

invert. Any pipe found defective or damaged during laying shall be removed at there cost of Contractor.

4. The pipes shall be jointed either by collar joint or by flush joint. In the former case, the collars shall be of R.C.C., 150 to 200 mm wide and having the same strength as the pipes to be jointed. Caulking space shall be between 13 and 20 mm according to the diameter of the pipes. Caulking material shall be slightly wet mix of cement and sand in the ratio of 1:2 rammed with Caulking irons. Before caulking the collar shall be so placed that its centre coincides with that of pipe and an even annular space is left between the collar and the pipes. Flush joint may be shaped to form a self centering joint with a joining space 13 cm wide. The joining space shall be filled with cement mortar. 1 cement to 2 sand, mixed sufficiently dry to remain in position when forced with a trowel or rammer. Care shall be taken to fill all voids and excess mortar shall be removed. All joints shall be made with care so that their interior surface is smooth and consistent with the interior surface of the pipes. After finishing, the joint shall be kept covered and damp for at least four days.

5. R. C. C. pipe shall be measured along their centre between their inlet and outlet ends in linear metres.

6. The rate for the pipes shall include the cost of pipe including loading, unloading, handling storing laying in position and joining complete.

ITEM-64 : Supplying and fixing reinforced concrete heavy duty non-pressure pipes with collars for culverts including setting and jointing the pipes in C. M. 1:2 watering and laying (to level or slope) of I.S. class of NP2 of following internal diameter. (i) 300 mm dia. (ii) 450 mm dia. (iii) 600 mm dia. (iv) 750 mm dia (v) 900 mm dia. (vi) 1050 mm dia (vii) 1200 mm dia.

1. The work shall be carried out as per item of NP3 pipes except that the pipes will be of NP2 class instead of NP3 class conforming to requirements of IS : 458 and of the dia as specified in this item.

ITEM-65 : Supplying and fixing NP1 class R.C.C. pipes

1. The work shall be carried out as per item of NP3 pipes except that the pipes will be ordinary irrigation pipes of NP 1 class instead of NP 3 class conforming to requirements of IS:458 and of the dia. as specified in this item. Please see Item No. 78 for detailed information.

ITEM-66 : Filling around the pipes with murrum including dressing, tampering etc. complete.

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

ITEM-67 : Providing and laying ordinary (unreinforced) concrete 1:2:4 (1 cement :2 coarse sand :4 crushed stone aggregate 20 mm nominal size) & curing complete including cost of form work (without reinforcement)

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

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

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

4. In gradients required for ordinary concrete cotaining one 50 kg. bag of cement for different proportions of mix shall be as given in Table below.

TABLE

Grade of Concrete	Mix by Volume	Total quantity of dry aggregate by volume per 50 kg cement to be taken as sum of individual volume of fine & coarse aggregate maximum (1 cubic metre = 1000 Litres)	Proportion of fine aggregate to Coarse aggregate	Quantity of water per 50 kg of cement maximum
1.	2.	3.	4.	5.
Ordinary M100	1:3:6	300	Generally 1:2 for fine aggregate to coarse aggregate by volume but to a upper limit of 1:1.5 and lower limit of 1:3	34
Ordinary M150	1:2:4	220		32
Ordinary M200	1:1.5:3	160		30
Ordinary M250	1:1:2	100		27

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

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

Note : A mix leaner than M 100 (1:3:6) may be used for non structural part, if provided in the contract. In such cases grading of aggregates shall be by volume. Other requirements 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.

i Plain C.C.	63 mm
ii Solid type piers, abutments and wing walls, and their per caps. (Coarse aggregate of size upto 40 mm shall be machine crushed.)	40 mm
iii C.C. Wearing Coat M-150 (Coarse aggregate of size upto 40 mm shall be machine crushed.)	20 mm

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

7. All materials shall be stored as to prevent their deterioration or intrusion 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.

8. Cement shall be stored above the ground level in perfectly dry and watertight sheds and shall be stocked not more than eight bags high. 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. Cement more than 3 to 4 months old shall invariably be tested to ascertain that it satisfies the acceptability requirements. The aggregates shall be stored in such a way as to prevent admixture of foreign materials. Different sizes of fine or coarse aggregate shall be stored in separate stock piles sufficiently removed from each other to prevent intermixing the materials at edges of the piles.

9. The water for mixing shall be potable water to the satisfaction of the Engineer-in-charge. 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 along with other accessories shall be kept in first class working condition and so maintained throughout the construction. Mixing shall be continued till materials are uniformly distributed and an uniform colour of the entire mass is obtained and each individual particles of the coarse aggregate shows complete coating of mortar containing its proportionate amount of cement. In no case shall the mixing be done for less than 2 minutes after all ingredients have been put into the mixer.

11. When hand mixing is permitted by the Engineer-in-charge for small jobs or for certain other reasons, it shall be done on a smooth watertight platform large enough to allow efficient turning over of the ingredients of concrete before and after adding water. Mixing platform shall be so arranged that no foreign material 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. Then shall be mixed thoroughly by turning over to mass turned over till a mix of required consistency is obtained. In hand mixing quantity of cement shall be increased by 10 percent above that specified.

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 by the Engineer-in-charge the first batch of concrete from the mixer shall contain only two third of normal quantity of coarse aggregate. Mixing plants 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 material takes place. All form work and reinforcement contained in it shall be cleaned and made free from standing water, dust snow or ice immediately before placing of concrete. No concrete shall be placed in any part of the structure until the approval of the Engineer-in-charge has been obtained.

14. If concreting is not started with 24 hours of the approval being given, it shall have to be obtained again from the Engineer-in-charge. Concreting then shall 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 designed agitators, operating continuously, when this time shall be within 2 hours of the addition of cement to the mix and within 30 minutes of its discharge from the agitator. Except where otherwise agreed to by the Engineer-in-charge, concrete shall be disposed in horizontal layer to a compacted depth of not more than 0.45 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 into place from a height exceeding 2 metres. When trucking or chutes are used they shall be kept clean and used in such 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 cleaned with a 13mm thick layer of mortar composed of cement and sand in the same ratio as in the concrete mix itself. This 13 mm. 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 new surface with wire or bristle brushed. Care being taken to avoid dislodgement of particulars 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 corner 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 vibrator cannot be used. Sufficient vibrators in serviceable condition shall be kept at site so that spare equipments 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, vibrations due to traffic, rapid temperature changes, fast drying put process. It shall be covered with wet sacking hessian or other similar absorbent material approved by the Engineer-in-charge soon after the initial set. It shall be kept continuously wet for a period of not less than 14 days from the date of placement. Masonry work over the foundation concrete may be started after 48 hours of its laying but the curing of concrete shall be continued for a minimum period of 14 days.

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

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 prescribed lines occurring during and after placing the concrete. Screw jacks or hardwood wedges where required shall be provided to make up any settlement in the form work either before or during the placing of concrete. Suitable camber shall be provided in horizontal members of surface specially in long spans to counteract the effects of any deflection. The frame work shall be so fixed as to provide for such camber. Forms shall be so constructed as to be removable in sections in the desired sequence, without damaging the surface of concrete or disturbing other sections. Unless otherwise specified or directed. Chamfers or fillets of size 25 mm x 25 mm shall be provided at all angles of fram work to avoid sharp corners.

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

21. Special measures shall be taken to ensure that the formwork does not hinder the shrinkage of concrete because without these cracking could occur before the form work is removed. Where applicable arrangements must be made to ensure that the form does not restrain the shortening and hogging of the beams of slabs during tensioning of the tendons. The formwork should take due account of the calculated amount at positive or negative camber so as to ensure the correct final shape of the structures having regard to the deformation of false work, scaffolding or propping and the instantaneous deformation due to various causes affecting prestressed structures. Where there are re-entrant angles in the concrete sections, the formwork should be removed at these sections as soon as possible after the concrete has set in order to avoid cracking due to shrinking 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 his responsibility for safety of 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 formworks, due consideration shall be given to local conditions, character of the structure, the weather and other conditions that influence the setting of concrete the removal of the load supporting or soffit forms may commence when concrete has attained strength and of the materials used in the ix. Where field operations are controlled by the strength test 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 subject 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 form work shall be removed without causing any damage to the concrete. Centering shall be gradually and uniformly lowered in such a manner as to avoid any shock or vibrations. Supports shall be removed 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 mortars. No permanently embedded metal part shall have less than 25 mm. cover to the finished concrete surface. Where it is intended to reuse the formwork it shall be cleaned and made good to the satisfaction of the Engineer-in-charge.

23. Immediately after the 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 25 mm. below the surface of the concrete and the resulting holes filled by cement mortar. All fins cause 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 a consistency as is possible to use. Considerable pressure shall be applied in filling and pointing to ensure thorough filling in all voids. Surface which have been pointed shall be kept moist for a period of 24 hours. If rock, pockets/ honeycombs, in the opinion of the Engineer-in-charge are of such an extent and character as to affect structure materially or to endanger the life of the strength of the steel reinforcement, he may declare the concrete defective and require the removal and replacement of the portions of the structure affected. Joint shall be filled up with bitumen as directed by Engineer-in-charge in case of C.C. wearing surface.

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

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

Item No. 68 A : Providing & laying C.C. 1:4:8 (1-Cement, 4-coarse sand, 8-grade agg 40 m.m. nominal size) and curing comp of form work.

Item No. 68 B : Providing & laying C.C. 1:5:10 (1-Cement, 4-coarse sand, 8-grade agg 40 m.m. nominal size) and curing comp. incl. cost of form work.

Materials : Specification for all the in gradients to be used shall be as per the details given in the central specifications for materials attached.

PROPORTION : The concrete shall consists for the part of cement, sand and metal as per (40 to 63 m.m. size) the above description of items.

MIXING : Mixing of the materials shall be done as for specified volumemetre proportion as a possible after water is added, so that every place of agg. is uniformly coated by cement plaster. The concrete must be used immediately after it is prepared and in any case shall be used after the cement has attained final set. Generally concrete prepared before more then half an hour shall not be permitted to be used.

LAYING : Consolidation shall be rapidly carried our sufficient labour being employed to permit of ramming reading be spreading etc. being comp. within as sfort items as possible causing the mortar to cream up in no case sahill bramming be prolonged after the cement has been to take its initial sets.

CURING : As soon as the concrete has set sufficiently i.e. after about an hour of laying the surface must be protected from repid curing out by being covered with at sand wet sunny of where possible curing shall done by forming the shall be allowed pools of water by means of sand pollics. The curing shall be continued or atleast 10 (ten) days broadly two or three weeks and where possible for longer period. The rate includes all necessary equipments, labour etc. Payment shall be made on cubic measure3ment of cement concrete. The entire work shall be carried out as per the specification for the PWD Hand book Vol. I Page No. 166 to the satisfaction of the Engineer-in-charge.

ITEM-69 Providing and laying ordinary (reinforced) concrete 1:2:4 (1 cement :2 coarse sand :4 crushed stone aggregate 20 mm nominal size) & curing complete (excluding cost of reinforcement)

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

26. 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 must depend upon the nature of work and methods of vibration of concrete, shall be determined by regular slumps test. Following test slump shall be adopted for different types of works:

Type of work	Stumps where vibrators are used	Stumps Where vibrators are not used.
(i) Mass concrete in R.C.C. foundation, footings and retaining walls.	10mm to 25 mm	80 mm
(ii) Beams, slabs and column simply reinforced	25 mm to 40 mm	100 mm to 120 mm
(iii) Thin R.C.C. section or sections with congested steel	40 mm to 50 mm	125 mm to 150 mm

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

Works strength test shall be made in accordance with IS : 516. Each test shall be conducted on ten specimens five of which shall be taken on each day of concreting and cubes shall be made at the rate of one for every 5 cubic metre to concrete or a part thereof. However, if concreting done in a day is less then 15 cubic metre, the minimum number of cubes can be reduced to 6 with the 15 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 test shall be carried out whenever the quality and grading of materials is changed irrespective of the quantity of concrete poured. The number of specimens may be suitably increased as deemed necessary by the Engineer-in-charge, when procedure of test given above reveals a poor quality to concrete and in other special cases.

28. 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.

29. The average strength of the group of cubes for each day shall be less then 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 specified strength.

30. R.C.C. work shall have exposed concrete surface. Centering design and it erection shall be approved by the Deputy 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 part as suitable platforms shall be provided so that steel reinforcement in positions is not disturbed. For ensuring proper cover, mortar blocks of suitable size shall be cast and tied to the reinforcement. Timber, kapachi or metal pieces shall not be used for this purpose. Concentring of important structural members shall always be done in the presence and under the supervision of department person not below the rank of Junior Engineer/Supervisor/Overseer.

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After removal of form work and shuttering, the Executive Engineer shall inspect the work and satisfy by random checks that concrete of good quality. Plastering shall not be allowed to the exposed face of concrete.

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

Item No. : 70 Providing T.M.T. & Fixing Bars (Thermo Mechanically Treated Bars of Sail, Tisco, Thermex, Kamdhenu or equivalent brand) reinforcement confirmed to IS-1786 Fe-415 for R.C.C. work including bending, binding and placing in position complete upto floor two level. (B) High yield strength deformed bars reinforcement.

The work include providing and laying in position HYSD / Mild Steel / Thermo mechanically treated bar of the following grade.

Grade Designation	Bar type conforming to Governing IS Specification	Characteristic strength f_y Mpa	Elastic modulus Gpa
S 415	IS 1786 High yield strength Deformed bar	415	200
S 240	IS 432, Part-II	240	

TMT BAR

415 TMT Bar shall conform to min. 415 Mpa yield strength, Tensile strength of min. 500 Mpa and elongation min. 22. The chemical composition of bars shall be as below :-

	% Max.
Carbon	0.25
Sulphur	0.05
Phosphorus	0.05
Sulphur and Phosphorus	0.01

1. All steel shall be procured from original producers, no re-rolled steel shall be incorporated in the work. Only new steel bars shall be delivered to the site. Every bar shall be inspected before assembling in the work and defective brittle or burnt bar shall be discarded. Cracked ends of bars shall be discarded.

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

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

4. Reinforcing steel conform accurately to the dimensions given in the bar bender schedules shown on relevant drawings. Bars shall be bent cold to the specified shape and dimensions or as directed by the Engineer-in-charge, using a proper bar bender, operated by hand or power to attain proper radius of bends. Bars shall not be bent or straightened in a manner that will be injure the material. Bars bent during transport or handling shall be straightened before being used on work, they shall be not heated to facilitate bending. Unless otherwise specified a "U" type hook at the end of each bar shall invariably provided. 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 atleast four times the diameter of the round bar. In the case of bar which are not round and in the case of deformed bars, ten diameter shall be taken as the diameter of circle having an equivalent effective area. The hooks shall be suitably encased to prevent any splitting of the concrete.

5. All reinforcement 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 conforming to I. S. 280 and by using stay blocks or metal chairs, spacers, metal hangers supporting wires or other approved device at sufficiently close intervals. Bars will not be allowed to sag between supports nor displaced during concreting or any other operation of the work. All devices used for positioning shall be of non-corrodible material. Wooden and metal supports will not extent to the surface of concrete, except as the work progresses for adjusting bar spacing will not be allowed. Pieces of broken stone or brick and wooden blocks shall not be used. Layers of bars shall be separated by spacer bar, precast motor blocks or other approved devices. Reinforcement after being placed in position shall be maintained in a clean condition until completely embedded in concrete. Special care shall be exercised to prevent any displacement of reinforcement in concrete all ready placed. To protect reinforcement from corrosion concrete cover shall be provided as indicated on the drawings. All bars protruding from concrete and to which other bars are to be spliced and which are likely to be exposed for an indefinite period shall be protected by a thick coat of neat cement grout.

6. Bars crossing each other, where required, shall be secured by binding wire (Annealed) of size not less than 1 mm, and conforming to I. S. 280, in such a manner that they do not slip over each other at the time of fixing and concreting.

7. As far as possible, bars of fully 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 a part of 25 mm or 1.25 time the maximum size of the coarse aggregate whichever is greater, by concrete between them. Where not feasible, overlapping bars shall be bound with annealed steel wire, and not less than 1 mm. Thickness twisted tight. The overlaps shall be staggered for different bars and located at points, along the span where neither sphere not bending moment is maximum.

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

9. When permitted or specified on the drawings, joints of reinforcement bars shall be but welded so as to transmit their full stresses.

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Welded joints shall preferably be located at points where steel is not to 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 process which excludes air from the molten metal and conforms to any other special provisions for the work will be accepted. Suitable means shall be provided for holding the bars securely in position during welding. It must be ensured that no voids are left in welding and when welding is done in 2 or 3 stages, previous surface shall be cleaned properly. Ends of the bars shall be cleaned of all loose scale, rust, grease, paint and other foreign matter before welding shall conform to IS 814. Welded pieces of reinforcement shall be tested. Specimen shall be taken from the actual site and their number and frequency of tests shall be as directed by the Engineer-in-charge.

10. Reinforcement shall be measured in length including overlaps, separately for different diameters as actually used in the work, where welding or coupling is restored in place of lap-joints such joints shall be measured for payment as the equivalent length of overlap as per design requirement. From the length so measured the weight of reinforcement shall be calculated in tones on the same basis of IS 1732. Length shall include hooks at ends. Wastage and annealed steel wire for binding shall not be measured and cost of these items shall be deemed to be included in the rates for reinforcement.

11. Rate for reinforcement shall include cost of all steel, its carting to work site, cutting, bending, placing, binding and fixing in position as shown on the drawings and as directed by Engineer-in-charge. It shall also include cost of all devices for keeping reinforcement in approved position, cost of jointing as per approved methods and all wastage, and spacer bars.

12. Payment shall be made on Kg. basis.

Item No. : 71 : Providing & Laying Controlled Cement Concrete M : 150 & Curing Complete (excluding Cost of reinforcement)

Relevant Specification of Item 67 shall be followed except that ingredients of concrete shall be of mix Design.

ITEM-72 : Providing Cement Pointing on uncoursed/coursed stone/brick wall masonry with cement mortar 1:3 (1 cement :3 sand) (A) Flush Pointing (B) Ruled Pointing

1. For a surface which is to be subsequently jointed, the joints shall be squarely raked out to a depth of 15 mm, while the mortar is still green. The raked joints shall be well brushed to remove dust and loose particles and the surface shall be thoroughly washed with water, cleaned and wetted.

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

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

4. For pointing, the mortar shall be filled and pressed into the raked out joints before giving the required finish. The pointing shall then be finished to proper type given on the drawings. If type of pointing after the mortar has been filled and pressed into the joints and finished off level with the edge of the bricks, it shall while still green be ruled along the centre with a half round tool of such width as may be specified by the Engineer-in-charge. The superfluous mortar shall then be cut off from the edges of the lines and the surface of masonry shall also be cleaned of all mortar.

5. Curing shall be started as soon as the mortar used for finishing has hardened sufficiently not to be damaged when watered. It shall be kept wet for a period of at least 7 days. During this period it shall be suitably protected from all damage.

6. Stage scaffolding shall be approved for the work. This shall be independent of the structure.

7. The work of pointing shall be measured in square metres of the surface treated.

8. The rate for pointing shall include erecting the removal of scaffolding all labour, materials and equipment incidental to complete the pointing, raking out joints, wetting filling with mortar, troweling, point and watering.

ITEM-73 Providing and laying 22.50 cms. thick rubble stone pitching including preparing surface, laying 15 cms thick murrum layer over prepared surface and arranging rubbles on it by hand packing and in level & lined surface in slope camber including filling the interstices between adjacent stone by spalls of proper size & wedged for right packing as directed etc complete without cement pointing.

1. The work shall consist of covering the slopes of guide banks, training works and road embankment with stone or boulders, over a layer of murrum bedding.

2. Stone subject to marked deterioration by water or weather will not be accepted. The stone shall be sound, hard, durable and fairly regular in shape and its thickness in any one direction shall not be less than the thickness of pitching as specified in the item and thickness of the stone at any place shall not be less by 15% of the thickness specified. The largest stones procurable shall be supplied on site. The sizes of spalls shall be minimum 25 mm and shall be suitable to fill the voids in the pitching. Thickness of the pitching shall be as specified in the pitching item.

(G.C.No. SSR/2080 IB 547/28/C, dated 6th March, 1982)

3. Before laying the pitching, the sides of banks shall be trimmed to the required slope and profiles put up by means of line and pegs at intervals of 3 metres to ensure regular straight work and uniform slope throughout. Depressions shall be filled and thoroughly compacted.

4. Murrum for bedding shall be laid over the prepared base and suitably compacted to a thickness 150 mm. Quality of murrum will be as per its relevant specifications.

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5. The stone pitching shall commence in a trench below the toe of the slope. Stone shall be placed by derrick or by hand to the required length, thickness and depth conforming to the drawings. Stones shall be set normal to the slope and placed so that the largest dimensions is perpendicular to the face of the slope, unless such dimensions are greater than the specified thickness of pitching. The largest stones shall be placed in the bottom courses and for use as headers for subsequent course. When full depth of pitching can be formed with a single stone, the stones shall be laid breaking joints and all interstices between adjacent stones shall be filled in with spalls of the proper size and wedged in with hammers to ensure tight packing. Pitching shall be done in panes of 3.0 M x 3.0 M with a 30 CM wide and 8 Cm. deeper band all around.

6. Payment shall be made on Square Meter basis of the finished work. If directed by the Engineer-in-charge, for measurement the materials may have to be stacked at site before laying and nothing extra will be paid to the Contractor for this stacking. Preparation of base for laying bedding shall be deemed indicated to the work.

7. The rate shall include the cost of preparing the base, putting to the profiles, providing, laying and compacting the murrum bedding and stone pitching of dry rubble as per embankment slopes to specified thickness, lines, curves, slopes levels and all labour and materials as well as tools and plant required of the work.

ITEM-74 Providing 12 mm thick premoulded asphalt filler joints as per drawings.

1. Open joints shall be constructed at the location as directed by the Engineer-in-charge using a wood strip metal plate or other suitable material which is subsequently removed. When removing the material, care shall be exercised to avoid chipping or breaking the corners of the concrete. The edge of the concrete, at the joints, shall be well finished. Reinforcement shall not extend across an open joint.

2. When preformed filler is to be provided, the filler shall be placed in correct position before concrete is placed against the filler. The filler material shall form part of the joint and while concreting the slab. Care shall be taken to prevent the former form being displaced. After the work is completed, the exposed face of the joint shall be cleaned of all loose materials sticking to it.

3. The material used for filling expansion joint shall be bitumen impregnated felt. Impregnated felt shall conform to the requirement of IS:1838, and shall be got approved from the Engineer-in-charge. The joint shall consist of large pieces and assembly of small pieces to make up the required size shall be avoided.

4. The expansion joint shall be measured in running metres. Thickness of the expansion joint will be 20 to 25 mm. Width of expansion joint shall be equal to full depth of the slab.

5. The rate shall include the cost of all materials, labour, equipments *incidental charges for fixing the joints complete in all respects as per these specifications and as shown on the drawings.

ITEM-75 Providing parapet of controlled cement concrete M 150 as per detailed drawing with necessary reinforcement including shuttering laying, vibrating & finishing to line level complete precast consistency.

1. Railings shall not be placed until the centering or false work for the span has been released, and is self supporting. The type of railing to be constructed shall be as shown on the drawing. The railing shall be carefully erected true to the line and grade. Posts shall be vertical with a tolerance not to exceed 6 mm in 3 metres.

2. The portion of the railing or parapet which is to be casting in place shall be constructed in accordance with the relevant specification for reinforced cement concrete. Forms shall either be of single width boards or shall be lined with suitable materials duly approved by the Engineer-in-charge. Form joints in plane surfaces will not be permitted. All mouldings, panels in the finished work shall be constructed according to the details shown on the drawings. All corners in the finished work shall be true, sharp and clean cut and shall be free from cracks, spall or other defects.

3. Railing shall be measured in running metres.

4. The rate of railing shall include the cost of all labour, material, tools and plant required, for doing the work complete in all respects in accordance with these specifications, and as shown on the drawing.

ITEM-76 Providing 15 mm thick cement plaster in single coat on brick/Concrete wall for interior plastering up to floor two level finished even and smooth in (i) Cement mortar 1:3 (1 cement :3 sand) (ii) Cement mortar 1:4 (1 cement :4 sand) (iii) Cement mortar 1:6(1 cement :6 sand)

1. For a surface which is to be subsequently plastered the joints shall be squarely raked out to a depth of 15 mm, while the mortar is still green. The raked joints shall be well brushed to remove dust and loose particles and the surface shall be thoroughly washed with water, cleaned and wetted.

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

3. The mixing shall be done intimately by hand mixing. The operation shall be carried out on a clean watertight platform, and cement and sand shall be first mixed dry in the required proportion to obtain a uniform colour and then the mortar shall be mixed thoroughly after addition of water. In case of cement mortar that has stiffened because of evaporation of water, the same shall be retempered by adding

water as frequently as needed to restore the requisite consistent but this retampering shall be permitted only within thirty minutes from the time of addition of initial mixing.

4. Plastering shall be started from top and worked down. All pitlog holes shall be properly filled in advance of the plastering as the scaffolding is being taken down. Wooden screeds 75 mm wide and of the thickness of the plaster shall be fixed vertically 2.5 metres to 4 meters apart to act as gauges and guides in applying the plaster. The mortar shall be laid on the wall between the screeds using the plaster float and pressing the mortar to the racked joints are properly filled.

The plaster shall then be finished off with a wooden straight edge reaching across the screeds. The straight edge shall be worked on the screeds with a small upward and sideways motion 50 mm or 75 mm at a time. Finally, the surface shall be finished off with a plaster's wooden float. Metal floats shall not be used.

5. When recommencing plastering beyond the work suspended earlier the edge of the old plaster shall be scrapped, cleaned and wetted before plaster is applied to the adjacent areas. No portion of the surface shall be left out initially or be patched by later on. The plaster shall be finished to a true and plumb surface and to the proper degree of smoothness as required by the Engineer-in-charge. The average thickness of plaster shall not be less than the thickness specified in the item with a tolerance of 3 mm thickness which appear in the surface and all portions, which sound hollow when tapped, or are found to be otherwise defective, shall be cut out in rectangular shape and re-done as directed by the Engineer-in-charge.

6. Curing shall be started as soon as the mortar used for finished has hardened sufficiently not to be damaged when watered. It shall be kept wet for a period of at least 7 days. During this period, it shall be suitably protected from all damages.

7. Stage scaffolding shall be provided for the work. This shall be independent of the structure.

8. The work of plastering shall be measured in sq. metre of the surface treated.

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

ITEM-77 White washing :

White washing with lime on wall surface two coat to give an even shade including thoroughly brooming the surface to remove all dirt, and mortar drops and other foreign matter.

1. **General :** Lime shall be hydraulic lime of approved quality.

The slaked lime, if stored, shall be kept in a weather proof and damp roof shed with impervious floor and sides to protect it against rain, moisture, weather and extraneous materials mixing with it. All lime that has been damaged in any ways shall be rejected and all rejected materials shall be removed from site of work.

2. **Workmanship :** The fat lime shall be slaked at site and shall be mixed and stirred with about five liters of water and 1 Kg of unslaked lime to make a thin cream. This shall be allowed to stand for a period of 24 hours and then shall be added to each cubic meter of lime cream. Small quantity of ultra marine blue shall also be added to the last two coat of white wash solution and the whole solution shall be stirred thoroughly before use.

3. **Preparation of surface :** The surface shall be thoroughly cleaned of all dust mortar dropping and other foreign matter before white wash is to be applied. Oil or grease spots shall be removed by suitable chemicals and smooth, surface shall be rubbed with wire brush.

All unsound portion of the surface plaster shall be removed to full depth of plaster in rectangular patches and plastered again after raking the masonry joints properly.

4. **Application of white wash :** On the surface so prepared the white wash shall be applied with brush. The first stroke of the brush shall be from top to downwards and another from bottom to upwards over the first stroke and similarly one stroke from the right and another from the left over the first stroke before it dries.

Each coat shall be allowed to dry before next coat is applied number of coats as specified in item shall be applied.

5. **Mode of Measurement & Payment :** All work shall be measured in the decimal system i.e. in sq. meters. Deduction for pipe openings shall be made fully both sides of openings. The rates shall include the cost of all materials, labour, scaffolding protective etc. involved in all the operations described. The rate shall be for a unit of one sq. meter.

ITEM-78 (A) Providing & laying C.C. 1:5:10 (1 Cement : 5 Coarse sand : 10 graded stone aggregate of 40 mm nominal size) and curing etc. complete excluding cost of formwork in foundation and plinth.

1.0 Material

1 Water

1.1 Water shall not be salty or brackish and shall be clean, reasonably clear and free from objectionable quantities of silt and traces of oil and injurious alkalis, salts organic matter and other deleterious material which will either weaken the mortar or concrete or our cause

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efflorescence or attack the steel in RCC contrainer for transport, storage and handling of water shall be clean water shall conform to the standards specifications in I.S. 456-1978

1.2 If required by the Engineer-in-charge it shall be tested by comparison with distilled water. Compression shall be and means of standard cement tests for soundness, time of setting and mortar strength as specified in I.S. 269-1976. Any indication on unsoundness, change in time of setting by 30 minutes or more of decrease or more than 10 percentage of mortar prepared with water sample when compared with the results obtained with mortar prepared with distilled wate shall be sufficient cause for rejection of water under test.

1.3 Water for curing mortar, concrete or masonry should not be too acidic or too alkaline. It shall be free of elements which significantly effect the hydration reaction or otherwise interface with the hardening of mortar or concrete during curing or those which produce objectionable stains or other unsightly deposits on concrete or mortar surfaces.

1.4 Hard and bitter water shall not be used for curing.

1.5 Portable water will generally be found suitable for curing mortar or concrete.

2.0 SAND

2.1 Sand shall be natural sand, clean well graded, hard strong durable and gritty particles free from immures amounts of dust, clay kanker modules, soft or flaky particles shall alkali salts, organic matter, learn mica or other deleterious substance and shall be got approved 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.

2.2 **Course Sand :** The fineness modules of coarse sand sand shall not be less than 2.5 and shall not exceed 3.0. The sieve analysis of coarse sand shall be as under :-

I.S. Sieve Designation	% by wt. passing
4.75 mm	100
2.36 mm	90 to 100
1.18 mm	70 to 100
600 MC	30 to 100
300 MC	20 to 70
150 MC	00 to 50

2.3 Fine Sand

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

I. S. Sieve Designation	% by wt. passing
4.75 mm	100
2.36 mm	100
1.18 mm	75 to 100
600 MC	40 to 85
300 MC	05 to 50
150 MC	00 to 10

3.0 Cement

3.1 Cement shall be ordinary portland slab cement as per I.S. 1975 pr portlar alag cement as per I.S. 455 1976.

4.0 Stone coarse Aggregate for Nominal Mix Concrete :

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

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

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IS Sieve designation	Percentage passing for single sized aggregate of nominal size		
	40 mm	20 mm	16 mm
80 mm	-	-	-
63 mm	100	-	-
40 mm	85-100	100	-
20 mm	0-20	85-100	100
16 mm	-	-	85-100

IS Sieve designation	Percentage passing for single sized aggregate of nominal size		
	40 mm	20 mm	16 mm
12.5 mm	-	-	-
10 mm	0.5	0.20	0.30
4.75 mm	-	0.5	0.5
2.35 mm	-	-	-

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

4.3 The grading test shall be taken in the beginning and at the change of source of material. This necessary that indicates in I.S. 383-1970 and I.S. 456-1978 shall have to be carried out to ensure the acceptability. Aggregate shall be stored separately and handled in such a manner as to prevent the intermixing diff. aggregate if the aggregate are covered with dust, they shall be washed with water to make them clean.

2.00 Workmanship :-

2.1 General :-

2.1.1 Before starting concreting the bed of foundation trenches shall be cleared of all loose materials, level, watered and rammed as directed.

2.2 Proportion of Mix :

2.2.1 The proportion of cement sand and coarse aggregate shall be one part of cement 5 parts of sand and 10 parts of bricks bats aggregate and shall be measured by volume.

2.3 Mixing :-

2.3.1 The concrete shall be mixed in a mechanical mixer at the site of hand mixing may however be allowed for collar quantity work if approved by the Engineer-in-charge when hand mixing is permitted by Engineer-in-charge in case of break down of machineries and in the interest of work is shall be carried out on water tight platform and care shall be taken to ensure that mixing is continued until the mass is uniform in colour and consistency. However in such cases 10% more cement extra case. One mixing in mechanical mixer shall be done period of 1.5 to 2 minutes and the quantity of water shall be just sufficient to provide a dense concrete of required workability for the purpose.

2.4 Transporting and Placing the Concrete :-

2.4.1 The concrete shall be handled from the place of mixing to the final position in not more than 15 minutes by the method as directed and shall be placed into its final position, completed and finished within 30 minutes of mixing with water i.e. before the setting commences.

2.4.2 The concrete shall be laid in layer of 15 cms to 20 cms.

2.5 Compacting

2.5.1 The concrete shall be rammed with heavy iron rammend and rapidly to get the require compaction and to allow all the interstices to be filled with mortar.

2.6 Curing :-

2.6.1 After final set the concrete shall be kept continuously wet if required by ponding for a period of not less than 7 days the date of placement.

2.7 Mode of Measurements and Payments :

2.7.1 The concrete shall be measured for its length, breadth and depth limiting dimensions to those specified on plan or as directed.

2.7.2 The rate shall be for a unit of one cubic metre.

ITEM 78 (B) : Providing & laying C.C. 1:5:10 (1 cement : 5 coarse sand : 10 graded brick bats of 40 to 50 mm. nominal size) & curing complete excluding cost of form work in foundation and plinth.

The specification shall be same as per item No.77 (A) except that coarse aggregate shall be brick bats of 40 mm to 50 mm nominal size instead of graded metal.

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ITEM - 78(C) : Providing & laying C.C. 1:5:10 (1 cement : 5 coarse sand : 10 graded stone aggregate of 40 to 63 mm. nominal size) including curing etc. complete excluding cost of form an work in the foundation and plinth.

The specification shall be same as per item No. 77 (A).

ITEM-79 Providing and fixing 4" (100 mm) dia, G.I. water spouts 2'6" long in CM necessary iron grating as per design etc. complete (10 CM dia pipe)

The galvanized water spouts of the size 10 cm dia and the Galvanize iron gritting shall be of the approved quality and type, and shall be first got approved from the Engineer-in-charge before actual use.. The G.I. pipe shall be of sufficient length projecting. Out beyond the concrete surface for sufficient discharge. Iron grating shall be fixed rigidly into the concrete. The galvanized pipe iron as well as gratings shall be painted with two coats of anticorrosive paint.

The measurement shall be recorded and paid on the basis of each No. of pipe fixed in position.

ITEM-80 Providing and laying weep holes in abutments and returns by jointing A.C. pipe of 100 mm. dia including laying in proper grade and joining etc. complete as per detailed specification.

Weep holes shall be provided in solid plain concrete/reinforced concrete, brick/stone masonry, abutment, wing wall and return walls as shown on the drawing or directed by the Engineer to drive moisture from the back filling. Weep holes shall be provided with 100 mm dia AC pipe for structures in plain/reinforced concrete or brick masonry. In case of stone masonry, weep holes shall be 80 mm wide, 150 mm high or circular with 150 mm diameter. Weep holes shall extend through the full width of concrete/masonry with slope of about 1 vertical:20 horizontal towards the draining face. The spacing of weep holes shall generally be 1 m in either direction or as shown in the drawing with the lowest at about 150 mm above the low water level or ground level whichever is higher or as directed by the Engineer.

The payment shall be made per number of weep holes provided in structure like abutment and returns, wing walls etc.

Unit rate shall be include cost of all materials, labour and equipment to complete the job.

ITEM-81 Providing and fixing 30 cm x 22 cm x 2.5 cm thick year plate of marble stone set in cm 1:4 including finishing and engraving letters etc complete.

Providing and fixing 30 cms x 22 cms x 2.5 cms No and year plate of marble and of standard lettering with leads or paint including finishing etc. complete.

Marble plate shall be white and of approved quality and shall be 25 mm thick and of standard size as directed by the Engineer-in-charge of the work.

Lettering shall be done by U-shape engraving and shall be filled with black paint of approved quality. Lettering shall be done as directed by the Engineer-in-charge. The marble plate shall be fixed in neat cement at a place as directed by the Engineer-in-charge. Cement shall conform to relevant I.S. specification.

Measurement shall be per number of marble plate fixed.

Unit rate includes cost of all material, labour etc. for complete work.

ITEM-82 Numbering the C.D. works with approved paint including all materials for painting etc. complete.

Numbering the C.D. works shall be carried out as per relevant I.R.C. specification. Oil paint of approved quality and make shall be used for the purpose. Numbering shall be very neat and clean Arrow shall be marked on the Head wall in the correct direction of flow of water. Payment shall be made on the number basis. Unit rate includes the cost of all materials, labours for painting & lettering as directed by Engineer-in-charge.

ITEM-83 : Providing & fixing Boundary stone as per I.R.C. type design including painting, carving, lettering etc. complete.
(i) Fixing in earth / Fixing in C.C. 1:5:10

1. Boundary stone shall be of the size 20 x 15 x 75 cms. true to all the faces.
2. Boundary stones shall be neatly finished shall be chisel dressed on all the sides and at top.
3. Boundary stones shall be fixed at the border line of acquired length so that the land width is properly demarcated. The width between boundary stones shall be fixed at a distance of 330 feet (100 mt.) a part in the direction of length of the road.
4. The letter B.B. of (Border) as directed by the Engineer-in-charge shall be carved on the face of the boundary stone & letter shall be painted with black Japan.
5. The measurement shall be recorded per No. of boundary stone fixed in position and paid accordingly.

ITEM-84 Providing and fixing junction Board of R.C.C. precast as per standard design of I.R.S. including fixing in C.C. block of 1:4:8 with necessary excavation enamel painting, lettering figures etc. complete.

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1. These boards should be fixed at a distance of 120 metre from the centre line of the crossing and they should be located on the left hand side of the road in the direction of the traffic and facing the traffic.
2. The board will be located in such a way that the edge of the board towards the centre of the road will be at a distance of 4.57 metres from the centre of a National Highway and 3.66 meters from the centre of State Highway or Major District Road.
3. The bottom of the board should be 1 metre above the road surface and the board shall be at right angle to the centre line of the road facing the direction of traffic.
4. The board shall be of the size of 107 c.m. in length and 91 c.m. in height for "T" and "Y" junctions shall be 145 C.M. in length and 91 C.M. in height for cross roads.
5. The board shall be painted by two coats, the Board and posts shall be R.C.C. as shown in the type design.
6. The post shall be fixed in concrete and the projection of this above the road level shall be 45 cm x 45 cm and height of 24 cms. above the road level and the top to be finished in plaster from the height of 15 cm.
7. The size of letter and figures shall be 8 cm. for English and 10 C.M. for devnagri and Gujarati scripts.
8. The post shall be painted in black and white reflective strips 23 cm. in height.
9. The board shall be painted in white with border 2 C.M. wide.
10. On this board tablets shall be painted in yellow with black and the tablets shall have 5 cm. clear distance from the board.
11. Each such tablet shall be 61 cm. in length and 33 C.M. in height, arrow lines indicating the direction of the road at the junctions shall be painted in black and shall have a thickness of C.M. for National Highway and 4 C.M. on a State Highway and a C.M. for a Major district road.
12. All letters and figures shall be painted in black.
13. The work shall be carried out as per design as per the instructions of the Engineer-in-charge. The measurements shall be recorded and paid on number basis for board fixed in position.

ITEM-85 Supplying and fixing rough kota stone 60 to 80 mm size including fixing in line & level etc. complete.

The stone to be used shall be approved quality kota stone. It shall be sound, hard, durable and fairly regular in shape and its thickness of the stone at any place shall not be less by 15% of the thickness specified.

The stone shall be laid in line and level with camber as directed & set properly in sand. The whole work shall be generally carried out to the entire satisfaction of Engineer-in-charge of the work.

The rate shall include the cost of all materials and labour involved in all the operations described above. The kota stone flooring shall be measured in square metre correct to two places of decimal. Length and breadth shall be measured correct to be centimeter & between the finished faces of skirting or Dado and no deduction shall be made for extra paid for any opening in floor of a unit of one Sq. M.

ITEM-86 Providing & laying Kota stone for kerbing on both sides of stone paving Incl. fixing kota stone kerbing in 0.30 Mtrs.. depth (Kerbing stone of 60 to 80 MM thick size)... etc. complete.

The stone shall be of approved quality kota stone. Specifications for the materials & laying as per item No. 83 above. The rate shall per unit of one Rmt.

ITEM-87 White stone Bela masonry in C.M. 1:5 including curing etc. complete.

The stone shall be fine dressed chisel draft one incl. the drafts on all beds and joints.

The stone shall be laid in regular course. The height of the course shall be as approved by the Executive Engineer. All the course shall be of same height unless otherwise ordered but no course will be thicker than any course below it. No stone shall be less in breadth than in height and less in length than twice the width.

The stone shall break the joints in each course and to be carried out in cement mortar 1:6 and thickness of the joints shall not be more than 10 mm. The side joints and beds of all stone shall be vertical and horizontal respectively and all stones shall be rough, true and square.

The work shall be measured and paid for cubic measurements of the work carried out as per approved drawing or as directed by the Engineer-in-charge.

SCHEDULE FOR TESTING OF MATERIALS

For ensuring quality control and workmanship, Various tests prescribed below for materials shall be taken at periodical intervals as stipulated below.

The materials shall be a got tested at Government recognised Laboratory, (R & B) or field Laboratory of GERI (R & B) for which 1% of the estimated amount put to Tender shall be recovered from the contractor from the R. A. bills and final bills at the testing charges shall be paid to the GERI by the Government. However if the charges increase over 1% no excess recovery shall be made from the contractor as per resolution of B & C Department dated 10th May. 1985 Vide TNC/1085 (4) s.

Item No. as per schedule 'B'	Brief Description of Materials to be tested	Qty. of Materials	Prescription of test which shall be carried out	Frequency @ which test shall be carried out	Total No. of Test to be taken																				
1	25 to 90 H. B. Metal 40 to 63 H. B. Metal 40 to 50 M. C. Metal 20 to 50 M.C. Metal Kopachi		Gradation Test - Impact value - Flakiness Index	(1 to 100 Cmt - 1 Test 100 to 500 Cmt - 3 Test 500 to 1500 Cmt - 5 Test 1500 to 5000 Cmt - 7 Test)																					
2	Grit		- Stripping Value	— As Above —																					
3	Murrum		- P. I. Value	One test per / 50 cmt																					
4	Sand Quarry Spaul CBR test per work		- Silt Content - Gradation	One test per work One test per 200 cmt.																					
5	Asphalt		1 Penetration Test as per IS. 1203 2 Ductility Test 3 Specification Gravity Test 4 Softening point Test 5 Viscosity Test	<table><tr><th>No. of Tanker</th><th>Test</th></tr><tr><td>1 to 10</td><td>1</td></tr><tr><td>11 to 20</td><td>2</td></tr><tr><td>21 to 50</td><td>3</td></tr><tr><td>51 to 100</td><td>4</td></tr><tr><td>Remaining every 50 tanker</td><td>1</td></tr><tr><td>As per IS. 1208</td><td></td></tr><tr><td>As per IS. 1202</td><td></td></tr><tr><td>As per IS. 1204</td><td></td></tr><tr><td>As per IS. 1206</td><td></td></tr></table>	No. of Tanker	Test	1 to 10	1	11 to 20	2	21 to 50	3	51 to 100	4	Remaining every 50 tanker	1	As per IS. 1208		As per IS. 1202		As per IS. 1204		As per IS. 1206		
No. of Tanker	Test																								
1 to 10	1																								
11 to 20	2																								
21 to 50	3																								
51 to 100	4																								
Remaining every 50 tanker	1																								
As per IS. 1208																									
As per IS. 1202																									
As per IS. 1204																									
As per IS. 1206																									
6	Tack coat		- Binder temperature for application. - Rate of spread of binder.	Irregular close in intervals Two tests per day.																					
7	Co ₂ & seal coat mix		- grading - temperature of binder in boiler, aggregates in the dryer and mix at the time of laying and rolling (Binder content vide 45 EMD 2172) - Rate of Spreaded mix materials	One Test on individual constituents and mixed aggre gates from the dryer for each 100 tonnes of mix subject to minimum of Two tests per plant per day. One Test for each 100 tons of mix subjects to mini. of Two per day plant Regular control through checks on layer thickness.																					
8	Bricks		- Water absorption - Efflorescence - Size - Compressive Strength	1 test per 50,000 Bricks																					

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Item No. as per schedule 'B'	Brief Description of Materials to be tested	Qty. of Materials	Prescription of test which shall be carried out	Frequency @ which test shall be carried out	Total No. of Test to be taken												
9.	Cement		<ul style="list-style-type: none">- Consistency- Setting time- Compressive Strength- Fineness- Chemical analysis- Soundness	Upto 50 T 1 test (As per 100 T 2 tests GERI 200 T 3 tests Manual 300 T 4 tests 2002) 500 T 5 tests 800 T 6 tests 1300 T 7 tests and 8 test for larger consignment													
10.	Steel		<ul style="list-style-type: none">- Tensile Strength- Yield Stress- Elongation- Size	1 test / 40 tonnes / per category													
11.	C.C. cube 1:2:4		<ul style="list-style-type: none">- Compressive Strength (I.S. 516 - 1959)	<table><tr><th>Qty. C.C.M³</th><th>No. of test</th></tr><tr><td>1 to 5</td><td>- 1 no.</td></tr><tr><td>6 to 15</td><td>- 2 no.</td></tr><tr><td>16 to 30</td><td>- 3 no.</td></tr><tr><td>31 to 50</td><td>- 4 no.</td></tr><tr><td>51 & above</td><td>- 4 + 1</td></tr></table> (For each additional 50 M ³ or part thereof).	Qty. C.C.M ³	No. of test	1 to 5	- 1 no.	6 to 15	- 2 no.	16 to 30	- 3 no.	31 to 50	- 4 no.	51 & above	- 4 + 1	
Qty. C.C.M ³	No. of test																
1 to 5	- 1 no.																
6 to 15	- 2 no.																
16 to 30	- 3 no.																
31 to 50	- 4 no.																
51 & above	- 4 + 1																

The number of tests will be as per Manual of Quality Control or latest Govt. G.R. / Circulars will be final.

The contractor shall have to pay 1% of the estimate cost put to tender towards all testing of materials & the same shall be deducted from their bills for the works. The testing of various materials shall be carried out in GERI and result received shall be binding to all i.e. the contractor and Govt.

Testing charges of GERI shall be born by Govt. No refund be made nor extra charges over 1 % shall be recoverable from the contractor.

SIGNATURE OF CONTRACTOR

EXECUTIVE ENGINEER