

TECHNICAL SPECIFICATION (STRUCTURE)

1.0 PREPARATION OF WORK AREAS:

All rubbish, jungles, bushes, bush wood and trees etc. shall be cleared and disposed of as per disposal plan approved by the E/I. All roots of trees, stumps shall be grubbed out to a minimum depth of 600mm below ground level or foundation level and wholes so formed to be filled with earth and well rimmed. The cleared and grubbed areas shall be maintained free of vegetable growth during the progress of work.

No separate payment be made for this item

2.0. LAY-OUT :

For lay-out pegs, strings, flags, pillars and labour required for setting out work, in lines and levels as per approved drawing or construction of bench marks may be required shall be provided by the contractor at his own cost, no separate payment will be made to the contractor on this account and the charge or lay out as above will be taken to be included in the tendered rates for the item or works specified in the bill of quantity.

3.0 EXCAVATION OF FOUNDATION:

Trenches for foundation shall be taken out to full width of lowest course of footing in exact length and depth as shown in the drawings or as directed by the E/I. A working space if at all needed will be permitted up to 0.50M at the foundation level wherever necessary. The sides shall be plumb where nature of the soil permits it, but they must be stepped back or shored up carefully where they show a tendency to fall in. The excavated materials shall be disposed of only in the manner and at the place approved by the E/I. Otherwise it will entitle the department not only to reject the quantity for the purpose of payment but also to recover from the contractor the cost involved in removal of the same. In case excavation is done deeper or wider than shown in the drawing the contractor shall have to fill up the extra depth or width so cut at his own expense with concrete or sand, watered and rammed to the satisfaction and direction of E/I. Bottom of foundation trenches shall be dressed and beveled both longitudinally and transversally and shall be watered and well rammed. Where stepping is indicated in drawing or order by E/I, it must be squarely benched out. If any soft place comes to light on inspection of exposed foundation they shall be dug out or dealt with as ordered by the E/I. All superfluous water in trenches or water coming from ground water table etc. shall be removed before

putting concrete. The foundation trenches shall be inspected, checked and approved in writing by the E/I before starting concrete or masonry work. No separate payment will be made to contractor on account of removal of water or for dewatering. The contractor supposed to include the charges on this account in the tender rates for the items of work specified in the bill of quantity.

3.1 EXCAVATION OF SOIL:

(a) **ORDINARY SOIL:** This shall include vegetable or organic soil, turf, sand, silt, loam, clay, mud, peat, black cotton soil, soft shale or loose moorum, a mixture of these and similar materials which yields to ordinary application of pick-axe and shovel, rake or any other ordinary digging tools or equipments, removal of gravel or any other

bouldery materials having diameter in any one direction not more than 300mm shall be deemed to be covered under this category.

(T.S.-2)

b) **HARD SOIL:** this shall include :

- i) stiff heavy clay, hard shale or compact moorum, requiring tools or picks or both and closely applied shovel .
- ii) gravel and cobble stone having 300mm maximum diameter in any one direction .
- iii) Soling or roads, path, etc. and hard core .
- iv) Macadam surface such as water –bond and bitumen /tar bond.
- v) Lime concrete , stone masonry in lime mortar and brick work in lime cement mortar or mud mortar below ground level.
- vi) Soft conglomerate , where the stone may be detached from the matrix with picks.
- vii) Generally any materials which require close application of picks or scarifiers to loosen and not offering resistance to digging greater than the hardness of any soil mentioned in (i) to (vi) above .

3.2 EXCAVATION OF ORDINARY ROCK :

This type of excavation may or may not need blasting . Soft rock excavation shall include only excavation in rock of hardness and texture as can be quarried or split with crowbars or with mild explosives . This shall include.

- i) Lime stone , sand stone, late rite hard conglomerate or other disintegrated rock which may be quarried or split with crowbars or with mild explosives.
- ii) Boulders which do not require blasting maximum diameter in any direction of not more than 300mm found lying as slope was and terrace materials of dissimilar origin.

Excavation is to be done in profiles and sections and grade . Any extra cut either in bed or slope below sub grade should be refilled with plain cement of (1:5:10) (with 25cm. stone chips) at the cost of the contractor.

3.3 EXCAVATION OF HARD ROCK :

This will include all solid rock in place which can not be removed by blasting and wedging out all boulders or detached pieces of solid rocks of having a dimension of not less than 300mm . The rock should be of such hardness and texture that it can not be loosened or broken down by tools. Blasting shall be resorted to only after it has been certified by the E/I. that blasting is necessary.

THAT HARD ROCK SHALL COMPRISE OF : i) Any rock or cement concrete for the excavation of which the use of compressor, jack hammer and blasting is required.

- ii) Reinforced cement concrete or (re-inforcement out through but not separated from the concrete) below ground level .
- iii) Boulders having minimum diameters of 300mm requiring blast .

Hard rock requiring blasting as described above but where blasting is prohibited for any reason , excavation has to be carried out by chiseling, wedging or any other agreed method. Blasting will be permitted only when proper precautions are taken for the protection of the life and all other properties and damage done to the work or the property of life by blasting shall be made good by the contractor at his own expense, no extra payment shall be made for this

(T.S.-3)

Blasting shall have to be done in case where removal of hard rock is necessary in bulk. Blasting near the finished section shall be done with light charges so as not to disturb the sub grade and bed and slope finished.

The blasting so done shall not create cracks or fissures lower down as this may result in weakening the sub grade. The hard rock so obtained will be neatly stocked by the contractor with all lifts and leads up to 160M at place indicated by the E/I. in sizeable and level stacks.

THE MODE OF MEASUREMENT OF EXCAVATED HARD ROCK SHALL BE AS UNDER:

i) If the area to be excavated comprises of visible hard work, this shall be marked out to specified 'Nay' in block level plan as calculated by stock measurement (deducting voids) shall be co-related and variation worked out. The stock measurement of hard rock shall not ordinarily be less than 90%. The maximum 10% difference may be left out for wastage in blasting and carriage which shall be ascertained by the E/I. and a certificate thereof shall be recorded in measurement book. If a higher variation is found after being verified out by the Executive Engineer, a report shall be forwarded to Superintending Engineer for approval. The Quantity excavated shall be also calculated on the basis of explosive quantity consumed and the minimum of the three will be payable.

ii) For mixed zone where ordinary (soft) rock, moorum etc. and hard rock are so mixed that separate measurement of hard rock by block level is not possible, excavation shall be carried out in usual way by ordinary tools and by blasting. The excavated rock shall be picked

upto 150mm size and properly stacked. For size 150mm and below separate stacks shall be made and accounted, for which the part of voids shall be discounted and no payment shall be made for it. Soft rock and moorum etc. shall however, be disposed of in suitable way as instructed by E/I.

The total excavation shall be measured by block level and quantity work out for the composite excavation, quantity of hard rock shall be permissible only to the extent of stock measurement after deducting voids.

iii) In case of stock measurement of hard rock as mentioned in para (i) and (ii) the volume shall be computed after making 25% deduction for voids therefrom. No extra payment for stacking shall be made. Hard rock so obtained will be the property of Govt. which shall be used in the works as required and the cost of hard rock will be recovered from the contractor's bill at Departmental rate. The department reserves right to use the hard rock so obtained for any other construction or in the work if required. The rock needed for work of pitching, filter or stone etc. shall be utilized out of the excavated hard rock if so required.

3.4 PAYMENT:

The contractor's rate shall include cutting, filling and removing excavated materials etc. as required during course of excavation. The quantity to be paid for excavation shall be as per actual section excavated subject to the maximum section as specified above.

4.0 EARTHWORK IN FILLING:

The earthwork in filling will be of two types (a) Backfill (b) Fill other than backfill.

4.1(A) BACKFILL

Backfill is defined as excavation refill which is required to be placed under these specification and which can not be deposited around the structures or adjacent embankment unit after the structures are completed. Such backfills may consist of either s. Previous or impervious earth. However the thickness of previous materials adjacent to the structure in the backfill shall not be less than 600mm at any place. The thickness of backfill with previous earth greater than 600mm will be depend upon availability of previous materials at site and will be decided by the E/I. This will be laid in 9 inch layers and compacted so as to give maximum dry density of not less than 95% at optimum moisture content. Payment for this type of work shall be made for cubical contents of finished work.

5(B) FILLS OTHER THAN BACKFILLS:

This shall consists of either previous or impervious materials. Such fills shall be done around the structures behind the back fill. The materials for the fill may be obtained from the excavation of foundation, or excavation of borrow areas. Attempts shall be made to use the materials obtained from foundation directly, in fills as far as practicable. Whenever the materials of the fill is received from the direct disposal of the foundation excavation as laid down in the clause 3.0, no extra payment will be made as the cost is included in item of excavation of foundation trenches but when the materials is borrowed from the outside and not received from the direct disposal of the foundation excavation, the cost will be paid as per rates accepted in the item of filling. The unit of measurement will be per cubic metre.

The fill shall be laid in 9" layers and compacted so as to give maximum dry density of 85% at optimum moisture content. The fill not conforming to above stipulation shall be rejected and Contractor will have to be re-done without any extra payment for this type of fill. Payment shall be made for cubical content of the finished work less the cubical content directly utilized from the time of excavation of foundation trenches. Contractor's rate for the item work shall include the cost of carriage, disposal, spreading, watering, rolling, compaction, leveling and dressing the same in suitable profile as per specification and direction of E/I, when soil shall be carried from the borrow area. When disposal of excavated soil will be utilized in filling work then payment for watering and rolling shall be made. The cost of other operation included in quoted rate will be deducted.

5.0 DEWATERING:

The Tenderer are supposed to be will acquainted with site conditions and quote their rate exclusive of cost of all arrangements and all operations of dewatering.

Separate payment will be made for dewatering involved at any time during the execution of work.

6.0 MATERIALS:

All materials to be used in the work shall conform with the requirement laid down in the specification or as per stipulation IS code for such type of materials. If any special materials not covered here is required to be used, it shall conform to relevant Indian Standard if there are any, or to the requirement specified by the E/I.

6.1 FIRST CLASS BRICKS:

First class bricks should be sound hard, well burnt, uniform deep, cherry red or copper colour, free from cracks, flaws, stones or lumps of any kind. These should be of good shape. Sharp edged and capable of withstanding a crushing stress of 100 kg /sq.cm. The absorption of well burnt brick after 6 hours immersion in water should not exceed 1/6 th of its weight when dry. They should emit a metallic pitched ringing sound when struck. The size will be 24.5cm x 12cm x 7cm brick should be stacked in such a way that each brick is visible; and can be inspected.

6.2 CEMENT:

Cement shall conform to the relevant clause of the I.S.O.P.C 33 grade or as latest revision (Govt. Lt No. 1135 dated 9.8.99)

Cement shall be used in approximately the same chrono-logical order in which it is received from the factory.

Cement delivered in bags shall be transported under complete damp proof covers and stored in damp proof structure with adequate provision for the prevention of absorption of moisture and stacked in a manner permitting inspection and identification of each consignment. Stacking height of bagged cement shall not exceed 3 metres, cement that has been in storage for more than 4 months shall not be used without special inspection, testing and approval as per clause 3.6.1 of IS.457-1957

6.3 COARSE AGGREGATE:

Coarse aggregate shall consist of crushed stones of approved quality. Quarrying and screening to obtain aggregate of required size and grading shall be the responsibility of the contractor. The

aggregate shall contain requisite fines to allow adequate finishing. Maximum size of aggregate shall not exceed 40mm as stipulated in bill of quantity concrete work. Grading of mix of for the concrete shall be approved by the E/I. Before the same is used by the contractor. The contractor shall have to make his own arrangement for quarrying, crushing to size, washing and transporting of aggregate of required sizes to work site at his own cost. Coarse aggregate shall conform to IS. 8383-1970. The aggregate shall be properly graded so as to produce a compact concrete. The gradation shall be finally approved by the E/I. The fibre particles and deleterious materials passing 4.75mm sieve shall not exceed 5 % in any case. The over size maximum size shall not exceed 3%. **QUALITY:**

The coarse aggregate shall consist of hard, dense, durable, uncoated rock fragments and shall be free from injurious amount of soft, friable, thin and laminated pieces, alkali, organic matter or other deleterious substance. Rounded pebbles, flaky laminated and decayed stone are not to be used.

6.4 FINE AGGREGATE:

i) **General** : Fine aggregate or sand is the material most of which passes through 4.75mm sieve. Fine aggregate for concrete, mortar shall be natural fine aggregate or coarse sand from river bed. Sand obtained from crushing of stone may also be used as fine aggregate provided if it satisfies the Indian Standard Specification.

ii) **Quality** : The fine aggregate shall consist of clean, hard, strong, sharp, durable, uncoated particles, free from injurious (dust, mica, shales, soft flaky particles, alkalies, organic matters, loam or other deleterious substances) the maximum percentage of

deleterious substance in the fine aggregates as delivered for use of work shall not exceed the following values.

(T.S.-6)

Materials passing No. 200 sieve	
Shale	1 %
Coal	1%
Claylumps	1%

Total of other deleterious substance (such as alkali ,mica coated grains ,soft ,flaky particles and loam) shall not be more than 2%.Theum of percentage of all deleterious substance shall not exceed 5% by weight.All sand to be used in the construction of the structure shall confirm to specification and limit of grading by I.S.I.in R.C.C. work and other of F.M.not less than 2.00 in r.C.C. work .Sand of F.M. 1.6 to 1.8 to 2.00 will be used in masonry ,pointing and plastering work.the sand shall be screened and washed to remove all foreign and deleterious materials before use in work.The fineness modueles shall be computed by adding commulating percentage of fine aggregate retained on the Indian Standard sieves and deviding the same by 100.the grading of the fine aggregates shall be controlled in such a manner that the fineness modulus atleast nine out of ten test samles will not very than 0.20 from the average fineness modulus of ten samples.

6. 5 RE-INFORCEMENT :

The re-inforcement bars,if provided will be on the departmental issue rate .The contractors will have to submit the phasewise requirements of re-inforcement atleast a 15days before use.The contractor will submit the reinforcement bnding schedule as per approved drawings and after approval by E/I,the cutting and bending of rods will be done .the re-inforcement must be clean and free from scales of rust and dirt.If rusts are found they shall be removed by rubbing with dry sand for which no extra payment will be made .All re-inforcement must be bent cold as per details given in the drawings or as directed by the E/I

6.6 WATER :

The water to be used in concrete and mortar shall be reasonably clear and free from objectionable uatities of slits,organic metter,alkalies,salts and other impurities and has to be arranged by the contractor at his own cost.

6.7 NP-2 HUME PIPE :

The pipe confirming to 1.8.1.158-1971 will be used and it will be laid as per design,drawings or as direction on E/I.

6.8 BOULDERS :

The boulder shall be supplied by the departmental stack yard if available .However ,carriage as per requirement shall have to be done by contractor.

The stone boulder shall consists of varieties like granite ,basalt,sand,stone etc.conforming to I.S.I.specification.

All stone shall be strong ,hard and durable as per I.S.I. specification.The stone shall be free from defects like cajitious cracks,flaws,stone holes,viens patches of soft or loose materials etc.The percentage of absorption shall not exceed 5%.Generally the stone should not contain crystaaline silica or chartmica impurities etc.The minum crushing

(T.S.-7)

Strength of boulde shall not be less than the values given hereunder .

Sl.	Type of stone	Minimum crushing strength in
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No.		kg./oper sq.cm.
1	2	3
1	Granite	1000
2	Rasalt	400
3	Sand stone	300

Sand stone normally be of size 9'0 to 12'0 and the length of the stone shall not exceed three times height .The specific gravity of stone shall be not less than 2.50.The minum weight of such stone boulder shall be less than 40kg..The stone shall also conform to I.S. 1123-1957 and I.S. 1127-1957 for payment purpose 16'0 height of stack shall be measurement at 12".The stone boulder shall be properly stacked in rows in stack yard or at site as per direction of E/I. or his representatives.The stack height should not exceed 1200mm in anycase and sufficient space shall be left all round the stacks to facilitate inspection and measurmment.

6.9 FILTER MATERIALS :

The filter materials shall be clean,sound well graded sand ,gravel or screened rock fragment .No practicals of the decomposed rock,debris and vegetable materials or other deleterious materials shall be permitted.

Specification in regard to gradation of the filter as mentioned in drawing or as per direction of the E/I should be followed strictly .

6.10 FILTER MATERIALS AT EXPANSION JOINTS :

The materials used for filling expansion joint shall be bitumen impregnated felt or any other similar material specificified on the drawing .Impregnated felt shal confirm to the requirements of I.S.I.1988 and shall be approved by the E/I.

6.11 Copper SEAL/RUBBER SEAL :

For the constriction of expansion joints,the cooper seal/rubber seal shall confirm to the latest I.S.I. specification and shall be got approved from the E/I.

7.0 BRICK WORK :

Brick,sand and ceent should be as per specification given in the specification of materials.Unless otherwise specified brick work shall be first class laid in cement mortar.Work shall be strickly as per drawing .Bricks shall be soaked in water for atleast 6 hours before use in masonry work.For this purpose the the contractor must construct at his own cost brick lined tanks of approved size which shall be dismantled or filled by after completion of work by the contractor at his own cost.

Cement and sand shall be measured and mixed dry.Minimum quantity of water tom ensure workability is to be added ,the mortar turned over backwards and forwards as approved by the E/I.All cement mortar shall be used within 30minutes of mixing.

The brick work is to be of English bond.No where half bricks shall be used than these necessary to complete the bond.Great care shall be taken in the selection of the bricks face which will be felt exposed .These brick shallbe uniform in size and appearance and no mortar shall be smeared over the brick face exposed to view .

(T.S.-8)

In laying each coarse must be truly levelled and in perfect bond ,all bricks being thoroughly bedded and flushed with mortar .No mortar joint is to exceed 10mm.thickness .The wall must be carried up roughly

and no portion of work should be left more than 900mm lower than the other. Temporary stops left during construction must be raked according to bond, so that when work is continued the new brick will be laid over these previously laid. The contractor shall provide lank on which the wetted brick shall be stacked before they are laid on wall.

All brick work shall be kept wet for at least a fortnight after it is laid. All brick work shall be left flush, and the end of each day's work by making through with mortar fillets.

All the fixture shall be built into walls in their correct position as work proceeded joints of the brick work shall be raked while the mortar is still green, to a depth of 1/2" (12mm) to ensure a good key to plaster. All scaffolding must be provided by the contractor. Double scaffolding (post) should always be provided in important structures where exposed faces are required to be pointed. The log holes must however, invariably be closed with bricks and mortar after the scaffolding is removed and before plastering is done. The contractor shall be responsible for any damage or injuries to labours resulting from improperly erected scaffolding or by the other causes. The contractor's rate for brick work shall include cost of all scaffolding, curing, providing necessary set backs, splays, projections, cutting, string course chiseling and making holes to various services as shown in drawing or as directed by the E/I.

7.1 MODE OF PAYMENT :

Payment for brick work bill be made per meter cube .

7.2 RANDOM RUBBLE MASONRY WORK :

The boulders shall be hammer-dressed on the face, sides and beds to such an extent that the same will come into close proximity. No stones shall tail to a point and shall not be of greater height than breadth of face or length. The random rubble masonry shall be laid uncoarsed in cement mortar 1:4. The beds and joints shall not exceed 25mm thickness. The hearting stones shall not be less than 15cm in any direction, carefully laid, hammered down with wooden mallets into place and solidly bedded with mortar, chips and spalls being wedged in to avoid thick beds of joints and mortar. Each stone is to be punched into the number of sides to which it can be most conveniently dressed, and will then be so fitted into wall that joints shall never exceed 25mm throughout random rubble masonry stone should be supplied with equal quoins and should be coarse every 50mm of wall in height. One fifth of the face should be through hearted.

Every stone is to be well flushed in mortar as described for other forms of masonry. All stones, which are not headers, should half bond or overlap one another at least one third the width of the wall. All stones shall be thoroughly wetted before laying. The masonry of the part is to be delayed, the work must be raked back at an angle not exceeding 40 degrees. One non working day the top of all finished masonry is to be kept flooded. The vertical face of walls should be carried true to plumb and the inclined face should be in one plane. The stone shall be fairly equal in size, every stone shall be fitted to adjacent stones.

Masonry during construction shall be protected from the effects of sun, frost and rain by suitable covering and masonry shall be kept moist for a period of at least 10 days. Unit for measurement of stone masonry work shall be for per cubic meter of finished work. The rate will include cost for carriage of stones from stacks to the place of work and their place of work and their placing in position.

(T.S.-9)

8.0 CEMENT CONCRETE WORK :

COMPOSITIONS :

Cement concrete shall be composed of cement sand .Sand aggregate and water in prescribed proportion by volume.The specification for these materials have been given under this chapter previously .

8.1 BATCHING :

The concrete ingredient shall be provided in specified quantities by volumetric measurements.When moist sand is used due allowance shall be made for bulking as directed by the E/I .Appropriate means of correct measurement of the concrete ingredients shall be provided means of correct measurement of the concrete ingredients shall be provided to the satisfaction of the E/I .The proportions of mixes have indicated in the item of work.

8.2 MIXING :

The more thoroughly a concrete is mixed ,the greater is its strength.The mixing shall therefore be done in mixer only. Wherever the quantity involved shall and other conditions do not permit the mix by mixer,hand mixing may be done with the specific approval of the E/I or his authorised representatives,it will be necessary for the contractor to arrange sufficient mixers for the desired concrete mix at the end mixing period .correct proportion of materials shall be loaded in the mixing machines in accordance with water cement ratio desired.It should then be kept rotating for 1.5 to 2 minutes till all materials are mixed thoroughly and then concrete should be disposed in one operation over a level platform and turned over one before being conveyed.Each time the work is stopped for the day ,the mixer should be cleared out and when next mixing is commenced the first batch should have 10% additional cement to allow for stacking losses.

Whenever the quantity of mix is so small and hand mixing has been permitted by the E/I the mixing shall be done on a water tight brick platform of adequate size approved by the E/I with strip fastened along there side to prevent materials being washed or shoveled off during mixing where hand mixing is allowed cement and sand shall first be mixed dry thoroughly by turning over backward and forward several times.This dry mortar shall then be spread over the top of premeasured stack of dry aggregate .The whole batch shall then be thoroughly mixed by turning over and over backward and forward atleast 5 times to ensure thorough mixing.To this water shall then be added from fitted with rate hole/gradually and the whole mass turned over and again till every stone materials is sufficiently coated with mortar.No excess water should be used .The bulking shall be made .The concrete prepared after mixing must possess a good consistency and workability in case this is found deficient the ingredients will be adjusted to improve the same with approval of the E/I or his authorised representative,slump test will be carried out regularly to check consistency and workability.The slump should be specified by the E/I .

(T.S.-10)

8.3 SURFACE PREPERATION :

When concrete has to be laid in consecutive layer and sufficient time has lapsed between first course and successive one the lower course should be well raked,brushed with wire to the satisfaction of E/I .All loose aggregates and lumps should be removed .To ensure bond and water tightness between the old concrete surface and the concrete to be placed the surface should be of initial green cut and sand blasting.The

the green cut method consists of rubbing the concrete surface with a high velocity air water jet accompanied by wire brushing and jobbing, chipping, surface layer to expose clean surface of sound concrete usually about 8 to 12 hours after placing.

If the initial clean up can not be performed at the proper stage in the hardening process. All defective and desirable concrete will be removed by either chipping and picking by hammer if so required or by sand blasting. Thereafter the entire surface shall be thoroughly washed and should be dry to permit smooth cleaning. Ordinary sand may not be used even for smaller work but sand of size 1.75mm to 4.75mm will have to be 5.63kg./sq.cm. After sand blasting and washing is over, the surface shall have to be got approved by the E/I and therefore covered with a 10mm to 20mm layer of mortar but care shall be taken that mortar does dry up excessively thus losing its consistency.

8.4 PLACING :

Concrete shall be placed in a planned manner along the span so as to avoid cold joint. For this process the contractor shall arrange sufficient labour, materials, tools and appliances to complete the work in suitable blocks as programmed.

NO CONCRETE SHALL BE PLACED WITHOUT FORM WORK :

Before depositing the concrete debris of all the kinds shall be removed from the site of concreting. The surface shall be well cleaned and brought to lines and levels as per drawing and specification. No concrete shall be placed up till form work and placing of reinforcement have been completed where required and checked by the E/I according to drawing and specification. Thereafter mixed concrete shall be laid (not thrown) in suitable layers and compacted with vibrator, suitable for the purpose and approved by the E/I.

8.5 PLACING CONCRETE UNDER WATER :

Concrete is being placed under water, unless placement. The dewatering operation should be stopped at the time for placing of concrete, extra cement up to 20% shall be added in the concrete under water. The admixture shall be added in the concrete under water, the mix shall be suitable in accordance with the specific written approval of the E/I. The total quantity of such concreting will have to be got recorded by the E/I or his authorised agent so that a check may be kept on extra cement consumed.

8.6 COMPACTION:

As concrete is being placed it should be compacted thoroughly and uniformly. Compacting includes rodding, spading, vibrating and such other operation as are necessary to compact the concrete properly, concrete shall be worked well around them in for cement enclosed fixture and corners of forms.

(T.S.-11)

Sufficient equipment together with necessary operation should be provided at site for compaction. As concrete starts setting immediately after it is placed, consolidation should be done when placing is going on. Excessive vibration causing segregation and formation of laitances shall be avoided.

HAND TAMPING :

16mm M.S. rods should be used for tamping. The tools should penetrate the full depth of layer being placed and should be used at or near vertical form faces. For dry hand tamped concrete the surface should be

rammed with heavy flats face trowel till a thin film of mortar appears at the surface showing that air pockets have been filled.

VIBRATION:

Mass concrete should be thoroughly compacted with the aid of vibrators .Immediately after placing concrete the vibrators should be started and operated for a few second .Then moved to the other without any hole or impression of the vibrator ,vibration should be continued till the entire batch gives uniform appearance and surface just start to glist,vibrator should be inserted and drawn slowly and operated continuously while being withdrawn ,it should be in such a manner that no voids are left in plastic concrete .

Sufficient number of vibrators should be used to compact each batch properly before placing the next one .A sufficient number of reserve vibrators in good conditions,concreting shall not be allowed to proceed without proper compaction with the vibrator,suitable for the purpose.Under no circumstances the vibrator should stick the face of forms not shall reinforcement steel or embedded metal be jerked with sufficient force to impair the bond between concrete and metals .

7. STOPPING WORK :

If for any reason it is necessary to stop concreting in the middle of a job,it should be stopped as under:

FOR SLAB :

In a vertical plane at right angles to the span either middle span over the centre of the supporting beam or girder .

FOR COLUMN :In horizontal at right angles to the length of the column.

FOR BEAM AND GIRDER :In vertical plane at right angle to the length of the beam or girder either the mid span or over the centre of the support of the beam .In no case shall the work be stopped in beams of slab where future shearing action will be great as for example near the end or direct under concentrated load.At place other than specified above,should become necessary to stop concreting for any unforeseen reasons,the same shall be done at the locations directed by the E/I.In all such cases the edges of the concrete shall be left and finished in a proper slope as per direction of the E/I.

Before commencing the work ,surface of the existing concrete must be carefully brushed with stiff brush to remove particules and dust thick grout of neat cement must be poured over it before new concrete is placed.

8.8 CURING AND PROTECTION OF CONCRETE :

The object of curing is to prevent or replenish the loss necessary of moisture during the early relatively rapid stage of hydration .Minimum curing period for the concrete shall be 21 days and is to commence as soon as the concrete has hardened but not before that 24 hours the time of placement .The curing shall be accomplished by keeping the exposed surface continuously moist condition.

Where forms are used these shall be kept sprinkled with water until removal.Wooden forms may be loosened wetted thoughly at frequent intervals so that water floods the space between the forms and concrete .Merely having form in place will not keep the concrete sufficiently moist for proper curing .When spray pipe system is used for spraying,galvanized or alloy pipe shall be used .This will prevent rust stain that may be formed by use of iron pipe.Construction joint shall be continuously kept wet for atleast 72 hours prior to the placing of

additional concretes. All water used in curing shall be free from excessive amount of silt and other impurities.

8.9 TESTING :

The contractor shall provide all labour required for making and cube test specimens without any separate payments. 8.10

CLASSIFICATION :

Except where required to meet special conditions, all concrete shall conform to the classification in the table given below defined according to maximum aggregate size and other approximate details. The mix proportions may have to be modified after detailed laboratory test and field experiment. These mixes may further be modified to suit the work or the nature of materials used further be modified to suit the work or the nature of materials used. The contractor's rates are to be based on the concrete of mixes of required strength and quantity of cement specified in the table below. The variations in ingredients will not be considered for adjustment in rates.

NOMINAL MIX PROPORTION AND CEMENT CONSUMPTION PER CUBIC METER OF FINISHED CEMENT

Nominal Mix	Maximum size of Aggregate	Cement consumption per cu.M.Finished Concrete
1	2	3
1:4:8	40 mm.	0.121 cu.m.
1:3:6	40mm.	0.157 cu.m.
1:2:4	20mm.	0.225 cu.m.
1:2:4	20mm.	0.225 cu.m.
1:1:5:4	20mm.	0.287 cu.m.
1:1:5:3	20mm.for 20mm aggregate size also to be maintained .	0.287 cu.m.

8.11 PAYMENT FOR CONCRETE :

The rate of concrete shall include cost of materials, mixing, placing, curing, compaction, finishing of concrete and also of providing and fixing supports, contrivances and form work along with removal thereof including the surface preparation for the next lift and removal and making good the damaged concrete as required. The unit of measurement will be per cubic meter.

8.12 FORM WORK :

a) The form work shall include all forms, sheeting, planks, poles, shores, ties, upright and all other temporary supports to the concrete during the process of laying and setting. The form work shall be of such dimension, strength and rigidity and so constructed as to hold the concrete and to withstand the necessary pressure and remain rigid during the laying, vibration and setting of concrete without any deflection from the prescribed lines. The joints must be water tight and smooth so as to prevent leakage of cement slurry. All faces which will come in contact with the concrete must be plain, clean, rigid, tight and smooth, suitable devices shall be used to hold the corners, adjacent ends and edge of panels or other forms together in accurate alignment. The form shall be such as to produce finish of striking of one.

b) Where wooden forms are used the lapping shall be in the direction of the structures as shown in the drawing or as directed of E/I. Wood sheathing or lining shall be of such a kind and quality or shall be so treated, that

there shall be not chemical deterioration or declaration of the formed concrete surface.

c) **FORM MATERIALS & CONCRETE SURFACE** : All timber used shall be of the best quality, sound straight, free from sap, loose knots, warps holes and other defects seasoning is of great importance partially seasoned

timber is to be best for form work, since if it is too dry it will tend to shrink from absorption of moisture while green timber is to be best for form

work, since if it is too dry it will tend to shrink from absorption of moisture while green timber will try to dry out and shrink in hot weather causing elevation and depression in the concrete. All timber faces coming in contact with concrete should be made plans to give better finish of the concrete face. The form work should have sufficient strength and rigidity.

d) **METAL FORMS** : Metal forms shall be permitted for permanently exposed surface. Curves and special forms shall be character that will result on smooth concrete surface. They shall be so designed and constructed that they will not warp or spring during erection or placing concrete. Forms to be used more than one shall be maintained in serviceable condition and will be thoroughly cleaned and smoothed in the forms with the minimum amount of bumps or other imperfections. The use of sheet metal be correct

imperfections in the lining of lumber faced forms for surface that be permanently exposed to view will not be permitted.

TIMES : The use of metal rods and other similar devices in the concrete for holding forms will be permitted if the ends of rods are omitted or subsequently removed to a depth of not less than 50mm from the surface of the concrete without injury to the concrete provided that for walls to be subjected to water pressure on side and to be water tight, the rods shall not be continuous through the wall. Removal of embedded rods shall not be permitted. Removal of embedded fasteners on the ends of the rods shall be such as to leave of regular shape for ramming. All hole left by the removal of fasteners from the in of the rods shall be immediately rammed with suitable end rammer, so as to leave the surface of the hole clean and rough and completely filled with dry patch mortar and the surface finished to meet adjacent concrete. Wire ties shall be permitted only when specifically approved and shall be cut flush with the surface of the concrete after the form are removed. Wire ties shall not be used where permanent exposed finish surface are required.

(T.S.-14)

e) **OILING** : All forms coming in contact with concrete should be oiled with cured oil preferably before being set in place. This oiling allows easy stripping of forms as the concrete does not stick to the oily form, if the concrete is to be placed, however, oil should not be used as it prevents the adhesion of plaster, wetting with water of soft soap and water will sufficient in such cases, in no case the reinforcement placed over the form work should be oiled.

f) **ERECTION OF FORMS** : Before placing of concrete, is placed, precaution shall be taken to see that all forms are in proper alignment and

that forms anchors and ties are thoroughly the form strips for narrow groove so as to prevent reeding of the forms subsequent damaged to concrete prior to the removal of forms where form for continuous surfdae are placed in successive units ,the forms shall fit roughly over the completed surface so as

to prevent leakage of mortar from the concrte and to maintain accurate alignment of the surface .

g) Removal of forms should never be started until the concrete is thoroughly set and has attained to give it sufficient strength to carry its own weight besides the live load.which is likely to come on the work during the coarse of construction .The length of time,the form should remain in place ,should be decided withn refence to weather condition,slopes and position of the structure of structural member and the nature and amount of dead and live loads,the decision given by the E/I.regarding the period for which the forms shall remain in place shall be final.

In no case forms be removed until there is assuarance that the removal can be accomplished without chiping,spalling of defacing the concrte surface further more heavy load should not be permitted until after the concrete has reached its design without jerking the structure of throwing heavily .Upon the concrete all forms shall be entirely removed to permit inspection before rest for the next lift.

8.13 STAGING :

The contractor shall provide efficient and rigid temporary staging required for constructing the structure .

The staging ,should be wide and strong enough to take two gang ways,one each side to used bottle by workmen as well as for inspection purposes. It should also be strong enough to permit working with vibrating and other machineries,as may be required for concreting etc.Due allowance for sagging of shuttering and support should be made in the design of the staging of the shuttering .On the completion of the work ,staging shall b removed to the entire satisfaction of the E/I.

8.14 PLACING OF RE-INFORCEMENT :

Re-inforcement bars shall be placed in the concrete wherever shown on the drawing .the bars shall be accurately outto length and could bend where required .the bends for strups shall be made around pin of diameter not less than eight times the diameter of the bars .The ends of the bars shall be hooked with internal radius of four times the diameter of the bars.

The surface of re-inforcement bar shall be cleaned of the rust scales,dirtsn ,grease and other objectionable substaces.the re-inforcement shall be accurately positioned and secured so that there is not movement when concrteete is placed .Bars crossing one another shall be tied at every intersection with 16SWG wire to make the skelton perfectly rigid.Metalsof concrete shares and spacers of approved type shall be provided suitably for proper support and spacing of re-inforcement .Slices in re-inforcementshall be avoided at points of maximum stress and such slices where provided shall be of sufficient length (s) (subject to minimum of40times the diameter)to transfer stress between bars,by bend lapped ends of bars shall be placed

so as to be supplied to the contractor,if available with I accordance with provision of bars available.All wastage shall be borne by the contractor and cut pieces shall not be taken back by the department .

8.15 WASTAGE OF GOVERNMENT MATERIALS :

In case of steel if supplied by the Department ,small pieces of steel rods is allowed to the maximum of 5% of quantity consumed in work executed .Out which 2.5% of steel rods should not be less than of the length of 3M wich will be returned to the department .But the small pieces less than length of 3M will not be taken back by department

.Hence ,for wastage the

value of 2.5% of quantity consumed will be treated as wastage and the amount for this much quantity will be recovered on issue rate from the contractor's bill.The materials received by the contractor in excess of actual consumption as determined above and not returned to department will be charged at panel rates which will be double the issue rates of materialor the market rates plus 10% which ever is higher .

9.0 CEMENT PLASTERING :

9.01 PLASTERING :

Good sand shall be used in plaster.The plaster is to be 12mm thick as specified but contractor should make allowance in the rate for the extra cost involved owing to the surface of wall being not very regular or plain.The proportion of sand and cement mortar of the specified in the item of work.If the water proof plaster is indicated in drawing or if the E/I.so dirrects,such plaster shall be provided in cement mortar of the specified

proportion after adding the approved quality of water proofing compound .The quantity of water ptoofing compound to be used shall be as directed by the E/I.Thecontractor's rate shall include the cost of all the materials together with cost of water proofing compound and labour etc.

The materials should be thoroughly mixed and the mortar of plaster being used within half an hour of being mixed .Joints of brick work to be plastered should be raked out to 12mm deep before plastering .Plaster shall be kept wet for period of 14 days.

The rate of plaster shall include (a) plastering surface and corners and rounding at angles (b)preparing,cleaning and watering surface(c) watering and protecting plaster after completion(d)provisionof erection and removal of scaffolding.

FLUSH POINTING :

All joints in masonry shall be raked cut to a depth of atleast 12mm .these shall be brushed and well watered .Pointing materials shall be one art of cement and three parts of sand by volume or as may be specified .Particular attention must be given to complete filling of joints .

After filling the joints with the pointing mortar ,the flush pointing shall be done as per specification ad direction of E/I .The pointing shall be kept moistfor atleast 10 days .

(T.S.-16)

11.0 PITCHING :

The boulder pitching shall be of good stone and shall confirm to the specification given in the description of materials .The pitching shall be done as per drawing unless otherwise specified .

The surface where boulder pitching has to be done shall be levelled and dressed up before the boulders are laid.The boulder not be less than 40 kg.each or as directed by E/I.and shall be selected as to size and

shape to secure fairly large flat surfaced stone which will lay up with even surface and minimum of voids. The top layer shall be levelled and hand packed so as to press at an even surface. Rock fragments and spawls shall be rightly driven in the interstices to wedge the pitching in place and to provide an opening to the underlying layers.

11.1 PAYMENT :

The item of work will be paid for at unit rates quoted which shall include the cost of all materials and labour required for work as pointed in this specification.

12.1 EXPANSION JOINTS :

The expansion joints shall be copper seal or rubber seal or any other type as per drawing of direction of E/I.

The expansion joints shall be so constructed as to render it absolutely water tight.

12.2 CONSTRUCTION JOINTS :

This will be done as specified in drawing or as per direction of the E/I.

13.0 WEEP HOLE :

Adequate weep holes shall be provided in the drainage wing wall, abutments and these will start about 450mm above drainage bed level. The weep holes shall be spaced 1.2 meter intervals in both directions. The size of weep holes shall be 50mm x 75mm face & 120mm x 150mm with a slope of 1 in 8 from back to the face. At back of the weep holes an inverted filter in total thickness 600mm x 600mm x 300mm will be provided in order to check the erosion of the back fill materials should be placed above suitably compacted earth to avoid displacement.

14.0 CLEANING OF SITE :

The contractor shall clear the site work of all shades, soaking vats, mortar platform debris, surplus construction materials etc. after construction work has been completed for which nothing extra will be paid.

15.0 IRON SAFETY LADDER :

The Iron safety ladder shall be made with size 5/8" dia rod as per specification and direction of E/I.

16 If any discrepancy is found between technical specifications and I.S Code, the provisions of I.S Code will prevail

CONTRACTOR

Executive Engineer
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Camp-Deoghar.