

# **PANCHAYAT ( R & B ) DIVISION**

## **RAJPIPLA.**



**NAME OF WORK:- Constructing R.C.C. Road From Village :  
Amiyar to Kodba Road. (V.R.) Taluka :- Sagbara. District:  
Narmada. ( Missing Link )**

## **DETAILED SPECIFICATIONS.**

## GENERAL TECHNICAL SPECIFICATION 1. General:

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

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

## 2 MEASUREMENT OF LEAD FOR MATERIALS

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

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

## 3 Surface, Regularity

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

**PERMITTED TOLERANCES OF SURFACE REGULARITY FOR PAVEMENT COURSES**

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

**Notes.**

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

**3.1 Rectification**

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

**3.2 Bituminous constructions**

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

**4.0 Quality control tests during Construction**

The materials supplied and the works carried out by the contractor shall conform to the enclosed relevant specifications. For ensuring the requisite quality of construction, the materials and works shall be subjected to quality control tests, as described here in after, by the Engineer-in-charge . Test procedures for the various quality control test are indicated in the respective sections of the Specifications or for certain tests within this section. Where no specific testing procedure is mentioned, the test shall be carried out as per the prevalent accepted Engineering practice to the directions of the Engineer-in-charge.

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

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

**ITEM No [1] Box cutting the road surface to proper slope and camber for making a base of road work including removing the excavated stuff and depositing on the road side slopes directed up to 50 mts. Lead.**

The sub grade/sub-base/ base to receive the water bound macadam course shall be prepared to the specified grade and camber and made of dust and other extraneous materials. Any nets or soft places shall be corrected in on approved manner and rolled until firm.

Cutting shall be paid on cross section area as established by the longitudinal level and cross sections for this purpose. The work shall be started after the initial longitudinal section of the ground and cross sections are taken and recorded.

The final surface shall confirm to proper profile, camber and super-elevation etc. as directed by the Engineer. The earthwork shall be paid on sectional measurements, cross sectional etc taken.

No allowance or payments shall be made for materials excavated prior to the taking of levels by the Engineer.

The rate is inclusive of cutting in all soil and Murrum including removal of all shrubs, jungle cutting, cutting stuff in slopes, side drain bank etc complete. This item also includes the clearing the sides and demarking the line as per requirement and cutting out the. existing trees on the road side, no extra payment will be paid for

at the time of preparing final bill, the road formation in embankment and cutting shall have be perfect condition true to grade, camber and side slope duly dressed and damages due to rain cuts etc., during entire working period shall have to be done by the contractor.

The work taken in length shall be completed in all respects viz. width, grades, camber, side drains, side slopes etc. and measurements for incomplete work shall not be taken otherwise

**1.0 Mode of Measurement & Payment:**

- 1.1.** The unit rate box cutting shall include the cost of all materials, tools and plant required for excavation in all type of soils in grade and camber, line and levels and finishing as per direction of the Engineer-in-charge, excavation and all other incidental expenses for producing item of box cutting of specified breadth and depth and grade to complete the item or its components as shown on the drawings and according to these specifications.
- 1.2.** The box cutting shall be measured for its cross sectional area and computing volumes of earth work in cubic metres by the method of average end areas
- 1.3.** The payment will be made on **Cubic Metre basis** of the finished work.

- ITEM [2]** Providing and laying compacted WBM of Grading-II MCBT metal of size 45 to 63mm in required layers including using 16% stone screening, 13.2mm size and 8% stone dust as filler including spreading watering & consolidation by vibratory roller etc. comp.

#### 404.1 SCOPE

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

#### 404.2 Materials

##### 404.2.1 Coarse Aggrtegates

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

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

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

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

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

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

#### **404.2.2 Crushed Broken Stone**

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

#### **404.2.3 Crushed Slag**

Crushed slag shall be made from air-cooled blast furnace slag. It shall be of angular shape, reasonably uniform in quality and density and generally free from thin, elongated and soft pieces, dirt or other deleterious materials. The weight of crushed slag shall not be less than 11.2 kN per m<sup>3</sup> and the percentage of glossy material shall not be more than 20. It should also comply with the following requirements:

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

#### **404.2.4 Overburnt (Jhama) Brick aggregates :**

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

#### **404.2.5 Grading requirement of Coarse aggregates :**

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

#### 404.2.6 Screenings

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

**TABLE 400-9 : GRADING REQUIREMENTS OF COARSE AGGREGATES**

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

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

Screenings shall conform to the grading set forth in Table 400–10. The quantity of screenings required for various grades of stone aggregates are given in Table 400–11. The table also gives the quantities of materials (loose) required for 10 m<sup>2</sup> for sub-base / base compacted thickness of 75 mm. The use of screenings shall be omitted in the case of soft aggregates such as brick metal, kankar, laterites etc. as they are likely to get crushed to a certain extent under rollers.

#### 404.2.7 Binding Material

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

The quantity of binding material where it is to be used will depend on the type of screening. Generally, the quantity required for 75 mm compacted thickness of water bound macadam will be 0.06 – 0.09 m<sup>3</sup> / 10 m<sup>2</sup>.

**TABLE 400 – 10. GRADING FOR SCREENINGS**

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

**TABLE 400 – 11. APPROXIMATE QUANTITIES OF COARSE AGGREGATES AND SCREENINGS REQUIRED FOR 75 MM COMPACTED THICKNESS OF WATER BOUND MACADAM (WBM) SUB-BASE / BASE COURSE FOR 10 M<sup>2</sup> AREA**

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

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



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

#### **404.3 Construction Operations**

##### **404.3.1 Preparation of base :**

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

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

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

##### **404.3.2 Inverted Choke / Sub surface Drainage layer**

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

##### **404.3.3 Lateral Confinement of Aggregates**

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

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

#### **404.3.4 Spreading coarse aggregates**

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

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

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

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

#### **404.3.5 Rolling:**

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

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

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

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

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

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

#### **404.3.6 Application of screenings:**

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

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

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

#### **404.3.7 Sprinkling of water and grouting :**

After application of screenings, the surface shall be copiously sprinkled with water, swept and rolled. Hand brooms shall be used to sweep the wet screenings into voids and to distribute them evenly. The sprinkling, sweeping

and rolling operation shall be continued, with additional screenings applied as necessary until the coarse aggregate have been thoroughly keyed, well-bonded and firmly set in its full depth and a grout has been formed of screenings. Care shall be taken to see that the sub base or sub grade does not get damaged due to the addition of excessive quantities of water during construction.

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

**Application of binding material :**

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

**404.3.8 Setting and drying :**

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

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

**404.4 Surface Finish and Quality Control of Work**

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

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

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

**404.4.4 Reconstruction of defective macadam :**

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

**404.5 Arrangement for Traffic**

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

**404.6 Mode of Measurement & payment**

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

**404.7 RATE**

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

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

**ITEM No. Providing & Filling in foundation with ordinary Cement Concrete M- 100 [3] mix & Providing necessary Vertical Pin & headers incl form work vibrating ramming and curing etc. complete**

- 1 In case of ordinary concrete, mix is not required to be designed by preliminary tests and proportions of cement, fine aggregate and coarse aggregate are specified by column as given in tables below for different grades of concrete designated as ordinary m – 100 M – 150 M – 200 and M – 250 .
- 2 In the designation of a concrete mix, letter “ M “ referrers to the mix and the number the specified 28 days works cube compressive strength of that mix on 150 mm cubes, expressed in Kg /cm<sup>2</sup>
- 3 The ordinary concrete mix shall generally be specified by volume shall be worked out taking 50 Kg of cement as 0.035 cubic meter in volume . While measuring aggregate by Volume shaking ramming or hammering shall not be done. Proportioning of sand shall be as per its dry volume in case it is dump allowance for bulking shall be made as per IS : 2386 ( Part – II )
- 4 Ingredient required for ordinary concrete containing one 50 Kg bad of cement of different proportions of mix shall be as given in table below.

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

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

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

**Note 2 :-** A mix leaner than M – 100 ( 1:3:6) may be used for non structural parts, if provided in the contract. in such case grading of aggregate shall be by volume . other requirement for mixing, placing and curing shall be the same.

- 5 Following shall be the maximum nominal size of coarse aggregate for the different items of work :

Sr. No.	Item of construction	Maximum nominal size of
(i)	RCC well curb, RCC well steining and RCC piles	40 mm
(ii)	RCC well seining	63 mm
(iii)	Well cap or pile cap, solid type	40 mm
(iv)	RCC work in cross girders deck slab, wearing coars, kerb, light	20 mm
	light ports, blast walls, approach slab etc and hollow type piers, abutment wings wall and their pier caps	
(v)	For any other item of construction not covered by item ( i ) to (v)	as specified on the drawing or as desired by the engineer in charge in

For heavily reinforced concrete members as in the case of ribs of main beams nominal maximum size of aggregate shall usually be restricted to 5 mm less than the minimum cover to the reinforcement, whichever is the smaller

- 6 Fine aggregate shall be clean, hard, coarse sand, it shall be free from dust and such other substance. The sand be got approved by the Engineer in charge.
- 7 All materials shall be stored as to prevent their deterioration or instruction of their quality and fitness for the work. Any materials which has deteriorated or has been damaged or is other wise considered defective by the Engineer – in – charge shall not be used in the works
- 8 Cement shall be stored above the ground level in perfectly dry and water tight sheds. Wherever bulk storage containers are used, their capacity should be sufficient to cater to the requirement at sit and should be cleaned at least once every 3 to 4 months. The aggregate shall be stored in such a was as to prevent admixture of foreign materials. Different size of fine or coarse aggregate shall be stored in such a way as to prevent admixture of foreign materials. Different size of fine or coarse aggregate shall be stored in separate stock piles sufficiently away from the other to prevent iner mixing the materials.

- 9 The water for mixing shall be potable water to satisfaction of the engineer in charges. The quantity of water shall be just sufficient to produce a dense concrete of required workability for the job.
- 10 For all work concrete shall be mixed in a mechanical mixer which along with other accessories shall be kept in first class working condition and so maintained through out the construction . Mixing shall be continued till materials are uniformly distributed and uniform colour of the entire mass is obtained and each individual particle of the coarse aggregate show complete coating mortar containing its proportionate amount of cement in no case shall the mixing be done for less than 2 minutes after all ingredients have been put in to the mixer
- 11 When hand mixing is permitted by the Engineer in charge for small jobs or for certain other reasons. It shall be on a smooth water tight platform large enough to allow efficient turning over of the ingredients of concrete before and after adding water. Mixing platform shall be so arranged that no foreign materials shall get mixed with concrete nor does the mixing water flow out. Cement in required number of bags shall be placed in a uniform layer on top of the measured quantity of fine and coarse aggregate. which shall also be spread in a layer of uniform thickness on the mixing platform. Dry coarse and fine aggregate and cement shall then be mixed thoroughly by turning over to get a mixture of uniform colour. Enough water shall then be added gradually through a rose can and the mass turned over till a mix of required consistency is obtained. In hand mixing quantity of cement shall be increase by 10 percent above that specified.
- 12 Mixers which have been out of use for more than 30 minutes shall be thoroughly cleaned before putting in a new batch. Unless otherwise agreed to be the Engineer – in – charge, the first batch of concrete from the mixer shall contain only two thirds of normal quantity of coarse aggregate. Mixing plant shall be thoroughly cleaned before changing from one type of cement to another
- 13 The method of transporting and placing concrete shall be approved by the engineer in charge . Concrete shall be so transported and placed that no contamination, segregation or loss of its constituent materials takes places. All form work and reinforcement contained in it shall be cleaned and made free from standing water, dust snow or ice immediately before placing of concrete. No concrete shall be placed in any part of the structure until the approval of the Engineer – in – charge has been obtained
- 14 If concreting is not started within 24 hours of the approval being given, It shall have to be obtained again from the Engineer- in – charge .Concreting being given it shall proceed continuously over the area between construction joints . Fresh concrete shall not be placed against concrete which has been in position for more than 30 minutes unless a proper construction joint is formed . Concrete shall be compacted in its final position within 30 minutes of its



discharge from the mixer unless carried in properly design agitators, operating continuously. When this time shall be within 2 hours of the additional of cement to the mix and within 30 minutes of its discharge from the agitator. Except where otherwise depth of not more than 45 metre when internal vibrators are used and not exceeding 0.30 metre in all other cases.

- 15 Unless otherwise agreed to by the engineer in charge concrete shall not be dropped in to place from a height exceeding 2 metres. When trunking of chutes are used they shall be kept clean and used in such a way as to avoid segregation. When concreting has to be resumed on a surface which has hardened, it shall be roughened, swept, clean, thoroughly wetted and covered with a 13 mm thick layer of mortar shall be freshly mixed and placed immediately before placing of new concrete. Where concrete has not fully hardened, all laitance shall be removed by scrubbing the well surface with wire

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

- 16 All concrete shall be compacted to produce a dense homogeneous mass with the assistance of vibrators, unless otherwise permitted by the engineer – in – charge for exceptional cases, such as concreting under water, where vibrators can not be used. Sufficient vibrators in serviceable condition shall be kept at site to that spare equipment is always available in the event of break downs

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

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

- (a) Shuttering i.e., form work required for forming the concrete
- (b) Scaffolding i.e., form work required for supporting shuttering. Forms for shuttering shall be constructed only in metal suitably lined. Forms for scaffolding shall be constructed of metal or timber. Both shuttering and scaffolding shall be or substantial rigid construction and shuttering shall be true to shape and dimensions shown on the drawings. All bolts and rivets shall be counter sunk and well ground to provide a smooth, plane surface

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

The formwork should take due account of the calculated amount of positive or negative camber so as to ensure the correct final shape of the structures having regard to the deformation of a false work, scaffolding or propping and the

camber so as to ensure the correct final shape of the structures having regard to the deformation of a false work, scaffolding or propping and the instantaneous or deferred deformation due to various causes affecting pre stressed structures. Where there are re entrant angles in the concrete sections the formwork should be removed at those sections as soon as possible after the concrete has set in order to avoid cracking due to shrinkage of concrete. Formwork shall be tight enough to prevent any appreciable loss of cement during vibrations, suitable tolerances should be provided in the formwork. Immediately before concreting all forms shall be thoroughly cleaned. Contractor shall give the Engineer in charge due notice before placing any concrete in the forms to permit him to inspect and accept the false work and forms as to their strength alignment and general fitness, but such inspection shall not relieve the contractor of hues responsibility for safety of men, machinery, materials and for results obtained.

- 22 The Engineer in charge shall be informed in advance by the contractor of his intention to strike any formwork. While fixing the time for removal of formwork, due consideration shall be given to local conditions, character of the structure, the weather and other conditions that influence the setting of concrete and of the materials used in the mix. Where field operations are controlled by strength tests of concrete, the removal of the load supporting or soffit forms may commence when concrete has attained strength equal to at least twice the stress to which the concrete will be subjected at the time of striking props including the effect of any further addition of loads. When field operations are not controlled by strength tests of concrete the vertical forms of beams, columns and walls, may be removed after 2 days. The props of slabs and beams may be removed after 14 and 21 days respectively. All formwork shall be removed without causing any damage to the concrete. Centering shall be gradually and uniformly lowered in such a manner as to permit the concrete to take stresses due to its own weight uniformly and gradually. Where internal metal ties are permitted, they or their removable parts shall be extracted without causing any damage to the concrete and remaining holes filled with mortar. No permanently embedded metal part shall have less than 25mm. cover to the finished concrete surface. Where it is intended to reuse the formwork, it shall be cleaned and made good to the satisfaction of the Engineer in charge.
- 23 Immediately after removal of forms, all exposed bars or bolts passing through the Cement concrete member and used for shuttering or any other purpose shall be cut inside the cement concrete member to a depth of at least 25mm. below the surface of the concrete and the resulting holes be filled by cement mortar. All fins caused by form joints, all cavities produced by the removal of form ties and all other holes and depressions, honeycomb spots, broken edges or corners and other defects, shall be thoroughly cleaned, saturated with water and carefully pointed and rendered true with mortar of cement and fine aggregate mixed in the proportions used in the grade of concrete that is being finished and of as dry as consistency as is possible to use. Considerable pressure shall be applied in filling and pointing to ensure thorough filling in all voids. Surfaces which have been pointed shall be kept moist for a period of twenty four hours. If rock pockets/honeycombs, in the opinion of the Engineer in charge are of such an extent or character as to affect the strength to the structure materially or to endanger the life of the steel reinforcement, he may declare the concrete defective and require the removal and replacement of the portions of the structure affected.
- 24 In the case of reinforced concrete work workability shall be such that the concrete surrounds and properly grips all reinforcement. The degree of consistency, which shall depend upon the nature of work and methods of vibration of concrete shall be determined by regular slump tests. Following slump shall be adopted for different types of works

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

- 25 Work strength tests shall be made in accordance with IS : 516. Each test shall be conducted on ten specimens. five of which shall be tested at seven days and the remaining five at 28 days. The samples of concrete shall be taken on each day of concreting and cubes shall be made at the rate of one for every 5 cubic metre of concrete or a part thereof. However, if concreting done in a day is less than 15 cubic metre the minimum number of cubes can be reduced to 6 with the specific permission of the Engineer in charge

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

- 26 The average strength of the group of cubes cast for each day shall not Be less than the specified works cube strength,20 per cent of the cubes cast for Each day may have values less than the specified strength, provided the lowest value is not less than 85 per cent of the specific strength
- 27 R.C.C.work shall have exposed concrete surface. Centering design and Its erection shall approved by the Engineer in charge.One carpenter with helper will invariably be kept present through out the period of concreting.Movement of labour and other persons shall be totally prohibited over reinforcement laid

in position. For access to different parts, suitable mobile platforms shall providedso that steel reinforcement in position is not disturbed. For ensuring proper cover,motar blocks of suitable size shall be cast and tied to the reinforcement. Timber,kapchi or metal pieces shall not be used for this purpose. Concreting of important structural members shall always be done in the presence and underthe supervision of departmental person not below the rank of Asstt. Engineer / Addl. Asstt. Engineer, Overseer or as instructed by the Engineer in charge. After removal of form work checks that concrete produced is of good quality.Plastering shall not be allowed to the expressed faces of concrete.

- 28 In reinforced concrete the volume occupied by reinforcement shall not be The slab shall be measured as running continuously through and the beam as the portion below the slab.
- 29 All necessary labour, materials,equipment, etc,for sampling, preparing test cubes curing etc. shall be provided by the Contractor. Testing of the materials and concrete may be arranged by the Engineer in charge in an approved laboratory at the cost of the contractor.

- 30 The payment will be made on cmt. basis of the finished work
- 31 The unit rate for concrete shall include the cost of all materials,labour tools and plan required for mixing, placing in position, vibrating and compacting finishing as per directions of the Engineer in charge,curing and all other incidental expenses for producing concrete of specified strength to complete structure or its components as show on the drawings and according to these specifications. The rate shall also include the cost of making / fixing and removing of all centres and forms required for the work

**ITEM No. Providing and casting in situ Ordinary Cement Concrete M - 200 for [4] Approach Slab including Form Work curing and Finishing Complete.**

The work shall be carried out as per relevant specification of this Tender Item No. - 3. The grade of concrete shall be **Ordinary C. C. M- 200**. The concreting shall be done as per detailed drawing. The contract unit rate includes centering, shuttering, scaffolding, wherever necessary laying, vibrating, curing and finishing comp.

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

**ITEM No. Providing Trimix Machine for levelling smooth, finish-ing including  
[6] channel fixing electric supply etc & dewatering of excess water through  
vacuum pump incl. transporting for machine incl. expansion joints filling  
asphalt filler etc. complete as directed.**

The process of trimix concrete work is inclusive of using following equipments

**1 Compactor :-**

Surface compactor is to be used for compacting the existing surface on which the concrete work is to be applied . The surface shall be compacted well with compactor before the concrete work is started.

**2 Concrete Mixer :-**

Concrete mixer of adequate capacity shall be used for mixing of in gradients C.C. work to be provided

**3 Double Beam Screed Board Vibrator :-**

Double beam screed board vibrator equipped with self traveling and only to be guided long the form work pulled by two operators at both ends with power unit 2 H.P. electric motor is to be used for surface vibration on concrete laid over the existing surface

**4 Vacuum Pump :-**

Vacuum pump is to be used for removal of excess water from concrete slab after compaction and leveling allowing faster floor finishing having power unit with 7.5 H.P. electric motor and with pump capacity 110 M3/ Hour

**5 Top & Bottom Mat :-**

Bottom mat ( sieve mat ) is to be used for preventing escape of concrete particles when vacuum dewatering takes place of having tailor made maximum size 7.00 mtr x 5.00 mtr top mat as to be spread easily and in size of 7.00 mtr x 5.00 mtr.

**6 Disc Float.:-**

Disc float having power unit with 3 H.P. electric motor is to be used for removed of undulations in laid surface prior to finish, fitted with circular disc

**7 Power Trowel :-**

For perfect finishing of surface power trowel is to be used fitted with 4 Nos of adjustable blades and power unit with 3 H.P. electric motor

The work shall be inclusive of using all labour and equipments with necessary operation of equipments with fuel and oil, lubricants and consumption of electricity etc and inclusive of mixing of the concrete in specified proportion, preparation of the existing surface for applying mix and applying the over the prepared existing surface

**8 Rate :-**

The rate are inclusive of all labour, equipment, power , fuel, lubricants as explained above to be utilized and exclusive of materials of mix of concrete. This is to be applied for the work. The unit of the rate shall be **Square Meter** basis

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

**Executive Engineer  
Panchayat ( R & B) Division  
Rajpipla.**