

Name Of Work:-

TALUKA :- Jamnagar

DISTRICT :- Jamnagar

GENERAL TECHNICAL  
SPECIFICATIONS  
FOR  
ROAD WORKS

(A) GENERAL TECHNICAL SPECIFICATIONS CONTENTS

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(A) GENERAL TECHNICAL SPECIFICATIONS

1. GENERAL :

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

	(i)
Length and breadth	10 mm.
(ii) Height, depth or thickness of earth work, sub-bases, bases, surfacing the structural members.	05 mm.
(iii) Areas	0.01Sq. Meter
(iv) Cubic contents	0.01 Cubic Meter

2. MEASUREMENTS OF LEAD FOR MATERIALS:

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

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

3. FOLLOWING MATERIALS SHALL CONFORM TO THE INDIAN STANDARDS SHOWN AGAINST THEM:

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1	Cement	IS : 269
2	Sand for masonry	IS : 2116
3	Sand for concrete	IS : 383
4	Coarse aggregate	IS : 383
5	Mild steel	IS : 432
6	High yield strength deformed bars	IS:1786

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4. BARREL THICKNESS OF PIPES OF DIFFERENT CLASS SHALL BE US UNDER

Sr. No.	Internal dial of pipes in mm	Barrel NP – 1	Thickness NP – 2	(In mm) NP – 3
1	2	3	4	5
01	80	25	25	-
02	100	25	25	-
03	150	25	25	-
04	250	25	25	-
05	300	30	30	-
06	350	32	32	75
07	400	32	32	75
08	450	35	35	75
09	500	-	35	75
10	600	-	40	80
11	700	-	40	80
12	800	-	45	90
13	900	-	50	100
14	1000	-	55	100
15	1100	-	60	115
16	1200	-	65	115

## 5. QUALITY CONTROL FOR ROAD WORKS:

### GENERAL

5.1 All materials to be used, all methods and all work performed shall be strictly in accordance with the requirements of these specifications. The contractor shall set up a field laboratory at locations approved by the Engineer and equip the same with adequate equipment and personnel in order to carry out all required tests and quality control work as per specifications and / or as directed by the Engineer. The internal layout of the laboratory shall be as per clause. 121 and / or as directed by the Engineer. The list of equipment and the facilities to be provided shall be got approved from the Engineer in advance.

5.2 The contractor's laboratory should be manned by a qualified materials Engineer / Civil Engineer assisted by experienced technicians, and the set-up should be got approved by the Engineer.

5.3 The contractor shall carry out quality control tests on the materials and work to be frequency stipulated in subsequent paragraphs, in the absence of clear indications about method and or frequency of tests for any item the instructions of the Engineer shall be followed.

5.4 For satisfying himself about the quality of the materials and work, quality control tests will also be conducted by the Engineer (by himself, by his quality control units or by any other agencies seemed fit by him), generally to the frequency set forth here in under. Additional tests may also be conduct where, in the opinion of the Engineer, need for such tests exists.

5.5 The contractor shall provide necessary co – operation and assistance in obtaining the samples for tests and carrying out the field tests as required by the Engineer form time to time. This may include provision of labour, attendants, assistance fin packing and dispatching and any other assistance considered necessary in connection with the tests.

5.6 For the work of embankment, sub grade and pavement, construction of subsequent layer of same or other material over the finished layer shall be done after obtaining permission from the Engineer, Similar permission from the Engineer shall be obtained in respect of all other items of works prior to proceeding with the next stage of construction.

5.7 The contractor shall carry out modifications in the procedure of work, if found necessary, as affected by the Engineer during inspection. Work falling short of quality shall be rectified / redone by the contractor at his own cost, and defective work shall also be removed from the site of works by the contractor at his own cost.

5.8 The cost of laboratory building including services, essential supplies like water, electricity, sanitary services and their maintains and cost of quality control according to the specification requirements shall be deemed to be incidental to the work and no extra payment shall be made from the same. If, however, there is a separate item in the bill of quantities for setting up of a laboratory and installing testing equipment, such work shall be paid for separately.

5.9 For testing of samples of soils / soil mixes, granular materials, and mixes, bituminous materials and mixes, aggregates, cores etc. Sample in the required quantity and from shall be supplied to the Engineer by the contractor at his own cost.

5.10 For cement, bitumen, mild steel, and similar other materials where essential test are to be carried out at the manufacturer's plants or at laboratories other than the site laboratory, the cost of samples, testing and furnishing of test certificates shall be borne by the contractor. He shall also furnish the test certificates to the Engineer.

5.11 For testing of cements concrete at site during construction, arrangements for supply of samples sampling, testing and supply of test results shall be made by the contractor as per the frequency and number of tests specified in the Hand book of quality control for construction of Roads and Runways (IRC : SP : 11) and relevant codes or relevant clauses of these specifications, the cost of which shall be borne by the contractor.

5.12 The method of sampling and testing of materials shall be as required by the "Hand Book of Quality control for construction of roads and Runways" (IRC : SP : 11), and these Most specification. Where they are contradicting, the provision in these specification shall be followed. Where they are silent, sound Engineering practices shall be adopted. The sampling and testing procedure to be used shall be as approved by the Engineer and his decision shall be final and binding on the contractor.

5.13 The materials for embankment construction shall be got approved from the Engineer. The responsibility for arranging and obtaining the land for borrowing or

exploitation in any other way shall rest with the contractor who shall ensure smooth and uninterrupted supply of materials in the required quantity during the construction period.

Similarly, the supply of aggregate for construction of road pavement shall be from quarries approved by the Engineer. Responsibility for arranging uninterrupted supply of material from the source shall be that of the contractor.

#### 5.14 DEFECTIVE MATERIALS

All materials which the Engineer / his representatives has determined as not conforming to the requirements of the contract shall be rejected whether in place or not; they shall be removed immediately from the site as directed, materials, which have been subsequently corrected, shall not be used in the work unless approval is accorded in writing by the Engineer. Upon failure of the contractor to comply with any order of the Engineer / his representative, given under this clause, the Engineer / his representative shall have authority to cause the removal of rejected material and to deduct the removal cost. There of from any payments due to the contractor.

#### 5.15 IMPORTED MATERIALS

At the time of submission of tenders, the contractor shall furnish a list of materials / finished products manufactured, produced or fabricated outside Indian which he proposed to use in the work. the contractor shall not be entitled to extension of time for acts or events occurring out side Indian and it shall be the contractor's responsibility to make timely delivery to the job site of all such materials obtained from outside India.

The materials imported from outside Indian shall conform to the relevant specifications of the contract. In case where materials / finished products are not covered by the specifications in the contract the details of specifications proposed to be followed and the testing procedure as well as laboratories / establishments where tests are to be carried out shall be specifically brought out and agreed to in the contract.

The contractor shall furnish to the Engineer a certificate of compliance of the tests carried out. In addition, certified till test reports clearly identified to the lot of materials shall be furnished at the contractor's cost.

### 6. CONTROL OF ALIGNMENT, LEVEL AND SURFACE REGULARITY

#### 6.1 GENERAL

All work performed shall conform to the lines, grades, cress sections and dimensions shown on the drawings or as directed by the Engineer, subject to the permitted to lerances described herein – after.

## 6.2 HORIZONTAL ALIGNMENT

Horizontal alignments shall be reckoned with respect to the centre line of the carriageway as shown on the drawings. The edges of the carriageway as constructed shall be cored within a tolerance of  $\pm 10$  mm there from. The corresponding tolerance for edges of the roadway and lower layers of payment shall be  $\pm 25$  mm.

## 6.3 SURFACE LEVELS

The levels of the sub grade and different pavement course as constructed, shall not vary from those calculated with reference to the longitudinal and cross – profile of the road shown on the drawings or as directed by the Engineer beyond the tolerances mentioned in table 6.1

TBLE – 6.1		TOLERANCES IN SURFACE LEVELS
1.	Sub grade	+ 20 mm - 25 mm
2.	Sub – base (a) Flexible payment (b) Concrete pavement (Dry lean concrete or Rolled concrete)	+ 10 mm - 20 mm + 06 mm
3.	Base – course for flexible pavement (a) Bituminous  (b) Other than bituminous (1) Machine laid  (2) Manually laid	+ 06 mm - 06 mm + 10 mm - 10 mm + 15 mm - 15 mm
4.	Wearing course for flexible pavement (a) Machine laid  (b) Manually laid	+ 06 mm - 06 mm + 10 mm - 10 mm
5.	Cement concrete pavement	+ 05 mm - 06 mm*

This may not exceed -08 mm at 0-30 mm from the edges.



Provided, however, that the negative tolerance for wearing course shall not be permitted in conduction with the positive tolerance for base course, if the thickness of the former is thereby reduced by more than 6 mm for flexible pavements and 5 mm for concrete pavements.

For checking compliance with the above requirement for sub grade, sub-base and base courses measurements of the surface levels shall be taken on a grid of points placed at 6.25 m. longitudinally and 3.5 in transversely. For any 10 consecutive measurements taken longitudinally or transversely, not more than one measurement shall be permitted to exceed the tolerance above, this one measurement being not in excess of 5 mm above the permitted tolerance.

For checking the compliance with the above requirement for bituminous wearing courses and concrete pavements, measurements of the surface levels shall be taken on a grid of points spaced at 6.25 m. along the length and at 0.5 m. from the edges and at the centre of the pavement. In any length of pavement compliance shall be deemed to be met for the final road surface, only if the tolerance given above is satisfied for any point on the surface.

#### 6.4 SURFACE REGULARITY OF PAVEMENT COURSES :

The longitudinal profile shall be checked with a 3 metre long straight edge / moving straight – edge as desired by the Engineer at the middle of each traffic lane along a line parallel to the centre line of the road.

The maximum permitted number of surface irregularities shall be as per Table 6.2

Surfaces of carriageways and paved shoulders					Surfaces of laybys, service areas and all bituminous base courses			
Irregularity	4 mm		7 mm		4 mm		7 mm	
Length (m)	300	75	300	75	300	75	300	75
National Highways / Expressways*	20	09	05	01	40	18	04	02
Roads of lower category*	40	18	04	02	60	27	06	03

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

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

For pavement surface (bituminous and cement concrete)	03 mm
For bituminous base courses	06 mm
For granular sub – base courses	08 mm
For sub – base under concrete	10 mm

## 6.5 RECTIFICATION

Where the surface regularity of sub grade and the various pavement courses fall outside the specific tolerances, the contractor shall be liable to rectify these in the manner described below and to the satisfaction of the Engineer.

### (1) SUBGRADE :

Where the surface is high, it shall be trimmed and suitably compacted. Where the same is low one deficiency shall be corrected by scarifying the lower layer and adding fresh material and recommitting to the required density. The degree of compaction and the type of materials to be used shall conform to the requirements of clauses – 305. (MOST 1995)

### (2) GRANULAR SUB – BASE :

Same as at (1) above, except that the degree of compaction and the type of material to be uses shall conform to the requirements of clauses – 401. (MOST 1995).

### (3) LIME / CEMENT STABILIZED SOIL SUB – BASE :

For lime / cement treated materials where the surface is high, the same shall be suitably trimmed while taking care that the material below is not disturbed due to this operation. However the surface is low. The same shall be corrected as described herein below.

For cement treated material, when the time lapsed between detection of irregularity and the time of mixing of the material is less than 2 hours, the surface shall be scarified to a depth of 50 mm supplemented with freshly mixed materials as necessary and recomputed to the relevant specification. When this time is more than 2 hours, the full depth of the layer shall be removed from the pavement and replaced with fresh material to specification. This shall also apply to lime treated material except that the lime criteria shall be 3 hours instead of 2 hours.

- (4) WATER BOUND MACADAM / WET. MAX / MACADAM SUB – BASE / BASE :  
Where the surface is high or low, the top 75 mm shall be scarified, reshaped with added material as necessary and recomputed to clause 404. (MOST 1995) This shall also apply to wet mix macadam to clause – 406. (MOST – 1995).

- (5) DRY LEAN CONCRETE SUB – BASE / ROLLED CEMENT CONCRETE :  
For bituminous construction other than wearing course, where the surface is low, the deficiency shall be corrected by adding fresh material over a suitable tack coat if needed and recompact to specifications. Where the surface is high, the full depth of the layer shall be removed and replaced with fresh material and compacted to specification.

For wearing course, where the surface is high or low, the full depth of the layers shall be removed and replaced with fresh material and compacted to specifications. In all cases where the removal and replacement of a bituminous layer is involved, the area treated shall not be less than 5 m. in length and not less than 3.5 m. in width.

- (6) DRY LEAN CONCRETE SUB – BASE / ROLLED CEMENT CONCRETE :  
The defective length of the course shall be removed to full depth and replaced with material conforming to clauses 601 of 603, (MOST 1995) as applicable. The area treated shall be at least 3 m. long not less than 1 lane wide and extend to the full depth. Before relaying the course, the disturbed sub grade on layer shall be corrected by leveling, watering and compacting.

- (7) CEMENT CONCRETE PAVEMENT:  
The defective areas having surface irregularity exceeding 3 mm. but not greater than 6 mm may be rectified by bump cutting or scrubbling or grinding using approved equipment. When required by the Engineer, areas which have been reduced in level by the above operation (s) shall be retextured in an approved manner either by cutting grooves (5 mm deep) or roughening the surface by hacking the surface. If high areas is excess 6 mm or low areas in excess of 3 mm occur, exceeding the permitted the permitted numbers if the contractor can not rectify, the slab shall be demolished and reconstructed at the contractor's expense and in no case the area removed shall be less than full width of the lane in which the irregularity occurs and full length of the slab.

If deemed necessary by the Engineer, any section of the slab which deviates from the specifies levels and tolerances shall be demolished and reconstructed at the constructed at the contractor's expense.

(7) QUALITY CONTROL TESTS DURING CONSTRUCTION :

(7.1) GENERAL

The materials supplied and the works carried out by the contractor shall conform to the specifications prescribed in the preceding clauses.

For ensuring the requisite quality of construction, the materials and works shall be subjected to quality control tests, as described hereinafter. The testing frequencies set forth are the desirable minimum and the Engineer shall have the full authority to carry out additional tests as frequently as he may deem necessary, to satisfy himself that the materials and works comply with the appropriate specifications. However, the number of tests recommended in Table 7.1 may be reduced at the discretion the Engineer if it is felt that consistency in the quality of materials can still be maintained with the reduced number of tests.

Test Procedures for the various quality control tests are indicated in the respective sections of these specifications or for certain tests within this section. Where no specific. Where no specific testing procedure is mentioned the tests shall be carried out at per the prevalent accepted engineering practice to the directions of the Engineer.

Table 7.1  
Schedule for testing of Materials for Road Work

Sr.	Material	Details of Test	Frequency
1.	Metal Gravel for crust	a) Gradation b) Flakiness index  c) Impact Value OR Abrasion Value	1. test for 100 Cmt. 3. test for 101 to 500 Cmt. 5. test for 501 to 1500 Cmt. 7. test for 1500 to 5000 Cmt.  Minimum 1 test for work.
2.	Kapachi grit for bituminous surface	a) Gradation b) Flakiness index  c) Impact Value OR Abrasion Value d) Stripping Value	1. test for 100 Cmt. 3. test for 101 to 500 Cmt. 5. test for 501 to 1500 Cmt. 7. test for 1500 to 5000 Cmt.  Minimum 1 test for work.
3.	Murum or yellow Earth as binding Material	P. I. Value	One test for 50 Cmt.
4.	Sand	Silt content	One test for work.
5.	Quarry spoils	Gradation	One test for work.
6.	Asphalt	Penetration test as per specification	Tanker Test 1 1 2 to 15 2

			16 to 50 3
7.	Tack coat	a) Binder temperature for application. b) Rate of spread of binder.	Irregular close in intervals two tests per day.
8.	Carpet & seal coat mix	a) Grading  b) Temperature of binder in boiler, aggregate in the dryer and mix at the time laying and rolling (Binder content vide 45 IMD.2172) c) Rate of spreaded mix materials.	One test On individual constituents and mixed aggregates from the dryer for each 100 tonnes of mix subject to minimum of two tests per plant per day.  One test for each 100 tonnes of mix subjects to mini. Of two test per day plant.  Regular control through checks on layer thickness.

8. ARRANGEMENT FOR TRAFFIC DURING CONSTRUCTION :

Clause 112 of most (Roads wing) Specification for road & Bridgeworks (Third revision - 1995)

8.1 GENRAL :

The contractor shall at all times carry out work on the highway in a manner creating least interference to the flow of traffic while consistent with the satisfactory execution of the same. For all works involving improvements to the existing highway, the contractor shall, in accordance with the directives of the Engineer, provide and maintain during execution of the work, a passage for traffic either along a part of the existing carriageway under improvement or along a temporary diversion constructed close to the highway. The contractor shall take prior approval of the Engineer regarding traffic arrangements during construction.

8.2 PASSAGE OF TRAFFIC ALONG A PART OF THE EXISTING CARRIAGEWAY UNDER IMPROVEMENT:

For widening / strengthening existing carriageway is proposed to e used for passage of traffic, treated shoulders shall be provided on the side on which work is not in progress, the treatment to the shoulder shall consist of providing at least 150 mm thick granular base course covered with bituminous surface dressing in a width of at least 1.5 m. and the surface shall be maintained throughout the period during which traffic uses the same to the satisfaction of the Engineer. The continuous length in which such work shall be carried out, would be limited normally to 500 m. at a place. however,

where work is allowed by the Engineer in longer stretches passing places at least 20 m. long with additional paved width of 2.5 m. shall be provided at every 0.5 km. interval.

In case of widening existing two-lane to four-lane, the additional two lanes would be constructed first and the traffic diverted to it and only thereafter the required treatment to the existing carriageway would be carried out. However, in case where on the request of the contractor, work on existing two – lane carriageway is allowed by the Engineer with traffic using part of the existing carriageway, stipulations as in para above shall apply.

After obtaining permission of the Engineer, the treated shoulder shall be dismantled the debris disposed of and the area cleared as per the direction of the Engineer.

### 8.3 PASSAGE OF TRAFFIC ALONG A TEMPORARY DIVERSION :

In stretches where it is not possible to pass the traffic on part width of the carriageway a temporary diversion shall be constructed with 7 m. carriageway and 2.5 m. earthen shoulders on each side (total width of roadway 12 m.) with the following provision for road crust in the 7 m width :

- (i) 200 mm (compacted) granular sub base;
- (ii) 225 mm (compacted) granular base course;
- (iii) Premix carpet with seal coat / mix seal surfacing.

The alignment and longitudinal section of diversion including junctions and temporary cross drainage provision shall be as approved by the Engineer.

### 8.4 TRAFFIC SAFETY AND CONTROL :

The contractor shall take at necessary measures for the safety of traffic during construction and provide, erect and maintain such barricades, including signs, markings, flags, lights and flagmen as may be required by the Engineer for the information and protection of traffic approaching or passing through the section of the highway under improvement. Before taking up any construction, an agreed phased programme for the diversion of traffic on the highway shall be drawn up in consultation with the Engineer.

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

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

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

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

#### 8.5 MAINTENANCE OF DIVERSIONS AND TRAFFIC CONTROL DEVICES :

Signs, lights barriers and other traffic control devices, as well as the riding surface of diversions shall be maintained in a satisfactory condition till such time they are required as directed by the Engineer. The temporary travelled way shall be kept free of dust by frequent applications of water, if necessary.

### 9. PREPARATION OF SURFACE FOR BASE AND SURFACE COURSES (BITUMINOUS)

Clause 501 of MOST (Road Wing) specifications for Road & Bridges works.

(Third Revision - 1995)

#### 9.1 SCOPE :

This work shall consist of preparing an existing granular or black – topped, surface to specified lines, grades and cross – section in advance of laying a bituminous course. The work shall be performed on such widths and lengths as shown in applicable drawing and consist of scarifying and re-laying the granular base course and / or

scarifying the existing surface, filling of potholes, sealing of cracks and / or applications of a profile corrective course (leveling course) as necessary.

## 9.2 MATERIALS :

### 9.2.1 FOR SCARIFYING AND RE-LAYING THE GRANULAR SURFACE

The materials used shall be coarse aggregates salvaged from scarification of the existing granular base course supplemented by fresh coarse aggregates and screenings so that aggregates and screening thus supplemented – correspond to clause 404 : Water bound Macadam or clause 406 : (most 1995) wet mix macadam, as the case may be.

### 9.2.2 FOR PATCHING POTHoles AND SEALING CRACKS :

For patching potholes, approved material having same specification as that of profile corrective course shall be used. For sealing small cracks finer than 3 mm. a fog seal conforming to section 3000 (most 1995) shall be applied while larger cracks wider than 3 mm. shall be treated with an emulsion slurry seal conforming to clause 516. (most 1995)

### 9.2.3 FOR PROFILE CORRECTIVE COURSE :

A profile corrective course (leveling course) is essentially a pavement base material course of correcting the existing pavement profile which has either lost its shape or has to be given a new shape to meet the requirement of specified lines, grades and cross – sections.

It shall be differentiated from the strengthening course or other type of structural pavement course needed for upgrading as a remedial measure against inherently deficient and / or distressed pavement. It is meant to remove the irregularity in the existing road profile only.

### 9.2.4 FOR PROFILE CORRECTIVE COURSE AND ITS APPLICATION :

The type of profile corrective course shall be as shown on the drawing. If it is to be laid as part of the overlay / strengthening course, the profile corrective course material shall be of the same specifications as that of the overlay / strengthening course. However, if provided as a separate layer, it may be of the same specification as the layer over which it is to be laid or intermediate between underlying and overlying layers, as shown on the drawing.

(i) Wherever isolated high spots projecting over the pavement surface do exist, the same shall be cut by milling machine or any other approved method, to minimize the



profile corrective course requirement. If, in the process, the bottom layer gets disturbed, the local area shall be cut and filled with profile corrective course material.

(ii) Where the maximum profile corrective course thickness works out to be not more than 40 mm it shall be done as an internal part of the overlay course, the profile corrective course shall be provided as a separate layer adopting such construction procedures and using such equipment as may be appropriate to the specified type of material and thickness of the course to be provided.

### 9.3 CONSTRUCTION OPERATIONS :

#### 9.3.1 PREPARING EXISTING GRANULAR SURFACE :

Where the existing surface is granular, all loose and disintegrated shall be removed and the surface lightly watered if the profile corrective course to be provided as a separate layer is also granular. If, however, over the existing granular surface, a profile corrective course of bituminous material is to be laid, the existing granular surface shall be primed as per clause – 502. (MOST 1995)

#### 9.3.2 SCARIFYING EXISTING BITUMINOUS SURFACE :

Where necessary, the existing bituminous layer in the specified width shall be removed with care without causing undue disturbance to the underlying layer by suitable method approved by the Engineer. After removing it. All loosened disintegrated materials of underlying layer which might have been disturbed in the process of removal shall, before laying of overlay course, be restored properly by spreading / hand packing of aggregates and compacting with suitable roller / heavy hand rammers / approved mechanical tamper so that the level of the top surface of such scarified area shall be even and properly graded with respect to adjoining surface. Where applicable, the granular surface, after removal of the existing bituminous layer, shall be primed as per clause – 502 (MOST 1995) to receive a bituminous profile corrective course. Reusable materials shall be stacked as directed by the Engineer with all lift and lead of 1000 m.

#### 9.3.3 PATCHING OF POTHoles AND SEALING OF CRACKS :

Before providing profile corrective course on the existing pavement, potholes, if any, shall be drained of water, cut to regular shape with sides vertical upto the affected depth and slightly beyond the limits of affected area and dried all loose and disintegrated materials from it shall be removed. The potholes shall then be filled with material as per clause No.501.2.2 in layers not exceeding 75 mm after painting the sides and bottom with a thin layer of hot straight – run bitumen / emulsion and each layer shall be compacted with approved mechanical tampers / small vibratory roller and the top layer

shall be flush with the existing bituminous surface. All loose and / or surplus materials on the surface after making good the potholes shall be removed.

The cracks in the old pavement surface shall be sealed with a fog seal if cracks are small (less than 3 mm width) fog seal shall consist of a spray of a bituminous cutback or a slow – setting bitumen emulsion diluted with an equal amount of water, the rate of a spray being 0.5 to 1.0 litre / sq.m. depending upon the texture and dryness of the existing bituminous surface. The spray is allowed to set a firm condition and traffic is allowed only there after so as to ensure that the materials is not picked up by traffic. For large cracks, the sealing shall be done with emulsion slurry seal as per clause – 516 (most 1995) of these specifications.

#### 9.3.4 LAYING THE PROFILE CORRECTIVE COURSE :

9.3.4.1 After preparing the granular surface as in clauses 501.3.1 and 501.3.2 the profile corrective course with material as per clause 501.2.3/501.2.4 shall be laid and compacted to the requirement of particular specification clause.

9.3.4.2 An existing bituminous surface shall be prepared as per clause 501.3.3 and after applying a tack coat conforming to clause 503, (MOST 1995) / the bituminous profile corrective course shall be laid and compacted to the requirement of particular specification clause.

9.3.5 In specific situation of short sags or depressions in the pavement, it may be come necessary to provide corrective course in the form of flat wedges. Normally layers in maximum thickness at any point more than 100 mm. shall not be provide. In placing multiple lifts, the lift or shortest length (at the lowest portion of the sag / depression) should be provided first, with successive lifts extending over and fully covering underneath layer, precluding development of a series of joins on the top surfaces, as illustrated in Fig. 500-1. (MOST 1995).

For camber correction or correction of super elevation of the existing carriageway method as shown in the illustrative fig. 500-2 (MOST 1995) shall be adopted depending on the profile of the existing carriageway.

10. TACK COAT : CLAUSE 503-308 MOST OF SPECIFICATION FOR ROAD & BRIDGE WORKS (THIRD REVISION - 1995)

10 TACK COAT :

10.1 PREPARATION OF BASE :

The surface on which the tack coat is to be applied shall be cleaned of dust and any extraneous material before the application of the binder, by using a mechanical broom or any other approved equipments / method as specified by the Engineer.

10.2 APPLICATION OF BINDER :

The surface shall be of grade 80/100 penetration and satisfying the requirement of IS-73 and shall be supplied by the contractor to the site of work at his own cost. It shall be the responsibility of the Contractor to carefully handle the inflammable bitumen so as to safeguard against any fire mishap. The binder shall be arrangement and spraying bar with nozzles having constant volume or pressure system capable of spraying bitumen at specified rates and temperature so as to provide a uniformly unbroken spread of bitumen. Work should be planned so that no more than the necessary tack coat for the day's operation is placed on the surface. After application and prior to succeeding construction of allow the tack coat to cure, without being disturbed, until the water / cutter has completely evaporated, as determined by the Engineer.

TABLE 10.2.1 RATE OF APPLICATION OF TACK COAT

Type Surface		Quantity if liquid bituminous
material in		kg. per 10 Sq. m. area
1)	On bituminous surface	5 kg. per 10 Sq. mt.
2)	On W.B.M. surface	10 kg. per 10 Sq. mt.

Note : There is no need to apply a tack coat on a freshly laid bituminous course if the subsequent bituminous course overlaid the same day without opening it to traffic.

# 11. GRADING REQUIREMENTS OF COARSE AGGREGATES

Grading No.	Size range	Is sieve Designation	Per cent by weight passing
1.	90 mm to 25 mm	100 mm.	100
		90 mm.	90 – 100
		50 mm.	40 – 60
		25 mm.	0 – 10
		20 mm.	0 – 5
2.	63 mm to 40 mm.	90 mm.	100
		63 mm.	90 – 100
		53 mm.	25 – 75
		45 mm.	0 – 15
		22.4 mm.	0 – 5
3.	50 mm. to 25 mm.	63 mm.	100
		53 mm.	95 – 100
		45 mm.	65 – 90
		22.4 mm.	0 – 10
		11.2 mm.	0 – 5

Deputy Executive Engineer  
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Jamnagar.

MINISTRY OF SURFACE TRANSPORT  
(ROADS WING)  
APPENDIX – ‘A’  
To letter No. RW – 2401 / 2 / 89 – RMP

TECHNICAL REQUIREMENT OF DRUM MIX PLANTS TO BE USED ON NATIONAL  
HIGHWAY WORKS

**GENERAL :**

The drum mix plant should be of required make and proven design, steady in structure and capable of producing desired quality of mix as per specification for laying bituminous road surface and should have following essential arrangements.

**[1] COLD AGGREGATE FEEDER :**

The cold aggregate feeder arrangement should have a minimum 3 bins of sufficient capacity capable of storing different sizes of aggregate and fines to ensure continuous uninterrupted supply of aggregate matching the capacity of the plant. Each bin should have independent belt feeder system driven by a variable speed motor and a control gate to ensure accurate aggregate feed to meet design mix formula. It is pre-requisite that only properly screened and graded materials are feed to the bins.

There should be a gathering conveyor to receive and transport material discharged from bins with separate drive arrangement.

There should be a screen or a suitable arrangement like baffle plate at the discharge end of gathering conveyor for rejection of any over – size metal above the permissible limit. The conveyor should be fitted with suitable electronic weight bridge divide for weighing quality of cold aggregate being fort to dryer drum.

The plant should have a mineral filler arrangement with suitable control device to accurately proportion the flow of filler material into dryer drum at appropriate stage.

**[2] DRYER DRUM :**

It should be thermo drum type with smooth rotation arrangement to give roted output and capable of reducing the moisture content of the aggregate to desirable limit of 28 to 68 and achieving hot mix temperature (up to 1600 as per requirement) with such design that no blue smoke is omitted from the exhaust. The drum may have optional

arrangement for feeding reclaimed material. There should be arrangement to restrict burner flame up to certain length in the drum before bitumen is injected.

It should be fitted with positive displacement bitumen pump driven by variable speed motor automatically controlled from control cabin capable of feeding desired quantity of bitumen syndromes with aggregate feed system. Thermic fluid system or hot oil circulation system should be an in – built beadier to keep bitumen pump and pipes sufficiently hot to avoid aligning of pipes.

[3] BURNER

The burner used should be capable of burning the fuel efficiently and develop the required temperature. It should be fitted with remote control system to detect, plants failure and also electric spark vignition system or some other suitable arrangement. Burner operation should have thermo should control of flame within the specified temperature range.

[4] BITUMEN HEATER

It should consist of an insulated work of adequate capacity fitted with effective and positive control of temperature, for allowing circulation of bitumen between bitumen heater and proportioning units. Suitable arrangements should be provided for recording the temperature at the tank and in circulating system.

[5] FUEL SYSTEM

Fuel tanks should be of sufficient capacity and fitted with suitable type of fuel pump to receive the fuel from storage tank and supply to line heater and burner.

[6] CYCLONE SYSTEM

Cyclone unit is required to control dust discharge within the admissible standard of pollution level.

[7] OPERATING CONTROL UNIT

The drum mix plant must have centralized control system with operation from a control cabin located adjacent to the drum mix plant. The control system should be capable of followings :

- i) Automatic control of speed of each bin feeder conveyor and gate, so as to control and regular the flow of various grades of material to ensure constant and accurate proportion of aggregates.

- ii) Pre-set and control the percentage of flow of aggregate and asphalt required as per design mix.
- iii) Automatic detection of plant operation failure, display of aggregate temperature, asphalt and mix temperature, aggregate flow etc. Fully automatic aggregate blending, bitumen, / aggregate ratio control and burner control system.
- iv) Control for pre-setting the moisture content of aggregate displayed digitally.
- v) Entire control system should be such that if desired it would be operated manually also.

[8] SURGE SILO

The plant may have optional arrangement to store hot mix material for at least equivalent to 30% of rated capacity to cater for any delay in loading the tippers. Temporary storage silo should have adequate automatically hydraulic unloading arrangement operated either from the control cabin or manually with necessary safety control.

Signature of Contractor.

Executive Engineer,  
Panchayat R.& B. Division,  
Jamnagar.

## ANNEXURE – ‘B’

### ADDITIONAL REQUIREMENT FOR THE DRUM MIX PLANT AND PAVER FINISHER

AS PER M.O.S.T. SPECIFICATION.

(IInd REVISION – FEBRUARY – 1988)

- (a) Cold aggregate feed system for providing blended aggregate in the correct proportion (called cold binfeed arrangement).
- (b) Retating cylindrical dryer drum fitted with suitable burner capable of heating the aggregate to the required temperature without any visible unburnt fuel or carbon residue on the aggregate and to reduce the moisture content of the aggregate to the specified minimum level.
- (c) The dryer units shall be fitted with approved type of thermometric instruments at appropriate places so as to indicate or automatically record / register the temperature of heated aggregate before adding / mixing the binder.
- (d) GRADATION CONTROL  
Except in case of drum mix plant, other two types of plants mentioned above shall have :
  - i) a screen unit for accurate sizing of hot aggregate and feeding the same to mixing unit by weight or volume control as per the specified job mix formula.
  - ii) Paddle mixer unit shall be capable of producing a homogenous mix with uniform coating of all particles of the mineral aggregate with binder.
- (e) In case of drum mix plant, the cold feed system shall have variable speed belt conveyors / or other suitable devices for regulating the accurate into an even feed flow automatically from a central operating central cabin.

#### BITUMEN CONTROL UNIT

Capable of measuring / metering and spraying required quantity of bitumen at specified temperature with automatic synchronization of bitumen and aggregate feed.

#### FILLER SYTEM

Fines feeder system suitable to receive bagged of bulk supply of filter material and its incorporation to the mix in the correct quantity shall be a necessary auxiliary.

#### DUST CONTROL

A suitable built in dust control equipment for the dryer to contain the exhaust of fine dust into atmosphere for environmental control, wherever so specified by the Engineer.

Suitable auxiliary bitumen boiler of adequate capacity with self heating arrangement and temperature control device. The boiler shall be fitted with temperature indicating instruments.



## REQUIREMENT FOR ESSENTIAL FEATURES FOR PAVER FINISHER

- (a) Loading hoppers and suitable distributing mechanism.
- (b) All drives having hydrostatic drive / control.
- (c) The machine shall have a hydraulically extendable screed for appropriate width requirement.
- (d) The screed shall have temping and vibrating arrangement for initial compaction to the layer as it is spread without rutting or otherwise marring the surface. It shall have adjustable amplitude and infinitely variable frequency.
- (e) The paver shall be equipped with necessary control mechanism so as to ensure that the finished surface is free from surface blemishes.
- (f) The paver shall be fitted with an electronic sensing device for automatic leveling and profile control within the specified tolerances.
- (g) The screed shall have thinternal heating arrangement 20 mm thick M.S.S. can be laid by means of self propelled mechanical paver with suitable lines grades and cross section.

Signature of Contractor.

Executive Engineer,  
Panchayat R.& B. Division,  
Jamangar.

Name of Work: -  
TALUKA :- Jamnagar

DISTRICT :- Jamnagar

# MATERIAL

# SPECIFICATIONS

## **SPECIFICATIONS OF MATERIALS**

### **M-1. Water**

- 1.1 Water shall not be salty brackish and shall be clean, reasonably clear and free objectionable quantities of silt and traces of oil and injurious alkalies, salts, organic matter and other deleterious material which will either weaken the mortar of concrete or cause efflorescence or attack the steel in R.C.C. Container for transport, storage and handling of water shall be clean. Water shall conform to the standard specified in I. S. 456 – 1978.
- 1.2 If required by the Engineer – in – charge it shall be tested by comparison with distilled water. Comparison shall be made by means of standard cement tests for soundness, time of setting and mortar strength as specified in I. S. 269 – 1976. Any indication of unsoundness, change in time of setting by 30 minutes or more or decrease of more than 10 per cent in strength, of mortar prepared with water sample when compared with the results obtained with mortar prepared with distilled water shall be sufficient cause for rejection of water under test.
- 1.3 Water for curing mortar, concrete or masonry should not be too acidic or too alkaline. It shall be free of elements which significantly affect the hydration reaction or otherwise interfere with the hardening of mortar or concrete during curing or those which produce objectionable stains or other unsightly deposits on concrete or mortar surfaces.
- 1.4 Hard and bitter water shall not be used for curing.
- 1.5 Potable water will generally found suitable for curing mortar or concrete.

### **M-2 Lime**

- 2.1 Lime shall be hydraulic lime as per I. S. 712 – 1973 Necessary tests shall be carried out as per I. S. 6932 (Parts I to X) 1973.
- 2.2 The following field tests for limes are to be carried out :
  1. A very rough idea can be formed about the type of lime by its visual examination i.e. fat lime bears pure white colour, lime in form of porous of dirty white colour indicates quick lime, and solid lumps are the unburnt lime stone.

2. Acid tests for determining the carbonate content in time Excessive amount of impurities and rough determination of class of lime.
- 2.3 Storage shall comply with I. S. 712 – 1973. The slaked lime, if stored, shall be kept in a weather proof and damp – proof shed with impervious floor and sides to protect it against rain, moisture, weather and extraneous materials mixing with it. All lime that has been damaged in any way shall be rejected and all rejected materials shall be removed from site of work.
- 2.4 Field testing shall be done according to I. S. 1624-1974 to show the acceptability of materials.
- M-3 Cement
- 3.1 Cement shall be ordinary Portland slag cement as per I. S. 269-1976 or Portland slag cement as per I. S. 455-1976.
- M-4 White Cement
- 4.1 The white cement shall conform to I. S. 8042 – E – 1978.
- M-5 Coloured Cement
- 5.1 Coloured cement shall be with white or grey Portland cement as specified in the item of the work.
- 5.2 The pigments used for coloured cement shall be of approved quality and shall not exceed 10% of cement used in the mix. The mixture of pigment and cement shall be properly ground to have a uniform colour and shade. The pigments shall have such properties as to provide for durability under exposure to sunlight and weather.
- 5.3 The pigment shall have the property such that it is neither affected by the cement nor detrimental to it.
- M-6 Sand
- 6.1 Sand shall be natural sand, clean, well graded, hard strong, durable and gritty particles free from injurious amounts of dust, clay lumps, nodules, soft or flaky particles shale, alkali salts organic matter, loam, mica or other deleterious substances and shall be got approved from the Engineer – in charge. The sand shall not contain more than

than 8 per cent of silt as determined by field test. If necessary the sand shall be washed to make it clean.

- 6.2 Coarse Sand : The fineness modulus of coarse sand shall be less than 2.5 and shall not exceed 3.0. The sieve analysis of coarse shall be as under :

I. S. Designation	Sieve passing sieve	Percentage by weight Designation	I. S. Sieve Percentage by passing sieve
4.75mm	100	600 Micron	30 – 100
2.36 mm	90 to 100	300 Micron	05 – 70
1.18 mm	70 – 100	150 Micron	00 – 50

- 6.3 Fine Sand :

The fineness modulus shall not exceed 1.0. The sieve analysis of fine sand shall be as under :

I. S. Designation	Sieve passing sieve	Percentage by weight Designation	I. S. Sieve Percentage by passing sieve
4.75mm	100	600 Micron	30 – 100
2.36 mm	90 to 100	300 Micron	05 – 70
1.18 mm	70 – 100	150 Micron	00 – 50

M-7 Stone Dust

- 7.1 This shall be obtained from crushing hard black trap or equivalent. It shall not contain more than 8% of its as determined by field test will measuring cylinder. The method of determining silt contents by fields test is given as under.
- 7.2 A sample of stone dust to be tested shall be placed without drying in 200 mm. measuring cylinder. The quantity of the sample shall be such that it fills the cylinder up to 100 mm. mark. The clean water shall be added up to 150 mm. mark. The mixture shall be stirred vigorously and the content allowed to settle for 3 hours.
- 7.3 The height of silt visible as settled layer above the stone dust shall be expressed as percentage of the height of the stone dust below. The stone dust containing more than 8% silt shall be washed so as to bring the content within the allowable limit.
- 7.4 The fineness nodules of stone dust shall not be less than 1.80.

M-8 Stone Grit

8.1 Grit shall consist of crushed or broken stone and be hard, strong, dense, durable, clean of proper gradation and free from skin or coating likely to prevent proper adhesion of mortar. Grit shall generally be cubical in shape and as far as possible flakey elongated pieces shall be avoided. It shall generally comply with the provisions of I. S. 383-1970. Unless special stone of particular quarries is mentioned grit shall be obtained from the best black trap or equivalent hard stone as approved by the Engineer – in – charge. The grit shall have no deleterious with cement.

8.2 The grit shall conform to the following gradation as per sieve analysis :

-----			
I. S. Designation	Sieve passing sieve	Percentage by weight Designation	I. S. Sieve Percentage by passing sieve
-----			
12.50 mm	100 %	4.75 mm.	0 – 20 %
10.00 mm	85 – 100 %	2.36 mm	0 – 25 %
-----			

8.3 The crushing strength of grit will be such as to allow the concrete in which it used to build-up the specified strength of concrete.

8.4 The necessary tests for grit shall be carried out as per the requirements of I. S. 2386 – (Parts – 1 or VIII) 1963, as per instructions of the Engineer – in – charge. The necessity of test will be decided by the Engineer – in – charge.

M-9 Clinder

9.1 Clinder is will burnt furnace residue which has been fused or sintered into lumps of varying sizes.

9.2 Clinder aggregates shall be well burnt furnace residue obtained from furnace using coal fuel only. It shall be sound clean and free from clay, dirt, ash or other deleterious matter.

9.3 The average grading for clinder aggregate shall be as mentioned below :

-----			
I. S. Sieve	Percentage	Sieve Designation	Percentage Passing
-----			
20 mm.	100	4.75 mm	70
10 mm	86	2.36 mm	52
-----			

#### M-10 Lime Mortar

10.1 Lime : Lime shall conform to specification M-2 Water : Water shall conform to specification M-1 Sand : Sand shall conform to specification M-6.

10.2 Proportion of Mix :

10.2.1 Mortar shall consist of such proportions of slaked lime and sand as may be specified in item. The slaked lime and sand shall be measured by volume.

10.3 Preparation of Mortar :

10.3.1 Lime mortar shall be prepared by wet process as per I. S. 1625-1971. Power driven mill shall be used for preparation of lime mortar. The slaked lime shall be placed in the mill in an even layer and ground for 180 revolution with a sufficient water. Water shall be added as required during grinding (care being taken not to add more water) that will bring the mixed material to a consistency of stiff paste. Thoroughly wetted sand shall then be added evenly and the mixture ground for another 180 revolutions.

10.4 Storage :

10.4.1 Mortar shall always be kept damp, protected from sun and rain till used up, covering it by tarpaulin or open sheds.

10.5 Use :

10.5.1 All mortar shall be used as soon as possible after grinding. It should be used on the day on which it prepared. But in no case mortar made earlier than 36 hours shall be permitted for use.

#### M-11 Cement Mortar

11.1 Water shall conform to specification M-1 Cement : Cement shall conform to specifications M-3 Sand : Sand shall conform to M-6.

11.2 Proportion of Mix

11.2.1 Cement and sand shall be mixed to specified proportion, sand being measured by measuring boxes, the proportion of cement will be by volume on the basis of 50 Kg. / Bag of cement being equal to 0.0342 Cu.M. The mortar may be hand mixed or machine mixed as directed.

11.3 Proportion of Mortar :

11.3.1 In hand mixed mortar, cement and sand in the specified proportions shall be thoroughly mixed dry on a clean impervious platform by turning over at least 3 times or more till a

homogeneous mixture of uniform colour is obtained. Mixing platform shall be so arranged that no deleterious extraneous material shall get mixed with mortar or mortar shall flow out. While mixing, the water shall be gradually added and thoroughly mixed to form a stiff plastic mass of uniform colour so that each particle of sand shall be completely covered with a film of wet cement. The water cement ratio shall be adopted as directed.

11.3.2 the mortar so prepared shall be used within 30 minutes of adding water. Only such quantity of mortar shall be prepared as can be used within 30 minutes.

M-12 Stone coarse Aggregate For Nominal Mix Concrete :

12.1 Coarse aggregate shall be of machine crushed stone of black trap or equivalent and be hard, strong, dense, durable, clean and free from skin and coating likely to prevent proper adhesion of mortar.

12.2 The aggregate shall generally be cubical in shape. Unless special stones of particular quarries are mentioned aggregates shall be machine crushed from the best black trap or equivalent hard stone as approved. Aggregate shall have no deleterious reaction with cement. The size of the coarse aggregate for plain cement and ordinary reinforced cement concrete shall generally be as per the table given below. However, in case of reinforced cement concrete the maximum limit may be restricted to 6 mm. less than the minimum lateral clear distance between bars or 6 mm. less than cover whichever is smaller.

TABLE

I. S. Sieve Designation	Percentage passing for single Sized aggregates of Nominal Size			I. S. Sieve Designation	Percentage passing for single Sized aggregates of Nominal Size		
	40mm	20mm	16mm		40mm	20mm	16mm
80 mm	-	-	-	12.5 mm	-	-	-
63 mm	100	-	-	10 mm	0.5	0.20	0.30
40 mm	85-100	100	-	4.75 mm	-	0.5	0.5
20 mm	0-20	85-100	100	2.35 mm	-	-	-
16 mm	85-100	-	-				

Note : This percentage may be varied some what by the Engineer – in – charge when considered necessary for obtaining better density and strength of concrete.



- 12.3 The grading test shall be taken in the beginning and at the change of source of materials. The necessary tests, indicating I. S. 383-1970 and 456-1978 shall have to be carried out to ensure the acceptability. The aggregates shall be stored separately and handled in such a manner as to prevent the intermixing of different aggregates. If the aggregates are covered with dust, they shall be washed with water to make them clean.

M-13 Black Trap or Equivalent Hard Stone Coarse

- 13.1 Aggregate For Design Mix Concrete : Coarse aggregate shall be of machine crushed stone of black trap or equivalent hard stone and be hard, strong, dense, durable, clean and free from skin and coating likely to prevent proper adhesion of mortar.
- 13.2 The aggregates shall generally be cubical in shape. Unless special stones of particular quarries are mentioned, aggregates shall be machine crushed from the best, black trap or equivalent hard stones as approved, Aggregates shall have no deleterious with cement.
- 13.3 The necessary tests indicated in I. S. 383-1970 and I. S. 456-1978 shall have to be carried out to ensure the acceptability of the material.

- 13.4 If aggregate is covered with dust it shall be washed with water to make it clean.

M-18 Mild Steel Bars

- 18.1 Mild steel bars reinforcement for R.C.C. work shall conform to I. S. 432 (Part - II) 1966 and shall be of tested quality. It shall also comply with relevant part of I. S. 456-1978.
- 18.2 All the reinforcement shall be clean and free from dirt, paint, grease, mill scale or loose or thick rust at the time of placing.
- 18.3 For the purpose of payment, the bar shall be measured correct up to 10 mm. length and weight payable worked out at the rate specified below.

1.	06 mm.	0.22 Kg/Rmt.	08.	20 mm.	2.47 Kg/Rmt.
2.	08 mm.	0.39 Kg/Rmt.	09.	22 mm.	2.98 Kg/Rmt.
3.	10 mm.	0.62 Kg/Rmt.	10.	25 mm.	3.85 Kg/Rmt.
4..	12 mm.	0.89 Kg/Rmt.	11..	28 mm.	4.83 Kg/Rmt.
5.	14 mm.	1.21 Kg/Rmt.	12.	32 mm.	6.31 Kg/Rmt.
6.	16 mm.	1.58 Kg/Rmt.	13.	36 mm.	7.99 Kg/Rmt.
7.	18 mm.	2.00 Kg/Rmt.	14.	40 mm.	9.86 Kg/Rmt.

M-19 High Yield Strength Steel Deformed Bars

- 19.1 High yield strength steel deformed bars shall be either cold twisted other rolled and shall conform to I. S. 1786-1966 and I. S. 1139-1966 respectively.
- 19.2 Other provisions and requirements shall conform to specification No. M-18 for Mild Steel Bars.

M-20 High Tensile Steel Wires

- 20.1 The high tensile wires for use in prestressed concrete work shall conform to I. S. 2090-1962.
- 20.2 The tensile strength of the high tensile steel bars shall be as specified in the item. In absence of the given strength the minimum strength shall be taken as per para 6-1 of the I. S. 1785-1962. Testing shall be done as per I. S. requirements.
- 20.3 The high tensile steel shall be free from loose mill scale, rust, oil, grease, or any other harmful matter. Cleaning of steel bars may be carried out by immersion in solvent solution, wire brushing or passing through.

M-21 Mild Steel Binding Wire

- 21.1 The mild steel wire shall be of 1.63 mm. or 1.22 mm. (16 to 18 guage) diameter and shall conform to I. S. 280-1972.
- 21.2 The use of black wire will be permitted for binding reinforcement bars. It shall be free from rust, oil, paint, grease, loose mill scale or any other undesirable coating which may prevent adhesion of cement mortar.

M-22 Structural Steel

- 22.1 All structural Steel shall conform to I. S. 226-1985. The steel shall be free from the defects mentioned in I. S. 226-1975 and shall have a smooth finish. The material shall be free from loose mill scale, rust pits or other defects affecting the strength and durability. River bars shall conform to I. S. 1148-1973.
- 22.2 When the steel is supplied by the Contractor test certificate of the manufacturers shall be obtained according to I. S. 226-1975 and other relevant Indian Standards.

M-27 Expansion Joints – Premoulded filler

- 27.1 The item provides for expansion joints in R. C. C. frame structures for internal joints, as well as exposed joints, with the use of premoulded bituminous joint filler.
- 27.2 Premoulded bituminous joints filler i.e. performed strip of expansion joints filler shall not get deformed or broken by twisting bending or other handling when exposed to atmospheric condition. Pieces of joints filler that have been damaged shall be rejected.
- 27.3 Thickness of the premoulded joints filler shall be 25 mm. unless otherwise specified.
- 27.4 Premoulded bituminous joints filler shall conform to I. S. 1838-1961.

M-28 Expansion joints – Copper strips & hold fasts

- 28.1 The item provide for expansion joints in R.C.C. frame structure for internal joints, as well as exposed joints, with the use of premoulded bituminous joints filler.
- 28.2 Copper sheet shall be of 1.25 mm. width and or 1.25 mm. width and the “ U “ shape in the middle. Copper strip shall have holdfast of 3 mm. diameter copper rod fixed to the plate soldered on strip at intervals of about 30 cm. or as shown in the drawing or as directed. The width of each flange (horizontal side) of the copper plate to be embedded in the concrete work shall be 25 mm. depth of “ U “ to be provided in the expansion joint, in the copper plate shall be of 25 mm.

M-77 Selected Earth

- 77.1 The selected earth shall be that obtained from excavated material or shall have to be brought from outside as indicated in the items. If item does not indicate anything the selected earth shall have to be brought from outside.
- 77.2 The selected earth shall be good yellow soil and shall be got approved from the Engineer – in – charge. In no case black cotton soil or similar expansive and shrinkable soil shall be used. It shall be clean and free from all rubbish and perishable materials, stones or brick bats. The clods shall be broken to a size of 50 mm. or less. Contractor shall make his own arrangement at his own cost for land for borrowing selected earth. The stacking of material shall be done as directed by the Engineer – in – charge in such a way not to interfere with any constructional activities and in proper stacks.

77.3 When excavated material is to be used, only selected stuff got approved from the Engineer – in – charge shall be used. It shall be stacked separately and shall comply with all the requirements of selected earth mentioned above.

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