

CIVIL SPECIFICATIONS (As Applicable as per BOQ)**STANDARD LIST OF APPLICABLE IS CODES**

| Sr. No. | Code No. | Code for | Year |
|---------|-------------------------|---|------|
| 1. | IS 383 | Aggregate | 1970 |
| 2. | IS 456 | Plain Cement concrete & RCC | 2000 |
| 3. | IS 3764 | Code of Safety for Excavation | 2000 |
| 4. | SP 34 | Hand Book for Reinforcement & detailing | 1987 |
| 5. | IS 1542 | Sand for plaster | 1992 |
| 6. | IS 1786 | High strength deformed steel bars and wire for construction Reinforcement | 2008 |
| 7. | IS 1200 (Part 1 to 28) | Method of Measurement for civil works | 2007 |
| 8. | IS 6461 (Part V) | Form work for Concrete | 1972 |
| 9. | IS 9103 | Specification for concrete Admixture | 1999 |
| 10. | IS 10262 | Concrete Mix Design | 2009 |

1.0 GRADES OF CONCRETE:**1.1 CONTROLLED CONCRETE:**

For controlled concrete, design of the mix shall be arrived at after preliminary tests and in its production all necessary precautions shall be taken to ensure that the required works cube strength is attained and maintained. The controlled concrete shall be in grades designated in from M:15 and M:60.

M:15/ M:20 concrete shall be used for all concrete used as Plain Cement Concrete under footings, rafts, bases, flooring on grade, as filling material etc.

M:30, M:40, M:50 & M:60 concrete shall be used for all structural members and in all such work where reinforcement is used.

In the designation of a concrete mix, letter M refers to the mix and the number to the specified 28 days works cube compressive strengths of that mix on 150 mm cubes expressed in N/mm².

2.0 STRENGTH REQUIREMENT OF CONCRETE:

The compressive strength requirements for various grades of concrete controlled as well as ordinary shall be as given in Table 1.

For controlled concrete, the mix shall be so designed as to attain in preliminary tests strength at least 33 percent higher than that required on works tests.

Table 1

| Grade of Concrete | Compressive works test strength in N/sq.mm on 150 mm cubes after tests conducted in accordance with IS-456. | |
|-------------------|---|-----------------|
| | Min. at 7 days | Min. at 28 days |
| M:15 | 11 | 15 |
| M:20 | 13 | 20 |
| M:25 | 16 | 25 |
| M:30 | 20 | 30 |
| M:40 | 26 | 40 |
| M:50 | 34 | 50 |
| M:60 | 41 | 60 |

Note:

In all cases, the 28 days compressive strength specified in Table 1 shall alone be the criterion for acceptance or rejection of the concrete.

Where the strength of a concrete mix, as indicated by tests, lies in between the strength for any two grades specified in Table 1, such concrete shall be classified for all purposes as a concrete belonging to the lower of the two grades between which its strength lies.

4. Applicable Codes

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

- 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 testing of 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 3025 : Methods of sampling and test (physical
and
chemical water used in
industry)

- 11) IS 432(Part I & II) : Specification for mild steel and medium tensile steel bars and hard drawn steel wire for concrete reinforcement.
- 12) IS 156 : Specification for plain hard drawn steel wire fabric for concrete reinforcement.
- 13) IS 1785 : Specification for plain hard drawn (Part I) steel wire for prestressed concrete.
- 14) IS 1786 : Specification for cold twisted steel bars concrete reinforcement.
- 15) IS 2090 : Specification for high tensile steel bars used in prestressed concrete.
- 16) IS 4990 : Specification for plywood for concrete shuttering work.
- 17) IS 2645 : Specification for integral cement water-proofing compounds.

(b) Equipment

- 1) IS 1791 : Specification for batch type Concrete mixers.

- 2) IS 2438 : Specification for roller pan mixer
 - 3) IS 2505 : Specification for concrete Libra-Torso 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)
Specification for steel scaffoldings.
 - 9) IS 2750
- (c) Codes of Practice
- 1) IS 456 : Code of practice for plain and reinforced concrete
 - 2) IS 457 : Code of practice for general construction of plain and reinforced concrete for dams and other massive structures.

engineering works.

The above mode of measurement shall be applicable only if it is not given specifically in the tender document.

5.0 MATERIALS:

5.1 Cement:

Unless otherwise specified or called for in the contract specifications, cement shall be of the following and the type selected should be appropriate for the intended use and as per the contract conditions, specifications and drawings.

53 Grade ordinary Portland cement conforming to IS 12269

5.2 Aggregates:

- a) "Aggregate" in general designates both fine and coarse inert materials used in the manufacture of concrete.
- b) "Fine Aggregate" is aggregate most of which passes through 4.75 mm I.S. sieve.
- c) "Coarse Aggregate" is aggregate most of which is retained on 4.75 mm I.S. sieve.

Aggregate shall comply with requirement of IS 383. As far as possible preference shall be given to machine broken and graded aggregate.

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

Aggregate shall, except as noted above, consists of natural sand, 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 to 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 test on concrete specified herein-after Machine Made Sand : Machine made sand will be acceptable, provided the constituent rock

composition is sound, hard, dense, non-organic, uncoated and durable against weathering.

Machine made sand shall be accepted provided grading & finer particle limits conform to IS 383.

Screening and Washing : Sand shall be prepared for use by such screening or washing or both, as necessary, to remove all objectionable foreign matter while separating the sand grains to the required size fractions. Sand with silt content more than 3 percent will not be permitted to be used unless the same is washed and silt content is brought within 3% by weight.

6. Water:

Water used both for mixing and curing shall be free from injurious amounts of deleterious materials. Potable waters are generally considered satisfactory for mixing and curing concrete. Chemical properties of water shall conform to I.S.456.

7. Mineral Admixtures:

Pozzolana: Pozzolanic materials conforming to relevant Indian Standards may be used with the permission of Engineer-in-charge, provided uniform blending with cement is ensured. Fly ash (pulverized fuel ash): Fly ash conforming to Grade 1 of IS 3812 may be used as part replacement of ordinary Portland cement provided uniform blending with cement is ensured.

8. Materials for Repair Work:

The use of approved construction chemicals for bonding between old and fresh concrete and pressure grouting with polymer additives used for repairs shall be paid separately.

The selection of the bonding agents and polymer grouts shall be made on written approval of the Engineer. These bonding agents and polymer grouts shall be applied and used in accordance with the instructions of the Manufacturer. However, it is the Engineer in charge's sole discretion whether the unsatisfactory portion of concreting is to be allowed to be repaired or to order the portion to be demolished to be reconstructed. The cost of the reconstruction will also be borne by the Contractor.

E.1 DESIGN MIX CONCRETE:

All reinforced concrete in the works shall be "Design Mix Concrete" as defined in I.S. 456-2000.

E.2 READY MIX CONCRETE:

(SPECIFICATIONS FOR READY MIXED CONCRETE, CONFORMING TO IS 4926)

Ready mix Concrete shall conform to latest revision of IS : 4926 following are the requirement for supply of R.M.C

A. Concrete delivered at site shall be in a plastic condition and requiring no further treatment before being placed in the position in which it is to set and harden

B. The process of continuing the mixing of concrete at a reduced speed during transportation to prevent segregation.

C. Truck mounted equipment designed to agitate concrete during transportation to the site of delivery.

D. Concrete produced by completely mixing cement, aggregates, admixtures if any and water at a stationary central mixing plant and delivered in containers fitted with agitating devices. The concrete may also be transported without being agitated as a special case and as requested.

MATERIALS :

A. The cement used shall be of specified grade ordinary Portland cement or low heat Portland cement conforming to IS: 269 . If the type is not specified, ordinary Portland cement shall be used.

B. Fly ash when used for partial replacement of cement, shall conform to the requirements of IS-3812 (Part I) and as specified by the users.

C. The aggregate shall conform to IS: 383. Fly ash when used as fine aggregate shall conform to the requirements of IS 3812 – (Part - II).

D. Water used for concrete shall conform to the requirement of IS 456-2000.

E. The admixtures shall conform to the requirements of IS : 456-2000 and their nature, quantities and methods of use shall also be specified. Fly ash when used as an admixture for concrete shall conform to IS : 3812 (Part II) – 1981. However, partial replacement of cement by fly ash shall not be more than 15% of designed requirement.

SUPPLY:

The ready-mixed concrete shall be manufactured and supplied on either of the following basis:

i) Specified strength based on 28-day compressive strength of 15 -cm cubes tested in accordance with IS: 456-2000.

When the concrete is manufactured and supplied on the basis of specified strength, the responsibility for the design of mix shall be that of the manufacturer and the concrete shall conform to the requirements specified.

GENERAL REQUIREMENTS:

A. When a truck mixer or agitator is used for mixing or transportation concrete, no water from the truck-water system or from elsewhere shall added after the initial introduction of the mixing water for the batch, when no arrival at the site of the work, the slump of the concrete is less that specified, such additional water to bring the slump within limits shall be injected into the mixer under such pressure and direct flow that the requirements for uniformity specified.

B. Unless otherwise specified when a truck or agitator is used for transporting concrete, the concrete shall be delivered to the site of the work and discharge shall be complete within within 2 hours of adding the mixing water to the mix of cement and aggregate or adding the cement to the aggregate whichever is earlier.

C. The temperature of the concrete at the place and time of delivery shall be not less than 5degC.Unless otherwise required by the purchaser, the concrete shall be delivered when the site temperature is less than 2.50 deg C.

D. Adequate facilities shall be provided by the manufacturer/supplier to inspect the materials used the process of manufacture and methods of delivery of concrete. He shall also provide adequate facilities to take samples of the materials used.

E. The tests for consistency or workable shall be carried out in accordance with requirements of IS 1199 by such other method as may be agreed to between the purchaser and manufacturer.

F. The sampling and testing of concrete shall be done in accordance with the relevant requirements of IS 456, IS 1199 and IS 516.

G. The compressive strength and flexural strength tests shall be carried out in accordance with the requirement of IS: 516 and the acceptance criteria for concrete whether supplied on the basis of specified strength or on the basis of mix proportion, shall conform to the requirements and other related requirements of IS: 456 -2000.

H. The testing shall be carried out in accordance with the requirements and the cost shall be borne by the Contractor.

I. The manufacturer shall keep batch records of the quantities by mass all the solid materials, of the total amount of water used in mixing and of the results of all tests. If required insisted, the manufacturer shall furnish certificates, at agreed intervals, giving this information.

J. However, consumption of RMC shall be maintained at site. Wastage, spillover, wastage due to pump blockage etc. shall be included in the quoted rate.

E.3 TRANSPORT, PLACING AND COMPACTION OF CONCRETE:

1.1 General:

The method of transporting and placing concrete shall be approved by the Engineer.

Concrete shall be so transported and placed that no contamination, segregation or loss of its constituent materials takes place. Transporting, placing, compacting and curing shall be done as per IS:456.

1.2 Formwork and embedment:

All formwork and reinforcement contained in it shall be cleaned and made free from standing water, or dust, immediately before placing of concrete. Formwork, reinforcement, all embedments shown on all drawings, i.e. architectural, plumbing, electrical, air-conditioning, structural reinforcement, structural steel inserts, etc. shall be properly placed and secured tightly to the formwork or reinforcement as the case may be and Engineer's approval shall be taken in writing as regards their accuracy in terms of dimensions, locations, numbers, spacing, quality, adherence to specifications etc. before placing concrete in any part of the structure.

1.3 Approval from Engineer:

No concrete shall be placed in any part of the structure until the approval of the Engineer has been obtained in writing.

If concreting is not started within 24 hours of the approval being given, it shall have to be obtained again from the Engineer. Concreting then shall proceed continuously over the area between pre-determined construction joints. Fresh concrete shall not be placed against concrete that has been in position for more than 30 minutes unless a proper construction joint is formed.

1.4 Temperature during concreting:

Concrete when deposited shall have a temperature of not less than 4.5 degree centigrade and not more than 40 degrees centigrade unless otherwise specified.

Care shall be taken to protect freshly placed concrete from overheating by sunlight in the first few hours of laying. The time of day selected for concreting shall also be chosen so as to minimize placing temperatures. In case of concreting in exceptionally hot weather the Engineer may in his discretion specify the use of ice either flaked and used directly in the mix or blocks used for chilling the mixing water.

1.5 Time lag between mixing and placing:

It 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.

1.6 Placing:

Except where otherwise agreed to by the Engineer concrete shall be deposited in horizontal layers to a compacted depth of not more than 0.45 meter when internal vibrators are used and not exceeding 0.30 meter in all other cases.

Unless otherwise agreed to by the Engineer, concrete shall not be dropped into place from a height exceeding 2 meter. When trunks or chutes are used they shall be kept clean and used in such a way as to avoid segregation. When concrete is conveyed by chute, the plant shall be of such size and design as to ensure practically continuous flow.

Slope of the chute shall be so adjusted that the concrete flows without the use of an excessive quantity of water and without any segregation of its ingredients. The delivery end of the chute shall be as close as possible to the point of deposit. The chute shall be thoroughly flushed with water before and after each working period and the water used for this purpose shall be discharged outside the formwork.

1.7 Compaction:

Internal (needle) and surface (screed board) vibrators of approved make shall be used for compaction of concrete.

Internal vibrators shall be used for compaction of concrete in foundations, columns, buttresses, arch sections etc. For sections such as slabs, the concrete shall be compacted by surface type vibrators. Depending on the thickness of layer to be compacted, 25 mm, 40 mm and 60 mm dia internal vibrators will be used. The concrete shall be compacted by use of appropriate diameter vibrator by holding the vibrator in position until:

- i. air bubbles cease to come to surface

ii. Resumption of steady frequency of vibrator after the initial short period of drop in the frequency when the vibrator is first inserted.

iii. the tone of vibrator becomes uniform

iv. flattened, glistening surface with coarse aggregate particles blended into it appear on the surface.

After the compaction is completed, the vibrator should be withdrawn slowly from the concrete so that concrete can flow in to the space previously occupied by the vibrator.

To avoid segregation during vibration the vibrator shall not be dragged through the concrete nor used to spread the concrete. The vibrator shall be made to penetrate into the layer of fresh concrete below if any for a depth of about 150 mm. The vibrator shall be made to operate at a regular pattern of spacing. The effective radii of action will overlap approximately half a radius to ensure complete compaction.

To secure even and dense surfaces free from aggregate pockets, vibration shall be supplemented by tamping or rodding by hand in the corners of forms and along the form surfaces while the concrete is plastic.

A sufficient number of spare vibrators shall be kept readily accessible to the face of deposition of concrete to assure adequate vibration in case of breakdown of those in use. 25 mm diameter immersion vibrators shall be used in thin sections. 40 mm diameter immersion vibrators in fairly wide sections and 60 mm diameter vibratos in foundations and arch abutments. Screed vibrators shall be used for precast deck elements and in the in-situ deck slab concreting where the thickness of the slab is 50 mm. Plain concrete in foundations shall be placed in direct contact with the bottom of the excavation, the concrete being deposited in such a manner as not to be mixed with the earth. Plain concrete shall be vibrated to achieve full compaction, using needle or screed vibrators as necessary. Direct contact between vibrator and reinforcement or inserts and embedments should be avoided.

1.8 Protection of wet concrete:

Concrete placed below the ground shall be protected from falling earth during and after placing. Concrete placed in ground containing deleterious substances shall be kept free from contact with such ground and with water draining there from during placing and for a period of seven days or as instructed thereafter. Approved means shall be taken to protect immature concrete from damage by debris, excessive loading, abrasion, vibrations, and deleterious ground water, mixing with earth or other concrete.

E.4 CURING OF CONCRETE:

Immediately after compaction, concrete shall be protected against harmful effects of weather, including rain, running water, shocks, vibration, traffic, rapid temperature changes, and drying out process. It shall be covered with wet sacking, Hessian or other similar absorbent material approved by the Engineer soon after the initial set, and shall be kept continuously wet for a period of not less than 21 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 21 days.

E.5 WORKING IN EXTREME WEATHER:

When depositing concrete in very hot weather, precautions shall be taken so that the temperature of wet concrete does not exceed 40 degrees centigrade while placing. This shall be achieved by stacking aggregate under the shade and keeping them moist, using cold water or crushed or flaked ice if specified and permitted by the Engineer, reducing the time between mixing and placing to the minimum, cooling formwork by sprinkling water, starting curing before concrete dries out and restricting concreting, as far as possible, to mornings and evenings. During hot weather and rains the concrete shall be covered with tarpaulins and transported in as short a time as possible and placed in the forms and consolidated to final state.

Commencement of concrete pours shall be avoided during heavy rains, storms and high winds.

E.7 TESTS AND STANDARD OF ACCEPTANCE:

Work strength tests shall be made in accordance with IS:516. Each test shall be conducted on six specimens, three of which shall be tested at 7 days and the remaining three at 28 days. The samples of concrete shall be taken on each day of concreting and cubes shall be made at the rate of one set for every 10 cubic meter of concrete or a part thereof for each grade. 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, when procedure of tests given above reveals a poor quality of concrete and in other special cases.

All work shall be carried out under the supervision of qualified and competent Engineer appointed by and working on behalf of the Contractor (not the Engineer-in-charge) who will supervise proportioning, placing and compacting of concrete at all stages. If concrete is batched at more than one point simultaneously, the above frequency of making cubes shall be followed at each point of batching.

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 an approved laboratory at the cost of the Contractor.

1. Standard of Acceptance:

The strength requirement of any particular grade of concrete will be considered satisfactory if the 28 days compressive strengths of individual sets (each set consists of 3 cubes) and of individual cubes satisfy the following requirements:

2. Field Tests:

As frequently as the Engineer may require, testing shall be carried out in the field for

- a. Moisture content and absorption and density of sand and aggregates.
- b. Silt content in sand
- c. Grading of sand and aggregates
- d. Slump test of concrete
- e. Concrete cube test

The Contractor shall provide and maintain on site at all times, until the works are completed, equipment and staff required for carrying out these tests.

3. Mandatory requirement of equipment

1. Cast iron cube moulds 15 cm. Size : 15 Nos.(min.)
2. Slump cone complete with tamping rod :1 Set
- 3: Measuring cylinder 250ml: 1set

E.8 INSPECTION OF STRUCTURES:

Immediately after stripping the form work, all concrete shall be carefully inspected and any defective work or small defects, either removed or made good before concrete has thoroughly hardened, as instructed by Engineer-in-Charge.

In case of doubt regarding the grade of concrete used or results of cube strength are observed to be lower than the designed strength as per specifications at 28 days, compressive strength test of concrete based on core test, ultrasonic test and/or load test shall be carried out by the digital ultrasonic concrete tester by an approved agency as directed by the Engineer-in-Charge all at the cost of the contractor. In case these tests do not satisfy the requirements, the Employer will be at liberty to reject the concrete, and the contractor, at his own cost, has to dismantle and re-do the same or carry out such remedial measures as approved by the Department.

E.9 REPAIR WORK:

Concrete, which is unsatisfactory, shall be repaired by cutting out the unsatisfactory material and by replacing it with new concrete. Voids to be so filled shall be provided with anchors, keys or dovetail slots whenever necessary to attach the new material securely in place. Surface of prepared voids shall be wetted for 24 hours immediately before the patching material is placed. Repair of concrete shall be made by skilled workmen. Repairs shall be made as soon as practicable after removal of forms and in a manner to meet the requirements for the finish specified for the particular location.

Repairing leakages in liquid retaining structures which become apparent during leak testing will also have to be repaired by the Contractor at his own cost following methods and specifications as directed by the Engineer.

For repair of the concrete works, the contractor may use epoxy as a bonding agent prior to placing fresh concrete. The use or otherwise of epoxy for the repair work will be at the discretion of the Engineer. Epoxies shall be applied in strict accordance with the instructions of the manufacturer.

Approved brands of repair material and chemicals shall be used to repair surfaces of damaged concrete at the discretion of the Engineer. The repair work shall be carried out strictly in accordance with the manufacturer's recommendations as regards the preparation of surface, cleaning, hacking, applying bonding agents, admixtures, polymer mortars etc. Any deviation shall be certified by the Engineer before being brought into execution.

Filling material or grout used in repair of surfaces which will be exposed after completion of the project shall be made with cement from the same sources as that used in concrete and blended with a sufficient amount of white Portland cement to produce the same colour as in the adjoining concrete. Patched surfaces shall be given a final treatment as required to make the texture of the patch match that of the surrounding material.

Immediately after patching is completed, the patched area shall be covered with an approved non staining, water-saturated material, which shall be kept wet and protected against sun and wind for a period of 12 hours. Thereafter, the patched

area shall be kept continuously wet by a fine spray or sprinkling for not less than 10 days. The layers of gunite may be reinforced with steel mesh if directed by the Engineer.

All materials, procedures and operations used in the repair of concrete and also the finished work shall be subject to the approval of Engineer. All fillings shall be tightly bonded to the concrete and shall be sound, free from shrinkage cracks, or dummy areas after the fillings have been cured and dried.

The extent of repair shall be decided upon by the Engineer. The cost of repairs of defective areas shall be borne by the contractor. The engineer may adopt at his discretion any other method of repairing like grouting with cement grout, epoxy grouts or guniting etc which will be carried out by the contractor at his cost as per the specifications supplied by the Engineer.

Repairing shall be carried out only if the Engineer feels that it is sufficient only to repair the concrete and demolition and reconstruction is not necessary.

E.11 MEASUREMENT FOR PAYMENT: (For Item rate contract)

i) The cement concrete shall be measured in cubic meters. In reinforced concrete the volume occupied by reinforcement shall not be deducted.

ii) Any concrete used in excess of the theoretical dimensions as shown on the drawings will not be paid.

iii) Unacceptable Work:

All defective concreting work, including but not limited to defects arising out of honeycombing, under sizing, etc. are liable to be demolished and rebuilt by the Contractor at his own cost. In the event of such works being accepted by carrying out repairs etc. as specified by the Engineer, the cost of repair will be borne by the contractor. In the event of the works being accepted by giving a design concession' arising out of but not limited to undersizing, understrength, by accepting high design stresses in members, or accepting materials not fully meeting the specifications etc. The Contractor will be paid for the work actually carried out by him at the reduced rate of 75% of the tendered rate for portion of the work thus accepted.

E.13 TOLERANCES:

16.1 Tolerances in Reinforced Concrete Work :

| Description | Permissible Departure |
|---|--|
| Departure from established alignment of all elements | 30 mm. |
| Departure from established grades | 10 mm. |
| Variation from plumb or specified) batter in lines and surface) columns, piers, walls and in rises) | 12 mm in 3 m. if exposed 25 m in 3 m. if backfilled |
| Variation from level or indicated) grade in slabs, beams, horizontal) and railing offsets. | 12 mm in 3 m. if exposed 25 mm in 3 m. if backfilled |
| Variation in cross sectional dimensions of columns, piers, slabs, walls and beams. | -6 mm to +12 mm |
| Variation in slab thickness | -3 mm to + 6 mm |
| Footings : plan dimensions | -15 mm to + 30 mm |
| Misplacement or eccentricity | 2% of footing width in the direction of misplacement and not exceeding 30 mm |
| Reduction in thickness | 5% of specified thickness |
| Variations in size and location : of slabs, wall openings. | 12 mm |

Notwithstanding the above allowances, it is presumed that all works will be carried out true to the lines, levels and grades shown on the drawings and within the tolerances specified below. The contractor shall establish, erect and maintain in an undisturbed condition, until final completion and acceptance of the project, control points and bench marks necessary and adequate to establish these tolerances.

E.14 . PLAIN CEMENT CONCRETE : Proportion 1:2:4

Plain Cement Concrete is for foundation below footings, floor and raft and trenches as per above mention specification for use of material including all material. Labour & Tools and tackle lying, spreading, ramming, consolidating, curing and finishing top surface rough or smooth as per instructions of R-infra Engineer.

Plain Cement Concrete M-15 Grade (with cement, sand and 20mm down size graded crushed stone aggregate as per approved mix design) including scaffolding, opening, recesses, chamfering, finishing top surface vibrating machine mixing, tamping, curing (excluding centering and shuttering)etc. complete as per the specifications, drawings and instructions R-Infra Engineer. (Excluding cost of reinforcement) The concrete work is to be based on IS: 456