

Technical Specification of Materials

GENERAL:

1. All materials to be used shall conform to I.S. 4031-1988 or the relevant specifications as per the latest version of Indian standard, unless otherwise stated in the detailed specifications of items of work.
2. Wherever a reference to any Indian standard appears in the specifications, it shall be taken to mean reference to the latest version of the standard.
3. Tests for materials shall invariably be got carried out by the contractor when the same are specified in the out, even the same are not specifically mentioned in the specifications if in the opinion of the Engineer-in-charge, the same are required to be carried out. All such tests shall be got carried in any Government approved Laboratories or GERI and cost thereof shall be entirely borne by the contractor.
4. No collection of materials shall be made before it is got approved from the Engineer-in-charge.
5. Collection of approved materials shall be done at site of working in a systematic manner. Materials shall be stored in such a manner as to prevent deterioration, intrusion of foreign matter and to ensure the preservation of their quality and fitness for the work.
6. Materials, if rejected by the Engineer-in-Charge shall be immediately removed within twenty-four hours of receiving such an information, Engineer-in-Charge dispose of such materials in a manner he choose and the contractor shall not be entitled to any compensation for the cost of such materials.
7. Approval to the samples of various materials given by the Engineer-in-Charge will not absolve the contractor from the responsibility of replacing the defective materials brought on site of materials used in the work found defective at a later date. The contractor shall have no claim to any payment to compensation whatsoever on account of any such materials being rejected by the Engineer-in-Charge.

The contractor shall be responsible for observing the laws, rules, and regulations imposed under the "MINOR MINERAL ACTS" and such other laws and rules prescribed by central/state Govt. from time to time.

DETAILED SPECIFICATION OF MATERIALS

M-1 WATER:-

Water shall not be salty or brackish and shall be clean, reasonably clear and free from objectionable quantities of silt and trace of oil and injurious alkalis, salts, organic matter and other deleterious materials which will either weaken the mortar or concrete or cause effluence or attack the steel in R.C.C. containers for transport storage and handling of water shall be clean. Water shall conform to the standard specified in I.S. 456-1978. Water for drinking will generally be found suitable for mortar or concrete.

Water for curing mortar, concrete or masonry should not be too acidic or too alkaline.

It shall be free of elements which significantly effect the hydration reaction or otherwise interfere with the hardening of mortar or concrete during curing of these which produce objectionable stains or other unsightly deposit on concrete or mortar surface.

Hard and bitter water shall not be used for curing. Potable water will generally be found suitable for curing mortar or concrete or masonry.

The turbidity in water shall not be more than 2000 ppm and shall preferably be as low as possible.

Where water is found to contain any sugar or an excess of acid, alkali or salt, the Engineer-In-Charge will refuse to permit its use. As a guide the following table represents the maximum permissible values.

Particulars	Percent by weight	Permissible maximum limit
Organic	0.02	200mg/l.
Inorganic	0.30	3000mg/l.
Sulphate	0.05	400mg/l.
Alkali Chlorides	0.10	2000mg/l.for concrete not containing embedded steel and 500mg/l.for reinforced concrete work.
Suspendedmatter	0.20	2000mg/l.
PHvalue	6to8	

M-2 CEMENT

1.1 Ordinary Portland Cement of grade 53 OPC/PPC shall be used conforming to I.S. 12269 - 1987 or it's latest version for the entire work under the tender in all respects and shall be procured in bag. The contractor shall have to make his own arrangement to procure the cement (bearing I.S.I. mark & which Cement brand /Company should be approved by department) directly from the manufacturer / authorized Dealer of Cement Company. The contractor shall arrange a suitable & adequate infrastructure for procuring, conveying with loading & unloading and proper storing the same to the site of work at his own cost with sufficient quantity for advance planning of work to be done in next fifteen days as approved by the Engineer-in-charge of the work, so that Dept. shall be conduct minimum required test to ascertain its quality. For verification of such purchase, the contractor shall have to produce all the bills of manufacturer / authorized dealer's along with testing details (i.e. manufacturer's test result conducted in the it's Q.C. laboratory for each batch of cement which is brought to the work site) to the Engineer- in-charge of the work, so that works can be allowed if manufacturer's lab. result is found OK till the receiving of test results from approved lab of Deptt. If OPC is not available in sufficient quantity in market Portland pozzolona cement will be allowed with prior approval of Engineer-In-Charge.

1.2 All cement shall be stored in dry, water tight stored shade, facilities to protect cement from dampness & properly ventilated structure. In case of storage of cement bag, the floor on which cement is to be stored shall be raised at least 30cm.above ground level & the bags shall not be piled more than 10 bags height and shall be arranged in headers & stretches fashion as close as possible. The Contractor shall be responsible for proper storage of cement and if any damage or deterioration

there in, shall be responsible for the change or removed at his own cost.

Cement should be used in the work, in order of receipt to the store/ site, for this purpose, such consignment it arrives should be stacked separately and play card bearing the date of arrival should be pinned to the pile. The arrangement of storage and utilization shall be such that to ensure the utilization of the cement in order of its arrival at the storage and the contractor shall maintain updated record which would at any time show the date of receipt and proposed utilization of cement lying in the store at the site.

The contractor shall provide a double locking arrangement for the store and the key of one lock will remain with the Engineer-in-charge of the work or his authorized. The Engineer-in-charge shall any time have an easy access to the store and the site of the work for checking. The Engineer-in-charge or his authorized shall have authority to check and examine the method of storage, records, accounting and security provided by the contractor. The Contractor shall produce the proof by way of record, books, return, Perform etc. maintain by his staff on site, on demand from Engineer-in-charge of the work or his authorized and the contractor shall at all-time keep this records update to enable to Engineer-in-charge of the work or his authorized to apply the check may desire to impose.

1.3 The cement brought by the contractor at the site, department shall be sampled as per I.S. 3535 (or latest version of I.S.) & sent it in approved lab. Of Deptt. for testing as per I.S. 4031, 4032 (or latest version of I.S.). The contractor shall have made arrangement for sampling work & it's submitted to the Government Laboratory or Govt. approved laboratory at his own cost. TESTING AT THE RATE OF 1% OF WORK DONE SHOULD BE DEDUCTED FROM RA BILL OF CONTRACTOR. The testing shall be done for each consignment received at the site. The cement consignments shall be more than 50 tons or part thereof; each consignments shall be stacked separately.

1.4 The cement not satisfying the criteria as per I.S. 12269 for grade 53 and IS 1489 shall be rejected and such stack of cement shall be removed immediately from the site of work. No extra cost either for testing or for rejected cement shall not paid to the contractor. No cement shall be used for the work without being tested and such work shall not be paid by the Engineer-in-charge and shall be removed at contractor's own cost. The results of the cement should be submitted by the contractor as and when required by the Engineer-in-charge or his authorized. Manufactures results as per lot of manufacturing will also have to be submitted.

1.5 A regular day to day account of cement received and consumed / used in the work, together with the particulars tender item & quantity of each of the work shall be maintained in ink by the responsible representative of the department and shall be signed both i.e. by the departmental representative as well as the contractor, after proper verification at the end of the day's work. The accounting shall be shown to the inspecting officer when asked for. The Engineer-in-charge of the work or his

authorized shall have the authority to verify the stock and check on the consumption in any manner he thinks proper. The volume of one bag cement weight 50 kg shall be considered as 0.0342 cum for mixing in concrete

1.6 Frequency for Cement testing shall as under.

Weight of lot/batch (in tonne)	No. of Sample to be taken
Upto 50	1
51 to 100	2
101 to 200	3
201 to 300	4
301 to 500	5
501 to 1000	6
1000 to 1300	7

Physical/chemical properties of cements shall confirm to IS 3535-1986 or its latest version. The contractor shall have to procure cement directly from the large scale manufacturer or authorized dealer which shall confirm I.S.I. The cement so purchased only shall be permitted to be used. The contractor shall provide satisfactory evidence to the Engineer-in-Charge in support of such purchase.

The cement after it is brought on sight (store) by the contractor, can only be allowed to use after obtaining necessary certificate of the test from any Government approved Laboratory/Institute & Company test result about its suitability for the use on the concerned works. The contractor shall produce/ submit the laboratory test results of cement samples as prescribed in I.S. 12269-(1987) & I. S. 4031-1999. Manufacturer's result as per lot of manufacturing will also have to be submitted. The contractor shall collect the required samples from the cement bags brought on site or work in the presence of Engineer-in-Charge or his authorised supervisory staff of the department, each sample shall be of 15 kg by weight. The number of sample shall be taken as prescribed in IS 269-1976 & 4031-1968 or as revised from time to time. The cement brought on site of work shall be utilized within six months from the date of manufacturing. The quality of cement which does not confirm to the requirement of I.S. standard shall have to be removed from the site of work at the risk and cost of contractor.

The cement to be used shall be O.P.C as per I.S. 12269-1987. Each bag of cement shall contain full quantity of 50 kg. The contractor shall take every precaution to store the cement properly so that it is not supplied by dampness of moist atmosphere or influence of foreign matter as per the satisfaction of Engineer-in-Charge. Cement shall be stored in such a way as to allow the removal and use of cement in chronological order of receipt i.e. first received in first used. Different brands of cement or cement of the same brand from the different factories shall be stored in separate groups and shall not be mixed during use. Cement shall be kept in a store under good condition. Any cement which is found defective shall not be used. Daily account of receipt and use of cement bags shall be

maintained by the department and the contractor in proforma approved by the Engineer-in-Charge. The contractor shall be fully responsible for the scope of local transport of cement from the site go down to the place of work.

Cement shall be kept in a store under double locking arrangements.

The cement shall be measured by one bag for all uses in concrete (except otherwise stated) and masonry etc. In no case cement shall be measured by the boxes or other means for the volumetric proportion of concrete and mortar. For calculation for the proportion, the volume of one cement bag taken as 0.034 cu. Mt. (1.20 cft) and measuring box / bag shall be of size 30 cms x 30 cms x 38 cms. For weight batch of concrete to be used, the cement shall have to be used as per actual weight and the contractor shall not be entitled for any compensation for loss in weight due to shifting of bags or on account of any reasons.

M-3 SAND:-

The sand to be used will be from the natural river bed. The max. size shall be limited to 5 mm. (3/16"). The sand is available from river. It shall be tested in Government laboratory or Government approved institute.

Details regarding F.M. etc. may be pointed out in particular that all the sand will be available in natural conditions and may require blending to specification. The contractor may however consider the alternative of bringing sand from the outside source which may meet with the specifications.

Quality:-

The sand shall consist of hard, dense, durable, uncoated siliceous gritty material from rock fragments. It shall be free from injurious amount of dust, lumps, soft and flaky particles, shale, alkali, organic matter, loan, mica and other deleterious substance, the max. percentage of the deleterious substance in sand as delivered to the mixers shall not exceed the following values.

Material passing S.No. 200	
Sieve B.S.S. or (I.S.No. 8)	3 percent
by eight Clay lumps	1 percent by eight
Cinders and clinkers	0.5 percent by weight
Mica	2 percent by weight
Total of all	Not more than
Deleterious substances	5 percent by eight

Mica, coated grains, Soft and flaky particles, Loan etc.

The sum of the percentage of all deleterious material however shall not exceed by 5% of weight. The sand impurities and sand producing a colour darker than the standard colorimetric test for organic impurities and sand producing a colour darker than the standard colorimetric test for

rganic impurities shall be rejected.

Grading:-

The sand shall be well graded and the sieve analysis of natural sand shall conform to the following limits of gradation.

I.S. Sieve	Cumulative % of weight passing through sieve
10mm	100
4.75mm	92–100
2.36mm	75–92
1.18mm	55–82
600Micron	30–64
300Micron	10–40
150Micron	3–10

Deviations from the prescribed limits of cumulative percentage retaining on sieve 10mm, 4.75mm, 2.37 mm, 1.18 mm, 600 micron, 300 micron and 150 micron shall be permitted provided the total of such deviations should not exceed 10%.

Fineness Modulus:-

The sand shall have a fineness modulus ranging between 2.2 and 3.2 subject to the gradations specified in the preceding paragraph. The modulus shall be computed by adding cumulative percentage of the sand retained on the standard screens from 10 mm, 4.75 mm, 2.36 mm, 1.18 mm, 600 micron, 300 micron and 150 micron I.S. Sieve and dividing the sum by 100. The gradation of the sand shall be controlled so that the fineness modulus of at least 9 out of 10 consecutive test samples of finished sand shall not vary by more than 0.10 from the average of 10 test samples. Any deviation from the specified range of gradation and fineness modulus will not be permitted without the written permission of the Engineer.

(i) Testing

The following testing frequencies shall be maintained for the same source of fine aggregates:

Sr.No.	Name of Test	Minimum number of tests specified
1.	Gradation	Daily on test for each nominal size of aggregates
2.	Water Content	Daily on test for each nominal size of aggregates
3.	Silt Content	Daily on test for each nominal size of aggregates
4.	Sp. Gravity and Water Absorption, Impact Abrasion, Density, Soundness, Alkali-	Once in concrete working season

	Acid reactivity, Petrographic examination	
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M-4 Black Trap Stone Coarse Aggregate:-

Coarse aggregates shall be machine crushed stone of black trap and shall be hard, strong, dense, durable, clean, free from skin and coating likely to prevent proper adhesion of mortar. All aggregates shall conform to IS 383-1963 and IS 515-1959 or as per latest version of Indian Standard.

The aggregate shall generally be cubical in shape, unless special stones of particular quarries are mentioned. Aggregate shall be machine crushed from the best black trap stone as approved by the

Engineer-in-charge.

Aggregates shall have no deleterious reaction with cement. The size of the coarse aggregate for plain cement concrete and ordinary reinforced cement concrete shall generally be as per the table given below. However, in case of reinforced cement concrete the maximum limit may be restricted to 6 mm less than the minimum lateral clear distance between bars or 6 mm less than the cover whichever is smaller.

Table-1

I.S. sieve	Percentage passing for single size aggregate for Nominal size.		
	40mm	20mm	10mm
63mm	100	---	---
40mm	85-100	100	---
20mm	0-20	85-100	---
16mm	---	---	---
12.5mm	---	---	100
10mm	0-5	0-20	85-100
4.75mm	---	0-5	0-20
2.36mm	---	---	0-5

Table: 1 Uniform grading of aggregate

IS SIEVE DESIGNA- TION	PERCENTAGE PASSING FOR SINGLE-SIZED AGGREGATE OF NOMINAL SIZE						PERCENTAGE PASSING FOR GRADED AGGREGATE OF NOMINAL SIZE			
	63 mm	40 mm	20 mm	16 mm	12.5 mm	10 mm	40 mm	20 mm	16 mm	12.5 mm
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
80 mm	100	—	—	—	—	—	100	—	—	—
63 mm	85 to 100	100	—	—	—	—	—	—	—	—
40 mm	0 to 30	85 to 100	100	—	—	—	95 to 100	100	—	—
20 mm	0 to 5	0 to 20	85 to 100	100	—	—	30 to 70	95 to 100	100	100
16 mm	—	—	—	85 to 100	100	—	—	—	90 to 100	—
12.5 mm	—	—	—	—	85 to 100	100	—	—	—	90 to 100
10 mm	0 to 5	0 to 5	0 to 20	0 to 30	0 to 45	85 to 100	10 to 35	25 to 55	30 to 70	40 to 85
4.75 mm	—	—	0 to 5	0 to 5	0 to 10	0 to 20	0 to 5	0 to 10	0 to 10	0 to 10
2.36 mm	—	—	—	—	—	0 to 5	—	—	—	—

Note : This percentage may vary somewhat by the Engineer-in-charge, when considered necessary for obtaining better density and strength of concrete. In concrete for canallining the percentage at 4.75 to 10 mm fraction shall be reduced to about 5 to 10 percent of the total coarse aggregate). However, the exact gradation required to produce a dense concrete of specified strength and desired workability shall be decided by the Engineer-in-Charge.

The percentage of deleterious substances in only size of coarse aggregates delivered to the mixture shall not exceed the following value.

Material passing No. 100 wt. Screen	percentage by
Shale	1 percent by weight
Coal	1 percent by weight
Soft fragments	1 percent by weight
Other deleterious substances	1 percent by weight
Clay lumps	1 percent by weight

The Grading test shall be taken in the beginning and at the change of source of materials. The necessary test indicated in the I. S. 383-1970 and I.S. 456-1978 shall have to be carried out to ensure the acceptability. The aggregates shall be stored separately and handled in such a manner to prevent the intermixing of different aggregates. If the aggregates are recovered with dust, it shall be washed to make it clean. The coarse aggregates for plain and ordinary reinforced concrete shall be measured by volume as per the direction of the Engineer-in-charge.

1	Material passing 150 micron IS sieve screen	1 percent by weight
2	Shale by weight	1 percent by weight
3	Coal and Lignite	1 percent by weight
4	Soft fragments	3 percent by weight
5	Clay lumps	1 percent by weight
6	Other deleterious substances	1 percent by weight

Following shall be maximum size of coarse aggregate for the different items of work.

Sr.No	Item of work	Maximum nominal size of coarse (MS A) aggregate
1	RCC/PC lining	20 mm

Testing.

The following testing frequencies shall be maintained for the same source of coarse aggregates.

Sr. No.	Name of Test	Minimum number of tests specified.
1	Gradation	Daily one test for each Nominal size of aggregates.
2	Water Content	Daily one test for each Nominal size of aggregate.
3	Silt Content	Daily one test for each Nominal size of aggregate.
4	Sp. gravity and water absorption, Impact or abrasion value, Density, Soundness, Alkali aggregate reactivity, Petrographic examination.	Twice in a concreting working season.

Flakiness and elongation Index.

Value of flakiness Index	Value of elongation Index	Remarks.
(A) <u>PCC/RCC</u> of all grades 20% Maximum	20% Maximum	Combined maximum allowable limit of both flakiness and elongation index shall be 35%
(B) <u>Road works.</u> --	--	The combined maximum allowable limit of both flakiness and elongation index shall be 30%.

Storage (Stock Piles).

Aggregates shall be stacked in such a way as to prevent the admixture of foreign materials such as soil, vegetable matter etc. Heaps of fine and coarse aggregates shall be kept separate. When different sizes of fine or coarse aggregate are procured separately, they shall be stored in separate stock piles, sufficiently away from each other to prevent the materials at the edge of the piles from getting intermixed.

- (i) The aggregates shall be stockpiled adjacent to the mixers sites so as to require minimum rehandling and labour when conveyed to the mixer.
- (ii) The aggregates shall be placed on a dry hard patch of ground if available or otherwise a platform of planks or plain galvanized iron sheets or alternatively on a floor of dry bricks or a thin layer of lean concrete.
- (iii) The aggregates shall be kept free of dirt, rubbish, papers, vegetable matter and bid, etc. on the stock piles by the collection of people.

To minimize moisture variations, the stock piles shall be spread over as large an area as possible but kept low and fairly uniform in height preferably 1.25 to 1.50 meter and the lowest layer of about 30 cm height shall be allowed to act as a drainage layer and not used till the end.

M-5 T.M.T Bars (FE-500D)

Thermomechanical treated M.S. Bars, conforming to IS : 1786- FE 500 and 1786/1966 shall be used for R.C.C. works shall conform to IS 432 (Part-II) 1996 and shall be of tested quality it shall also comply with relevant part of IS 456-1978. The steel shall be used in various components of various canal structures as

per the drawing or as per instruction of Engineer-in-Charge.

For the purpose of payment the bar shall be measured correct up to 10 mm length and weight Table:

Cross Sectional Area And Mass (IS: 1786) payable at the rates specified below:

Nominal size mm	Cross- Sectional Area mm ²	Mass per Metre Run kg	Nominal size mm	Cross- Sectional Area mm ²	Mass per Metre Run kg
8mm	50.3	0.395 Kg/mt	25mm	491.1	3.855 Kg/Rmt
10mm	78.6	0.617 Kg/m t	28mm	616.0	4.836 Kg/Rmt
12mm	113.1	0.888 Kg/m t	32mm	804.6	6.316 Kg/Rmt
16mm	201.2	1.579 Kg/m t	36mm	1018. 3	7.994 Kg/Rmt
18mm	254.6	1.999 Kg/m t	40mm	1257. 2	9.869 kg/mt
20mm	314.3	2.467 g/mt	45mm	1591. 1	12.49 kg/mt

The contractor shall have to procure T.M.T Bars directly from the Main producer/authorised dealer which shall conform to I. S. The steel so purchased shall only be permitted to use. The contractor shall provide satisfactory evidence to the Engineer-in-charge in support of purchase, test certification of the manufacturer shall be produced, if so required by the Engineer-in-charge shall be produced. If further test be necessary, they will be done according to I.S. 226-1968 and I.S. 223-1950 or as revised from time to time.

M-6 Mild Steel Binding Wires:-

The mild steel wires shall be of 1.63 mm or 1.22 mm or (16 or 18 gauge) diameter and shall conform to I.S. 280-1972 and I.S. 432-1982 or as revised from time to time.

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

M-7 Preparation of surface:

- 1 The surface shall be thoroughly cleaned of all dust, dirt, mortar cropping and other foreign matter before white wash is to be applied.
- 2 The surface spoiled by smoke soot shall be scrapped with steel wire brushes or steel scrapers or shall be rubbed with over-burnt surkhi or brick bats. The surface shall be then broomed to remove all dust, dirt and shall be washed with clean water.
- 3 Oil or grease spots shall be removed by suitable chemical and smooth shall be rubbed with wire brushes.
- 4 All unsound portion of the surface plaster shall be removed to full depth of plaster in rectangular patches and plastered again after raking the masonry joints properly. Such portions shall be wetted and allowed to dry. They shall then be given one coat of white wash.
- 5 All unnecessary nails shall be removed, the holes cracks patches etc. shall be made good with materials similar in composition to the surface to be prepared.

M-8 Cement Mortar.

Water shall conform to specification M-1.

Cement: Cement shall conform to specification M-

2. Sand: Sand shall conform to M-3.

Proportion of Mix:

1 Cement and sand shall be mixed to specified proportion, sand being measured by measuring boxes. The proportion of cement will be by volume on the basis of 50 Kg. / Bag of cement being equal to 0.0342 Cu.m. The mortar may be hand mixed or machine mixed as directed.

Preparation of Mortar:

In hand mixed mortar cement and sand in the specified proportion shall be thoroughly mixed by on a clean impervious platform by turning over at least 3 times or more till a homogeneous mixture of uniform color is obtained. Mixing platform shall be so arranged that no deleterious extractors material shall get mixed with mortar or mortar shall flow out. While mixing, the water shall be gradually added and thoroughly mixed to form a stiff plastic mass of uniform colour so that each particle of sand shall be completely covered with a film of

Wet cement. The Water cement ratio shall be adopted as directed. The Mortar so prepared shall be used within 30 minutes of adding water. Only such quantity of mortar shall be prepared as can be used within 30 minutes.

M-9 MEMBRANE:-

- (a) ~~The compound shall meet with the requirement of water retention test as per ASTM designation C-156-80. The loss of water in this test shall be restricted to not more than 0.55 Kg/m of exposed surface in 72 hours.~~
- (b) ~~The white pigmented compound (Type 2) when tested as specified in accordance with method E-97 of ASTM shall exhibit a daylight reflectance of not less than 60A of that of magnesium oxide.~~
- (c) ~~It shall fulfill the requirement of drying time when tested in accordance with ASTM C-309-81. The compound applied shall be dry to touch in not more than 4 hours. After 12 hours it shall neither be tack off (peel off) concrete when walked upon nor it shall impart a slippery surface.~~

M-10 STONE (RUBBLE)

1. The stones shall be black trap type as approved by Engineer-in-charge.

The stones shall be obtained only from the approved quarry:-

- 3 Stones shall be hard, sound, durable and of uniform texture & free from defects like cavities, cracks, sand holes, flaws, injurious spots, patches of loose or soft material etc. and weathered portions and other structural defects or imperfections tending to affect their soundness and strength. The stones with round surfaces shall not be used.
- 4 Flaky and elongated stones shall not be used.
- 5 50% of stones used in pitching work shall be weighing more than 30kg.
- 6 A sample test of representative rubble stone shall be carried by contractor at approved laboratory to confirm specifications laid from lot of every 300 C.M rubble stones used. The test shall be carried out to ascertain following test:

(A) SPECIFIC GRAVITY TEST:

As per Is: 1124-1974 using specific gravity bottle (50ml), value generally shall not be less than 2.5

(B) WATER ABSORPTION TEST:

As per Is: 1124-

1974, stones shall not absorb water more than 5 (Five) percent of its weight after 24 hours immersion in water.

(C) WEATHERING TEST:

As per Is: 1125-

1976, there should be no effect of weather on the rubble stone. This test measures durability and strength of stone. The value shall not exceed 10%.

M-11 BRICKS

~~1. Bricks shall be hand or machine moulded and made from suitable soil and kiln burnt. Bricks shall be free from cracks and flaws and nodules of free lime. They have smooth rectangular faces with sharp corners and shall be of uniform colour. Bricks shall be moulded with frog on one of its flat sides. The bricks shall not break when thrown on the ground from a height of 60 cm. The size of bricks shall be 22 cm x 11 cm x 6 cm only. Bricks of one standard size shall be used. (available in market conventional size)~~

~~The compressive strength of bricks shall not be less than 35 kg/cm². The average water absorption shall not be more than 20% by weight variation by +10% shall not be considered as non-standard material.~~

M-12. Structural Steel

~~12.1. All structural steel shall conform to IS. 226-~~

~~1985. The steel shall be free from the defects mentioned in I.S. 226-1975 and shall have a smooth finish. The material shall be free from loose mill scale, rust, pits or other defects affecting the strength and durability. River bars shall conform to I.S. 1148-1973.~~

~~12.2. When the steel is supplied by the Contractor test certificate of the manufacturers shall be obtained according to I.S. 226-1975 and other relevant Indian Standards.~~

M-13. Galvanized Iron Sheets

~~13.1. The galvanized iron sheets shall be plain or corrugated sheets of gauges as specified in item The G.I. Sheets shall conform to I.S. 277-1977. The sheets shall be undamaged in carnage and handling either by rubbing off of zinc coating or otherwise. They shall have a clean and bright surface and shall be free from dents, bends, holes, rust or white powdery deposit.~~

M-14 R.C.C. NP2 CLASS Pipes.

The pipes shall be of specified diameter NP-2 type pressure pipes and conforming to I.S. 458-1988*. The minimum length of the pipes shall not be less than 2.5M. The Contractor shall order for the pipes required for the work on the basis of construction program.

The Contractor shall purchase the pipes from the manufacturer approved by the Engineer-in-Charge. The manufacturer should have sufficient manufacturing process and testing facilities shall confirm to I.S. standard. Testing shall be carried out at manufacture in presence of department representative. The concrete mix design, the reinforcement pattern and the source of materials such as cement, steel, aggregates etc. should be thoroughly examined regarding their correctness as well as acceptability. The gradation of coarse aggregates should be as per the design mix as required. The care shall be taken to see that all the materials as well as mix design and steel pattern should be as per the mix design requirement. The care shall be taken to see that all the materials as well as mix design and steel pattern should be in compliance to relevant I.S. 456 and 458 provision.

Transportation of pipes, collars, shall be done by the Contractor without extra cost. Any damage to pipe/collar caused during loading, transportation, unloading, laying etc. shall be made good by the Contractor and in such a way that its strength and functional value shall remain same as was of undamaged pipe or otherwise shall be replaced with new pipes of equal standards at the Contractor's cost.

The Contractor shall order for the pipes required for the work on the basis of the construction drawings supplied to him by the Engineer-in-Charge. Pipes marked with the following information on each type shall only be accepted for the work.

(a) Class of pipe

- (b) Date of manufacture
- (c) Name of manufacturer or his trademark or both

M-15. Stone Grit

8.1. Grit shall consist of crushed or broken stone and be hard strong, dense, durable, clean, of proper gradation and free from skin or coating likely to prevent adhesion of mortar. Grit shall generally be cubical in shape and as far as possible flaky elongated pieces shall be avoided. It shall generally comply with the provisions of I.S. 383-1970. Unless special stone of particular quarries is mentioned, grit shall be obtained from the best black trap or equivalent hard stone as approved by the Engineer-in-charge. The grit shall have no deleterious reaction with cement.

8.2. The grit shall conform to the following gradation as per sieve analysis

LS. Sieve Designation	Percentage by Weight Passing sieve	IS. Sieve Designation	Percentage by Weight Passing through sieve
12.50mm	100%	4.75mm	0-20%
10.00mm	80-100%	2.36mm	0-25%

8.3. The crushing strength of grit will be such as to allow the concrete in which it is used to be built up to the specified strength of concrete.

8.4. The necessary tests for 'grit shall be carried out as per the requirements of I.S. 2386 (Parts I to VII) 1963, as per instructions of the Engineer-in-charge. The necessity of test will be decided by the Engineer-in-charge.

M-16. Brick Bat Aggregate

14.1. Brick bat aggregate shall be broken from well burnt or slightly over burnt and dense brick.

It shall be homogeneous in texture, roughly cubical in shape, clean and free from dirt or any other foreign material. The brick bats shall be of 40 mm. to 50 mm. size unless otherwise specified in the item. The under burnt or over burnt brick bats shall not be allowed.

14.2. The brick bats shall be measured by volume by suitable boxes or as directed.

M-17. Asphalt:

~~Bitumen 80/100: The characteristics of this grade conform to that of S90 grade of I.S. 73-1992~~

M-18. Structural Steel:

~~All structure steel shall conform to I.S. 226-1965. The steel shall be free from the defects mentioned in I.S. 226-1975 & shall have a smooth finish. The material shall be free from loose mill scale, rust pits or other defects affecting the strength & durability. Rivet bars shall conform to I.S. 1148-1973. Steel should be used of a standard manufacturer's company as recommended by engineer in charge.~~

~~When the steel is supplied by the Contractor test certificates of manufacture shall be obtained according to I.S. 226-1975 & other relevant Indian Standard.~~

M-19. Admixtures.

(a) General.

Air Entraining Agent (AEA) as an admixture shall be added to the concrete batch in solution. It shall be batched by means of mechanical batcher capable of correct measurement and in such a manner as will ensure uniform distribution of the agent throughout the batch during the specified mixing period. The amount of AEA used shall be such as to affect air entrainment from 4 to 6 percent by volume in that portion of the concrete containing aggregates smaller than the 40 mm square mesh sieve after its placement and vibration in the forms. The actual percentage of air shall be as fixed by the Engineer-In-Charge and will be changed whenever necessary to meet the varying conditions encountered during construction. The result in

modification if any to the content or portion of cement as a consequence thereof shall be accounted for in the rate for payment according to general technical specification for concrete. The contractor will be allowed to use admixture, only after prior approval of the Engineer-In-Charge. Cost of such admixture shall be borne by the contractor and shall be deemed to have been included in the unit rates quoted by the contractor for relevant items.

(b) Tests.

If the contractor uses his approved admixture, the contractor shall provide satisfactory facilities for easy and quick collection of adequate test samples. All tests for the evaluation and approval of an admixture shall be made by the Department and testing charges will be deducted as per Clause 34 of SBD. The suitability of an air entraining admixture shall be determined as per the requirement of IS:9103-1979.

M-20. OTHER MATERIALS:-

If the bidder desires to obtain the materials other than those provided in Schedule 'A' he may request Engineer-in-charge in writing. Depending upon the materials as may be available and can be spared as per terms in force, the Engineer-in-charge may approve the bidder's request. The bidder shall have to pay the equal payment comprising of the cost of materials, storage charge and supervision charges etc. for such materials, material will be issued at Government stores. The machinery, if available with the department, shall be spared to the bidder on rental basis as per prevailing rules in force.

6. RUBBLE FOR Pitching:-

All the stones to be used for the loose stone apron should be obtained from the quarries approved by the Engineer-in-charge. The rubble shall be sound, hard, tough, compact grained and of uniform texture and colour. It should be free from Veins, cracks, flaws, seams, shale, partings, conglomerate, bends and other defect which may tend to increase their susceptibility to destruction by water & weathering action.

- 7.(i) (a) The shape of the individual rock fragments shall be angular with a thickness not less than 50% of maximum longitudinal direction. No stone shall weigh less than 10 kg & more than 40 kg so as to give roughly the following percentage of different type of stones.

Wt. of each stone	percentage
10kg to 20kg	10%
20kg to 30kg	15%
Above 40 kg	75%

The size of stone shall not be less than 300 mm.

- 7.(ii) The stones shall have as far as practicable large flat surfaces, and shall be sound having good weathering qualities. The stone with skin will be allowed provided they are otherwise sound and free from weathering inside. The stones shall be laid with their broadest face in contact with river bed and height normal to river bed.
- 7.(iii) The laying of apron stone shall begin from the riverbed upwards. The apron shall be laid in two or more layers as directed. The first layer from river bed should be laid first duly packed with spauls. While laying stones care should be taken to have minimum of joint space. They should break joints

in all directions so that they are well keyed together. The interstices left between the stones shall be filled by wedging large chips tightly driven with the help of hammer. The care should however be taken to interlock the two layers of the pitching by selection of proper sizes of stones. Larger stones shall in general be put in the top layers. Large voids on top shall be properly filled up by wedging in long stone pieces of suitable sizes in such a way that after completion of apron, it should not be possible for a person with normal strength to move or dislodge any stone with hands.

7.(IV) Abrasion test shall be conducted as per I. S. Code No. 1124(1974). Also water absorption, after the stone being kept in water for 24 hours, shall not exceed 2.5% of water by wt. The stones not in conformity with the above specifications & the norms laid down in IS 1124(1974) shall be rejected & shall be removed by the bidder from the site of work at his risk & cost.

8. Material for pitching

The pitching material shall consist of the most durable rock fragments of approved quality selected for the purpose. The stones shall be used from the approved quarries and shall be subject to thorough inspection and approval by the Engineer-in-Charge. The quality of individual stones shall be hard, dense, sound and resistant to abrasion and shall be free from cracks, seams, shale partings, conglomerate, bands and other defects that would tend to increase unduly their susceptibility to destruction by water and weathering action. The shape of the individual stones shall be angular. Stone having thickness less than 50 % of their maximum dimensions shall not be used for pitching.

8(i) Rubble (stones)

Stones shall be hard, sound free from cracks, decay and weathering, stone shall be used from the approved quarries and shall be subject to thorough inspection. Stones with round surface shall not be used. Stones when immersed in water for 24 hours shall not absorb water by more than 5 percent of their dry weight when tested in accordance with IS: 1124-1974

8(ii). Size of Stone

The length of stone shall not exceed three times its height and the breadth on base greater than three fourth of the thickness of wall and in any case not less than 15 cm. Minimum crushing strength of stone shall not be less than 105 kg/cm². No stone shall be less than 0.021 m³ in size. At least 15 % of stone to be used for pitching shall have depth equal to the thickness of pitching i.e. 30 cm. All stones to be used shall have a minimum depth of 29.5 cm. No stones shall have any dimensions less than 15 cm.

APPLICABLE PUBLICATIONS

All items of work concrete, its constituents, methods and procedures of manufacture shall conform to Indian Standard Specifications and other publications listed below unless otherwise specified.

Indian Standards

1	IS:383-1970	Specification for coarse and fine aggregates from natural sources for concrete (third revision)
2	IS:456-2000	Code of practice for plain and reinforced concrete (third revision)
3	IS:457-1957	Code of practice for general construction of plain and reinforced concrete for dams and other massive structures.
4	IS:460-1985	Specification for test sieves (Part 1 to 3)
5	IS:516-1959	Method of test for strength of concrete (Amendment No. 1)
6	IS:650-1966	Specification for standards and for testing of cement (first revision) (Amendments No. 1, 2 & 3)
7	IS:1199-1959	Method of sampling and analysis of concrete
8	IS:1489-1976	Specification for Portland Pozzolan cement (second revision) (Amendments No. 1 to 7)
9	IS:1791-1985	Specification for batch type concrete mixers (second revision)
10	IS:2386-1977 (Part I to VIII)	Method of test for aggregates for concrete
11	IS:2430-1986	Methods for sampling of aggregates for concrete (first revision)
12	IS:2505-1980	General requirements for concrete vibrators, immersion type (second revision)
13	IS:2506-1985	General requirements for screed board type concrete vibrators
14	IS:2580-1982	Jute sacking bags for packing cement (second revision) (with Amendments No. 1 to 3)
15	IS:3085-1965	Method of test for permeability of cement, mortar and concrete
16	IS:3535-1986	Method of sampling hydraulic cement (First revision)
17	IS:3873-1978	Code of practice for laying in situ cement concrete lining of canals (first revision)
18	IS:4031-1988 (Part 1 to 13)	Methods for physical test for hydraulic cement (first revision)
19	IS:4032-1985	Method of chemical analysis of hydraulic cement (first revision)
20	IS:4558-1983	Code of practice for under-drainage of lined canals (first revision)
21	IS:4634-1968	Method for testing performance of batch-type concrete mixers.
22	IS:4656-1968	Specification for form vibrators for concrete
23	IS:4845-1968	Definitions and terminology relating to hydraulic cement (Reaffirmed 1987)
24	IS:4925-1968	Specification for concrete batching and mixing plant

25	IS:4926-1976	Specification for ready mixed concrete (first revision)
26	IS:5256-1968	Code of practice for sealing joints in concrete lining on canals.
27	IS:5512-1983	Specifications for flow table for use in test of hydraulic cement and pozzolanic materials (first revision)
28	IS:5513-1976	Specification for Vicar apparatus (first revision) (Amendment No. 1)
29	IS:5515-1983	Specification for compacting factor apparatus (first revision)
30	IS:5529-1985 (Part I & II)	Code of practice for in-situ permeability test
31	IS:5640-1970	Method of test for determining aggregate impact value of soft coarse aggregates
32	IS:5816-1970	Method of test for splitting tensile strength of concrete cylinders
33	IS:5889-1970	Specification for vibratory plate compactor
34	IS:5892-1970	Specification for concrete transit mixer and agitators
35	IS:6461 (Part I to XII)	Glossary of terms relating to cement concrete
36	IS:6923-1973	Method of test for performance of screed board concrete vibrators
37	IS:6925-1973	Method of test for determination of water-soluble chlorides in concrete admixtures
38	IS:7245-1974	Specification for concrete pavers
39	IS:7320-1974	Specification for concrete slump test apparatus (Amendment No. 1)
40	IS:7861-1975 (Part I & II)	Code of practice for extreme weather concreting
41	IS:8041-1978	Specification for Rapid Hardening Portland cement (first revision) (Amendments No. 1 to 4)
42	IS:8043-1978	Specification for Hydrophobic Portland Cement (first revision) (Amendments No. 1 to 3)
43	IS:8112-1989	Specification for 43 grade ordinary Portland Cement (First Revision)
44	IS:8142-1976	Method of test for determining setting time of concrete by penetration resistance
45	IS:9013-1978	Method of making, curing and determining compressive strength of accelerated cured concrete test specimens.
46	IS:9103-1979	Specification for admixtures for concrete
47	IS:9284-1979	Method of test for abrasion resistance of concrete
48	IS:12200-1987	Code of practice for provision of water stops at transverse contraction joints in masonry and concrete dams.
49	IS:12269-1987	Specification for 53 grade ordinary Portland Cement (First Revision)

1.1.2 Other Technical Publications

- 1 Concrete Manual: USBR
- 2 ASTM: (i) C-156-80 water retention test

- (ii) C-309-81 Type -2 Liquid membrane forming compound
for curing concrete
- (iii) C-491-80 Water Reducing
Agent (iv) E-97 Light reflectance Test
- (v) C-494-80
- 3 Design Aids for Reinforced Concrete SP-16(S&T)-
1980 To IS:456-2000
- 4 CBIP: (Manual on Canal Lining)

Note: (i) Generally the Bureau of Indian Standard code will be followed for all items of works. Whenever this code does not exist there reference will be taken to the technical publications directed by Engineer-In-Charge.
(ii) Latest Version of IS and other publications shall be used.

**માલસામાન પરીક્ષણ અંગે ટેસ્ટની સંખ્યા અને સ્વીકૃતિના ધોરણો દર્શાવતું પત્રક
ગુણવત્તા નિયમન માર્ગ અને મકાન વિભાગ.**

ક્રમાંક	ટેસ્ટની વિગત	ટેસ્ટના ધોરણો	પરીક્ષણોની સ્વીકૃતિના ધોરણો	
૧	૨	૩	૪	
	મેટલ	મોસ્ટ સેક્શન અ. ૮૦૦ મુજબ	આઈ.એસ. -૨-૨૪૩૦ પ્રમાણે	
૧	મેટલ ગ્રેવલ	૧. ગ્રેડેશન ૨૦૦ કી.મી.	પરિક્ષણ મ.મી.	પરિક્ષણની સંખ્યા
		૧. પરિક્ષણ	૧૦૦ મ.મી.	૧
		૨. ફલેકનેશ	૧૦૧ થી ૫૦૦	૩
		૩. ઇમ્પેક્ટ	૫૦૧ થી ૧૫૦૦	૫
		૪. અબરેઝન	૧૫૦૧ થી ૫૦૦૦	૭
		૫. કશીંગ ટેસ્ટ	ઓછામાં ઓછા એક ટેસ્ટ કામ માટે	૧
૨	ગ્રીટ કપચી	૧. ગ્રેડેશન ૫૦ થી ૧૦૦ ઘ.મી.	૧૦૦ ઘ.મી.	
		૨. ફલેકનેશ	૧૦૧ થી ૫૦૦	
		૩. ઇમ્પેક્ટ	૫૦૧ થી ૧૫૦૦	
		૪. અબરેઝન	૧૫૦૧ થી ૫૦૦૦	
		૫. કશીંગ ટેસ્ટ		
		૬. ટ્રીપીંગ ટેસ્ટ		ઓછામાં ઓછા એક ટેસ્ટ
		૭. ટ્રેડેશનલ પરિક્ષણ એક દિવસ પ્લાન્ટ સાઇટ		કોઇ સુધારો નથી.
		૮. બાઇનડર: પરિક્ષણ ટેસ્ટ એક દિવસ પ્લાન્ટ સાઇટ		
		૯. ડામરની ગુણવત્તા જરૂરીયાત પ્રમાણેનું પરિક્ષણ	ટેન્ડરની સંખ્યાઆઇ.એસ. મુજબ ૧૨૦૧	પરિક્ષણની સંખ્યા ૧૯૭૮ મુજબતા. ૨૬/૭/૮૦ ના સામે પરિપત્ર મુજબ
			૧	
			૨ થી ૧૫	
			૧૬ થી ૫૦	
			૫૧ થી ૧૫૦	
			૧૫૧ થી ૫૦૦	
			૫૦૧ થી ઉપર	
		૧૦. માટીની ફીલ્ડ ડ્રાય કેપેસિટી નક્કી કરેલ ધોરણસર સ્થળ પર ક્ષેત્રીય કર્મચારીઓને લેવાની રહેશે.		
૩	રેતી	૧. ફાઇનેશ મોડ્યુલર	૨૫૦ ઘ.મી.	એક ટેસ્ટ
		૨. ગ્રેડેશન	--સદર--	--સદર--
		૩. પી.આઇ. વેલ્યુ	૪૦૦૦ ઘ.મી.	એક ટેસ્ટ
૫	સીમેન્ટ			
	(ક) સેટીંગ ટાઈમ ઈનીશીયલ,ફાઈનલ	૫૦ ટનની ટકા થેલીઓમાંથી ૧૫ કીલોનો એક સેમ્પલ લેવાનો રહે છે.	૩૦ મીનીટ કરતા ઓછું નહી ૬૦૦ મીનીટ કરતા વધારે નહી	

		૫૦ થી ૧૦૦ ટન-૨ સેમ્પલ ૧૦૦ થી ૨૦૦ ટન-૩ સેમ્પલ ૨૦૦ થી ૩૦૦ ટન-૪ સેમ્પલ ૩૦૦ થી ૫૦૦ ટન-૫ સેમ્પલ ૫૦૦ થી ૮૦૦ ટન-૬ સેમ્પલ ૮૦૦ થી ૧૩૦૦ ટન-૭ સેમ્પલ	
	(ખ) ફાઈનનેશ	પાંચ સેમ્પલ માંથી એક ટેસ્ટ (આઈ.એસ. સીવ ૮૦ માઈક્રોન)	૮૦ માઈક્રોનની સીવમાંથી ૮૦% અગર વધુ પગાર થવું જોઈએ.
	(ગ) કન્સીસ્ટેન્સી ટેસ્ટ	એક સેમ્પલ (દરેક સેમ્પલ ઉપર મુજબ)	૩૦% જેટલું
	(ઘ) કોપ્રેસીવ ટેસ્ટ	ત્રીજા દિવસે ઓ.પી.સી. માટે ૧૧૦ કી.ગ્રા./સે.મી. ^૨ સાતમા દિવસ માટે ૨૨૦ કી.ગ્રા / સે.મી. ^૨ અઠવાવીસ માં દિવસે ઓ.પી.સી. માટે ૩૧૦ કી.ગ્રા./ સે.મી. ^૨	દરેક સેમ્પલ ઉપર મુજબ
	(અ) ફાઈનનેશ ટેસ્ટ પેસીફિક સરફેસ ધ્વારા	ઓ.પી.સી. માટે ૨૦૩૫ સેમી/ગ્રામ વધારે પી.પી.સી. માટે ૩૦૩૦ સેમી/ગ્રામ	ઉપર મુજબ પાંચ સેમ્પલમાંથી એક ટેસ્ટ
	(બ) રાસાયણિક પૃથક્કરણ આઈ.એસ ૪૦૩૨-૮૬૮	૧. મેગ્નેશિયમ ઓક્સાઈડ ૬% થી ઓછું ૨. સલ્ફર ટ્રાય ઓક્સાઈડ ૨.૭૫% થી ઓછું ૩. ઈન્નીશન લોશ ૫% સુધી	ઉપર મુજબ પાંચ સેમ્પલમાંથી એક ટેસ્ટ.
૨.	રેતી		
	(અ) સીલ્ટકન્ટેન્ટ	૧૫૦ ઘન મી. એક ટેસ્ટ (એક સેમ્પલ ૧૦ કી.ગ્રા)	૩% સુધી સ્પેસીફિકેશન નિયત કરેલા ધોરણ મુજબ સામાન્ય રીતે ચોથા જોન માંથી આવતી રેતી વાપરવી નહીં.
	(બ) ફાઈનનેશ મોડ્યુલસ		
૩	ગ્રીટ કપચી (ડામર કામ માટે)	બીટુ મીનસ મેકાડમ, ગ્રીટ અને કપચીના અલગ સ્પેસીફિકેશન નિયત કરેલા ધોરણો મુજબ બે તેમજ મીક્ષ એગ્રીગેટના દર રોજ બે ટેસ્ટ એક જ પ્લાન્ટ ઉપરથી લેવાના રહેશે. (અલગ અલગ બે અને ડ્રાયરમાંથી બે)	સ્પેસીફિકેશનના નિયત કરેલા ધોરણો મુજબ.
	(ક) ગ્રેડેશન ટેસ્ટ	પ્રતિ ૨૦૦ ઘન મીટરે એક ટેસ્ટ	ડામર સપાટી માટે ૩૫% થી વધુ નહીં.
	(ખ) ફલેકીનેશ ટેસ્ટ	પ્રતિ ૧૦૦ ઘન મીટરે એક ટેસ્ટ	વધુ નહીં.
	(ગ) એબ્રેશન ટેસ્ટ	પ્રતિ ૧૦૦ ઘન મીટરે એક ટેસ્ટ	૩૦ % થી વધુ નહીં.
	(ઘ) એબ્રેશન ટેસ્ટ	૨૫ થી ૧૦૦ ઘન મીટરે એક ટેસ્ટ દર રોજ	૩૫ % થી વધુ નહીં.
	(ગ) સ્ટ્રીપીંગ ટેસ્ટ	બે ટેસ્ટ એક જ પ્લાન્ટ માટે લેવાના રહેશે દર ૧૦૦ ટને એક ટેસ્ટ અથવા જરૂરિયાત મુજબ.	૨૫ % થી વધુ નહીં.
	(અ) ડામર એક્સ્ટ્રેશન ટેસ્ટ (બ) ડામરની ગુણવત્તાનો ટેસ્ટ (પેનીટ્રેશન ટેસ્ટ)		૦.૩% (નિયત ધોરણોના) ૦.૮૦ ૪ % ૮૦-૨૨૫ ૫% ૨૨૫ થી ઉપર ૦ %
૪	ઈટો (ક) એબ્લોરેશન ટેસ્ટ (ખ) વોટર એબસોર્પેશન ટેસ્ટ (ગ) કોપ્રેશીવ સ્ટ્રેન્થ ટેસ્ટ	૨૦૦૦ ઈટોના જથ્થામાંથી ૨૦ ઈટો લેવાની રહે છે. ૩૫૦૦૦ ઈટોના જથ્થામાંથી ૩૨ ઈટો લેવાની રહે છે. અને દરેક ૫૦૦૦૦ ઈટોના જથ્થામાંથી ૫૦ ઈટો લેવાની રહે છે.	મેડરેટ ૨૦ % થી વધુ નહીં. એવરેજ ૩૫ કી.ગ્રા./ સે.મી. ^૨ થી ઓછુ નહીં. અને દરેક રીઝલ્ટ નિયત ધોરણોના ૨૦ થી ઓછુ હોવું

			જોઈએ.			
૫	સી.સી. ફલોરીંગ ટાઈલ્સ (ક) વોટર અબસોશન ટેસ્ટ (ખ) ટ્રાન્સવરી સ્ટ્રેન્સ ટેસ્ટ (ગ) એબ્રેશન ટેસ્ટ	૨૦૦૦ ટાઈલ્સમાંથી ૬ ટાઈલ્સ લેવાની રહે છે. ૨૦૦૦ ટાઈલ્સમાંથી ૧૨ ટાઈલ્સ લેવાની રહે છે. ૨૦૦૦ ટાઈલ્સમાંથી ૬ ટાઈલ્સ લેવાની રહે છે.	વધુમાં વધુ ૧૦ % ભીની સુકી ૮૦ કી.ગ્રા./સેમી ૧૨૦ કી.ગ્રા./સેમી (ઓછામાં ઓછી) એવરેજ ધસારો ૩.૫ મી.મી. થી વધુ નહીં.			
૬	પાણી કેમીકલ એનાલીસીસ	એક સોર્સ માટે એક જ વખત ટેસ્ટ લેવાનો રહેશે. પછી જો શંકા થાય તો જ.	ટીડીએસ (મી. ગ્રા./લીટર-૩૦૦૦ રાફેટ (મી.ગ્રા./લીટર-૫૦૦ પી.એચ.વેલ્યુ ૬ થી ૮ ક્લોરાઈડ મી.ગ્રા./ લીટર-૨૦૦૦ (પી.પી.સી.) - ૧૦૦૦ (આર.સી.સી.) કાર્બનીક પદાર્થ ૨૦૦ અકાર્બનીક પદાર્થ ૩૦૦૦			
૭	સીમેન્ટ કોફીટના ક્યુબ ટેસ્ટ	(અ) ઓડીનરી અને કંટ્રોલ કોફીટ માટે આઈ.એસ. ૪૫-૧૯૭૮ જથ્થો સેમ્પલની સંખ્યા ૧ થી ૫ ઘન મીટર ૧ ૨ થી ૧૫ ઘન મીટર ૨ ૧૬ થી ૨૦ ઘન મીટર ૩ ૩૧ થી ૫૦ ઘન મીટર ૪ ૫૧ થી ઉપરના ૪+ દરેક જથ્થા માટે ૫૦ ઘન મીટર અથવા તેના ભાગ માટે એક સેમ્પલ (૧ સેમ્પલ - ૬ ક્યુબ) (બ) ઓડીનરી અને કંટ્રોલ કોફીટ પુલોના કામ માટે આઈ.આર.સી. ૨-૧૯૬૬ મુજબ ગતિ ૫૦ ઘન મી.ના જથ્થા માટે ૧૦ ક્યુબ લેવાના જે પૈકી ૫ ક્યુબ ૭ દિવસના અંતે અને ૫ ક્યુબ ૨૮ દિવસના અંતે ટેસ્ટ કરાવવાના રહે છે. કોફીટ કામ દરમ્યાન પહેલા ૬ દિવસ માટે કાયમ ઉપર મુજબ ક્યુબ લેવાના અને ત્યાર પછી ત્રણ દિવસે એકવાર ક્યુબ ભરવાના રહે છે. (ક) સીમેન્ટ કોફીટ બીમના કામ માટે પ્રતિ ૩૦ ઘન મી.ના જથ્થા માટે ૧૦ ક્યુબ ભરવાના જે પૈકી ૫ ક્યુબ ૭ દિવસ અને બાકીના ૫ ક્યુબ ૮ દિવસે ટેસ્ટ કરાવવાના રહેશે.	(બ) જુદા જુદા ગ્રેડના કોફીટ માટે નિયત કરેલ મજબુતાઈ મેળવવાની જરૂરી છે. ૭ દિવસ ૨૮ દિવસ કી.ગ્રા/સે.મી. ^૨ કી.ગ્રા/સે.મી. ^૨ એમ. ૧૦૦-૭૦ ૧૦૦ એમ. ૧૫૦-૧૦૫ ૧૫૦ એમ. ૨૦૦-૧૩૫ ૨૦૦ એમ. ૨૫૦-૧૭૦ ૨૫૦ એમ. ૩૦૦-૨૦૦ ૩૦૦ આ ઉપરાંત આઈ.એસ.આર-૧૯૭૮ ના કો. મુજબ વિશિષ્ટ મજબુતાઈ (કેરેક્ટરી સ્ટીક સ્ટ્રેપ ગજા.... કરીને મેળવવાના હોય છે. (બ) દર રોજ ટેસ્ટ કરેલા ક્યુબની સરેરાસ કોગ્રેસીન સ્ટ્રેન્થ નિયત ધોર..... ઓછી જોઈએ. દર રોજ ટેસ્ટ કરેલા ક્યુબના ક્યુબની સ્ટ્રેન્થ નિયત ધોરણોની સ્ટ્રેન્થના થી ઓછી ના હોવી જોઈએ.			
૮	લોખંડ					
	(ક) માર્શલ્ડ સ્ટીલ (આર.સી.સી.)	૪૦ ટને ઓછામાં આઠું એક ટેસ્ટ લેવાના રહે છે.	જાડાઈ મીમી	અલ્ટીમેટ ટેન્સાઈલ સ્ટ્રેન્થ (કી.મી. / સેમી) કી.ગ્રા / સે.મી.	ઈલોગેશન ના ટકા
			૦-૨૦ ૨૦-૪૦	૪૨ ૪૨	૨૨ ૨૪	૨૩ ૨૩

	(ખ) બવીસ્ટેક સ્ટીલ બાર	કિ. ગ્રા.				
	(ગ) મીસ્ટેક કોક્રીટ માટે સ્ટીલના વાર	કિ. ગ્રા.	૨૦ થી વધુ બધી સાઈઝ માટે	૪૨ ૪૯.૫	૨૪ ૪૨.૫	૨૩ ૧૪.૫
			૮.૦	૧૪૦	આવેલ	૪ ગ્રોજ
			૭.૦	૧૫૦	ટે-સાઈલ	૪
			૫.૦	૧૬૦	સ્ટ્રે-પી	૪૨૦૦ મીમી
			૪.૦	૧૭૫	ઓછામાં	૩
			૩.૦	૧૮૦	ઓછું ૮૫%	૨.૫

TABLE 1 : TYPE OF DEFECTS & LEVEL OF SERVICE

Sr.No	Type of Defects	Level of Service
1	Pot holes shallow & deep	Area of each exceeding 25 sq. cm. & 1 cm. depth
2	Cracking –Type , width & extent	Over all not to exceed 5 % of surface area.
3	Ruts extent	Not exceeding 20mm.(depth of rut measured with 2m. straight edge with a length of 10m. at a place)
4	Corrugations	Not exceeding 25mm.(depth of rut measured with 3m. straight edge) Area exceed 1m
5	Reveling	Not to exceed 1sq.m.in an area
6	Bleeding	Not to exceed 5 % of surface area
7	Edge drop	Not to exceed 50mm.
8	Broken edge	Not to exceed 5 %
9	Patch work	Should not exceed 30 % in case, if exceeds surface to be renewal with wearing coat as originally land by contractor

Maintenance Norms

Sr. No	Distress and service Level	Remedy	Period to attend for the Contractor
1	Potholes – area of each exceeding 25 sq. cm. and 1 cm. in depth irrespective of number	Patching / Pothole filling MORT & 11 Specification 3004.1	One Month
2	Cracks exceeding 5 % of area in each K.m.	MORT & 11 Specification 3004.1	
	(a) Width of crack less than 3 mm.	Fog seal Clause 518 of MORT & 11	One Month
	(b) Width of crack more than 3 mm.	Slurry seal Clause 516 of MORT & 11	One Month
	(c) Alligator cracking more than 5 %	Full depth patching	One Month
	(d) Broken edge exceeding 5 %	Repair and reconstruct Shoulder with good quality material	One Month
3	Rutting depth of rut exceeding 10 mm. with a length of 10m. at a place	Full depth patching	One Month
4	Corrugation area exceeds 1sq. mat a place and depth / height of corrugation exceeds 25mm.	Full depth patching	One Month
5	Bleeding over 5 % area	Application of hot sand Clause M-3	One Month
6	Patch work area exceeds 30 %	Renewal with wearing coat as originally laid by Contractor	One Month

7	Roughness index of pavement exceeding 3500 mm/km during guarantee period (Checking of – Roughness index once in a year and 3 months before date of expiration of the guarantee period)	Renewal with wearing coat as originally laid by contractor	One Month
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Schedule for testing of materials

For ensuring quality control and workmanship, various tests prescribed below corresponding to the material concrete shall be taken as periodic intervals as stipulated bellow.

The material/CC Cubes shall be got tested at GERI (**10% Samples**) , Govt. recognized Laboratory(**10%Samples**) & field Laboratory(**Remaining**)also the testing charges shall be born by the contractor.

Item No. as per Sch-B	Brief Description of materials to be tested.	Prescription of test which shall be carried out	Frequency @ which test shall be carried out	Qty. of material	Total No. of test to be carried out
	Granular materials	Gradation Atterberg : Limits	One test per 200 m ³		
	Lime/cement	Quality of lime/Cement	One test for each consignment subject to a minimum of the test per 5 tonnes.		
	Coarse aggregate	Impact value Grading Flakiness & Elongation Abrasion Crushing test	One test per 200 m ³ (MOST): I.S.D. 100 m ³ 1 test : 2430/ 101 M3 -500 M3 3 test: 19-1 86 501 M3 -1500 M3 5 test: 1501 M3 -5000 M3 7 test: (Minimum one test per work)		
	Binding materials For paving quality concrete	Atterberg limit			
1	Cement	Physical Chemical test	One for each for source of supply and occasionally when called for in case of long/improper storage.		
2	Coarse aggregate	Impact value Los angels Abrasion Value	One for each source of supply and subsequently on monthly basis.		
3	Concrete	Strength of concrete	2-Cubes and 3 beams per 150 M3 or part there of (one for 7 days and other for 28 days strength) or minimum 6 cubes per day's work whichever is more.		
4	Water	Chemical test	One for approval of source of supply		
5	Asphalt	1) Penetration test as per	No.of Tanker Test		

Item No. as per Sch-B	Brief Description of materials to be tested.	Prescription of test which shall be carried out	Frequency @ which test shall be carried out	Qty. of material	Total No. of test to be carried out
		I.S. 1203 2)Ductility test	1to10 1 11to20 2 21 to50 3 51to100 4 Remaining every 50 tanker 1 As per I.S. 1208		
	Binding materials	3) Specification gravity test 4) Softening point test 5) Viscosity Test Atterberg limit	As per I.S. 1202 As per I.S. 1204 As per I.S. 1206 Remaining every 50 tanker		
6	Sand Quarry Spaul CBR 1test per work CBR-1test per work	Silt content Gradation	One test per work One test per 200 cmt.		
7	Bricks	Water absorption Effluence Size Compressive Strength	1 test per 50,000 bricks		
8	Steel	Tensile Strength Yield stress Elongation size	1 test/40 tonnes/per category		
9	Cement	Consistency setting time Compressive Strength Fineness Chemical Analysis soundness	Upto 50 T per 100 T GERI 200 T Manual 300 T 2002) 500 T	1 test (As 2 test 3 Test 4 Test 5 Tests	

Item No. as per Sch-B	Brief Description of materials to be tested.	Prescription of test which shall be carried out	Frequency @ which test shall be carried out	Qty. of material	Total No. of test to be carried out
			800 T 6 tests 1300 T 7 tests And 8 test for larger consignment		
10	Cement concrete	Compressive strength (I.S. 516-1959)	Qty. C. C. M3 No. Of test 1 to 5 1 6 to 15 2 No. 16 to 30 3 No. 31 to 50 4 No. 51 & above 4 +1 (For each additional 50 M3 or part thereof).		

