

4. TECHNICAL SPECIFICATIONS

GENERAL

1. The following Technical Specifications, code of practices etc. referred herein form part of the Item Specifications and the work shall be executed accordingly. Items which are not covered under Technical Specifications shall be carried out as per relevant IS Specifications or as per Manufacturers' specifications or as directed by the Consultant.

2. In case of discrepancy between Technical Specifications and Item Specifications provided along with Schedule of Quantities, the Item Specifications should prevail.

3. All the measurements shall be as per latest edition of B.I.S.

4.1.0 CONCRETE AND ALLIED WORKS

4.1.1 Applicable Codes

The following codes and standards are made a part of the Specifications. All standards, codes of practices referred to herein shall be the latest edition including all applicable official amendments and revisions.

In case of discrepancy between this specification and those referred to herein, this specification shall prevail.

4.1.2.1 Materials

- 1) IS 269 : Specification for ordinary, rapid hardening and low heat Portland cement
- 2) IS 455 : Specification for Portland blast furnace slag.
- 3) IS 1489 : Specification for Portland- pozzolana cement
- 4) IS 4031 : Methods of physical tests for hydraulic cement
- 5) IS 650 : Specification for standard sand for testing of cement
- 6) IS 383 : Specification for coarse and fine aggregates from natural sources for concrete
- 7) IS 2386(Parts I to VIII): Methods of test for aggregates for concrete
- 8) IS 516 : Methods of test for strength of concrete
- 9) IS 1199 : Methods of sampling and analysis of concrete
- 10) IS 2396(I)
IS 5640 : Flakiness Index of aggregates
- 11) IS 3025 : Methods of sampling and test (physical and chemical water used in industry)
- 12) IS 432(Part I&II) : Specification for mild steel and medium tensile steel bars and hard drawn steel wire for concrete reinforcement
- 13) IS 1139 : Specification for hot rolled mild steel and medium tensile steel deformed bars for concrete reinforcement
- 14) IS 1566 : Specification for plain hard drawn steel wire fabric for concrete reinforcement
- 15) IS 1785 : Specification for plain hard drawn (Part I) steel wire for pre-stressed concrete
- 16) IS 1786 : Specification for cold twisted steel bars for concrete reinforcement

- 17) IS 2090 :Specification for high tensile steel bars used in pre-stressed concrete
- 18) IS 4990 :Specification for plywood for concrete shuttering work
- 19) IS 2645 :Specification for integral cement water-proofing compounds

4.1.2.2 Equipment

- 1) IS 1791 :Specification for batch type concrete mixers
- 2) IS 2438 :Specification for roller pan mixer
- 3) IS 2505 :Specification for concrete vibrators immersion type
- 4) IS 2506 :Specification for screed board concrete vibrators
- 5) IS 2514 :Specification for concrete vibrating tables
- 6) IS 3366 :Specification for pan vibrators
- 7) IS 4656 :Specification for form vibrators for concrete
- 8) IS 2722 : Specification for portable swing weigh-batchers for concrete (single and double bucket type)
- 9) IS 2750 : Specification for steel scaffoldings

4.1.2.3 Construction Safety

- 1) IS 3696 : Safety code for scaffolds and ladders

4.1.2.4 Measurement

- 1) IS 1200 : Method of measurement of building works

IS 3385 :Code of practice for measurement of civil engineering works

4.2.1 General

The quality of materials, method and control of manufacture and transportation of all concrete work irrespective of mix, whether reinforced or otherwise shall conform to the applicable portions of this specification.

3.2.2 Cement

3.2.2.1.1 If the Contractor is instructed to supply cement, then the following conditions shall be applicable:

- a) Unless otherwise specified, the cement shall be ordinary portland cement in 50 kg bags. The use of bulk cement will be permitted only with the approval of the Consultant.
- b) A certified report attesting to the conformance of the cement to IS specifications by the cement manufacturer's chemist shall be furnished to the Consultant if demanded.
- c) Cement held in storage for a period of sixty (60) days or longer shall be tested. Should at any time Consultant have reasons to consider that any cement is defective, then irrespective of its origin, and/or manufacturer's test certificate, such cement shall be

tested immediately at contractor's cost in an approved laboratory and until the results of such tests are found satisfactory, it shall not be used in any work. Contractor shall not be entitled to any claim of any nature on this account.

4.2.2.1.2 Aggregates

4.2.2.1.3 Aggregate in general designates both fine and coarse inert materials used in the manufacture of concrete. Fine aggregate is aggregate all of which passes through 4.75 mm IS sieve. Coarse aggregate is aggregate most of which is retained on 4.75 mm sieve. Specification mentioned against various item of work may also be followed.

4.2.2.1.4 All fine and coarse aggregates proposed for use in the work shall be subject to Consultant's approval and after specific materials have been accepted the source of supply of such materials should not be changed without prior approval of Consultant.

4.2.2.1.5 Aggregates shall, except as noted above, consist of natural sands, crushed stone and gravel from a source known to produce satisfactory aggregate for concrete and shall be chemically inert, strong, hard, durable against weathering, of limited porosity and free from deleterious materials that may cause corrosion of the reinforcement or may impair the strength and / or durability of concrete. The grading of aggregates shall be such as to produce a dense concrete of specified strength and consistency that will work readily into position without segregation and shall be based on the mix design and preliminary tests on concrete specified later.

4.2.3.1 Brick aggregates

The brickbats shall be of new bricks well burnt, hard, durable and broken to sizes, well graded. It shall be free from dust, the size shall be of 37 mm and down. It shall be free from earth and other impurities.

4.2.3.2 Mix Design

4.2.3.2.1 It shall be very clearly understood that whenever the class of concrete such as M 20 is specified it shall be the Contractor's responsibility to ensure that minimum crushing strength stipulated for the respective class of concrete is obtained at works. The maximum total quantity of aggregate by weight per 50 kg of cement shall not exceed 250 kg except when otherwise specifically permitted by Consultant.

4.2.3.2.2 Water proofing agent

Where specified and approved by Consultant, water proofing agent conforming to IS 2645 shall be added in quantities specified by Consultant.

4.2.4 Preparation prior to concrete placement

4.2.4.1 Before the concrete is actually placed in position, the insides of the form work shall be inspected to see that they have been cleaned and oiled. Temporary openings shall be provided to facilitate inspection, especially at bottom of columns and walls forms to permit removal of saw dust, wood shavings, binding wire, rubbish dirt, etc. Openings shall be placed or holes drilled so that these materials and water can be removed easily. Such openings/holes shall be later suitably plugged.

4.2.4.2 The various agencies shall be permitted ample time to install drainage and plumbing lines in floor and trench drains, conduits, hangers, anchors, inserts, sleeves, bolts, frames and other miscellaneous embedments to be cast in the concrete as indicated on the drawings or as is necessary for

the proper execution of the work. Contractor shall co-operate fully with all such agencies and shall permit the use of scaffolding form work, etc., by other agencies at no extra cost.

4.2.5. Curing, protecting, repairing and finishing

4.2.5.1 Curing

4.2.5.1.1 All concrete shall be cured by keeping it continuously damp for the period of time required for complete hydration and hardening to take place. Preference shall be given to the use of continuous sprays or ponded water, continuously saturated covering of sacks, canvas, hessian, polythene sheets or other absorbent materials, or approved effective curing compounds applied with spraying equipment capable of producing a smooth, even textured coat. Extra precautions shall be exercised in curing concrete during cold and hot water as outlined hereinafter. The quality of curing water shall be the same as that used for mixing concrete.

4.2.5.1.2 Fresh concrete shall be kept continuously wet for a minimum period of 15 days from the date of placing of concrete following a lapse of 12 to 14 hours after laying of concrete. The curing of horizontal surfaces exposed to the drying winds shall however begin immediately the concrete has hardened. Water shall be applied uniformly to concrete surfaces within 1 hour after concrete has set. Water shall be applied to formed surfaces immediately upon removal of forms. Quantity of water applied shall be controlled so as to prevent erosion of freshly placed concrete.

4.2.5.1.3 Curing shall be assured by use of an ample water supply under pressure in pipes with all necessary appliance of hose, sprinklers and spraying devices. Continuous fine mist spraying or sprinkling shall be used, unless otherwise specified or approved by Consultant.

4.2.6.1 Repair and replacement of unsatisfactory concrete

4.2.6.1.1 Immediately after the shuttering is removed, the surface of concrete shall be very carefully inspected and all defective areas brought to the attention of Consultant who may permit patching of the defective areas or reject the concrete unit either partially or entirely. Rejected concrete shall be removed and replaced by contractor at no additional expense to owner. Holes left by form bolts, etc., shall be filled up and made good with mortar composed of one part of cement to one and half parts of sand passing 2.36 mm IS sieve after removing any loose stones adhering to the concrete shall be finished as described under the particular items of work.

4.2.6.1.2 Superficial honeycombed surfaces and rough patches shall be similarly made good immediately after removal of shuttering in the presence of Consultant and superficial water and air holes shall be filled in. The mortar shall be well worked into the surface with a wooden float. Excess water shall be avoided. Unless instructed otherwise by Consultant the surface of the exposed concrete placed against shuttering shall be rubbed down immediately on removal of shuttering to remove fine or other irregularities and necessary care being taken to avoid damage to the surface. Surface irregularities shall be removed by grinding.

4.2.6.1.3 If reinforcement is exposed or the honey combing occurs at vulnerable positions eg. ends of beams or columns it may be necessary to cut out the member completely or in part and reconstruct. The decision of Consultant shall be final in this regard. If only patching is necessary, the defective concrete shall be cut out till solid concrete is reached (or to a minimum depth of 25 mm) the edges being cut perpendicular to the affected surface or with small under cut if possible. Anchors, tees or dovetail slots shall be provided whenever necessary to attach the new concrete securely in place an area extending several centimeters beyond the edges and the surfaces of the prepared voids shall be saturated with water for 24 hours immediately before the patching material is placed.

4.2.7.1 Finishing

4.2.7.1.1 The type of finish for formed concrete surface shall be as follows, unless, otherwise specified by the Consultant.

4.2.7.1.2 For surfaces against which backfill or concrete is to be placed, no treatment is required except repairing of defective area.

4.2.7.1.3 For surface below grade which will receive waterproofing treatment the concrete shall be free of surface irregularities which would interfere with proper application of the waterproofing material which is specified for use.

4.2.7.1.4 Unless specified, surfaces which will be exposed when the structure is in service shall receive no special finish, except repairing of damage or defective concrete removal of fins and abrupt irregularities, fillings of holes let by form ties and rods and clean up of loose or adhering debris.

4.2.7.1.5 Surfaces which will be exposed to the weather and which would normally be level, shall be sloped for drainage. Unless the drawing specifies such as stair treads, walls shall be sloped across the width approximately 1 in 30 broader surface such as walkways, roads, parking areas and platforms shall be sloped about 1 in 50. Surfaces that will be covered by backfill or concrete sub floors to be covered either concrete topping, terrazzo or quarry tile and similar surfaces shall be smooth screeded and levelled to produce even surfaces. Surface irregularities shall not exceed 6 mm. Surfaces which will not be covered by backfill, concrete or tile toppings such as outside decks, floors of galleries and sumps, parapets, gutters, sidewall floors and slabs shall be consolidated, screeded and floated. Excess water and laitance shall be removed before finishing. Floating may be done with hand or power tools and started as the screeded surface has attained a stiffness to permit finishing operation and these shall be the minimum required to produce a surface uniform in texture and free from screed marks or other imperfections. Joints edges panels and forms linings shall be of uniform size and be as large as practicable and installed with closed joints. Upon removal of forms the joint marks shall be smoothed off and all blemishes, projections etc., removed leaving the surfaces reasonably smooth and unmarked.

4.3.0 MASONRY WORKS

4.3.1 Applicable codes and specifications

a)The following codes, standards and specifications are made a part of this specification. All standards, tentative specifications, codes of practices referred to herein shall be the latest edition including all applicable official amendments and revisions.

IS:1077 - Common burnt clay building bricks

IS:3102 - Classification of burnt clay bricks

IS:2180 - Burnt clay building bricks, heavy duty

IS:3495 - Method of sampling and testing clay
building bricks

IS:2691 - Burnt clay facing bricks

IS:2221 - Code of practice for brick work

IS:2185 - Load bearing hollow concrete blocks

IS:5498 - Lime-cement-cinder hollow concrete blocks

IS:3115 - Lime-cement cinder solid blocks

IS:1597 - Code of practice for construction of stone masonry (Part I)

4.3.2 Brick

4.3.2.1 Bricks used in works shall be bricks of specified crushing strength as described in the Schedule of Quantities. They shall have the following general properties:

4.3.2.2 They shall be sound, hard, homogenous in texture, well burnt in kiln without being verified, table moulded, deep red, cherry or copper coloured, of regular shape and size and shall have sharp and square edges and paralleled faces. The bricks shall be free from pores, chips, flaws or humps of any kind. Bricks containing unground particles and which absorb water more than 1/5th of their weight when soaked in water for twenty four hours shall be rejected. Over burnt or under burnt bricks shall be liable to rejection. These bricks shall give a clear ringing sound when struck.

4.3.2.3 Samples of bricks shall be submitted before starting the brickwork to the Consultant for approval. Bricks supplied shall conform to these approved samples. Brick sample shall be got tested as per IS:3495 by Contractor at no extra cost. Bricks rejected by Consultant shall be removed from the site of works within 24 hours.

4.3.3 Mortar

4.3.3.1 Mix for cement mortar shall be as specified in the respective items of work. Gauge boxes for sand shall be of such dimensions that one complete bag of cement containing 50 kgs. of cement forms one unit. The sand shall be free from clay, shale, loam, alkali, and organic matter and of

sound, hard, clean and durable practices. The Consultant shall approve Sand. If so directed by the Consultant, sand shall be thoroughly washed till it is free of any contamination.

4.3.3.2 For preparing cement mortar the ingredients shall first be mixed thoroughly in dry condition. Water shall then be added and mixing continued to give a uniform mix of required consistency. Cement mortar shall preferably be machine mixed, through mixing in a thorough manner may be allowed. The mortar so mixed shall be used within 30 minutes of mixing. Mortar left unused in the specified period shall be rejected.

4.3.3.3 The Contractor shall arrange for test on mortar samples if so directed by the Consultant, re-tempering of mortar shall not be permitted.

4.3.4 Workmanship

4.3.4.1 All bricks shall be thoroughly soaked in clean water for at least one hour immediately before being laid. The cement mortar for brick masonry work shall be as specified in the respective item of work. Brick work 230 mm thick and over shall be laid in English bond unless otherwise specified. While laying bricks shall be pressed into the mortar and shoved into final position so as to embed the brick fully in mortar. Bricks shall be laid with frogs uppermost.

4.3.4.2 All brick work shall be plumb, square and true to dimensions. Vertical joints in alternate courses shall come directly one over the other and be in line. Horizontal courses shall be levelled.

The thickness of brick courses shall be kept uniform. For walls of thickness greater than 230 mm both faces shall be kept in vertical planes. No broken bricks shall be used except as closers. Care shall be taken that the bricks forming the top corners and ends of the wall shall be properly radiated and keyed into position. Holes kept in masonry for scaffolding shall be closed before plastering. All interconnected brickwork shall be carried out at nearly one level (so that there is uniform distribution of pressure on the supporting structure) and no portion of the work shall be left more than one course lower than the adjacent work where this is not possible, the work shall be raked back accordingly to bond (and not saw toothed) at an angle not exceeding 45°.

4.3.4.3 Bricks shall be so laid that all joints are well filled with mortar. The thickness of joints shall not be less than 6 mm and not more than 10 mm. The face joint shall be raked to a minimum depth of 12 mm by raking tools daily during the progress of work when the mortar is still green so as to provide a proper key for the plaster or pointing to be done. Where plastering or pointing is not required to be done the joints shall be uniform in thickness and be struck flush and finished at the time of laying. The face of brickwork shall be cleaned daily and all mortar droppings removed. The surface of each course shall be thoroughly cleaned of all dirt before another course is laid on top. If the mortar in the lower course has begun to set the joints shall be raked out to depth of 12 mm before another course is laid.

4.3.4.4 All brick work shall be built tightly against columns, floor slabs or other structural member.

4.3.4.5 The work shall be cured for 15 days.

4.3.5. SCAFFOLDING

(a) Scaffolding independent of block work, double legged single / multiple staging scaffolding shall be provided. It should be tied to block work or structure at suitable intervals in both directions. Two rows of planks shall be provided all around. Planks shall be at least 50 mm thick and well-tied to scaffolding. Railing to the outside face shall be provided. While erecting scaffolding, the following points must be noted and closely followed:

1. Minimum number of holes in the horizontal direction. Holes shall be formed by omitting header brick.
2. No holes near the skew backs of arches.
3. Scaffolding must be sound and strong and easy to maintain.
4. Holes left must be closed while finishing the plaster.

(b) Raking back shall be carried out at an angle not steeper than 45 degrees in case all the block work is not raised together.

(c) The block should be of full height and no cut pieces shall be allowed. PCC levelling course shall be laid to fill up the gap.

4.4.0 **FINISHING WORKS**

4.4.1 **Applicable Codes**

- 1)IS:2394 - Code of practice for application of lime plaster finish
- 2)IS:1477 - Code of practice for painting of ferrous metals in buildings and allied finishes (Part I & II)
- 3)IS: 427 - Distemper, dry colour as required

4)IS:2395 - Code of practice for painting concrete, masonry and plaster surfaces

5)IS: 428 - Distemper, oil emulsion, colour as required

4.4.2 Plastering

3.4.2.1 The surface to be plastered shall be washed with fresh and clean water free from all dirt, loose material, grease, etc., and thoroughly wetted for 6 hours before plastering work is commenced. Concrete surfaces to be plastered will however be kept dry. The wall should not be too wet but only damp at the time of plastering. The damping shall be uniform to get uniform bond between the plaster and the wall. **The junction between the brick work and RCC should be fixed with chicken wire mesh/PVC strip as directed before plastering.**

4.4.2.2 The proportion of the mortar shall be as specified under the respective items of work. Cement shall be mixed thoroughly in dry condition and then just enough water added to obtain a workable consistency. The quality of water, sand and cement shall be as mentioned in the Specifications for Concrete & allied works. The mortar thus mixed shall be used immediately and in no case shall the mortar be allowed to remain for more than 30 minutes after mixing with water. The plaster shall be laid in a single coat. The mortar shall be splashed on the prepared surface with a trowel and finished smooth by trowelling. The plastered surface shall be rubbed with iron plate

till the surface shows cement paste. The work shall be in line and level. Curing of plaster shall be started as soon as the applied plaster has hardened enough so as not to be damaged. Curing shall be done by continuously applying water in a fine spray and shall be carried out for at least 7 days.

4.4.2.3 The plaster shall be carried out on jambs, lintel and sill faces top and undersides, etc., as shown in the drawing or as directed by the Consultant / Representative of KSFDCC.

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