

NAME OF WORK: - CAMPUS DEVELOPMENT WORK IN DISRA AT SECTOR 14 GANDHINAGAR.

ITEM WISE SPECIFICATION

Item No:- 1

Box cutting the road surface to proper slope and camber for making a base for road work including removing the excavated stuff and depositing on the road side slope as directed up to 50Mt.lead.

1. This work shall consist of excavation, removal and satisfactory disposal of all materials necessary for the construction of widening carriageway in accordance with requirements of these specifications and the lines, grades and cross sections shown in the drawings or as indicated by the Engineer.
2. After the site has been cleared the limits of excavation box cutting the road surface shall be set out true to lines, curves, slopes, grades and sections as shown on the drawings or as directed by the Engineer.
3. Box cutting shall be carried out in conformity with the directions laid here in under and in a manner approved by the Engineer. The work shall be so done that the suitable materials available from box cutting excavation are satisfactorily utilized as directed.
4. The contractor shall not excavate outside the limits of box cutting. Subject to the permitted tolerances, any excess depth width excavated beyond the specified levels dimensions on the drawings shall be made good at the cost of the contractor with suitable material of characteristics similar to that removed and compacted as directed.
5. Cutting shall be done in proper grade and camber as per measurements given. Care must be taken that all slopes are evenly and truly dressed. Cutting shall be done to the exact depth required and shall be as per formation level in proper grade and the camber. If extra depth of cutting is done due to negligence of contractor the same shall be refilled with approved quality of materials duly consolidated to the satisfaction of the Engineer-in-charge (without extra cost).
6. The bottom level of box cutting i.e. sub grade shall be watered and well compacted with vibratory roller at OMC to the desired density as directed by the Engineer in charge. Rolling and compaction shall be deemed to be incidental to the work and no extra cost shall be paid for compaction of box cutting base surface.
7. The stuff received from the cutting shall be used for filling and correcting side slopes of bank and earthwork for embankment as directed by the Engineer in charge with all lead and lift.
8. The measurement of box cutting shall be taken on level basis and level shall be taken at 30 mt. interval. Volume shall be computed in cubic meters by average area method.
9. The payment shall be made on Cmt. basis.
10. The rate includes cost of all labour, machineries required, cost of carting and spreading the cutting stuff with all lead and lift and leveling the dumping ground embankment, rolling and consolidation of subgrade level etc. complete.

Item No:- 2

Construction of granular sub-base 150mm thick layer by providing coarse graded machine crushed B.T. material satisfying MOST specification of grading I (B.T. stone aggregate 53 mm to 26.5 mm 35 %, 26.5 to 4.75 mm - 45 % and 2.36 mm below - 20 %) including spreading in uniform layer with motor grader on prepared surface, mixing by mix in place method with rotavator at OMC and compacting with vibratory roller to achieve the desired density etc. complete.

401.1 Scope:

This work shall consist of laying and compacting well graded material on prepared sub grade in accordance with the requirements of these specifications. The material shall be laid in one or more layers sub base and upper sub base (termed as sub base herein after) as necessary according to lines, grades and cross sections shown on the drawings or as directed by the Engineer.

401.2 Materials:

401.2.1 The materials to be used for the work shall be crushed stone of required grading. The material shall be free from organic or other deleterious constituents and conform to the grading I as mentioned below.

TABLE 400-2.

GRADING FOR COARSE GRADED GRANULAR SUB-BASE
MATERIALS.

IS sieve Designation	Percent by weight passing the IS sieve. Grading I
75.0 mm	100
53.0 mm	—
26.5 mm	55 – 75
9.5 mm	—
4.75 mm	10 – 30
2.365 mm	
0.425 mm	
0.075 mm	< 10
CBR Value (Minimum)	30

Material passing 425 micron (0.425 mm) sieve for all the three grading when tested according to IS : 2720 (Part 5) shall have liquid limit and plasticity index not more than 25 and 6 percent respectively.

401.2.2 Physical requirements:

The materials shall have a 10 percent fines value of 50 KN or more (for sample in soaked condition) when tested in compliance with B.S.: 812 (Part 111). The water absorption value of the coarse aggregate shall be

determined as per IS : 2386 (Part 3) : if this value is greater than 2 percent, the soundness test shall be carried out on the material delivered to site as per IS : 383. For grading II and III materials, the CBR shall be determined at the density and moisture content likely to be developed in equilibrium conditions which shall be taken as being the density relating to a uniform air voids content of 5 percent.

401.3 Strength of sub-base.

It shall be ensured prior to actual execution that the material to be used in the sub base satisfies the requirements of CBR and other physical requirements when compacted and finished.

When directed by the Engineer, this shall be verified by performing CBR tests in the laboratory as required on specimens remolded at field dry density and moisture content and any other tests for the "Quality" of materials, as may be necessary.

401.4 Construction Operations:

401.4.1 Preparation of Sub grade:

Immediately prior to the laying of sub-base, the sub grade already finished to Clause 301 or 305 as applicable shall be prepared by removing all vegetation and other extraneous matter, lightly sprinkled with water, if necessary and rolled with two passes of 80-100 KN smooth wheeled roller.

401.4.2 Spreading and compacting:

The sub-base material of grading specified in the Contract shall be spread on the prepared sub grade with the help of a motor grader of adequate capacity, its blade having hydraulic controls suitable for initial adjustment and for maintaining the required slope and grade during the operation or other means as approved by the Engineer.

When the sub-base material consists of combination of materials mentioned in Clause 401.2.1, of this item mixing shall be done mechanically by the mix in place method.

Manual mixing shall be permitted only where the width of laying is not adequate for mechanical operations, as in small-sized jobs. The equipment used for mix-in-place construction shall be a rotavator or similar approved equipment capable of mixing the material to the desired degree. If so desired by the Engineer, trial runs with the equipment shall be carried out to establish its suitability for the work.

Moisture content of the loose material shall be checked in accordance with IS:2720 (Part 2) and suitably adjusted by sprinkling additional water from a truck mounted or trailer mounted water tank and suitable for applying water uniformly and at controlled quantities to variable widths of surface of other means approved by the Engineer so that, at the time of compaction, it is from 1 percent above to 2 percent below the optimum moisture content corresponding to IS:2720 (Part 8). While adding water, due allowance shall be made for evaporation losses. After water has been added, the material shall be processed by mechanical or other approved means like disc barrows, rotators until the layer is uniformly wet.

Immediately thereafter, rolling shall start. If the thickness of the compacted layer does not exceed 100 mm, a smooth wheeled roller of 80 to 100 KN weight may be used. For a compacted single layer upto 225 mm the compaction shall be done with help of a vibratory roller of minimum 80 to 100 KN static weight with plain drum or pad foot drum or heavy pneumatic tyred roller of minimum 200 to 300 KN weight having a minimum tyre pressure of 0.7 MN/ M2 or equivalent capacity roller capable of achieving the required compaction.

Rolling shall commence at the lower edge and proceed towards the upper edge longitudinally for portions having unidirectional cross fall and super elevation and shall commence at the edges and progress towards the centre for portions having cross fall on both sides each pass of the roller shall uniformly overlap not less than one third of the track made in the preceding pass. During rolling, the grade and cross fall (camber) shall be checked and any high spots or depressions, which become apparent, corrected by removing or adding fresh material. The speed of the roller shall not exceed 5 Km per hour. Rolling shall be continued till the density achieved is at least 98 percent of the maximum dry density for the material determined as per IS:2720 (Part 8). The surface of any layer of material on completion of compaction shall be well closed, free from movement under compaction equipment and from compaction planes, ridges, cracks or loose material. All loose, segregated or otherwise defective areas shall be made good to the full thickness of layer and re-compacted.

Surface Finish and Quality Control of work:

The surface finish of construction shall conform to the requirements of Clause 902 of MORT & H specifications. Control on the quality of materials and works shall be exercised by the Engineer in accordance with Section 900 of MORT & H specifications.

401.6 Arrangements for Traffic:

During the period of construction, arrangement of traffic shall be maintained in accordance with Clause 112 of MORT & H specifications.

401.7 Measurements for Payment: Granular sub base shall be paid as finished work in position on cross sectional measurements and computing the volume of GSB work in cubic meters by average area method.

The protection of edges of granular sub base extended over the full formation as shown in the drawing shall be considered incidental to the work of providing granular sub-base and as such no extra payment shall be made for the same.

401.8 Rate:

The Contract unit rate for granular sub base shall be payment in full for carrying out the required operations including full compensation for:

- [i] Making arrangements for traffic to Clause 112 as above except for initial treatment to verges, shoulders and construction of diversions.
- [ii] Furnishing all materials to be incorporated in the work including all royalties, fees, rents where necessary and all leads and lift.
- [iii] All labour, tools, equipment and incidentals to complete the work to the specifications.
- [iv] Carrying out the work in part widths of road where directed, and
- [v] Carrying out the required tests for quality control.

Item No:- 3

Providing and laying wet mix macadam 0.15m thick layer base course using machine crushed B.T. chips as per required gradation mixing with required optimum quantity of water, conveying the mix to site of work,

spreading in to grade and camber with mechanical paver and consolidation each layer with vibratory roller including cost of material labour plant and equipment etc. complete.

406.1 SCOPE

This work shall consist of laying and compacting clean, crushed, graded aggregate and granular material, premixed with water, to a dense mass on a prepared subgrade sub base/ base or existing pavement as the case may be in accordance with the requirements of these specifications. The material shall be laid in two layers to lines, grades and cross-sections shown on the approved drawings or as directed by the Engineer.

The thickness of a single compacted Wet Mix Macadam layer shall not be less than 75mm. When vibrating or other approved types of compacting equipment are used, the compacted depth of a single layer of the sub-base course may be increased to 20cm upon approval of the Engineer.

406.2 MATERIALS

406.2.1 AGGREGATES

406.2.1.1 PHYSICAL REQUIREMENTS: Course aggregates shall be crushed stone. If crushed gravel / shingle is used, not less than 90 percent by weight of the gravel / shingle pieces retained on 4.75 mm sieve shall have at least two fractured faces. The aggregates shall conform to the physical requirements set forth in Table 400-10 below.

TABLE 40-10 PHYSICAL REQUIREMENT OF COARSE AGGREGATES FOR WET MIX MACADAM FOR SUB-BASE / BASE COURSES

Test	Test Method	Requirements
1.*Los Angeles Abrasion value	IS : 2386 (Part-4)	40 percent (Max)
Aggregate impact value	IS : 2386 (Part-4) or IS : 5640	30 percent (Max)
2. Combined Flakiness and Elongation indices (Total)**	IS : 2386(PART-1)	30 percent (Max)

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

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

If the water absorption value of the coarse aggregate greater than 2 percent, the soundness test shall carried out on the material delivered to site as per 2386 (Part – 5).

406.2.1.2 Grading requirements:

The aggregates shall conform to the grading given in Table 400-11

TABLE 400-11. GRADING REQUIREMENTS OF AGGREGATES FOR WET MIX MACADAM.

Is Sieve Designation	Percent by weight Passing the IS sieve
53.00 mm	100
45.00 mm	95-100
26.50 mm	-
22.40 mm	60-80
11.20 mm	40-60
4.75 mm	25-40
2.36 mm	15-30
600.00 micron	8-12
75.00 micron	0-8

Materials finer than 425 micron shall have plasticity index (P.I) not exceeding 6.

The final gradation approved within these limits shall be well graded from coarse to fine and shall not vary from the low limit on one sieve to the high limit on the adjacent sieve or vice- versa.

406.3 Construction Operation :

406.3.1 Preparation of base : Clause 404.3.1 as below shall apply.

404.3.1 Preparation of base: The surface of the subgrade/sub-base/base to receive the water bound macadam course shall be prepared to the specification lines and cross fall(camber) and made free of dust and other extraneous material. Any ruts or soft yielding places shall be corrected in an approved manner and rolled unit firm surface is obtained if necessary by sprinkling water. Any sub-base/base/surface irregularities, where predominant, shall be made good by providing appropriate type of profile corrective course(levelling course) to clause 501 of these specification.

As far as possible, laying water bound macadam course over an existing thick bituminous layer may be avoided since it will cause problems of internal drainage of the pavement at the interface of two course. It is desirable to completely pick out the existing thin bituminous wearing course where water bound macadam is proposed to be laid over it. However, where the intensity of rain is low and the interface drainage facility is efficient, water bound macadam can be laid over the existing thin bituminous surface by cutting 50 mm x 50 mm furrows at an angle of 45 degrees to the centre line of the pavement at one metre intervals in the existing road. The directions and depth of furrows shall be such that they provide adequate bondage and also serve to drain water to the existing granular base course beneath the existing thin bituminous surface.

406.3.2 Provision of lateral confinement of aggregates :

While constructing wet mix macadam arrangement shall be made for the lateral confinement of wet mix. This shall be done by laying materials in adjoining shoulders along with that of wet mix macadam layer and following the sequence of operations described in Clause 407.4.1 as below.

407.4 Construction Operations:

407.4.1 Shoulder: The sequence of operations shall be such that the construction of paved shoulder is done in layers each matching the thickness of adjoining pavement layer. Only after a layer of pavement and corresponding layers in paved and earth shoulder portion have been laid and compacted, the construction of next layer of pavement and shoulder shall be taken up.

Where the materials in adjacent layers are different, these shall be laid together and the pavement layer shall be compacted first. The corresponding layer in paved shoulder portion shall be compacted thereafter, which shall be followed by compaction of earth shoulder layer. The adjacent layers having same material shall be laid and compacted together.

In all cases where paved shoulders have to be provided along side of existing carriageway, the existing shoulders shall be excavated in full width and to the required depth as per clause 301.3.7 under no circumstances, box cutting shall be done for construction of shoulders.

Compaction requirement of earthen shoulder shall be as per table 300-2 in the case of bituminous courses, work on shoulder (earthen/hard/paved), shall start only after the pavement course has been laid and compacted.

During all stages of shoulder (earth/hard/paved) construction, the required cross fall shall be maintained to drain off surface water

Regardless of the method of laying, all shoulder construction material shall be placed directly on the shoulder. Any spilled material dragged on to the pavement surface shall be immediately removed, without damage to the pavement, and the area so affected thoroughly cleaned.

406.3.4 Preparation of mix :

Wet Mix Macadam shall be prepared in an approved mixing plant of suitable capacity having provision for controlled addition of water and forced / positive mixing arrangement like pug-mil or pan type mixer of concrete batching plant.

Optimum moisture for mixing shall be determined in accordance with IS : 2720 (Part – 8) after replacing the aggregate fraction retained on 22.4 mm sieve with material of 4.75 micron to 22.4 mm size. While adding water, due allowance should be made for evaporation losses. However, at the time of compaction, water in the wet mix should not vary from the optimum value by more than agreed limits. The mixed material should be uniformly wet and so segregation should be permitted.

406.3.4 Spreading of mix :

Immediately after mixing, the aggregates shall be spread uniformly and evenly upon the prepared sub grade / sub-base / base in required quantities. In no case should these be dumped in heaps directly on the area where these are to be laid nor shall their hauling over a partly completed stretch be permitted.

The mix may be spread either by a paver finisher or motor grader. For portions where mechanical means cannot be used, manual means as approved by the Engineer shall be used. The motor grader shall be capable of spreading the material uniformly all over the surface. Its blade shall have hydraulic control suitable for initial adjustments and maintaining the same so as to achieve the specified slope and grade.

The paver finisher shall be self – propelled, having the following features :

- (i) Loading hoppers and suitable distribution mechanism
- (ii) The screed shall have tamping and vibrating arrangement for initial compaction to the layer as it is spread without rutting or otherwise marring the surface profile.
- (iii) The paver shall be equipped with necessary control mechanism so as to ensure that the finished surface is free from surface blemishes.

The surface of the aggregate shall be carefully checked with templates and all high or low spots remedied by removing or adding aggregate as may be tested by depth blocks during construction.

No segregation of larger and fine particles should be allowed. The aggregates as spread should be allowed. The aggregates as spread should be of uniform gradation with pockets of fine materials.

406.3.5 Compaction :-

After the mix has been laid to the required thickness, grade and camber the same shall be uniformly compacted, to the full depth with suitable roller. If the thickness of single compacted layer does not exceed 100mm, a smooth wheel roller of 80 to 100 KN weight may be used. For a compacted single layer up to 200mm, the compaction shall be done with the help of vibratory roller of minimum static weight of 80 to 100 KN or equivalent capacity roller. The speed of the roller shall not exceed 5 km/h. In portions having unidirectional cross fall / super elevation rolling shall commence from the lower edge and progress gradually towards the upper edge. Thereafter, roller should progress parallel to the center line of the road. Uniformly over-lapping each preceding track by at least one fourth width until the entire surface has been rolled. Alternate trips of the roller shall be terminated in stops at least 1 m away from any preceding stop.

In portions in camber, rolling should be at the edge with the roller running forward and backward until the edges have been firmly compacted. The roller shall then progress gradually towards the center parallel to the center line of the road uniformly overlapping each of the preceding track by at least one – Fourth width until the entire surface has been rolled.

Any displacement occurring as a result of reversing of the direction of a roller or from any other cause shall be corrected at once as specified and / or removed and made good.

Along forms, Kerbs, walls or other places not accessible to the roller, the mixture shall be thoroughly compacted with mechanical tampers or a plate compactor. Skin patching of an area without scarifying the surface to permit proper bonding of the added material shall not be permitted.

Rolling should not be done when the sub grade is soft or yielding or when it causes a wave-like motion in the sub – base/ base course or sub grade. If irregularities develop during rolling which exceed 12mm when tested with a 3 meter straight edge, the surface should be loosened and premixed material added or removed as required before rolling again so as to achieve a conforming to the desired grade and cross fall. In no case should the use of unmixed material be permitted to make up the depressions.

Rolling shall be continued till the density achieved is at least 98 per cent of the maximum dry the material as determined by the method outlined in IS : 2720 (Part-8)

After completion, the surface of any finished layer shall be well-close, free from movement under compaction equipment or any compaction planes, ridges, cracks and loose material. All loose, segregated or otherwise defective areas shall be made good to the full thickness of the layer and re-compacted.

406.3.6 Setting and drying:

After final compaction of wet mix macadam course, the road shall be allowed to dry for 24 hours.

406.4 Opening to Traffic :

Preferably no vehicular traffic of any kind should be allowed on the finished wet mix macadam surface till it has dried and the wearing course laid.

406.5 Surface Finish and Quality control of work

406.5.1 Surface evenness :

The surface finish of construction shall conform to the requirements of Clause 902 of MORT & H specifications.

406.5.2 Quality Control :

Control on the quality of materials and works shall be exercised by the Engineer in accordance with section 901 of MORT & H specifications

406.6 Rectification of Surface Irregularity :

Where the surface irregularity of the wet mix macadam course exceeds the permissible tolerances or where the course is otherwise defective due to subgrade soil getting mixed with the aggregates, the full thickness of the layer shall scarified over the affected area. Reshaped with added premixed material or removed and replaced with fresh premixed material as applicable and recomputed in accordance with Clause 406.3 of this item . The area treated in the aforesaid manner shall not be less than 5m long and 2m wide. In no case shall depressions be filled up with unmixed and ungraded material or fines.

406.6.7 Arrangement for Traffic :

During the period of construction, arrangement of traffic shall be done as per Clause 112 of MORT & H specifications

406.8 Measurements for Payment :

Wet mix macadam shall be paid as finished work in position on cross sectional measurements and computing the volume of WMM work in cubic meters by average area method.

406.9 Rate: The Contract unit rate for wet mix macadam shall be payment in full for carrying out the required operations including full compensation for all components listed below.

i) Making arrangement for traffic to Clause 112 as above Except for initial treatment to verges, shoulders and Construction of diversions :

- ii) Furnishing wet materials to be incorporated in the work including all royalties, fees, rents where necessary and all leads and lifts ;
- iii) All labour, tools, equipment and incidentals to complete the work to the specifications ;
- iv) Carrying out the work in part widths of road where directed ; and
- v) Carrying out the required tests for quality control.

Item No:- 4

Providing and laying in position Ready Mixed M-150 grade concrete for reinforced cement concrete work in Foundations & Plinth, using cement content as per approved Design Mix manufactured in fully automatic batching plant established on site and transported to site of work in transit mixer having continuous agitated mixer, manufactured as per mix design of specified grade for reinforced cement concrete work including pumping of R.M.C. from transit mixer to site of laying, excluding the cost of reinforcement and including cost of centering, shuttering, formwork finishing and admixtures in recommended proportions as per IS : 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer -In - Charge. Without Fly Ash (Min cement level as per latest IS 456 shall be maintained) PCC

Detail specification for materials used for these Items shall be as per General Technical Specification for Building works booklet P/ 3, 4 Item No M-1, M-3, M-6, M-8, M-13. For form work used for this Item shall be as per General Technical Specification for Building works booklet P/ 54, Item No 9.1 (A).

1.1.1 Ready Mix concrete

1.1.2 Mixing

Thorough mixing is essential for production of uniform concrete. Equipment and methods used shall be capable of effectively mixing concrete materials to produce uniform mixes of the lowest slump practical for the work. Materials required for producing the specified grade of concrete as per schedule B of this tender shall be as per Mix Design. The minimum cement level for cement concrete M15, M20, M25, M30, M35, M40 shall be according to I.S. Code 456. The letter "M" refers to mix and numbers specify 28 days works cube compressive strength of 150 mm cubes of the mix expressed in kg per Cum.

The proportion of cement, aggregates, water & Admixture shall be determined by weight, the weigh batch machine shall be used for maintaining proper control over the proportion of aggregates as per Mix Design. Before execution you should approved your make of Cement with engineer in charge.

The strength requirement of different grades of concrete shall be as under:

	Compressive strength of 150 mm cubes in kg / Cum at 28days, conducted in accordance with IS 516-1959	
Grade of Concrete	Preliminary Test Min.	Work test Min.
M-150	200	150

M-200	260	200
M-250	320	250
M-300	380	300
M-350	440	350
M-400	500	400

In all cases, the 28 days compressive strength specified in above table be the criteria for acceptance or rejection of the concrete.

Where the strength of a concrete mix as indicated by tests, lies in between the strength of any two grades specified in the above table, such concrete shall be classified in for all purposes as concrete belonging to the lower of the two grades between which its strength lies. Admixture's cost is including in item and it's provided by contractor as per mix design.

1.1.3 The proportions for ingredients chosen shall be such that concrete has adequate workability for conditions prevailing on the work in question and can be properly compacted with means available except where it can be shown to the satisfaction of the Engineer – In charge, that the supply of properly graded aggregate of uniform quality can be maintained till the completion of the work. Grading of aggregate shall be controlled by obtaining the coarse aggregates, in different sizes and bringing them in the right proportions as required. Aggregate of different sizes shall be stocked in separate stock piles. The required quantity of material shall be stock piled several hours preferably a day before use. The grading of the coarse and fine aggregate shall be checked as frequently as possible, the frequency for a given job being determined by the Engineer – in – charge to ensure that the suppliers are maintaining the uniform grading as approved for samples used in the preliminary tests.

1.1.4 In proportioning concrete, the quantity of both cement and aggregate shall be determined by weight. Where the weight of cement is determined by accepting the maker's weight per bag a reasonable number of bags shall be weighted separately to check the net weight. Where cement is weighted from bulk stocks at site and not by bags, it shall be weighted separately from the aggregates. Water shall be either measured by volume in calibrated tanks or weighted. All measuring equipment's shall be maintained in clean and serviceable condition. Their accuracy shall be periodically checked.

1.1.5 It is most important to keep the specified water cement ratio constant and at its correct value. To this end, moisture content in both fine and coarse aggregates shall be determined by the Engineer – in – charge, according to the weather conditions. The amount of mixing water shall then be adjusted to compensate for variations in the moisture content. For determination of moisture content in the aggregate, I.S. 2389 (Part-III) shall be referred. Suitable adjustments also be made in the weights of aggregates due to variations in their moisture content. Minimum quantity of cement used in concrete shall not less than minimum cement level specified as above for reinforced cement concrete work for cement concrete grade shown in item. The concrete work shall be carried out at level / floor level mentioned in the item of schedule B of this tender.

1.2 Charging of mixer.

1.2.1 Mixers both stationary and truck mounted shall be so charged that there is a pre blending of the ingredients as the stream flows into the mixer.

1.2.2 Water shall enter the mixer first, but must continue to flow while other ingredients are entering the mixer. Water charging pipes shall be of proper design and of adequate size so that water enters at a point well inside the mixer. Water charging shall be complete within the first 25% of the mixing time.

1.2.3 Cement shall be charged along with other materials, but it shall be ensured that cement enters the stream after approximately 10% of the aggregate is in the mixer. When it is necessary to charge cement into truck mixers separately, additional mixing time shall be allowed to obtain desired uniformity to mix.

1.2.4 Admixtures shall be charged to the mixer at the same time in the mixing sequence for every batch. Liquid admixtures shall be charged with the water, powdered admixtures shall be sprinkled in to the mixer with other dry ingredients. When more than one admixture is used. They shall be batched separately and they shall not be premixed before entering the mixer.

1.3 Mixer performance

1.3.1 Mixer performance checks shall be made at regular intervals to ensure uniformity of the concrete. Visual examination of the concrete shall be one of the aids for maintaining and checking mixer performance.

1.3.2 Results of tests on air content, slump unit weight of air free mortar shall be guide lines on mixer performance.

1.4 Mixing Time.

1.4.1 Mixing time shall be measured from the time all ingredients are in the mixer.

1.4.2 Mixing time shall be established from mixer performance tests conducted at frequent intervals throughout the period of the work. However, as an initial guide, mixer manufacture's recommendation may be followed. Other guide line being 1.33 mins. for 1 cum capacity of mixer and 0.33 min for every additional 1 cum of mixer capacity.

1.4.3 Mixer shall be designed to have audible indicators and combination inter locks which prevent mixer discharge prior to completion of a preset mixing time. Mixer shall also be designed to start and stop operation with full load.

1.5 Re-Tempering

1.5.1 Provided that design water cement ratio is not exceeded, small increments of remembering water may be added to mixed batches to obtain the desired slump.

1.5.2 Addition of water in excess of designed water cement ratio to compensate for slump loss resulting from delays in delivery or placing of concrete shall be permitted.

1.6 Mix Temperature

1.6.1 Batch to batch uniformity of concrete regard to slump, water requirement and air content is dependant on temperature of concrete. It shall therefore, be ensured that the maximum and minimum temperatures of concrete throughout all seasons of the year do not vary beyond the limits given below.

Maximum : 30 C Minimum : 20

C

1.6.2 Necessary measures shall be taken to lower or raise the temperature of water to maintain the mixed concrete between the specified temperature limits.

1.7 Discharging of mixer.

1.7.1 Mixer shall be capable of and handled properly so that concrete of lowest desired slump can be effectively discharged without causing segregation.

1.8.1 Ready-Mix concrete may be :

Mixed in a central plant and transported to the job in agitating or non-agitating truck bodies. Mixed entirely in transit. Mixed entirely after reaching the job site. Mixed partially in a central plant and completed in transit or after reaching the job site (Shrink mixing)

1.8.2 In ready mix concrete special attention shall be given to the addition of mixing water quantity, which if incorrect, shall result in reduction of concrete quality.

1.8.3 Concrete consistency (Slump) is also affected by :

Amount and rate of mixing. length of haul time period for unloading temperature conditions.

1.8.4 In cool weather or short haul and with prompt delivery concrete quality may not be significantly affected. But with reverse conditions, quality of concrete may be significantly affected. Addition of water to compensate for slump loss shall not exceed that quantity necessary to compensate for a maximum 25mm slump loss. However, by this additional quantity of water, the design water cement ratio shall not be exceeded.

1.8.5 Loss in workability in warm weather shall be minimized by expediting delivery and placement, and by controlling the concrete temperature

1.8.6 If it becomes necessary to use readers to prolong the time the concrete will respond to vibrations

1.8.7 In hot weather conditions or delays in delivery/ placement, use may be made of the procedure of withholding some of the mixing water till the mixer arrives at the job site, in such cases after addition of the balance (Withheld) quantity of water an additional 30 revolutions of mixer at mixing speed shall be given to adequately incorporate the additional water into the mix.

1.8.8 When loss of slump or workability cannot be controlled by measures stated above. Complete mixing shall be done at the job site using centrally dry batched ingredients.

1.9 Supply and placing of ready-mix concrete.

1.9.1 Responsibility of in-place quality of ready-mix concrete shall be shared by the manufacturer/ supplier of ready mix concrete and the placing contractor.

1.9.2 They shall work in close coordination. The placing crew shall be in direct radio / telecommunication contact with the batch plant to ensure. Avoidance of delay in dispatching concrete from batch plant. Inform batching plant delays in formwork, reinforcement work, handling or placing.

1.9.3 The placement contractor shall give in writing his requirement of a particular batch of concrete to the supplier.

1.9.4 The ready - mix concrete manufacturer / supplier shall along with each batch of concrete delivered to the placement contractor give him a concrete delivery

ticket. The supplier shall give copies of all such delivery tickets to the Engineer- inCharge for his record and also shall get duplicate Copies of all such delivery tickets duly received and signed from the placement contractor .

1.9.5 Ready mixed concrete as supplied by the manufacturer and as placed by the contractor shall in no way be different from the specifications of concrete as approved by the Engineer-in - Charge.

2.0 Transportation.

2.1 Fresh concrete can be transported to the placement area by a variety of methods common among them are :

- Mixer trucks.
- Stationary truck bodies with or without agitators.
- Buckets hauled by trucks.
- Conveyor belts.
- House or pipe line by pumping.

Each type of transportation has specific advantages and limitations depending on the condition of use, mix, accessibility and location of placing.

2.2 Transportation by mixer trucks.

2.2.1 These are essentially revolving drums mounted on truck chassis. Truck mixers used in the job shall be labeled permanently to indicate the manufacture specifications. for mixing like.

- Capacity of drum.
- Total number of drum revolutions required for complete mixing.
- Mixing speed.
- Maximum time limit before completion of discharge and after cement has entered the drum.
- Reduction in time period of discharge.
- Due to warm weather or other variables.

All above information shall only form guidelines for the manufacture/ producer of concrete.

2.2.2 Fulfillment of the stipulated number of revolutions or elapsed time shall not be acceptable criterion. As long as the mixing water limit not exceeded and the concrete has satisfactory plastic physical properties and is of satisfactory consistency and homogeneity for satisfactory placement and consolidation and is without initial set the concrete shall be acceptable.

2.2.3 When the concrete is totally mixed in transporting trucks or in case of shrink- mix concrete, exceed 63% of the rated capacity of the drum. In case the concrete is totally mixed in the central batching plant, the transporting truck may be loaded up to 80% of the rated capacity of the drum. In this case the drum shall be rotated at charging speed during loading and reduced to agitating speed after loading is complete.

2.2.4 When transporting concrete by truck mixers, delivery time shall be restricted to

1.50 hours from the time cement has entered the mixer to completion of discharge.

2.3 Transporting by agitating.

2.3.1 Transporting ready mix concrete by this method shall consist of truck chassis mounted with open top bodies. The metal body shall be smooth and streamlined for easy discharge. Discharge may be from the rear when the body is mechanically tilted. Body of the truck shall have a provision of discharge gate. Mechanical vibrators shall be installed at the discharge gate for control of discharge flow.

2.3.2 Agitators, if mounted, also aid in the discharging of concrete from the truck in addition to keeping the concrete alive.

2.3.3 Water shall not be added to concrete in transport through this system.

2.3.4 Bodies of trucks shall be provided with protective covers during period of inclement weather.

2.3.5 Delivery period when adopting this system of transporting, concrete shall be restricted to 30 minutes from the moment all ingredients including cement and water enters in mixer to completion of discharge.

2.4 Transporting by buckets.

2.4.1 This method of transportation is very common for transportation of centrally mixed concrete. Buckets of suitable capacities may be fitted with concrete which is totally mixed in central plant and hauled to the job site. Buckets then may be conveyed to the actual point of placement either with the help of crane / hoist or they may be carted.

2.4.2 As in the case of open truck transportation water shall not be added to concrete transported in buckets. Concrete shall be protected from inclement weather by necessary covering arrangements. Also, maximum delivery period for this system of transportation from the time cement is introduced into the mixer to completion of discharge shall not exceed 30 minutes.

2.5 Cleaning

2.5.1 Before loading concrete in either truck mixer open bodied trucks or buckets, the containers shall be thoroughly cleaned, washed and dried so that there is no water or moisture in the container which may affect the designed water content of the concrete.

2.6 Other methods of transportation.

2.6.1 Transportation of concrete either by belt conveyors or by pumping is envisaged in this work.

2.6.2 If, however, producer/ manufacturer/ purchaser or ready mix concrete desires to use such methods of transportation, they may do so provided their scheme and complete specifications are submitted to the Engineer-in - Charge for his record and approval.

2.7 Objective

2.7.1 Method of transportation used shall ensure.

- Efficient delivery of concrete
- No significant alteration of properties.
- with regard to water cement ratio.
- slump, air content and homogeneity.

2.7.2 All variables in transportation considering type and accessibility of place, men, locations. distance, time interval etc. shall be carefully studied before arriving at the method

used.

3.0 PLACING CONCRETE BY PUMPING METHODS.

3.1 General

3.1.1 Concrete conveyed by pressure through either rigid pipes or flexible hoses and discharged directly into the desired area is termed as pumped concrete. The method of conveying the concrete through pipe lines is dealt with in these specification.

3.1.2 Method of applying pressure to concrete is by pumps. Pumps to be used shall be either of the two types as mentioned below.

a) piston type pumps.

b) Squeeze pressure type pumps.

Compressed air pressure pumps shall not be used in the works.

3.2.1 Pumping Equipment

3.2.2 Piston pumps

Piston pump to be used in the works shall consist of a receiving hopper for mixed concrete, an inlet valve, an outlet valve, and the pump shall be a twin piston pump. The two pistons shall be so arranged that one piston retracts when the other is moving forward and pushing concrete into the pipe line to maintain reasonably steady flow of concrete. Single piston pumps shall not be acceptable.

Inlet and outlet valves shall be any one of the following types.

- Rotating plug type
- Sliding plate type
- Guided plunger type
- Swing type
- Flapper type
- Or any combination of the above.

The pistons shall be mechanically driven using crank or chain or hydraulically driven using oil or water. The receiving hopper shall have a minimum capacity of 1.0 cum and the hopper shall be fitted with mixing rotating blades capable of maintaining consistency and uniformity of concrete. The primary power for pumps may be supplied by gasoline, diesel, or electric motors. The primary power unit and the pump unit may be truck trailer or skid mounted.

3.2.2 Squeeze pressure pumps

Squeeze pressure pumps shall consist of a receiving hopper fitted with re-mixing blades. Re-mixing blades shall be such that these can put the concrete into the flexible hose connected at the bottom of the hopper.

The flexible hose shall pass through a metal drum around the inside periphery of the drum and come out through the top part of the drum. The drum shall be maintained under a very high degree of vacuum during operation. The drum shall be so fitted with hydraulically operated metal rollers, which when rotating, create a squeeze pressure on the flexible hose carrying and forces the concrete out into the pipe line.

3.2.3 Effective Range and Discharge of pumps.

3.2.3.1 Effective range of pumps to be used in the work shall be decided by the contractors after studying the site conditions. However, the minimum horizontal range shall not be less than 150 meters and minimum vertical range shall not be less than 50 meters.

3.2.3.2 Selection of pumps based on discharge capacity shall be decided by the contractors after studying the requirements for the project Discharge capacity shall be worked out by the contractors and approval obtained from the Engineer- in - Charge. As a guide line figure the contractors may assume a discharge capacity of 15 cubic meter / hour / pump.

3.3 Pipe Lines.

All concrete carrying pipe lines shall generally be rigid pipe lines. Flexible pipe lines may only be used at bend curves in lines or at discharge ends if required. Placements of flexible units shall be done judiciously and connected to the pipe lines only when it meets the approval of the Engineer- in Charge.

3.3.2 Rigid line / Hard Line/ slick line such lines shall be made either of steel or plastic Aluminum alloy pipes shall not be used. Minimum pipeline diameter shall be 100 millimeters and shall have normal maximum length of 3 meter in each section connected through couplers.

3.3.3 Flexible pipe line.

Flexible lines shall be made out of rubber or spiral wound flexible metal or plastic The pipe shall again be such that they are in sections of 3 meter length each and connected through couplers. These pipes shall be such that they are interchangeable with rigid lines. while installing flexible units, care shall be taken that there are no links in the pipeline, which is a normal tendency with these pipes having diameters 10mm and above.

3.4 couplers

3.4.1 Couplers to be used for connection pipeline sections (either hard or flexible) shall have adequate strength to withstand stresses due to handling, misalignments poor support to pipe lines etc. For horizontal runs of pipes and for vertical runs up to 30 meter height the couplers shall be rated for a minimum pressure of 35 kg/ cm square. couplers used for rising runs between 30 meter and 50 meter heights shall have a minimum pressure rating of 50 kg. cm square. couplers shall be designed to allow for replacement of any pipe section without displacing other sections. These shall provide for the full internal cross section with no constructions or service, which may disrupt the smooth flow of concrete. for pipelines of size 150 mm and above, double toggled type coupler with a thick rubber gasket and secondary wedge- take up is recommended types of couplers that may be used shall be any of the following .

- Grooved end coupler
- One piece extended lever swing type couplers
- And full flow oil line type couplers.

3.5 Other Accessories

3.5.1 Other accessories which shall be catered for are as under :-

- Rigid and flexible pipes of varying lengths
- Curved sections of rigid pipes
- Swivel joints and rotary distributors

- Pin and gate valves to prevent back flow in pipelines
- Switch valves to direct the flow into another pipeline
- Splints, rollers, and other devices for protection of conduit over rock concrete Reinforcing steel and form and to provide lifting and lashing points in the pipe line.

- Transitions for connecting different sizes of pipe sections.
- Air vents for downward pumping
- Clean out equipment

3.5.2 For concreting of columns, walls and scattered small placements, reorientation is made for special cranes or power controlled booms carrying pipelines with a pendant type concrete delivery hose.

3.6 Lubricating of pipe Line

3.6.1 Before pumping concrete into the pipeline the line shall be lubricated with a properly designed mortar/grout lubricant. This shall be ensured by starting the pumping operation with a properly designed mortar, or with a batch of regular concrete with the coarse aggregate canted.. The quantity of mortar required as lubricant is dependent on the smoothness and cleanliness of the pipelines, As a guide line, for a 100mm diameter pipe line of 100 meter length, 0.03 cum to 0.10 cum of mortar should normally be adequate, but this shall not be taken as specified and the contractor shall establish his requirement. The quantity of mortar that comes out of the delivery end of the pipeline shall not be used in place of the concrete work. However with the approval of Engineer in Charge this mortar may be used as bedding mortar against construction joints. The rest of the mortar shall be wasted Lubrication shall be maintained as long as the pumping of concrete continues.

3.7 Guide Lines of Field Practice

3.7.1 Proper planning of concrete supply pump locations, line layout, placing sequence and the entire pumping operation will result in savings of time and expense.

3.7.2 The pump shall be placed as near the placement area as practicable. The surrounding area of the pump shall be free of obstructions to allow for movement of concrete delivery trucks. The surface must be strong enough to withstand the loaded trucks operating on it. if the surface is a suspended in consultation with the Engineer-in-Charge.

3.7.3 Pipe lines from the pump to the placing area shall be laid with minimum number of bends. for large placement areas alternate lines shall be installed for rapid connection when required. A flexible pipe at the discharge end will permit placing over a large area directly without re handling of pipelines The pipeline shall firmly supported. If more than one size of pipe must be used, the smaller diameter pipe shall be placed at the pump end and the larger diameter at the discharge end.

3.7.4 When pumping downwards, an air release valve shall be provided at the middle of the top bend to prevent vacuum or air buildup. similarly, while pumping upwards, a no- return valve shall be provided near the pump to prevent the reverse flow of concrete during the fitting of clean up equipment or when working on the pump.

3.7.5 It is essential that direct radio/ telecommunication be maintained between the pump operator and the concrete placing crew good communication between the pump operator and the batching- plant is also essential, The placing rate shall be estimated by the pump operator so that concrete can be ordered at an appropriate delivery rate.

3.7.6 The pump shall be started for a check run and operated without concrete to ensure that all moving parts are in operation properly. Before placing concrete the pump shall be run with some grout/ mortar for lubricating the line.

3.7.7 When concrete is received in the hop per, the pump shall be run slowly until the lines are completely full and the concrete is steadily moving a continuous pumping must be ensured, because, if the pump is stopped, concrete in the line maybe difficult to move again.

3.7.8 When a delay occurs because of concrete delivery or some form repair works or for any other reason, the pump shall be slowed down to maintain some movement of concrete in the receiving hopper shall be made to last as possible by moving the concrete in the lines occasionally with intermittent strokes of the pump. It is sometimes essential to run a return line back to the pump so that concrete can be re-circulated during long delays.

3.7.9 If after a long delay, concrete cannot be moved in the line, it may be necessary to clean out the entire line. However quite often only a small section of pipeline may be plugged and required cleaning. The pump operator who know such details as the length of line, age of concrete in the line etc, should be dependent upon to aid in deciding the appropriate section to be cleaned.

3.7.10 When the form is nearly full, and there is enough concrete in the line to complete the placement. the pump shall be stopped and a " go devil" inserted at the appropriate time so that concrete ahead of the go- devil shall be forced completion of the work. The go- devil shall be forced through the pipeline to clean it out. Use of water pressure is a safer method. The go - devil shall be stopped at the discharge end to ensure that water does not spill on the placement area. if air pressure is used extreme care shall be taken and the pressure must be carefully regulated. A trap shall be installed at the end of the line to prevent the go- devil being ejected as a dangerous projectile. An air release valve shall also be installed in the line to prevent air pressure build up.

3.7.11 It is essential to clean the line after concrete placing operation is complete cleaning shall be done in the reverse direction from the form work end to the pump end where the concrete in the line can be dumped in a bucket. after removal of all concrete , all pipe lines and other equipments shall be cleaned thoroughly and made ready for the next use.

3.8 Submittals

3.8.1 Along with their bid the contractors shall be required to submit the following information regarding the equipments proposed to be used by them :Type, number capacity range, mounting, nature of primary power used and the operating weights of pump and mounting. Manufacture's specifications for pipe lines giving pressure ratings sizes and material for straight and curved sections. Manufacture's certificates.

4.0 SAMPLING AND TESTING. (MATERIALS)

4.1 AGGREGATES

4.2 Supplier of aggregates shall furnish the following information before the material is delivered to site : Precise location of source from where the material is to be supplied. Trade group of principal rock type as per table 8 presence or reactive minerals

Trade group names of aggregates to be used for concrete Granite, Gabbro, Dolerite, Rhyolite, Basalt, Quartzite Gneiss

The supplier shall also furnish reports on test results giving the following information for approval to Engineer- in Charge before delivery of material at site :

- Specific Gravity
- Bulk density
- Moisture content
- Absorption value
- Aggregate impact value
- Abrasion value
- Flakiness index
- Elongation index
- Limits of deleterious substances in the aggregate
- Soundness of aggregates.
- Potential reactivity of aggregates.

All test shall be conducted in accordance with I.S 2386(Part-i to VIII)

If ready mix plant is situated within 10 km lead from site of work no deduction shall be made in payment however if the plant is situated more than 10 km lead necessary permission shall be taken from Engineer – in – Charge before execution starts. If the permission for installing ready mix plant more than 10 km away from site of work is taken from Engineer – in – Charge , the slump height and other parameters as per relevant I.S. code at site of work for different type of concreting shall be maintained by contractor for which no extra payment shall be made to the contractor. No extra payment for conveying of ready mix concrete shall be made if the ready mix plant is situated beyond 10 km though necessary permission is taken from Engineer – in – Charge. Plasticizers can be added within the permission limit mention in relevant I.S. code or can be added on permission of Engineer – in – Charge keeping the slump height and other parameters as per relevant I.S. code at site of work as per standard mention in relevant I.S Code. No extra payment shall be made to the contractor for using plasticizers. If pipe / system/ device for pouring / placing the cement concrete blocked in conveying system / device, necessary permission shall be taken for placing the construction joint in the member during execution of work of ready mix cement concrete at site of work. However if such problem occur during concreting the decision for demolition shall be carried out without claiming any extra charges. The demolition shall be carried out without disturbing the structural strength and stability of adjoining part or a building or member itself. The entire work shall be carried out to the satisfaction of Engineer – in – Charge . the decision of Engineer – in – Charge for allowing / not allowing installing ready mix plant within or beyond 10 km from the site of work shall be binding to the contractor without claiming any charges for completing work. The contractor is bound to installed ready mix plant within the campus if sufficient land area is available without claiming any extra charges though the ready mix plant is available within 10 km lead. If plant is not available within 10 km lead no extra payment shall be made to the contractor for transporting ready mix concrete to the site of work.

The contractor is bound to replace certain part of above mentioned ready mix concrete work methodology by using weigh batcher or self-loading concrete mixture machine as and when instructed by engineer in-charge.

Rate shall be for a unit of one cubic meter. No additional payment for Admixture given in mix design also no additional payment for formwork. Rate includes all transportation, labour and material with necessary fastener and fixture.

Rate shall be for a unit of one Cubic Metres (m³).

Item No:- 5

Providing and laying trimix vacuum dewatering process of Ready Mixed M-250 grade concrete for reinforced cement concrete work in Road , using cement content as per approved Design Mix manufactured in fully automatic batching plant established on site and transported to site of work in transit mixer having continuous agitated mixer, manufactured as per mix design of specified grade for reinforced cement concrete work including pumping of R.M.C. from transit mixer to site of laying, excluding the cost of reinforcement and centering. shuttering, formwork finishing and admixtures in recommended proportions as per IS : 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer -In - Charge. Without Fly Ash (Min cement level as per latest IS 456 shall be maintained) including Compaction and finishing of cement concrete surface by trimix process ,inclusive of labour charges for the trimix vacuum dewatering process on cement concrete surface by using vacuum dewatering pump, surface floater, surface vibrator and machanical trowel including Channelling & making grooves and rough finish to surface by providing expansion Joints, Contraction joints & construction joints with filling of joints with asphalt filler as directed by Engineer In charge & as per specification.

The relevant specification shall be followed as per Item No: -8 except using of trimix vacuum dewatering process of Ready Mixed M-250 grade concrete. For all RCC elements like Footings , Mass concrete and all R.C.C. members at all floor level

Rate shall be for a unit of one Cubic Metres (m³).

Item No:- 6

Providing TMT Bar FE 550D reinforcement for R.C.C. work including bending, binding and placing in position complete upto floor two level complete for all floors.

1.0. GENERAL

This work shall consist of furnishing and placing TMT Fe-500 Conforming to IS 1786 2008 reinforcement Providing and applying anticorrosive treatment with polymer base materials to the steel reinforcement including descaling the dust and applying the preventive coating of approved make etc. complete, bars (intentioned) of the shape and dimensions shown on the drawings and conforming to these Specifications or as approved by the Engineer in charge.

2.0. MATERIAL

2.1. TMT Bars

Reinforcements may be either **TMT Fe-500** tensile steel, high strength deformed bars. They may be uncoated or coated with epoxy or with approved protective coatings.

2.2. T.M.T. bars reinforcement for R C C work shall conform IS 432 (Part II) 1966 and shall be of tested quality. It shall also comply with relevant part of IS 456-1966

2.3. All reinforcement shall be clean and free from dirt, paint, grease or oil, all scale or loose or thick rust at the time of placing

2.4. All steel shall be procured from original producers no re-rolled steel shall be incorporated in the work

2.5. Only new steel shall be delivered to the site every bar shall be inspected before placing to its position and defective brittle or burnt bar shall be discarded cracked ends of bars shall be discarded

3.0. Pitch

3.1. Distance between bars shall be as specified in drawings and as directed by the Engineer in Charge all bars shall be placed at an accurate distance from each other and shall be bind tightly to maintain the desired pitch Suitable means shall be provided for holding bars securely in position

4.0. Binding wire

4.1. Mild steelbinding wire shall be of 1.63 mm or 1.22 mm (16 to 18 gauge diameter and shall conform IS 280-1972

4.2. The use of black wire will be permitted for binding reinforcement bars. It shall be free from dirt, paint, grease or oil, oil scale or loose or thick rust and any other undesirable coating which may prevent adhesion of cement mortar at the time of binding

4.3. Only new binding wire shall be delivered to the site all binding wire shall be inspected before binding to its position and defective brittle, rusted, used wire, shall be discarded

5.0. PROTECTION OF REINFORCEMENT

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

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

6.0. Workmanship

6.1. The work shall consist of furnishing and placing reinforcement to the shape and dimensions shown as on the drawings or as directed by The Engineer in charge.

6.2. Reinforcing steel shall conform accurate to the dimensions given in the bar bending schedules shown on relevant drawing

7.0. BENDING OF REINFORCEMENT

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

7.2. Reinforcing steel shall conform to the dimensions and shapes given in the approved bar bending Schedules.

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

Bars shall not be bent or straightened in a manner that will damage parent material or the coating bars bent during transport or handling shall, be straightened before being used on work and shall not be heated to facilitate straightening.

8.0. PLACING OF REINFORCEMENT

8.1. The reinforcement cage should generally be fabricated in the yard at ground level, and then shifted and placed in position. The reinforcement shall be placed strictly, in accordance with the drawings and shall be assembled in position, only when structure is otherwise ready for placing of concrete. Prolonged time gap, between assembling of reinforcements and casting of concrete, which may result in rust formation on the surface, shall not be permitted.

8.2. Reinforcement bars shall be placed accurately in position as shown on the drawings. The bars, crossing one another shall be tied together at every intersection with binding wire (annealed), conforming to IS 280 to make the skeleton of the reinforcement rigid such that the reinforcement does not get displaced during placing of concrete, or any other operation. The diameter of binding wire shall not be less than 1 mm.

8.3. Bars shall be kept in position usually by the following methods

In case of beam and slab construction, industrially produced polymer cover blocks of thickness equal to the specified cover shall be placed between the bars and formwork subject to Satisfactory evidence that the polymer composition is not harmful to concrete and reinforcement. Cover blocks made of concrete may be permitted by the Engineer, provided they have the same strength and specification as those of the member.

8.4. In case of dowels for Columns and walls the vertical reinforcement shall be kept in position by means of timber templates with slots in them accurately, or with cover blocks tied to the Reinforcement Timber templates shall be removed after the concreting has progressed up to a level just below their location.

8.5. Layers of reinforcements shall be separated by spacer bars at approximately One meter intervals. The minimum diameter of spacer bars shall be 12 mm or equal to maximum size of main reinforcement or maximum size of coarse aggregate, whichever is greater. Horizontal reinforcement shall not be, allowed to sag between supports.

8.6. Necessary stays, blocks, metal chairs, spacers, metal hangers supporting wires etc, or other subsidiary, reinforcement shall be provided to fix the reinforcements firmly in its correct position.

8.7. Use of pebbles, broken stone, metal pipe, brick, mortar or wooden blocks etc as devices for positioning reinforcement shall not be permitted.

8.8. Bars coated with epoxy or any other approved protective coating shall be placed on supports that do not damage the coating. Supports shall be installed in a manner such that planes of weakness are not created in hardened concrete. The coated reinforcing steel shall be held in place by use of plastic or plastic coated binding wires especially manufactured for the purpose.

8.9. Placing and fixing of reinforcement shall be inspected and approved by the Engineer before concrete is deposited.

9.0. Lapping

9.1. All reinforcement shall be furnished in full lengths as indicated on the drawing. No splicing of bars, except where shown on the drawing; will be permitted without approval of the Engineer. The lengths of the splice shall be as indicated on drawing or as approved by the Engineer. Where practicable, overlapping bars shall not touch each other, and shall be kept apart by 25 mm or 1 1/4 times the maximum size of coarse aggregate, whichever is greater, If this is not feasible, overlapping bars shall be bound with annealed steel binding wire, not less than 1 mm diameter and twisted tight in such a manner as to maintain minimum clear cover to the reinforcement from the concrete surface. Lapped splices shall be staggered or located at points, along the span where stresses are low.

10.0. Welding

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

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

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

is 0.4 or less.

10.3. The method of welding shall conform to IS 2751 and IS 9417 and to any supplemental specifications to the satisfaction of the Engineer

10.4. Bars shall be bent cold to the specified shape and dimensions or as directed by Engineer in charge using the proper bender tool, operated by hand or power to attain proper radius of bends. Bars shall not be bent or straightened in a manner that will injure the material. Bars bent during transport or handling shall be straightened before being used in the work. Bars shall not be heated to facilitate bending

10.5. Unless otherwise specified a 'U' type hook at the end of each bar shall invariably be provided to main reinforcement. The radius of the bend shall not be less than twice the diameter of the round bar and the length of the straight part of the bar beyond the end of the curve shall be at least four times of the diameter of the round bar. In case of bars which are not round and in case of deformed bars, the diameter shall be taken as the diameter of circle having an equivalent effective area. The hooks shall be suitably encased to prevent any spalling of the concrete

10.6. All reinforcement bars shall be accurately placed in exact position shown on the drawings and shall be securely held in position during placing of concrete by annealed binding wire not less than 1 mm in size and by using say blocks or metal chairs spacers, metal hangers, supporting wires or other approved devices at sufficiently close intervals, Bars shall not be allowed to sag between supports not displaced during concreting or any other operations of the work All devices used for positioning shall be of non-corrodible material wooden and metal supports shall not extend to the surface of the concrete, except where shown in drawings. Placing bars on layers of freshly laid concrete as the work progresses for adjusting bar spacing shall not be allowed. Pieces of broken stone or brick and wooden blocks shall not be used Layers of bars shall be separated by spacer bars pre-cast mortar blocks or other approved devices. Reinforcement after bending placed in position shall be maintained in a clean condition until completely embedded in concrete, Special care shall be exercised to prevent any displacement of reinforcement in concrete already placed. To prevent reinforcement from corrosion, concrete cover shall be provided as indicated on drawings. All bars protruding from concrete and to which other bars are to be lapped and which are likely to be exposed for a period exceeding 10 days shall be protected by a thick coat of neat cement grout

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

As far possible bars of full length shall be used in case this is not possible, overlapping of bars shall be done as directed by the Engineer in charge When practicable overlapping bars shall not touch each other, but be kept apart by 25 mm Where no feasible overlapping bars shall be bound with annealed wires not less than 1 mm thick twisted tight The overlaps shall be staggered for different bars and located at points along the span where neither shear nor bending moments is maximum.

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

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

Welded pieces of reinforcement shall be tested. Specimen shall be taken from the actual site and their number shall frequency to test shall be as directed by the Engineer in charge

11.0 MODE OF MEASUREMENTS and PAYMENT

For the purpose of payment the bar shall be measured correct up to 10 mm length and weight payable works out at the rate specified below

Sr. No	Diameter of steel	weight of steel per running meter	Sr. No	Diameter of steel	weight of steel per running meter
1	6 mm	0.22 Kg Rmt	8	20 mm	2.47 Kg Rmt
2	8 mm	0.39 Kg Rmt	9	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	40mm	9.86 Kg Rmt

Excess consumption over 5% will be charged at penal rate.

Reinforcement shall be measured in length including hooks, if any, separately for different diameters as actually used in work, excluding overlaps. From the length so measured, the weight of reinforcement shall be calculated in tonnes on the basis of IS 1732. Wastage, overlaps, couplings, welded joints, spacer bars, chairs, stays, hangers and annealed steel wire or other methods for binding and placing shall not be measured and cost of these items shall be deemed to be included in the rates for reinforcement..

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

The unit Rate for coated reinforcement shall be deemed to also include cost of all material, labour, tools and plant, royalty, transportation and expertise required to carry out the work. The rate shall also cover sampling, testing and supervision required for the work. **No Payment shall be given for Lap.**

The rate shall be for a unit of **One Kg.**

Item No:- 7

Providing and fixing pre-cast Rubber Dye / steel Dye inter locking concrete block 60mm thick with grade of concrete M300 pneumatic compressed / vibrated mechanically and as per approved design Confirming to IS

15658 : 2006 including 35 mm Sand layer for levelling and filling the joint with sand in proper line and level as per guidelines of IRC : SP 63-2018 etc. Complete.

Materials

1.1 Water shall not be salty brackish and shall be clean reasonably clear and free objectionable quantities of silt and traces of oil \injurious alkalis 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 huddling of water shall be clean, Water shall confirm to the standard specified in I S 455 -1978

1.2 If required by the Engineer in charge it shall be tested by comparison with distilled water compression 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 charge in time of setting by 30 minutes or more or decrease of more than 10 percent strength of mortar prepared with distilled water sample when compared with the result 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

1.4 It shall be free of elements which significantly affect the hydration reaction or otherwise interface with the hardening of mortar or concrete during curing or those which produce objectionable stains or other unsightly deposits on concrete or mortar surfaces

1.5 Hard and bitter water shall not be used for curing

1.6 Potable water will generally found suitable for curing mortar or concrete

2.0 CEMENT

2.1 Cement shall be ordinary Portland slag cement as per IS 1624 -1974 or Portland slag cement as per IS 455-1976

2.2 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 requirements at site and should be cleaned at least once every 3 to 4 months. The 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 each other to prevent intermixing the materials.

3.0 SAND

3.1 Sand shall be natural sand, clean well graded, hard strong durable and gritty particular free from immures amounts of dust, clay, kankar modules, soft or flaky particles shall alkali salts, organic matter, learn mica or other deleterious substance and shall be got approved from the Engineer-in-charge. The sand shall not contain more than 8 percent of slit as determined by field test. if necessary the sand.

Coarse Sand

The fineness modules of coarse sand shall not be less than 2.5 and shall not exceed 3.0. The sieve analysis of coarse sand be as under –

I. S. Sieve Designation	% by wt. passing
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4.75 mm	100
2.36mm	90 to 100
1.18 mm	70 to 100
600 MC	30 to 100
300 MC	85 to 70
150 MC	00 to 50

3.2 FINE SAND

The fineness module shall not exceed 1.0 the sieve analysis of fine sand be as under

IS. Sieve Designation	% by wt. passing
4.75 mm	100
2.3 6mm	100
1.18 mm	75 to 100
600 MC	40 to 85
300 MC	05 to 50
150 MC	00 to 10

3.3 Materials shall be stored as to prevent their deterioration of their quality and fitness for the work. Any material which has deteriorated or has been damaged or is otherwise considered defective by the Engineer-in-charge shall not be used in the work.

4.0 CEMENT CONCRETE INTERLOCKING BLOCKS

4.1 Ruber dye Interlocking cement concrete reberous reflective blocks (M-200) shall be hard even sound, and regular in shape and generally uniform in colour. The colour of the interlocking BLOCKS shall generally be uniform colour. Bracken BLOCKS or damaged blocks with cracks shall not be allowed for use. They shall be without any soft veins cracks of flaws

4.2 The size of the Interlocking cement concrete blocks to be used for flooring shall be of required size or as directed. However smaller sizes will be allowed to be used to the extent of maintaining required pattern. Thickness shall be 60 mm.

4.3 The edges of Interlocking cement concrete blocks shall in true shape of casting. All angles and edges of the Interlocking cement concrete blocks shall be true, square and free chipping and surface shall be true and plain.

4.4 The Interlocking cement concrete blocks shall have flat plain surface with rubourous reflective top finish in required pattern and colour. When brought on site, the Interlocking cement concrete blocks shall be in good condition. The Interlocking cement concrete blocks for paving shall generally be used in good condition

5.0 WORKMANSHIP

5.1 Interlocking cement concrete blocks of approved quality shall be laid evenly to level and slope as directed by Engineer in charge over a bed of a base layer consisting of 50mm to 60mm thick average sand bedding to maintain slope.

5.2 Joints shall be filled with a clean sharp sand by brooming.

5.3 The flooring work shall be finished by rubbing of flooring is set properly

5.4 The rate of flooring is inclusive of providing and laying in true line and level including filling the joints with finishing as directed by Engineer in charge

5.5 Protecting the open edges of paving with cement concrete as directed.

6.0 MODE OF MEASUREMENT and PAYMENT

6.1 The unit rate flooring shall include the cost of all materials, tools and plant required for mixing, laying of base layer in true level and slope as required applying and placing stones in position, compacting, finishing and all other incidental expenses for producing flooring work to complete the structure or its components as shown on the drawings and according to these specifications. They shall also include the cost of making, fixing and removing of all scaffolding and forms required for the work.

The rate of work shall include the cost of all labour, materials tools and plant scaffolding and all incidental expenses as described herein above.

6.2 The work shall be measured for its length and width, limiting dimensions to those specified on plan or as directed. The rate shall be for a unit of one square meter.

6.3 The payment shall be made on **square Meter** basis of the finished work.

Item No:- 8

Providing and Laying homoginious Grey cement based concrete kerbing of size 30 cm x 30 cm x 10 cm size as per detailed drawing having grade of concrete M25 grade, including necessary excavation, BBCC 1:5:10 7.5 cm as per ddetailed drawing fixing in line and level, filling joints in CM 1:3 with smooth finished, white washing three coats etc. complete as directed by Engineer in charge.

Precast Concrete Kerb Stone

Precast concrete kerb stone shall be hard even sound, and regular in shape. Broken kerb stone or damaged one with cracks shall not be allowed for use.

The precast kerb stone shall be of size as specified or as approved by the Engineer. It shall be 30 cm x 30 cm x 10 cm size made from cement concrete M 250 grade The precast kerb stone shall have flat plain surface. When brought on site, the precast kerb stone shall be in good condition.

WORKMANSHIP

Excavation for kerb block as required and as directed by the Engineer shall be carried out as per detailed relevant specifications of It. No. 1 of this contract. Bick bat cement concrete in proportion of 1:4:8 and 10 cm thick bedding shall be carried out as per the relevant specifications of general technical specification for building work booklet Item No.5.3.3/ page No. 39.

The kerb stone shall be erected in position in true line and level. The Joints between two blocks shall be filled with cement slurry and joint shall be flushed.

MODE OF MEASUREMENT & PAYMENT:

The unit rate shall include the cost of all material, labour charges for excavation & fixing, cost of BBCC, tools and plant required, placing blocks in position and all other incidental expenses required to complete the work.

The work shall be measured in running meter

The payment will be made on **running meter** basis.

Item No:- 9

Providing laying (to level or slopes) and jointing reinforced concrete Light duty non-pressure pipes I.S. class NP2 of the following internal diameter with collars and butt ends prepared for collar joints including testing of joints complete.(D) 300mm.

The relevant specification shall be followed as per General Technical specification for Building work booklet It.No.24.22.(D) P.No.177

The work shall be measured in running meter

The payment will be made on **running meter** basis.

Signature of Contractor

**Deputy Executive Engineer Capital
Project Sub Division: 08
Gandhinagar**