet/ Mix seal surfacing.	(i) Quality of binder	Same as mentioned under serial No.1
		(ii) Aggregate Impact value or los angeles abrasion value	Same as mentioned under serial No.2
		(iii) Combined Flakiness Index or Elongation Index	Same as mentioned under serial No.2
		(iv) Stripping value	Same as mentioned under serial No.2
		(v) Water absorption of aggregate.	Same as mentioned under serial No.2
		(vi) Water sensitivity of mix	Same as mentioned under serial No.2
		(vii) Grading aggregates.	Same as mentioned under serial No.2
		(viii) Soundness (Magnesium Sulphate/Sodium Sulphate)	Same as mentioned under serial No.2
		(ix) Polished stone Value	Same as mentioned under serial No.2
		(x) Temperature of binder at application.	At regular intervals.
		(xi) Binder content	Two test per plant.
		(xii) Percentage of fractured faces (When gravel is used)	Same as mentioned under serial No.2
4.	Bituminous Macadam	(i) Quality of binder	Same as mentioned under serial No.1
		(ii) Aggregate Impact value or los angeles abrasion value	Same as mentioned under serial No.2
		(iii) Combined Flakiness Index or Elongation Index	One test per 350 cum for each source.

S. No.	Type of Construction	Test	Frequency (Min.)
		(iv) Stripping value	Same as mentioned under serial No.2
		(v) Water absorption of aggregates	Same as mentioned under serial No.2
		(vi) Water sensitivity of mix	Same as mentioned under serial No.2
		(vii) Grading of aggregate	Same as mentioned under serial No.2
		(viii) Soundness (Magnesium Sulphate/Sodium Sulphate)	Same as mentioned under serial No.2
		(xiii) Percentage of fractured faces (When gravel is used)	Same as mentioned under serial No.2
		(ix) Binder content	Same as mentioned under serial No.3
		(x) Control of temperature of binder and aggregate for mixing and of the mix at the time of laying and rolling	Same as mentioned under serial No.2
		(xi) Density of compacted layer.	One test per 700m <sup>2</sup> of area.
		(xii) Rate of spread of mixed material	At regular interval.

S. No.	Type of Construction	Test	Frequency (Min.)
5.	Dense Bituminous Macadam/Semi Dense Bituminous Concrete/ Bituminous Concrete.	(i) Quality of binder	Number of samples per lot and tests as per IS :73 or IRC:SP:53, IS:15462
		(ii) Aggregate Impact Value/Los Agneles Abrasion Value	One test per 350 cum of aggregate for each source and wherever there is change in the quality of aggregate.
		(iii) Flakiness Index and Elongation Index	One test per 350 cum of aggregate for each source and wherever there is change in the quality of aggregate.
		(iv) Soundness (Magnesium Sulphate/Sodium Sulphate)	One test of each source and wherever there is change in the quality of aggregate.
		(v) Water absorption of aggregate	One test of each source and wherever there is change in the quality of aggregate.
		(vi) Sand equivalent test	One test of each source and wherever there is change in the

S. No.	Type of Construction	Test	Frequency (Min.)
			quality of aggregate.
		(vii) Plasticity Index	One test of each source and wherever there is change in the quality of aggregate.
		(viii) Polished stone Value	One test of each source and wherever there is change in the quality of aggregate.
		(xiv) Percentage of fractured faces (When gravel is used)	One test per 350 cum of aggregate for each source and wherever there is change in the quality of aggregate.
		(ix) Mix Grading	One set of tests on individual constituents and mixed aggregate from the dryer for each 400 tonnes of mix subject to a minimum of two tests per plant per day.
		(x) Stability and voids analysis of mix including theoretical maximum specific of loose mix	Three test for stability, flow value, density and void contents for each 400 tonnes of mix subject to minimum of two tests per day per plant.
		(xi) Moisture Susceptibility of mix (AASHTO T 283)	One test for each mix type whenever there is change in the quality or source of coarse or fine aggregate.
		(xii) Temperature of binder in boiler, aggregate in dryer and mix at the time of laying and mix at the time of laying and compaction.	At regular intervals.
		(xiii) Binder content	One set for each 400 tonnes of mix subject to minimum of two tests per day per plant
		(xiv) Rate of spread of mixed material	After every 5 <sup>th</sup> truck load.
		(xv) Density of compacted layer.	One test per 700m <sup>2</sup> of area.

S. No.	Type of Construction	Test	Frequency (Min.)
6.	Sand Asphalt base course.	(i) Quality of binder	Same as mentioned under Serial No.2
		(xvi) Aggregate Impact Value/Los Angeles Abrasion Value	Same as mentioned under Serial No.2
		(ii) Sand equivalent test	Same as mentioned under Serial No.2
		(iii) Plasticity Index	Same as mentioned under Serial No.5
		(iv) Mix grading and binder content.	Same as mentioned under Serial No.2 and 3
		(v) Stability of Mix.	Same as mentioned under Serial No.5
		(vi) Control of temperature of binder in boiler, aggregate in the dryer and mix at the time of laying and rolling.	Same as mentioned under Serial No.2
		(vii) Thickness of layer	Same as mentioned under Serial No.5
		(viii) Density of compacted layer	Same as mentioned under Serial No.5

S. No.	Type of Construction	Test	Frequency (Min.)
7.	Slurry seal and Micro surfacing	(i) Quality of Aggregate sand Equivalent value water absorption soundness test (Sodium/ Magnesium Sulphate Test)	One per source/site.
		(ii) Quality of Emulsion	One per lot of 20 tonne as per IS : 8887
		(iii) Aggregate Moisture	Two per day
		(iv) Aggregate Gradation	Two per day at site
		(v) Binder Content	Two per lane per km
		(vi) Calibration of Machine	Once per Project
		(vii) Quantity of Slurry (By weight of aggregate)	Daily (Travel time of Machine)

S. No.	Type of Construction	Test	Frequency (Min.)
8.	Stone Matrix Asphalt	(i) Quality of binder	Number of samples per lot and tests as per IS :73 or IRC:SP:53, IS:15462
		(ii) Aggregate Impact Value/Los Angeles Abrasion Value	One test per 100 cum of aggregate
		(iii) Flakiness Index and Elongation Index	One test per 100 cum of aggregate
		(iv) Soundness (Magnesium Sulphate/Sodium Sulphate)	One test for each method for each source and wherever there is change in the quality of aggregate.
		(v) Water absorption of aggregate	One test of each source and wherever there is change in the quality of aggregate.
		(vi) Sand equivalent test	One test of each source
		(vii) Plasticity Index	One test of each source
		(viii) Polished stone Value	One test of each source
		(xv) Percentage of fractured faces (When gravel is used)	One test per 50 cum when crushed gravel is used.
		(ix) Mix Grading	One set of tests on individual constituents and mixed aggregate from the dryer for each 400 tonnes of mix subject to a minimum of two tests per plant per day.
		(x) Air voids analysis of mix including theoretical maximum specific gravity of loose mix	Three test per day.
		(xi) Moisture Susceptibility of mix (AASHTO T 283)	One test for each mix type whenever there is change in the quality or source of coarse or fine aggregate.
		(xii) Temperature of binder in boiler, aggregate in dryer and mix at the time of laying and mix at the time of laying and compaction.	At regular intervals.
		(xiii) Binder content	One set for each 400 tonnes of mix subject to minimum of two

S. No.	Type of Construction	Test	Frequency (Min.)
			tests per day per plant
		(xiv) Rate of spread of mixed material	After every 5 <sup>th</sup> truck load.
		(xv) Density of compacted layer.	One test per 250m <sup>2</sup> of area.

9.	Mastic Asphalt	(i) Quality of binder	Same as mentioned under Serial No.5
		(ii) Aggregate Impact Value/Los Angeles Abrasion Value	Same as mentioned under Serial No.5
		(iii) Combined Flakiness Index and Elongation Index	Same as mentioned under Serial No.5
		(iv) Stripping value	Same as mentioned under Serial No.2
		(v) Water sensitivity of mix	Same as mentioned under Serial No.5
		(vi) Grading of aggregates	Two tests per day per plant both of the individual constituents and mixed aggregates from the dryer
		(vii) Water absorption of aggregates.	Same as mentioned under Serial No.5
		(xvi) Soundness (Magnesium Sulphate/Sodium Sulphate)	Same as mentioned under Serial No.5
		(viii) Percentage of fractured faces (When gravel is used)	Same as mentioned under Serial No.5
		(ix) Binder content and aggregate grading.	Same as mentioned under Serial No.3
		(x) Control of temperature of binder and aggregate for mixing and of the mix at the time of laying and rolling.	At regular close intervals.
		(xi) Rate of spread of mixed material.	Regular control through checks of layer thickness.
		(xii) Hardness number.	minimum two tests per day.
10.	Recycled Material Grading of aggregate	Two tests per day	
11.	Cold Mixes	All tests as per S. No. 5	
12.	Quality of Modified Binder	Number of samples per lot and tests as per IS : 15462	
13.	Geotextiles	The requirements of Section 700 shall apply.	



## USEFUL DATA

1. Areas & Weights of Steel

a) Mild Steel Round Bars

<b>Dia in mm</b>	<b>Area Sq. Cm.</b>	<b>Weight Kg/M</b>	<b>Perimeter Cms.</b>
6	0.283	0.222	1.887
8	0.503	0.395	2.514
10	0.785	0.617	3.143
12	1.131	0.888	3.771
16	2.011	1.578	5.028
18	2.545	2.000	5.657
20	3.142	2.466	6.286
22	3.801	2.984	6.914
25	4.909	3.853	7.857
28	6.157	4.830	8.800
32	8.042	6.313	10.057
40	12.566	9.684	12.571

b) High Tensile Steel

<b>Dia in mm</b>	<b>Area Sq. Cm.</b>	<b>Weight Kg/M</b>	<b>Perimeter Cms.</b>
3	0.070	0.056	0.943
5	0.196	0.154	1.571
7	0.385	0.302	2.200
8	0.503	0.395	2.514

c) H.T. Cables each containing 12 wires.

<b>Dia of wire in mm</b>	<b>Total area of H.T. Sq.Cm.</b>	<b>Weight Kg/M</b>
3	2.352	1.848
5	4.620	3.624
8	6.036	4.740

## USEFUL DATA

d) Structural steel (Sections which are normally required in bridge works)

<b>Type Section</b>	<b>Size in M.M.</b>	<b>Weights Kg./M.</b>
Angle	40 x 40 x 6	3.500
	50 x 50 x 6	4.500
	75 x 75 x 6	6.800
	75 x 75 x 10	11.000
	100 x 100 x 6	9.200
	100 x 100 x 10	14.900
	130 x 130 x 10	19.700
	130 x 130 x 12	23.400
Tee	100 x 100 x 10	15.00
Channel	75 x 40 x 6	5.700

e) Structural Flats (Sections which are normally required in bridge works)

<b>Thickness of Plate</b>	<b>Weights Kg./M.</b>
1 M.M.	0.00078
2 M.M.	0.00156
3 M.M.	0.00235
6 M.M.	0.00470
10 M.M.	0.00783
12 M.M.	0.00940
20 M.M.	0.01566
25 M.M.	0.01957

## USEFUL DATA

### 2. Weight of Materials for construction.

S.No.	Material	Unit Metric	Weights
1.	Cement	Cum.	1440
2.	Steel		
	a) Mild Steel	Cu.Cm.	0.0078
	b) Cast Steel	Cu.Cm.	0.0078
	c) H.T. Steel	Cu.Cm.	0.0078
3.	Stainless Steel	Cu.Cm.	0.0078
4.	Lead	Cu.Cm.	0.0113
5.	Plain Cement Concrete or R.C.C.	Cu.M.	2306 to 2400
6.	Stones		
	a) Lime	Cum.	2650
	b) Sand	Cum.	2800
7.	Stone Masonry Rubble	Cum.	2100
8.	Bricks	Cum.	1600
9.	Brick Masonry	Cum.	1920
10.	Timber	Cum.	650 to 720

### 3. Conversion Factors.

Top Convert	Into	Multiply	
Inch	Millimeter	25.40	0.039
Inch	Centimeter	2.540	0.3937
Foot	Meter	0.3048	3.2808
Mile	Kilometer	1.609	0.621
Square Inch	Sq.Centimeter	6.4516	0.155
Square Foot	Square Meter	0.0929	10.764
Acre	Hectare	0.4047	2.471
Sq.Mile	Sq.Kilometer	2.590	0.386
Cubic Inch	Cu.Centimeter	16.387	0.0161
Cubic Foot	Cubic Meter	0.0283	35.3147
Gallon (Imp.)	Litre	4.546	0.220
Pound	Kilogram	0.4536	2.2046
Ton	Tonne	1.0160	0.9842
Lbs. Per Sq. Inch	Kg.PerSq.Cm.	0.0703	14.223
Ton Per Sq.Foot	Tonne Per Sq.M.	10.937	0.0914
To obtain	From	Multiply by	

## 4. Strength of Concrete

<b>In Metric Unit</b>	
<b>Symbol of concrete in M. Unit</b>	<b>Strength kg./cm<sup>2</sup></b>
M - 15	150
M - 20	200
M - 25	250
M - 30	300
M - 35	350
M - 40	400
M - 45	450

NOTE :1) In the SOR for bridges concrete has been specified by strength as per column (1) in metric units.

## 5. Quantities of Materials for Finished Items of Works.

<b>S.No.</b>	<b>Items</b>	<b>Materials</b>	<b>Quantities</b>
a)	Unit per Cubic meter of finished item		
1.	Cement Mortar (1:3)	Cement	0.33 Cum.
		Sand	1.00 Cum.
2.	Cement Mortar (1:4)	Cement	0.25 Cum.
		Sand	1.00 Cum.
3.	Cement Mortar (1:6)	Cement	0.16 Cum.
		Sand	1.00 Cum.
4.	Course Rubble Masonry	Stones	1.00 Cum.
		Mortar	0.33 Cum.
5.	Cut Stone Masonry	Stones	1.00 Cum.
		Mortar	0.16 Cum.
6.	Fine Ashlars Stone Masonry	Stones	1.00 Cum.
		Mortar	0.12 Cum.
b)	Unit per Sq.Meter of finished item		
7.	Flush pointing to stone work	Mortar	0.004 Cum.
8.	Tuck Pointing of stone work	Mortar	0.008 cum.

## MAINTENANCE OF BITUMINOUS SURFACING

The type of defects in bituminous surfacing are grouped under four categories:

- a) Surface defects which include fatty surfaces, smooth surfaces, streaking and hungry/dry surfaces.
- b) Cracks which cover hairline cracks, alligator cracks, longitudinal cracks, edge cracks, shrinkage cracks and reflection cracks.
- c) Deformation defects, which comprise of slippage, rutting, corrugation, shoving, shallow depressions and settlements.
- d) A disintegration defect, which consists of stripping, loss of aggregates, reeling, pot-holes and edge breaking.

The general causes and remedies for these defects are given as below :

- a) Surface Defects.

Natural Defect	Cause	Remedy
Fatty surfaces	Excess bitumen, soft grade of bitumen, non-uniform spraying and loss of cover aggregates as in surface dressing, heavy axle loads.	Apply hot dry cover aggregates or sand and roll gently for removal of excess binder; burn it, if necessary or relay area affected.
Smooth surfaces	Polishing of aggregates by traffic, excess binder.	Resurface with premix carpet using hard aggregates or with slurry seal.
Streaking (alternate lean and rich lines of bitumen in surface dressing) in longitudinal/ transverse direction. Hungry / Dry surfaces.	Non-uniform application of binder, low temperature of binder, manual spraying, mechanical faults during spraying. Use of insufficient binder, use of absorptive aggregates, loss of aggregates from surface.	Apply new surface dressing with proper care in spraying of bitumen.  Apply slurry seal, or for emergency repair apply fog seal.

- b) Cracks

Hair-line cracks (fine cracks at close intervals).	Insufficient bitumen, excess filler, compacting when too hot, over compaction.	Apply fog-seal with bitumen, cutback bitumen or bitumen emulsion.
Alligator cracks (interconnected cracks forming a series of blocks)	Excessive movement of base or sub-base layer, base saturation, excessive loads over weathered surfacing, inadequate pavement thickness.	Fill crack with bitumen emulsion or cutback bitumen and apply slurry seal or sand-bitumen mix, install drainage.
Longitudinal cracks (at the joint between pavement and shoulder or at the joint between two paving lanes).	Contraction or movement of sub-grade beneath shoulder, lane joint crack due to weak joint or differential frost heave along centre-line.	Fill and seal cracks with cutback bitumen or bitumen emulsion, apply sand-bitumen mix, if cracks are wider than 3mm.

<b>Natural Defect</b>	<b>Cause</b>	<b>Remedy</b>
Edge cracks (parallel to outer edge of pavement 0.3 to 0.5m. inside)	Lack of lateral support from shoulder, poor surface drainage, base saturation shrinkage, frost heave inadequate pavement width.	Rectify drainage system, provide hard and paved shoulders, fill cracks and lay premix carpet with seal - coat, if edge of the pavement has settled, bring it upto the desired grade with plant mix patching material.
Shrinkage cracks (transverse direction or inter-connected cracks in large blocks.)	Shrinkage of bituminous layer caused by volume change of bituminous mix with high content of hard bitumen, lack of traffic.	Apply slurry seal, or sand - bitumen mix for filling such cracks.
Reflection cracks (usually in over lays over cement concrete or badly cracked bituminous base).	Due to joints and cracks in the pavement layer underneath.	Fill cracks and seal suitably depending on size of crack. Apply a crack relief layer for prevention of such cracks.

## c) Deformation defects

Slippage (between top layer and layer below accompanied by crescent-shaped. Cracks in direction of the thrust of wheels).	Lack of bond between layers due to omission or inadequacy of tack coat or prime coat, dust or moisture in between layers, heavy thrust by traffic.	Remove affected area, apply tack coat and patch with premix.
Rutting (Longitudinal depressions or grooves in wheel tracks).	Heavy channelized traffic, low stability of mix due to inadequate compaction, weak pavement, high intensity of load stress as from bullock carts, plastic deformation.	Fill ruts with premix carpet and compact. Relay affected portion with bituminous mix of good stability if necessary.
Corrugations (Regular undulations causing shallow wavy surface).	Lack of stability in mix, excess binder/fines, soft bitumen, poor aggregate interlock, oscillations set up by vehicles, frequent braking of vehicles, faulty laying of mix.	Scarify and relay the surface, cut high spots and fill low spots. Use heater-planer to rectify defects.
Shoving (plastic movement within surface resulting in localised bulging of surface, occurring commonly at bus stops, intersections, sharp curves, steep gradients).	Lack of stability of mix, excess binder/fines, softer grade of bitumen, lack of bond between layers, heavy traffic with frequent braking, sharp negotiation of curves and gradients.	Remove affected portion and relay with-premix carpet and compact.

<b>Natural Defect</b>	<b>Cause</b>	<b>Remedy</b>
Shallow depressions (localised and limited in size) dipping about 25mm or more below desired profile.	Heavier traffic, settlement of lower pavement layers, poor construction method.	Fill with premix carpet and compact to desired grade and profile.
Settlement (large localised deformation which may or may not be generally followed by extensive cracks)	Poor compaction of fill, poor drainage in lower layer, inadequate pavement thickness, frost heave or swelling effect of moisture on expansive soil.	Excavate defective fill, reconstruct under controlled conditions to required thickness, provide adequate drainage, strengthen the pavement if required.

## d) Disintegration defects

Stripping (loss of adhesion between binder and aggregates in presence of water).	Softer grade bitumen, siliceous type of aggregates, rain, soon after laying of surface.	Use anti-stripping agent in suitable doses in case of siliceous aggregates, use of proper grade of bitumen for coating, and provide adequate surface drainage.
Loss aggregates (as in surface-dressing)	Non uniform spraying of binder, delayed spreading of aggregates, traffic soon after laying, insufficient binder, ageing of binder.	Apply liquid seal, fog-seal or slurry-seal. Relay, if necessary with liquid seal with proper quality control.
Ravalling (progressive disintegration of premix carpet by loss of aggregates)	Insufficient binder, ageing of binder, overheated bituminous mix, improper coating, inferior aggregates, lack of compaction while laying, construction during, cold weather.	If ravalling if not extensive provide surface dressing, sand bitumen mix or slurry seal. For extensive ravalling, apply renewal coat of premix carpet.
Pot-holes (bowl shaped holes of varying sizes on surface and extending to base course resulting from localized disintegration)	Poor surface drainage, localized defects in bituminous mix, insufficient binder, insufficient layer thickness.	Fill pot holes with premix carpet, after cutting these to regular size and applying tack coat. Fill deep pot holes with bituminous penetration macadam or storable mix.
Edge breaking (frayed edges)	Infiltration of water, softening of foundation, worn-out shoulders with insufficient side support, inadequate thickness at edge.	Relay shoulders with good materials and compact provide adequate drainage.

## CARRIAGEWAY MARKING

A broken line shall be used for centre line on two and three lane road, and for traffic lane lines. These lines are for guidance of the drivers and may be crossed at their discretion.

Longitudinal solid lines are used as guiding of regulating lines and are not meant to be crossed by the driver.

	Line to be provided on 2 or more lanes.
a) Road with restricted visibility	White centre line to be solid.
b) 4 lane undivided road	White centre line to be solid.
c) Edges of road	Yellow line to be solid 20-30 cm.h wide 15cm. from edge in respect of 2 lane road. Yellow line to be solid 15 cm. wide 15 cm. from edge for multi lane road with central verge.
Carriageway width transition	White centre line solid 10 cm. thick with converging lines solid 10cm. thick for a length of 20 times the offset distance yellow edge line 30 cm. wide.
Stop	Stop line indicates where vehicles should stop when directed by a traffic officer or a traffic controlled device on urban and sub urban roads. 2.0 to 3.0 m. from 20 cm. wide located from pedestrian crossing on rural roads. Solid 30.00 cm. wide. 1.25 to 9.0 m. from nearest carriageway of the intersecting road.
Pedestrian crossing	Width of pedestrian crossing <2.0 m. >4.0 m. White 10 cm. wide lines 20 cm. c/c.