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|-------------------------------|--|--------------------|-------------------|
| <b>Laboratory</b>             | <b>Independent Calibration Laboratories, National Council for Cement and Building Materials, 34, KM Stone, NH-2, Delhi-Mathura Road, Ballabgarh, Haryana</b> |                    |                   |
| <b>Accreditation Standard</b> | <b>ISO/IEC 17025:2005</b>  |                    |                   |
| <b>Discipline</b>             | <b>Mechanical Calibration</b>  | <b>Issue Date</b>  | <b>30.06.2014</b> |
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| <b>Quantity Measured/<br/>Instrument</b> | <b>Range / Frequency</b>                   | <b>*Calibration Measurement<br/>Capability (<math>\pm</math>)</b> | <b>Remarks</b>                 |
|--|--|---|--------------------------------|
| <b>I.DIMENSION<sup>\$</sup></b>          |  |   |                                |
| <b>1. Test Sieves</b>                    | 45 $\mu$ m to 850 $\mu$ m<br>1 mm to 10 mm | 6.0 $\mu$ m<br>7.0 $\mu$ m  | Using Profile Projector        |
| <b>2. Test Sieves</b>                    | >10 to 150 mm                              | 20.0 $\mu$ m  | Using Vernier Caliper          |
| <b>3. Glass Scale</b>                    |  |   |                                |
| <b>LC: 0.1 mm</b>                        | Upto 100 mm                                | 10.0 $\mu$ m  | Using Profile Projector        |
| <b>LC: 0.5 mm</b>                        | >100 to 200 mm                             | 30.0 $\mu$ m  |                                |
| <b>4. Steel Scale</b>                    | Upto 300 mm                                | 100.0 $\mu$ m   | Using Profile Projector        |
| <b>5. Vernier Caliper</b>                |  |   |                                |
| <b>LC : 0.01 mm <sup>Φ</sup></b>         | Upto 300 mm                                | 10.0 $\mu$ m  | Using Caliper Checker          |
| <b>6. Dial Gauge</b>                     |  |   |                                |
| <b>LC: 0.001 mm <sup>Φ</sup></b>         | 0 to 25 mm                                 | 1.7 $\mu$ m   | Using Dial Gauge<br>Calibrator |

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|--|--------------------------|--|----------------|
|--|--------------------------|--|----------------|

## **II. ACCELERATION & SPEED**

### **1. Tachometer<sup>s</sup>**

|                    |                         |       |                             |
|--------------------|-------------------------|-------|-----------------------------|
| <b>LC: 0.1 RPM</b> | 100 RPM to 1000 RPM     | 0.49% | Using Digital<br>Tachometer |
|                    | >1000 RPM to 5000 RPM   | 0.18% |                             |
| <b>LC: 1.0 RPM</b> | >5000 RPM to 10000 RPM  | 0.15% |                             |
|                    | >10000 RPM to 25000 RPM | 0.10% |                             |

### **2. RPM<sup>#</sup>**

|                          |                     |       |   |
|--------------------------|---------------------|-------|---|
| <b>Vibrating Machine</b> | 85 RPM to 15000 RPM | 0.10% | Using Digital<br>Tachometer as per<br>IS 10080: 1982<br>(RA 2004) |
| <b>Planetary Mixer</b>   | 85 RPM to 15000 RPM | 0.10% | Using Digital<br>Tachometer as per<br>IS 10890: 1980<br>(RA 2004) |
| <b>Flow Table</b>        | 85 RPM to 15000 RPM | 0.10% | Using Digital<br>Tachometer as per<br>IS 5512: 1983<br>(RA 2004)  |

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| Quantity Measured/<br>Instrument | Range / Frequency | *Calibration Measurement<br>Capability ( $\pm$ ) | Remarks |
|----------------------------------|-------------------|--|---------|
|----------------------------------|-------------------|--|---------|

### III.MASS<sup>\$</sup>

|                   |        |          |   |
|-------------------|--------|----------|---|
| <b>1. Weights</b> | 1 mg   | 0.01 mg  | Using Precision Balance and standards weight E2 and F1 classes, Substitution method of weighing and "ABBA/ABA" cycle. Procedure based on OIML R 111 (2004). |
|                   | 2 mg   | 0.01 mg  |   |
|                   | 5 mg   | 0.01 mg  |   |
|                   | 10 mg  | 0.01 mg  |   |
|                   | 20 mg  | 0.01 mg  |   |
|                   | 50 mg  | 0.011 mg |   |
|                   | 100 mg | 0.011 mg |   |
|                   | 200 mg | 0.012 mg |   |
|                   | 500 mg | 0.013 mg |   |
|                   | 1 g    | 0.014 mg |   |
|                   | 2 g    | 0.016 mg |   |
|                   | 5 g    | 0.019 mg |   |
|                   | 10 g   | 0.022 mg |   |
|                   | 20 g   | 0.027 mg |   |
|                   | 50 g   | 0.032 mg |   |
|                   | 100 g  | 0.051 mg |   |
|                   | 200 g  | 0.1 mg   |   |
|                   | 500 g  | 0.001 g  |   |
|                   | 1 kg   | 0.001 g  |   |
|                   | 2 kg   | 0.001 g  |   |
|                   | 5 kg   | 0.002 g  |   |
|                   | 10 kg  | 0.11 g   |   |
|                   | 20 kg  | 0.11 g   |   |
|                   | 50 kg  | 0.14 g   |   |
|                   | 100 kg | 0.21 g   |   |

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|----------------------------------|--|--|--|
| <b>2. Balances</b>               | (0 to 200) g<br>Readability: 0.01 mg   | 0.13 mg  | Using Standard weights<br>(E2 and F1 class).<br>Procedure based on<br>OIML – R76 (2006). |
|                                  | (0 to 5) kg<br>Readability: 1.0 mg     | 6.0 mg   |  |
|                                  | (0 to 150) kg<br>Readability: 100.0 mg |  |  |
|                                  | (5 to 20) kg                           | 110.0 mg   |  |
|                                  | (20 to 50) kg                          | 140.0 mg   |  |
|                                  | (50 to 100) kg                         | 200.0 mg   |  |
|                                  | (100 to 150) kg                        | 290.0 mg   |  |

#### IV. VOLUME<sup>s</sup>

##### 1. Volumetric Glassware

|                |               |          |   |
|----------------|---------------|----------|---|
| <b>Pipette</b> | 3 to 5 ml     | 0.002 ml | Using Standard weights<br>and distilled water of<br>known density and<br>reference weights<br>(E2 and F1 class).<br>Procedure based on ISO<br>4787 & ISO 8655-6 |
|                | >5 to 10 ml   | 0.004 ml |   |
|                | >10 to 50 ml  | 0.010 ml |   |
|                | >50 to 100 ml | 0.022 ml |   |

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|--|--|---|--|
| <b>Burette</b>   | 3 to 5 ml<br>>5 to 10 ml<br>>10 to 50 ml<br>>50 to 100 ml  | 0.002 ml<br>0.004 ml<br>0.010 ml<br>0.022 ml                                  | Using Standard weights and distilled water of known density and reference weights (E2 and F1 class).<br>Procedure based on ISO 4787 & ISO 8655-6 |
| <b>Measuring Cylinder, Flasks</b>                                | 3 to 5 ml<br>>5 to 10 ml<br>>10 to 50 ml<br>>50 to 100 ml<br>>100 to 250 ml<br>>250 to 500 ml<br>>500 to 1000 ml | 0.002 ml<br>0.004 ml<br>0.010 ml<br>0.022 ml<br>0.023ml<br>0.025ml<br>0.030ml |  |
| <b>Volume</b>  | (1.6 to 2.0) cm <sup>3</sup>   | 0.0034 cm <sup>3</sup>  | Using Blaine Cell  |
| <b>V.PRESSURE<sup>s</sup></b>                                    |  |   |  |
| <b>1. Pressure (Pressure Gauge, Calibrator, Pressure switch)</b> | 3 kg/cm <sup>2</sup> to 61.1 kg/cm <sup>2</sup>  | 0.01% rdg   | Using Digital Pressure Gauge with Dead Weight Tester by Comparison method (DKD-R6.1)   |
|  | 61.1 kg/cm <sup>2</sup> to 1200 kg/cm <sup>2</sup>   | 0.02% rdg   |  |

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| Quantity Measured/<br>Instrument                                   | Range / Frequency | *Calibration Measurement<br>Capability ( $\pm$ ) | Remarks   |
|--|-------------------|--|---|
| <b>VI. FORCE*</b>  |                   |  |   |
| 1. Compression Testing<br>Machines/<br>UTMs in Compression<br>Mode | 3 kN to 3000 kN   | 0.50%**  | Using class 0, 1 & 2<br>force proving<br>instruments as per<br>IS 1828<br>(Part I):2005 |

\* Measurement Capability is expressed as an uncertainty ( $\pm$ ) at a confidence probability of 95%

\$ Only in Permanent Laboratory

\* Only for Site Calibration

# The laboratory is also capable for site calibration however, the uncertainty at site depends on the prevailing actual environmental conditions and master equipment used.

Φ Laboratory can also calibrate instruments/devices of coarser resolution / least count within the accredited range using same reference standard/ master equipment under the scope of accreditation.

\*\* Relative accuracy error has not been considered for CMC estimation.