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|-------------------------------|--|--------------------|-------------------|
| <b>Laboratory</b>             | <b>Bureau Veritas (India) Pvt. Ltd. - Construction Services Laboratory,<br/>Plot B3/B4, TTC Industrial Area, Off Thane-Belapur Road, M.I.D.C.,<br/>Digha, Navi Mumbai, Maharashtra</b> |                    |                   |
| <b>Accreditation Standard</b> | <b>ISO/IEC 17025: 2005</b>   |                    |                   |
| <b>Discipline</b>             | <b>Chemical Testing</b>  | <b>Issue Date</b>  | <b>06.05.2015</b> |
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|-------------------------------|---|--|--|---|
| <b>I. WATER</b>               |   |  |  |   |
| <b>1.</b>                     | <b>Water<br/>(for Construction<br/>Purpose)</b>   | Alkalinity<br>(Volume of 0.02 N H <sub>2</sub> SO <sub>4</sub><br>consumed to 100 ml of water<br>sample) | IS 3025 (Part 23): 1986 (RA 2009)<br>IS 456: 2000                          | 0.1 ml to 50 ml                                   |
|                               |   | Acidity<br>(Volume of 0.02 N NaOH<br>Consumed to neutralized 100 ml<br>of water sample)                  | IS 3025 (Part 22): 1986 (RA 2009)<br>IS 456: 2000                          | 0.1 ml to 15 ml                                   |
|                               |   | pH value   | IS 3025 (Part 11): 1983 (RA 2012)  | 4 to 10   |
|                               |   | Chloride content   | IS 3025 (Part 32): 1988 (RA 2009)  | 5 mg/l to 5000 mg/l                               |
|                               |   | Sulphate content   | IS 3025 (Part 24): 1986 (RA 2009)  | 1 mg/l to 2000 mg/l                               |
|                               |   | Inorganic Solids (Fixed Residue)   | IS 3025 (Part 18): 1984 (RA 2012)  | 1 mg/l to 10000 mg/l                              |
|                               |   | Organic Solids<br>(Volatile Residue)   | IS 3025 (Part 15): 1984 (RA2009)   | 1 mg/l to 4000 mg/l                               |
|                               |   | Suspended Matter   | IS 3025 (Part 17): 1984 (RA 2012)  | 1 mg/l to 3000 mg/l                               |
| <b>II. BUILDING MATERIALS</b> |   |  |  |   |
| <b>1.</b>                     | <b>Cement<br/>[Ordinary<br/>Portland Cement,<br/>Portland<br/>Pozzolana<br/>Cement (PPC),<br/>Portland Slag<br/>Cement (PSC)]</b> | Insoluble Residue  | IS 4032: 1985 (RA 2009)  | 0.5 % to 40 %                                     |
|                               |   | Loss on Ignition   | IS 4032: 1985 (RA 2009)  | 0.5 % to 08 %                                     |
|                               |   | Silica Content (SiO <sub>2</sub> )   | IS 4032: 1985 (RA 2009)  | 5.0 % to 40 %                                     |
|                               |   | Alumina (Al <sub>2</sub> O <sub>3</sub> )  | IS 4032: 1985 (RA 2009)  | 0.2 % to 15 %                                     |

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|               | <b>Cement<br/>[Ordinary<br/>Portland Cement,<br/>Portland<br/>Pozzolana<br/>Cement (PPC),<br/>Portland Slag<br/>Cement (PSC)]</b> | Ferric Oxide (Fe <sub>2</sub> O <sub>3</sub> )          | IS 4032: 1985 (RA 2009)  | 0.2 % to 6 %                                      |
|               |   | Calcium Oxide (CaO)                                     | IS 4032: 1985 (RA 2009)  | 5 % to 75 %                                       |
|               |   | Sulphuric Anhydride (SO <sub>3</sub> )                  | IS 4032: 1985 (RA 2009)  | 0.1 % to 5 %                                      |
|               |   | Magnesia (MgO)  | IS 4032: 1985 (RA 2009)  | 0.5 % to 10 %                                     |
|               |   | Sodium Alkali (Na <sub>2</sub> O)                       | IS 4032: 1985 (RA 2009)  | 0.03 % to 3 %                                     |
|               |   | Potassium Alkali (K <sub>2</sub> O)                     | IS 4032: 1985 (RA 2009)  | 0.03 % to 3 %                                     |
|               |   | Alkalies equivalent Sodium<br>Oxide (Na <sub>2</sub> O) | IS 4032: 1985 (RA 2009)  | 0.03 % to 3 %                                     |
|               |   | Sulphur as Sulfide                                      | IS 4032: 1985 (RA 2009)  | 0.01 % to 5 %                                     |
|               |   | Chloride  | IS 4032: 1985 (RA 2009) Amd 2  | 0.005 % to 1.0 %                                  |
| <b>2.</b>     | <b>Admixture/<br/>Water Proofing<br/>Compound</b>   | Chloride Content  | IS 6925: 1973 (RA 2008)  | 0.001 % to 2.0 %                                  |
|               |   | Ash Content   | IS 9103: 1999 (RA 2008)  | 1 % to 35 %                                       |
|               |   | pH  | IS 9103: 1999 (RA 2008)  | 4 to 10   |
|               |   | Dry Material Content                                    | IS 9103: 1999 (RA 2008)  | 1 % to 70 %                                       |
|               |   | Relative density  | IS 9103: 1999 (RA 2008)  | 0.8 to 3.0  |
| <b>3.</b>     | <b>Ceramic Tiles-<br/>Unglazed tiles</b>  | Chemical Resistance                                     | IS 13630 (Part 7): 2006 (RA 2012)  | Qualitative<br>(Visual test)                      |

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| <b>4.</b>     | <b>Soil</b>   | Determination of total soluble Sulphate content                   | IS 2720 (Part 27): 1977 (RA 2011)  | 0.005 % to 2.0 %                                  |
|               |   | pH value  | IS 2720 (Part 26): 1977 (RA 2011)  | 4 to 10   |
| <b>5.</b>     | <b>Pozzolanic<br/>Material /<br/>Pulverised<br/>Fuel Ash</b>    | Loss on Ignition  | IS 1727: 1967 (RA 2008)  | 0.1 % to 30 %                                     |
|               |   | Sulphuric Anhydride (SO <sub>3</sub> )                            | IS 1727: 1967 (RA 2008)  | 0.1 % to 5 %                                      |
|               |   | Silica content ( SiO <sub>2</sub> )                               | IS 1727 : 1967 (RA 2008)   | 20 % to 70 %                                      |
|               |   | Mixed Oxides  | IS 1727: 1967 (RA 2008)  |   |
|               |   | Fe <sub>2</sub> O <sub>3</sub>                                    |  | 0.5 % to 8.0 %                                    |
|               |   | Al <sub>2</sub> O <sub>3</sub>                                    |  | 5 % to 45 %                                       |
|               |   | Lime (CaO)  | IS 1727: 1967 (RA 2008)  | 0.5 % to 20 %                                     |
|               |   | Magnesia (MgO)  | IS 1727 : 1967 (RA 2008)   | 0.5 % to 10 %                                     |
|               |   | Sodium Alkali (Na <sub>2</sub> O)                                 | IS 3812 (Part 1): 2013   | 0.03 % to 3 %                                     |
|               |   | Potassium Alkali (K <sub>2</sub> O)                               | IS 3812 (Part 1): 2013   | 0.03 % to 3 %                                     |
| <b>6.</b>     | <b>Ground<br/>Granulated Blast<br/>Furnace Slag<br/>(GGBFS)</b> | Available Alkalies as equivalent Sodium Oxide (Na <sub>2</sub> O) | IS 3812 (Part 1): 2013   | 0.05 % to 3 %                                     |
|               |   | Chloride  | IS 4032: 1985 (RA 2009) Amd. 2   | 0.004 % to 2.0 %                                  |
|               |   | Insoluble Residue   | IS 4032: 1985 (RA 2009)  | 0.1% to 15 %                                      |
|               |   | Silica Content (SiO <sub>2</sub> )                                | IS 4032: 1985 (RA 2009)  | 5 % to 50 %                                       |
|               |   | Alumina (Al <sub>2</sub> O <sub>3</sub> )                         | IS 4032: 1985 (RA 2009)  | 0.5 % to 25 %                                     |

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| <b>7.</b>     | <b>Ground<br/>Granulated Blast<br/>Furnace Slag<br/>(GGBFS)</b> | Ferric Oxide ( $\text{Fe}_2\text{O}_3$ )                    | IS 4032: 1985 (RA 2009)  | 0.2 % to 6%                                       |
|               |   | Calcium Oxide ( $\text{CaO}$ )                              | IS 4032: 1985 (RA 2009)  | 5 % to 50 %                                       |
|               |   | Magnesia ( $\text{MgO}$ )                                   | IS 4032: 1985 (RA 2009)  | 0.5 % to 15 %                                     |
|               |   | Sulphur as Sulfide  | IS 4032: 1985 (RA 2009)  | 0.01 % to 5 %                                     |
|               |   | Manganese Oxide ( $\text{MnO}$ )                            | IS 4032: 1985 (RA 2009)  | 0.01 % to 10 %                                    |
|               | <b>Microsilica/Silica<br/>Fume</b>                              | Loss on Ignition  | IS 1727: 1967 (RA 2008)<br>IS 15388: 2003                                  | 0.1 % to 30 %                                     |
|               |   | Silica Content ( $\text{SiO}_2$ )                           | IS 1727: 1967 (RA 2008)<br>IS 15388: 2003                                  | 20 % to 96 %                                      |
|               |   | Moisture Content  | IS 1727: 1967 (RA 2008)<br>IS 15388: 2003                                  | 0.1 % to 20 %                                     |
|               |   | Sodium Alkali ( $\text{Na}_2\text{O}$ )                     | IS 4032: 1985 (RA 2009)<br>IS 15388: 2003                                  | 0.03 % to 3 %                                     |
|               |   | Potassium Alkali ( $\text{K}_2\text{O}$ )                   | IS 4032: 1985 (RA 2009)<br>IS 15388: 2003                                  | 0.03 % to 3 %                                     |
| <b>8.</b>     | <b>Gypsum Plaster</b>   | Alkali equivalent sodium Oxide<br>( $\text{Na}_2\text{O}$ ) | IS 4032: 1985 (RA 2009)<br>IS 15388: 2003                                  | 0.05 % to 5 %                                     |
|               |   | Loss on Ignition  | IS 2547 (Part 1): 1976 (RA 2002)<br>IS 1288: 1982                          | 1 % to 21 %                                       |
|               |   | Suphuric Anhydride ( $\text{SO}_3$ )                        | IS 2547 (Part 1): 1976 (RA 2002)<br>IS 1288: 1982                          | 0.1 % to 60 %                                     |

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|               | <b>Gypsum Plaster</b>                 | Calcium Oxide (CaO)   | IS 2547 (Part 1): 1976 (RA 2002)<br>IS 1288: 1982                          | 5 % to 50 %   |
|               |                                       | Magnesium Oxide (MgO)   | IS 2547 (Part 1): 1976 (RA 2002)<br>IS 1288: 1982                          | 0.01 % to 0.5 %   |
|               |                                       | Soluble Salt of sodium Oxide<br>(Na <sub>2</sub> O)   | IS 2547 (Part 1): 1976 (RA 2002)<br>IS 1288: 1982                          | 0.01 % to 3 %   |
|               |                                       | Free Lime   | IS 2547 (Part 1): 1976 (RA 2002)<br>IS 1288: 1982                          | 0.0037 % to 0.4 %   |
| <b>9.</b>     | <b>Coarse Aggregate</b>               | pH  | IS 2720 (Part 26): 1977 (RA 2011)  | 4 to 10   |
|               |                                       | Chloride  | BS EN 1744-1: 2009<br>Amd. 1: 2012   | 0.002 % to 0.5 %  |
|               |                                       | Sulphate  | BS EN 1744-1: 2009<br>Amd. 1: 2012   | 0.002 % to 1 %  |
|               |                                       | Alkali Aggregate reactivity<br>a) Reduction in Alkalinity<br>b) Silica Content  | IS 2386 (Part 7): 1963 (RA 2011)   | 10 milimoles/l to<br>500 milimoles/l<br>2 milimoles/l to<br>100 milimoles/l |
|               |                                       | Soundness by<br>a) Sodium Sulphate<br>(Na <sub>2</sub> SO <sub>4</sub> )-5 cycles<br>b) Magnesium Sulphate<br>(MgSO <sub>4</sub> )-5 cycles | IS 2386 (Part 5): 1963 (RA 2011)   | 0.1 % to 20 %   |

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|               | <b>Coarse Aggregate</b>               | Deleterious Material  |  |   |
|               |                                       | a) Coal & Lignite   | IS 2386 (Part 2): 1963 (RA 2011)   | 0.001 % to 3 %                                    |
|               |                                       | b) Material Finer than 75<br>microns IS Sieve                     | IS 2386 (Part 1): 1963 (RA 2011)   | 0.1 % to 30 %                                     |
|               |                                       | c) Soft Particle  | IS 2386 (Part 2): 1963 (RA 2011)   | 0.1 % to 5 %                                      |
| <b>10.</b>    | <b>Fine Aggregate</b>                 | pH  | IS 2720 (Part 26): 1977 (RA 2011)  | 4 to 10   |
|               |                                       | Chloride  | BS EN 1744-1: 2009 Amd. 1: 2012  | 0.002 % to 0.5 %                                  |
|               |                                       | Sulphate  | BS EN 1744-1: 2009 Amd. 1: 2012  | 0.002 % to 1 %                                    |
|               |                                       | Alkali Aggregate reactivity                                       | IS 2386 (Part 7): 1963 (RA 2011)   |   |
|               |                                       | a) Reduction in Alkalinity  |  | 10 milimoles/l to<br>500 milimoles/l              |
|               |                                       | b) Silica Content   |  | 2 milimoles/l to<br>100 milimoles/l               |
|               |                                       | Soundness by  | IS 2386 (Part 5): 1963 (RA 2011)   | 0.1 % to 30 %                                     |
|               |                                       | a) Sodium Sulphate<br>(Na <sub>2</sub> SO <sub>4</sub> )-5 cycles |  |   |
|               |                                       | b) Magnesium Sulphate<br>(MgSO <sub>4</sub> )-5 cycles            |  |   |
|               |                                       | Organic impurities  | IS 2386 (Part 2): 1963 (RA 2011)   | Qualitative                                       |
|               |                                       | Deleterious Material  |  |   |
|               |                                       | a) Coal & Lignite   | IS 2386 (Part 2): 1963 (RA 2011)   | 0.001 % to 3 %                                    |
|               |                                       | b) Material finer than 75<br>microns IS Sieve                     | IS 2386 (Part 1): 1963 (RA 2011)   | 0.1 % to 30 %                                     |
|               |                                       | c) Clay Lumps   | IS 2386 (Part 2): 1963 (RA 2011)   | 0.1 % to 50 %                                     |

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| 11.                    | Lime   | Loss on Ignition  | IS 6932 (Part 1): 1973 (RA 2009)                                  | 0.1 % to 35 %                             |
|                        |  | Silica Content (SiO <sub>2</sub> )  | IS 6932 (Part 1): 1973 (RA 2009)                                  | 0.2 % to 25 %                             |
|                        |  | Mixed Oxides (Fe <sub>2</sub> O <sub>3</sub> & Al <sub>2</sub> O <sub>3</sub> ) | IS 6932 (Part 1): 1973 (RA 2009)                                  | 0.5 % to 15 %                             |
|                        |  | Calcium Oxide (CaO)   | IS 6932 (Part 1): 1973 (RA 2009)                                  | 0.5 % to 90 %                             |
|                        |  | Magnesium Oxide (MgO)   | IS 6932 (Part 1): 1973 (RA 2009)                                  | 0.5 % to 10 %                             |
|                        |  | Insoluble Residue   | IS 6932 (Part 1): 1973 (RA 2009)                                  | 0.1 % to 30 %                             |
| 12.                    | Hardened<br>Concrete/Mortar                                | pH  | IS 2720 (Part 26): 1977 (RA 2011)                                 | 4 to 14                                   |
|                        |  | Chloride  | BS 1881 (Part 124): 1988  | 0.001 % to 5 %                            |
|                        |  | Sulphate  | BS 1881 (Part 124): 1988  | 0.1 % to 5 %                              |
| III. METALS AND ALLOYS |  |   |   |   |
| 1.                     | Steel (Reinforced,<br>Mild Steel<br>& Structural<br>Steel) | Carbon  | IS 228 (Part 1): 1987 (RA 2008)                                   | 0.05 % to 0.4 %                           |
|                        |  | Sulphur   | IS 6226 (Part 2): 1987 (RA 2008)                                  | 0.005 % to 0.4 %                          |
|                        |  | Phosphorous   | IS 228 (Part 3): 1987 (RA 2008)                                   | 0.005 % to 0.4 %                          |
|                        |  | Manganese   | IS 228 (Part 2): 1987 (RA 2008)                                   | 0.1 % to 2.0 %                            |
|                        |  | Silicon   | IS 228 (Part 8): 1987 (RA 2008)                                   | 0.01 % to 2 %                             |

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