



PRODUCT MANUAL FOR COARSE AND FINE AGGREGATE FOR CONCRETE ACCORDING TO IS 383 : 2016

This Product Manual shall be used as reference material by all Regional/Branch Offices & licensees to ensure coherence of practice and transparency in operation of certification under Scheme-I of Bureau of Indian Standards (Conformity Assessment) Regulations, 2018 for various products. The document may also be used by prospective applicants desirous of obtaining BIS certification licence/certificate.

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| 1. | Product | : | IS 383 : 2016 |
| | Title | : | COARSE AND FINE AGGREGATE FOR CONCRETE |
| | No. of Amendments | : | 2 |
| 2. | Sampling Guidelines: | | |
| a) | Raw material | : | NA |
| b) | Grouping guidelines | : | Please refer ANNEX – A |
| c) | Sample Size | : | Coarse aggregates – 50 kg Fine aggregates – 40 kg {For assessment of conformity of product for alkali aggregate reaction test as per clause 5.6, where petrographic analysis is not carried out, if sample is tested and found conforming as per Chemical method [clause 5.6(1)] and accelerated mortar bar method [clause 5.6 (3)], it shall be considered as conforming to requirements of Alkali aggregate reaction test as per clause 5.6 } |
| 3. | List of Test Equipment | : | Please refer ANNEX – B |
| 4. | Scheme of Inspection and Testing | : | Please refer ANNEX – C |
| 5. | Possible tests in a day | : | Please refer ANNEX – D |
| 6. | Scope of the Licence | : | Please refer ANNEX – E |

ANNEX-A
Grouping Guidelines

1. IS 383:2016 covers Coarse and Fine Aggregate for Concrete which are categorized as under:

a) Aggregates are mainly categorized into following types based on sizes as below :

i) Fine aggregate: Grading zone - Zone I / Zone II/ Zone III/ Zone IV

ii) Coarse aggregate: Single Size – 10 mm, 12.5 mm, 16 mm, 20 mm, 40 mm & 63 mm

Graded aggregate: 12.5 mm, 16 mm, 20 mm & 40 mm

For Mass Concrete – Small / Medium / Large/ Very large

Coarse aggregates are further grouped into following groups based on size:

| Type of coarse aggregate | Group – I | Group –II |
|---------------------------------|------------------|--------------------|
| Single size aggregate | 10 mm to 20 mm | 40 mm to 63 mm |
| Graded aggregate | 12.5 mm to 20 mm | 40 mm |
| Aggregates for Mass concrete | Small & Medium | Large & Very large |

iii) All – in – Aggregate

b) Fine aggregates are further classified as given below depending on source (Aggregates from Natural source and Manufactured aggregates):

(i) Natural sand

(ii) Crushed sand – Crushed stone sand/Crushed gravel sand

(iii) Mixed sand

(iv) Manufactured fine aggregate (Manufactured sand):

- Iron slag aggregate
- Steel slag aggregate
- Copper slag aggregate
- Recycled concrete aggregate
- Bottom ash from Thermal Power Plant

c) Coarse aggregates are further classified as given below depending on source:

(i) Uncrushed gravel or stone

(ii) Crushed gravel or stone

(iii) Partially crushed gravel or stone [blend of (i) & (ii) above]

(iv) Manufactured from other than natural source:

- Iron slag aggregate
- Steel slag aggregate
- Recycled concrete aggregate
- Recycled aggregates

2. Considering the above, the following grouping guidelines for GoL/CSoL have been developed:
 - a) One sample of fine aggregate from any grading zone shall be tested for all requirements to cover all fine aggregates of all grading zones in the scope of licence.
 - b) One sample of any size of coarse aggregate from each size group and Type [refer clause 1(a)(ii)] shall be tested for all requirements to cover all sizes of that particular type in that size group.
 - c) Separate sample of fine aggregate/coarse aggregate from each source and sub-source [refer clause 1(b) & (c)] shall be tested to cover fine aggregate/coarse aggregate of that particular source and subsource.
 - d) Sample of All-in-Aggregate shall be tested for all requirements to cover this variety in the scope of the licence.
3. The Firm shall declare the varieties intended to be covered in the Licence. The Scope of Licence may be restricted based on the Manufacturing and Testing capabilities of the Manufacturer.
4. During the operation of the Licence, BO shall ensure that all the varieties covered in the Licence are tested in rotation, to the extent possible.

ANNEX B
List of Test Equipment

Major test equipment required to test as per the Indian Standard

| Sl No | Tests used in with Clause Reference | Test Equipment |
|-------|--|---|
| 1 | Deleterious Materials (Clause 5.2, Table 2) | <p><u>Clay Lumps:</u></p> <ul style="list-style-type: none"> - Weighing balance - Wide container - IS Sieves- 4.75 mm, 10 mm, 20 mm, 40 mm, 1.18 mm, - Hot air oven <p><u>Coal & Lignite:</u></p> <ul style="list-style-type: none"> - Weighing balance - Containers - Skimmer - 300 μ, sieve cloth - Oven/hot plate - Hydrometer - Carbon tetrachloride - Bromo- trichloromethane - IS sieve 300 μ & 4.75 mm - 1,1,2,2- Tetrabromoethane - Bromoform - Benzene <p><u>Materials finer than 75 μ sieve:</u></p> <ul style="list-style-type: none"> - Weighing balance - IS sieve 75 μ and 1.18 mm - Container (pan or vessel) - Oven - Distilled water <p style="text-align: center;"><u>Soft Fragments/ Particles:</u></p> <ul style="list-style-type: none"> - Brass Rod [As per Cl 5.2 of IS 2386 (Part II) : 1963] - IS sieve 10 mm and other sizes <p><u>Shale & Mica :</u></p> <ul style="list-style-type: none"> - Petrographic examination as per IS 2386 (Part VIII) : 1963 |
| 2 | Combined Flakiness and Elongation Index (Clause 5.3) | <ul style="list-style-type: none"> - Weighing balance - Metal gauge [Fig 2 of IS 2386 (Part 1) : 1963] - Metal gauge [Fig 3 of IS 2386 (Part 1) : 1963] - IS Sieves- 63 mm, 50 mm, 40 mm, 31.5 mm 25 mm, 20 mm, 16 mm, 12.5 mm, 10 mm and 6.3 mm |

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| 3 | Aggregate crushing value/Ten Percent Fines Value (Clause 5.4.1) | <ul style="list-style-type: none"> - Steel cylinder [As per clause 2.2.(a) and Fig 1 of IS 2386(Part 1) : 1963] - Metal tamping rod - Weighing balance - IS sieves -12.5 mm, 10 mm & 2.36 mm - Compression testing machine - Cylindrical metal measures of 15.0 cm and 7.5 cm dia. - Oven - Steel scale - Open-ended steel cylinder with plunger and base plate as per clause 3.2 (a) of IS 2386 (Part 1) : 1963 - Cylindrical measure of 11.5 cm dia and 18.0 cm height |
| 4 | Aggregate impact value (Clause 5.4.2) | <ul style="list-style-type: none"> - Impact testing machine [Clause 4.2 (a) and Fig 2 of IS 2386 (Part 4) : 1963] - IS sieves -12.5 mm, 10 mm & 2.36 mm - Cylindrical metal of dia- 75 mm and Depth 50 mm - Tamping rod rod - Weighing balance - Oven |
| 5 | Aggregate abrasion value (Clause 5.4.3) | <ul style="list-style-type: none"> - Los Angles machine [as per clause .5.3.1.(a) of IS 2386 (Part 4) : 1963] - IS sieve 1.70 mm - Oven - Abrasive charge [As per clause .5.3.2 of IS 2386 (Part 4) : 1963] - Tachometer |
| 6 | Soundness of Aggregate (Clause 5.5) | <ul style="list-style-type: none"> - Sieves – 80 mm, 63 mm, 50 mm, 40 mm, 25 mm, 20 mm, 12.5 mm, 10 mm, 4.75 mm, 4 mm, 2.36 mm, 1.18 mm, 600 μ, 300 μ and 150 μ - Temperature controlled water bath or cabinete for regulating temperature of sample during test - Container - Weighing balance - Drying oven - Sodium Sulphate - Hydrometer - Magnesium Sulphate - Thermometer - Hygrometer - Distilled/Deionized water - Apparatus and tools for determination of volumetric expansion ratio of slag aggregates as per clause E-2 of IS 383 : 2016 |

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| 7 | Density and water absorption (Clause 5.7) | <ul style="list-style-type: none"> - Weighing balance - Hot air oven - Wire basket (Mesh < 6.3 mm) - A stout watertight container - Two dry soft absorbent clothes - Shallow tray - Air tight container (Capacity similar to basket) - AC - Thermometer - Steel scale, Vessel [As per Clause 2.4 (c) of IS 2386 (Part 3): 1963] - Means for supplying a current of warm air such as dryer - Filter paper & funnel. |
| 8 | Total Sulphur content as SO ₃ (Clause 5.7) | <ul style="list-style-type: none"> - Cold water - Hydrochloric acid - Glass rod - Beaker - Hot plate - Filter paper- Whatman No 42 - Funnel - Barium chloride - Pipette - Steam Bath - Platinum/Porcelain crucible - Muffle Furnace - Desiccator with Silica gel |
| 9 | Water soluble chloride content (Clause 5.7) | <ul style="list-style-type: none"> - Weighing balance - Beaker - Graduated cylinder 1000 ml - HNO₃ - Distilled water - Stirrer - Stop watch - Beaker-250 ml - Whatman filter paper No.1 - Burette with burette stand - Pipette - Conical flask – 250 ml - Ferric alum - Nitrobenzene - Silver nitrate - Sodium chloride - Potassium chromate |
| 10 | Total alkali content as Na ₂ O equivalent (Clause 5.7) | <ul style="list-style-type: none"> - Calcium carbonate - Hydrochloric acid - Potassium chloride |

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| | | <ul style="list-style-type: none"> - Sodium chloride - Required glassware - Flame photometer - Standard cement sample no. 1013/ 1015/1016 - Weighing balance |
| 11 | Calcium oxide as CaO (Clause 5.7) | <ul style="list-style-type: none"> - Hydrochloric acid - Volumetric flask - Bromine water - Ammonium hydroxide - Hot plate - Nitric acid - Methyl red indicator - Ammonium oxalate - Whatman filter paper No 42 - Platinum crucible - Muffle furnace - Desiccator - Conical flask - Glycerol - Sodium hydroxide - P&R indicator - EDTA solution |
| 12 | Total Sulphur as S (Clause 5.7) | <ul style="list-style-type: none"> - Gas generating flask - Ammoniacal zinc sulphated - Beaker - Flask - Stannous chloride - Hydrochloric acid - Starch solution - Hot plate - Potassium iodate |
| 13 | Total iron as FeO (Clause 5.7) | <ul style="list-style-type: none"> - Weighing balance - Hydrochloric acid - Glass rod - Hot plate - Stannous chloride - Pipette - Mercuric chloride - Manganese sulphate - Potassium permanganate - Glass beaker - Pipette |

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| | | <ul style="list-style-type: none"> - Burette - Ammonium hydroxide - Sulphosalicylic acid - EDTA solution |
| 14 | Magnesium oxide as MgO (Clause 5.7) | <ul style="list-style-type: none"> - Hydrochloric acid - Volumetric flask - Ammonium hydrogen phosphate - Beaker - Ammonium hydroxide - Ammonium nitrate - Platinum crucible - Muffle furnace - 1:1 triethenolamine - Thymol phthalexone - EDTA solution - Required glassware |
| 15 | Chlorine as NaCl (Clause 5.7) | <ul style="list-style-type: none"> - Nitric acid - Silver nitrate - Ammonium thiocyanate - Ferric alum - Hot plate - Required glassware - Nitrobenzene - Desiccator - Whatman filter paper No 40 - Micro pipet |
| 16 | Basicity as Cao/SiO ₂ (Clause 5.7) | <ul style="list-style-type: none"> - Physical balance - Hydrochloric acid - Hot plate - Glass rod - Steam bath - Glass dish - Whatman filter paper No 40 |
| 17 | Size and Grading of aggregate (Clause 6) | <ul style="list-style-type: none"> - IS sieves of all sizes - Sieve shaker - Weighing balance |

The above list is indicative only and may not be treated as exhaustive.

ANNEX C
Scheme of Inspection and Testing

1. LABORATORY - A laboratory shall be maintained which shall be suitably equipped (as per the requirement given in column 2 of [Table 1](#)) and staffed, where different tests given in the specification shall be carried out in accordance with the methods given in the specification.

1.1 The manufacturer shall prepare a calibration plan for the test equipments.

2. TEST RECORDS –The manufacturer shall maintain test records for the tests carried out to establish conformity.

3. LABELLING AND MARKING – As per the requirements of IS 383 : 2016..

4. CONTROL UNIT – All aggregates of same type, source and classification manufactured in continuous production schedule in a day shall constitute a control unit.

5. LEVELS OF CONTROL - The tests as indicated in column 1 of [Table 1](#) and the levels of control submitted by the manufacturer in column 3 of Table 1, shall be carried out on the whole production of the factory which is covered by this plan and appropriate records maintained in accordance with paragraph 2.0 above.

5.1 All the production, which conforms to the Indian Standards and covered by the licence should be marked with Standard Mark.

6. REJECTIONS–Disposal of non-conforming product shall be done in such a way so as to ensure that there is no violation of provisions of BIS Act, 2016.

TABLE 1

| (1) | | | | (2) | (3) | | |
|--------------|--|--------------|----------------------------|--|-------------------------------|--|---|
| Test Details | | | | Test equipment requirement R: required (or) S: Sub-contracting permitted | Recommended Levels of Control | | |
| Clause | Requirement | Test Methods | | | No. of Sample | Frequency | Remarks |
| | | Clause | Reference | | | | |
| 5.1 | General | 5.1 | IS 383 | - | All | - | - |
| 5.2 | Deleterious Materials | 5.2 | IS 383 | | | | |
| | (i) Coal and lignite | | IS 2386 (Part 2) | R | One | Once in a month for each type, source and classification of aggregate | See note 1 below Table 2 of IS 383 : 2016. The test shall be carried out whenever there is change in source or manufacturing process. |
| | (ii) Clay lumps | | IS 2386 (Part 2) | R | One | | |
| | (iii) Material finer than 75 µm IS sieve | | IS 2386 (Part 1) | R | One | | |
| | (iv) Soft fragments | | IS 2386 (Part 2) | R | One | | |
| | (v) Shale | | - | S | One | Once in three months for each type, source and classification of aggregate | See note 2 and 3 below Table 2 of IS 383 : 2016. The test shall be carried out whenever there is change in source or manufacturing process. |
| | (vi) Mica | | - | S | One | Once in three months for each type, source and classification of aggregate | |
| | (vi) Total percentage of all deleterious materials (Except mica) | | - | S | One | Once in three months for each type, source and classification of aggregate | |
| | Organic impurity | 5.2 | IS 383 IS 2386 (Part 2) | S | One | Once in six months for each type, source and classification of aggregate | See note 4 below Table 2 of IS 383 : 2016. The test shall be carried out whenever there is change in source or manufacturing process. |

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| 5.3 | Combined Flakiness and Elongation Index | 5.3 | IS 383 IS 2386 (Part 1) | R | One | Each Control Unit | - |
| 5.4 | MECHANICAL PROPERTIES | | | | | | |
| 5.4.1 | Aggregate crushing value/ Ten percent fines value | 5.4.1 | IS 383 IS 2386 (Part 4) | R | One | Each Control Unit | - |
| 5.4.2 | Aggregate impact value | 5.4.2 | IS 383 IS 2386 (Part 4) | R | One | Each Control Unit | - |
| 5.4.3 | Aggregate abrasion value | 5.4.3 | IS 383 IS 2386 (Part 4) | R | One | Each Control Unit | - |
| 5.5 | Soundness of aggregate | 5.5.1 | IS 383 IS 2386 (Part 5) | R | One | Once in a month for each type, source and classification of aggregate | - |
| | | 5.5.2 | IS 383, Annex – D, Annex – E | S | One | Once in a month for each type, source and classification of aggregate | |
| 5.6 | Alkali Aggregate Reaction | 5.6 | IS 383 IS 2386 (Part 7) | S | One | Once in six months for each type, source and classification of aggregate | The test shall be carried out whenever there is change in Source of manufacturing process. |
| 5.7 | ADDITIONAL REQUIREMENTS FOR ALL MANUFACTURED AGGREGATES | | | | | | |
| | Total Alkali content as Na ₂ O equivalent | 5.7, Table 3 | IS 383 | S | One | Once in a month for each source of aggregate | - |
| | Total Sulphate Content as SO ₃ | 5.7, Table 3 | IS 383 | S | One | Once in a month for each source of aggregate | - |
| | Water Soluble Chloride Content | 5.7, Table 3 | IS 383 | S | One | Once in a month for each source of aggregate | - |
| | Water Absorption | 5.7, Table 3 | IS 383 | R | One | Once in a month for each source of aggregate | - |

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| | Specific Gravity | 5.7, Table 3 | IS 383 | R | One | Once in a month for each source of aggregate | - |
| | Additional Requirement for Iron and Steel Slag aggregates | 5.7, Table 4 | IS 383 | S | One | Once in a month for each source of aggregate | - |
| | Calcium Oxide as CaO | | | | | | |
| | Total Sulphur as S | | | | | | |
| | Total Iron as FeO | | | | | | |
| | Additional Requirement for Electric furnace oxidation slag coarse aggregate | 5.7, Table 5 | IS 383 | S | One | Once in a month for each source of aggregate | - |
| | Magnesium Oxide as MgO | | | | | | |
| | Calcium Oxide as CaO | | | | | | |
| | Total Iron as FeO | | | | | | |
| | Basicity as CaO/SiO ₂ | | | | | | |
| | Additional Requirement for Copper slag aggregate | 5.7, Table 6 | IS 383 | S | One | Once in a month for each source of aggregate | - |
| | Calcium Oxide as CaO | | | | | | |
| | Total Sulphur as S | | | | | | |
| | Total Iron as FeO | | | | | | |
| | Chlorine as NaCl | | | | | | |
| 6 | Size and Grading of aggregates | 6.1, 6.2, 6.3 , 6.4, Table 7, Table 8, Table 9 | IS 383 IS 2386 (Part 1) | R | One | Each control Unit | - |

Note 1 - Sub-contracting is permitted to a laboratory recognized by the Bureau or Government laboratories empaneled by the Bureau.

Note 2 - Levels of control given in column 3 are only recommendatory in nature. The manufacturer may define the control unit/batch/lot and submit his own levels of control in column 3 with proper justification for approval by BO Head.

ANNEX – D

Possible tests in a day:

- a) Combined flakiness and elongation index (Clause 5.3)
- b) Aggregate crushing value/Ten percent fines value (Clause 5.4.1)
- c) Aggregate impact value (Clause 5.4.2)
- d) Aggregate abrasion value (Clause 5.4.3)
- e) Size and grading of aggregate (Clause 6)

ANNEX – E**Scope of the Licence:**

Licence is granted to use Standard Mark as per IS 383 : 2016 with the following scope:

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|---|---|
| Name of Product | Coarse and Fine Aggregate for Concrete |
| Type | Coarse Aggregate/ Fine Aggregate/ All-in-Aggregate |
| Grading and Nominal Size in mm (For coarse aggregates) | Single Size : 10/ 12.5/ 16/ 20/ 40/ 63 |
| | Graded : 12.5/ 16/ 20/ 40 |
| | For mass concrete : Small /Medium/Large/Very large |
| Classification of aggregates (For Coarse Aggregates) | Uncrushed gravel or stone /Crushed gravel or stone/ Partially crushed gravel or stone/ Manufactured from other than natural source (Iron slag aggregate/Steel slag aggregate/Recycled concrete aggregate/ Recycled aggregate) |
| Grading Zone (For Fine Aggregates) | I/ II/ III/ IV |
| Classification of aggregates (For Fine Aggregates) | Natural sand/Crushed stone sand/ Crushed gravel sand/ Mixed sand/ Manufactured sand (Iron slag aggregate/ Steel slag aggregate/Copper slag aggregate/Recycled concrete aggregate/ Bottom ash from Thermal Power Plant) |

