

Laboratory

Ghaziabad Testing Laboratories Private Limited, AO-150, Amrit Steel Compound, South Side, G.T. Road, Industrial Area, Ghaziabad, Uttar Pradesh

Location 1: AO-150, Amrit Steel Compound, South Side, G.T. Road, Industrial Area, Ghaziabad, Uttar Pradesh

Location 2: 28-29, Prem Vihar, Bisrakhroad, Chhaprola, Ghaziabad, Uttar Pradesh

Accreditation Standard ISO/IEC 17025: 2005

Certificate Number TC-6170

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Validity 03.12.2017 to 02.12.2019

Last Amended on 07.02.2018

| Sl. | Product / Material of Test | Specific Test Performed | Test Method Specification against which tests are performed | Range of Testing / Limits of Detection |
|-----|----------------------------|-------------------------|---|--|
|-----|----------------------------|-------------------------|---|--|

CHEMICAL TESTING

| LOCATION 1 | | | | |
|-------------------|--------------------------|--|-----------------------|----------------|
| I. | BUILDING MATERIAL | | | |
| 1. | Steel | Carbon | IS 228(P-1) | 0.01% to 0.60% |
| | | Sulphur | IS 228(P-9) | 0.01% to 0.25% |
| | | Phosphorus | IS 228(P-3) | 0.01% to 0.1% |
| | | Manganese | IS 228(P-2) | 0.10% to 2.0% |
| | | Silicon | IS 228(P-8) | 0.10% to 1.5% |
| 2. | Cement (OPC/PPC) | Loss of Ignition | IS4032 | 1.0% to 10.0% |
| | | Insoluble Residue | | 1.0% to 40% |
| | | Alumina as Al ₂ O ₃ | | 1.0% to 15% |
| | | Ferric Oxide as Fe ₂ O ₃ | | 1.0% to 6.0% |
| | | Calcium Oxide as CaO | | 30% to 70% |
| | | Magnesium Oxide as MgO | | 0.5% to 5.0% |
| | | Sulphuric Anhydride as SO ₃ | | 1.0% to 5.0% |
| | | Silica (SiO ₂) | | 1.0% to 50% |
| | | Alkali Content | | 0.1% to 5% |
| | | Chloride Content | | 0.01% to 1% |
| 3. | Fly Ash | Silicon Dioxide SiO ₂ +Aluminium Oxide Al ₂ O ₃ +Iron Oxide (Fe ₂ O ₃) | IS 1727 | 30% to 99.9% |
| | | Silicon Dioxide (SiO ₂) | IS 1727 | 10% to 99.9% |
| | | Reactive Silica | IS 3812(P-1), Annex-B | 10% to 99.99% |

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| | | Magnesium Oxide (MgO) | IS 1727 | 1% to 10.0 % |
| | | Total Sulphur as Sulphur Trioxide (SO ₃) | IS 1727 | 1% to 10% |
| | | Available Alkalies as equivalent Sodium Oxide (Na ₂ O) | IS 3812(P-1), Annex-C | 0.1% to 5% |
| | | Total Chloride | IS 4032 | 0.01% to 1% |
| | | Loss On Ignition | IS 1727 | 1% to 10% |
| 4. | Admixture | Dry Material Content | IS 9103 Annex-E | 10% to 50% |
| | | Ash Content | | 5% to 50% |
| | | Relative Density | | 1.0 to 1.5 |
| | | Chloride Ion Content | IS 6925 | 0.01% to 1.0% |
| | | pH | IS 9103 Annex-E | 6.0 to 12.0 |
| II. | SOLID FUELS | | | |
| 1. | Coal & Coke | Moisture | IS 1350 (P-1) | 1% to 50% |
| | | Ash Content | | 0.05% to 50.0% |
| | | Volatile Matter | | 2.0% to 98.0% |
| | | Gross Calorific Value | IS 1350 (P-11) | 100 cal/g to 11000 cal/g |
| | | Fixed carbon | GTL/Chem/SOP/FC-1.0 Issue No:1 | Qualitative |
| III. | PETROLEUM PRODUCTS | | | |
| 1. | Lubricating Oils, Gear Oils, Hydraulic Oil and Insulating Oil | Gross Calorific Value | IS 1448(P-6) | 100cal/g to 11000cal/g |
| | | Flash Point COC | IS 1448(P-69) | 90°C to 370°C |
| | | Flash Point PMC | IS 1448(P-21) | 20°C to 200°C |
| | | Dielectric Strength | IS 6792 | 10kV to 100kV |

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| IV. | FOOD AND AGRICULTURAL PRODUCTS | | | |
| 1. | Honey & Honey Products | Moisture | IS 4941 | 5.0% to 40% |
| | | Reducing Sugar | | 5.0% to 90% |
| | | Sucrose | | 0.5% to 90% |
| | | FG Ratio | | 0.9 to 1.3 |
| | | Acidity as Formic Acid | | 0.1% to 5% |
| | | Fiehe's Test | | Qualitative |
| | | Ash Content | | 0.05% to 5% |
| V. | WATER | | | |
| 1. | Potable water | Colour | IS 3025(Part-4) (Clause-2) | 1Hazen to 500 Hazen units |
| | | Turbidity | IS 3025(Part-10) | 1NTU to 100NTU |
| | | pH Value | IS 3025(Part-11) | 1 to 12 |
| | | Total Hardness | IS 3025(Part-21)Clause 5 | 2mg/l to 15000mg/l |
| | | Iron (Fe) | IS 3025(Part-53) Clause-6&7 | 0.05mg/l to 2mg/l |
| | | Chloride (Cl) | IS 3025(Part-32)Clause -2 | 2mg/l to 1000mg/l |
| | | Sulphate(SO ₄ /SO ₃) | IS 3025(Part-24)Clause-4 | 2.0mg/l to 500mg/l |
| | | Total Dissolved Solids | IS 3025(Part-16) | 20mg/l to 2000mg/l |
| | | Alkalinity | IS 3025(Part-23) | 2mg/l to 100mg/l |
| | | Fluoride | IS 3025(Part-60) | 0.2mg/l to 100mg/l |
| | | Copper (Cu) | IS 3025(Part-42), Clause 6 | 0.1mg/l to 100mg/l |
| | | Mercury (Hg) | IS 3025(Part-48), Clause 5 | 0.1mg/l to 100mg/l |
| | | Cadmium (Cd) | IS 3025(Part-41)Clause 5 | 0.1mg/l to 100mg/l |
| | | Arsenic(As) | IS 3025(Part 37)Clause - 2&3 | 0.1mg/l to 100mg/l |

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| | | Chromium(Cr) | IS 3025(Part-52) Clause -7 | 0.2mg/l to 100mg/l |
| | | Lead (Pb) | IS 3025(Part-47) Clause-7 | 0.5mg/l to 100mg/l |
| | | Silver (Ag) | IS 13428, Annexure -J | 0.2mg/l to 100mg/l |
| 2. | Waste Water | Colour | IS 3025(Part-4), Clause 2 | 5 Hazen to 500 Hazen units |
| | | Turbidity | IS 3025(Part-10) | 1 NTU to 1000NTU |
| | | pH Value | IS 3025(Part-11) | 4 to 12 |
| | | Total hardness | IS 3025(Part 21) Clause -5 | 20mg/l to 15000mg/l |
| | | Iron | IS 3025(Part-53)Clause - 6&7 | 0.05mg/l to 100mg/l |
| | | Copper (Cu) | IS 3025(Part-42),Clause 6 | 0.1mg/l to 100mg/l |
| | | Mercury (Hg) | IS 3025(Part-48),Clause 5 | 0.1mg/l to 100mg/l |
| | | Cadmium (Cd) | IS 3025(Part-41) Clause 5 | 0.1mg/l to 100mg/l |
| | | Arsenic(As) | IS 3025(Part 37)Clause - 2&3 | 0.1mg/l to 100mg/l |
| | | Chromium(Cr) | IS 3025(Part-52),Clause 7 | 0.2mg/l to 100mg/l |
| | | Lead (Pb) | IS 3025(Part-47) ,Clause 7 | 0.5mg/l to 100mg/l |
| | | Silver (Ag) | IS 13428 Annexure J | 0.2mg/l to 100mg/l |
| 3. | Construction Water | Neutralization Value (NaOH/H ₂ SO ₄) | IS 3025(Part-22&23) | 0.2ml to 100ml |
| | | Sulphate (SO ₄ /SO ₃) | IS 3025(Part-24) | 1mg/l to 10000mg/l |
| | | Organic | IS 3025(Part-18) | 20mg/l to 10000mg/l |
| | | Inorganic | IS 3025(Part 18) | 20mg/l to 10000mg/l |
| | | Suspended Solids | IS 3025(Part-17) | 10mg/l to 10000mg/l |
| | | Total Solids | IS 3025(Part-16) | 20mg/l to 10000mg/l |
| | | pH Value | IS 3025(Part-11) | 1.0 to 12.0 |
| | | Chloride | IS 3025(Part-32),Clause 2 | 2mg/l to 1000mg/l |

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| VI. | METALS & ALLOYS | | | |
| 1. | Carbon Steel (Low Carbon, Medium Carbon, High Carbon Steel) | Carbon | IS 8811 ASTM-E 415 | 0.1% to 1.3 % |
| | | Silicon | | 0.1% to 1.8% |
| | | Manganese | | 0.1% to 2% |
| | | Sulphur | | 0.01% to 0.1 % |
| | | Chromium | | 0.1% to 3.25% |
| | | Phosphorus | | 0.01% to 0.1 % |
| | | Molybdenum | | 0.05% to 3 % |
| | | Nickel | | 0.038% to 4.5 % |
| | | Aluminum | | 0.05% to 0.2 % |
| | | Copper | | 0.01% to 0.8 % |
| | | Vanadium | | 0.1% to 0.4 % |
| | | Boron | | 0.01% to 0.5 % |
| | | Cobalt | | 0.02% to 0.35% |
| | | Lead | | 0.01% to 0.16% |
| 2. | Stainless Steel | Niobium | IS 9879 ASTM E-1086 | 0.038% to 0.25% |
| | | Tungsten | | 0.01% to 0.5% |
| | | Tin | | 0.005% to 0.3% |
| | | Titanium | | 0.005% to 0.25% |
| | | Carbon | | 0.01% to 1.17% |
| | | Silicon | | 0.01% to 2.2% |
| | | Manganese | | 0.01% to 14.0% |
| Sulphur | 0.01% to 0.2 % | | | |
| Phosphorus | 0.01% to 0.2% | | | |
| Chromium | 0.3% to 29.8% | | | |
| Molybdenum | 0.01% to 3.0% | | | |

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| | | Nickel | | 0.2% to 23.0% |
| | | Copper | | 0.024% to 7.0% |
| | | Vanadium | | 0.03% to 0.28% |
| | | Niobium | | 0.02% to 2.3% |
| | | Titanium | | 0.01% to 0.8% |
| | | Lead | | 0.01% to 0.3% |
| | | Aluminum | | 0.01% to 1.4% |
| | | Ferrous | | 65% to 99% |
| 3. | Cast Iron | Carbon | ASTM E-1999 IS 228 (P-1) | 0.1% to 4.5% 0.05% to 5% |
| | | Silicon | ASTM E-1999 IS 228(P-8) | 0.1% to 2.85% 0.05% to 5% |
| | | Manganese | ASTM E-1999 IS 228(P-2) | 0.1% to 1.5% |
| | | Sulphur | ASTM E-1999 IS 228(P-9) | 0.01% to 0.2% 0.01% to 0.25% |
| | | Phosphorus | ASTM E-1999 IS 228(P-3) | 0.01% to 1% |
| | | Chromium | ASTM E-1999 IS 228(P-6) | 0.5% to 7.9% 0.1% to 5% |
| 4. | High Speed Tool Steel | Carbon | ASTM-E 352 | 0.1% to 0.2% |
| | | Silicon | | 0.1% to 1 % |
| | | Manganese | | 0.1% to 4 % |
| | | Sulphur | | 0.01% to 0.2 % |
| | | Phosphorus | | 0.01% to 0.2% |
| | | Chromium | | 0.1% to 5% |
| | | Molybdenum | | 0.4% to 11 % |
| | | Vanadium | | 0.05% to 0.15% |

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|-----|----------------------------------|-------------------------|---|--|
| | | Tungsten | | 0.1% to 21 % |
| | | Cobalt | | 0.1% to 13% |
| 6. | Aluminum & its Alloys | Copper | ASTM E-1251 | 0.01% to 5.0% |
| | | Magnesium | | 0.05% to 14.50% |
| | | Silicon | | 0.2% to 17.0% |
| | | Iron | | 0.1% to 1.5% |
| | | Nickel | | 0.02% to 3.15% |
| | | Manganese | | 0.02% to 11.0% |
| | | Zinc | | 0.01% to 7.5% |
| | | Lead | | 0.02% to 0.35% |
| | | Tin | | 0.02% to 0.25% |
| | | Titanium | | 0.02% to 0.30% |
| | | Chromium | | 0.01% to 0.25% |
| | | Vanadium | | 0.02% to 0.3% |
| | | Antimony | | 0.01% to 0.5 % |
| | | Cadmium | | 0.005% to 0.3% |
| 7. | Copper & its Alloys | Aluminum | BS EN 15079 | 1.0% to 99.99% |
| | | Tin | | 0.02% to 18.0% |
| | | Lead | | 0.05% to 22.0% |
| | | Aluminum | | 0.005% to 12.0% |
| | | Cadmium | | 0.002% to 1.3% |
| | | Iron | | 0.01% to 7.0% |
| | | Nickel | | 0.01% to 35.0% |
| | | Manganese | BS EN 15079 IS 4027 IS 3685 | 0.01% to 13.0% |

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| | | Phosphorus | BS EN 15079 IS 4027 | 0.01% to 0.8% |
| | | Silicon | BS EN 15079 | 0.02% to 8.0% |
| | | Zinc | BS EN 15079 IS 4027 IS 3685 | 0.01% to 50% |
| | | Bismuth | BS EN 15079 IS 440 | 0.01% to 6.0% |
| | | Arsenic | BS EN 15079 IS 440 | 0.01% to 0.5% |
| | | Copper | BS EN 15079 IS 440 IS 4027 IS 3685 | 0.1% to 99.99% |
| | | Silver | BS EN 15079 | 0.02% to 1.0 % |
| 8. | Copper Wire & Copper Conductor | Copper | IS 440 | 70% to 99.99% |
| | | Silver | GTL/SOP/CU/Chem/01-02 | 0.001% to 0.10% |
| | | Bismuth | Issue No 1 | 0.0005% to 0.005% |
| | | Lead | | 0.01% to 0.2% |

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MECHANICAL TESTING

| LOCATION 1 | | | | |
|-------------------|--|---------------------------------------|-----------------------|--|
| I. | MECHANICAL PROPERTIES OF METALS | | | |
| 1 | Structural Steel/ High Strength Deformed Bars | Tensile Strength | IS 1608 | 100N/mm ² to 1500N/mm ² |
| | | Yield Stress | IS 1608 | 100N/mm ² to 1200 N/mm ² |
| | | % Elongation | IS 1608 | 2% to 60% |
| | | Mass per Meter Run | IS 1786 | 0.2 kg/m to 10kg/m |
| | | Bend (Nominal Diameter: 8-32mm) | IS 1599 | Qualitative (Mandrel Size: 8, 10, 12, 16, 18, 20, 24, 30, 32, 36, 40, 48, 54, 56, 60, 64, 7, 75, 80, 84, 100, 112, 125, 150, 168mm) |
| | | Rebend (Nominal Diameter: 8-32mm) | IS 1786 | Qualitative (Mandrel Size: 16, 20, 24, 30, 32, 40, 50, 72, 84, 96, 112, 120, 140, 150, 168, 175, 196mm) |
| 2. | Bond in Reinforced Concrete | Pullout (Nominal Diameter: 8-32mm) | IS 2770 (Part-1):1967 | 1N/mm ² to 15N/mm ² |

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| 3 | Cold Rolled Low Carbon Steel Sheet & Strip | Tensile Strength | IS 1608 | 100N/mm ² to 1500N/mm ² |
| | | Yield stress | IS 1608 | 100N/mm ² to 1200 N/mm ² |
| | | Elongation | IS 1608 | 2% to 60% |
| | | Bend | IS 1599 | Qualitative (Mandrel Size: 2,3,4,6,7,8,9,10,5,12mm) |
| | | Hardness (HRB) | IS 1586(Part-1) | 40HRB to 90HRB |
| | | Hardness (HRC) | IS 1586(Part-1) | 20 HRC to 60 HRC |
| 4. | Mild Steel and Medium Tensile Steel Bars and Hand Drawn Steel Wire for Concrete Reinforcement | Ultimate Tensile Stress | IS 1608 | 100N/mm ² to 1500N/mm ² |
| | | Yield Stress | IS 1608 | 100N/mm ² to 1200 N/mm ² |
| | | % Elongation | IS 1608 | 2% to 30% |
| | | Bend | IS 1599 | Qualitative (Mandrel Size: 8,10,12,16,18,20,24,30,32 mm) |
| | | Mass | IS 432(Part-1) | 0.10kg/m to 15kg/m |
| | | Nominal Size | IS 432(Part-1) | 0.02mm to 300mm |
| 5. | Hard Drawn Steel Wire | Ultimate Tensile Stress | IS 1608 | 100N/mm ² to 1500N/mm ² |
| | | 0.2% Proof Stress | IS 1608 | 100N/mm ² to 1200 N/mm ² |
| | | % Elongation | IS 1608 | 2% to 15% |
| | | Freedom From Defects | IS 432(Part-2) | Qualitative |
| | | Nominal Size | IS 432(Part-2) | 0.02mm to 25mm |

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| 6. | Mild Steel Wire For General Engineering Purposes | Tensile Strength | IS 1608 | 100N/mm ² to 1500 N/mm ² |
| | | Wrapping | IS 1755 | Qualitative |
| | | Bend (Over 5mm) | IS 280 | Qualitative |
| | | Mass Of Zinc Coating | IS 6745 | 1g/m ² to 500 g/m ² |
| 7. | Stainless Steel Plates, Sheets, and Strips | Tensile Strength | IS 1608 | 100N/mm ² to 1500 N/mm ² |
| | | Yield Stress | IS 1608 | 100N/mm ² to 1200 N/mm ² |
| | | % Elongation | IS 1608 | 2% to 60% |
| | | Hardness (HRB) | IS 1586(Part-1) | 40 HRB to 90 HRB |
| 8. | Steel Tubes for Structural Purposes | Tensile Strength | IS 1608 | 100N/mm ² to 1500N/mm ² |
| | | Yield Stress | IS 1608 | 100N/mm ² to 1200 N/mm ² |
| | | % Elongation | IS 1608 | 2% to 50% |
| | | Weight | IS 1161 | Upto 30kg/m |
| | | Flattening | IS 2328 | Qualitative |
| | | Mass of Zinc Coating | IS 6745 | 1g/m ² to 500g/m ² |
| 9. | Steel Wire for Mechanical Springs | Tensile | IS 1608 | 100N/mm ² to 2000N/mm ² |
| | | Wrapping | IS 1755 | Qualitative |
| | | Torsion | IS 1717 | 1 Rev to 1000 Rev |
| | | Mass Of Zinc Coating | IS 6745 | 1g/m ² to 500 g/m ² |
| | | Dimensions | IS 4454(Part-1) | 0.01mm to 25mm |
| | | Freedom From Defects | IS 4454(Part-1) | Qualitative |

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Location 1: AO-150, Amrit Steel Compound, South Side, G.T. Road, Industrial Area, Ghaziabad, Uttar Pradesh

Location 2: 28-29, Prem Vihar, Bisrakhroad, Chhaprola, Ghaziabad, Uttar Pradesh

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| Sl. | Product / Material of Test | Specific Test Performed | Test Method Specification against which tests are performed | Range of Testing / Limits of Detection |
|-----|--|---------------------------------------|---|--|
| 10. | Cold Rolled Brass Sheets, Strips & Foils | Tensile Strength | IS 1608 | 100N/mm ² to 500N/mm ² |
| | | % Elongation | IS 1608 | 2% to 80% |
| | | Bend | IS 3260 | Qualitative |
| | | Freedom From Defects | IS 410 | Qualitative |
| | | Dimensions | IS3052 | 0.01mm to 25mm |
| 11. | Galvanised Steel Barbed Wire | Diameter of Line Wire | IS 278 | 0.001mm to 5mm |
| | | Diameter of Point Wire | IS 278 | 0.001mm to 5mm |
| | | Freedom From Defects | IS 278 | Qualitative |
| | | Tensile Strength | IS 1608 | 100N/mm ² to 1500N/mm ² |
| | | Wrapping | IS 1755 | Qualitative |
| | | Breaking Load Of Complete Barbed Wire | IS 1608 | 0.1kN to 1000kN |
| 12. | Uncoated Stress Relaxation Seven Ply Strand for Pre-Stressed Concrete | Mass Of Zinc Coating | IS 6745 | 1g/m ² to 500 g/m ² |
| | | Breaking Load | IS 1608 | 0.1kN to 1000kN |
| | | 0.2% Proof Load | IS 1608 | 0.1kN to 1000kN |
| | | Mass of Strand | IS 14268 | 100kg/km to 1000kg/km |
| | | Nominal Diameter of Strand | IS 14268 | 0.01mm to 25mm |
| | | Lay Of Length | IS 14268 | 0.5mm to 300mm |
| | Elongation | IS 1608 | Upto 10% | |
| II. | BUILDINGS MATERIALS | | | |
| 1. | Concrete | Compressive Strength | IS 516 | 5 N/mm ² to 70 N/mm ² |
| 2. | Cement | Fineness By Blain Air Permeability | IS 4031(Part-2) | 100m ² /kg to 550m ² /kg |

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|-----|---|--|---|--|
| | | Consistency | IS 4031(Part-4) | 20% to 35% |
| | | Setting Time Initial | IS 4031(Part-5) | 10minutes to 300minutes |
| | | Setting Time Final | IS 4031(Part-5) | 30minutes to 600minutes |
| | | Soundness (Lechatlier) | IS 4031(Part-3) | 0.5mm to 10mm |
| | | Soundness (Autoclave) | IS 4031(Part-3) | 0.01% to 10% |
| | | Compressive Strength | IS 4031(Part-6) | 5N/mm ² to 80N/mm ² |
| 3. | Cement Concrete | Permeability | DIN 1048(Part-5) | 0.1mm to 30mm |
| 4. | Bricks (Clay Brick/FlyAsh Brick) | Compressive Strength | IS 3495 (Part-1) | 5N/mm ² to 40N/mm ² |
| | | Water Absorption | IS 3495 (Part-2) | 1% to 50% |
| | | Efflorescence | IS 3495 (Part-3) | Qualitative |
| | | Dimensions | | |
| | | Length | IS 1077 | 2200mm to 4800mm |
| | | Width | IS 1077 | 1800mm to 2400mm |
| | | Height | IS 1077 | 800mm to 1600mm |
| 5. | Coarse Aggregate | Grading Of Aggregate (Sieve Analysis) | IS 2386(Part-1) | 0.01% to 100% Sieve Sizes in (mm) 4.75 to 75mm |
| | | Deleterious Material Clay Lumps Finer Than 75µ | IS 2386(Part-2) | 0% to 10% 0.01% to 2% 0.5% to 8% |
| | | Unit Weight (Bulk Density) | IS 2386(Part-3) | 1.3 kg/l to 2.0 kg/l |
| | | Impact Value | IS 2386(Part-4) | 5% to 60% |
| | | Crushing Value | IS 2386(Part-4) | 5% to 60% |
| | | Loss Angels Abrasion | IS 2386(Part-4) | 5% to 60% |

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|-----|--|--|---|---|
| | | Value | | |
| | | 10% Fine Value | IS 2386(Part-4) | 5 Tonnes to 40 Tonnes |
| | | Water Absorption | IS 2386(Part-3) | 0.2% to 5% |
| | | Specific Gravity | IS 2386(Part-3) | 2 to 3 |
| | | Flakiness | IS 2386(Part-1) | 5% to 50% |
| | | Elongation Index | IS 2386(Part-1) | 5% to 50% |
| 6. | Fine Aggregate | Grading Of Fine Aggregate (Sieve Analysis) | IS 2386(Part-1) | 0 .01% to 100% Sieve Sizes: 0.150mm to 10mm |
| | | Deleterious Material | IS 2386(Part-2) | 0.01% to 10%. |
| | | Bulk Density | IS 2386(Part-3) | 1.3 kg/l to 2.0 kg/l |
| | | Water Absorption | IS 2386(Part-3) | 0.2% to 5% |
| | | Specific Gravity | IS 2386(Part-3) | 2 to 3 |
| 7. | Cement Concrete Flooring Tiles | Water Absorption | IS 1237 | 1% to 20% |
| | | Dimension | IS 1237 | 50 mm to 300 mm |
| | | Flatness | IS 1237 | 150 mm to 300mm |
| | | Perpendicularity | IS 1237 | 0.1% to 5% |
| | | Straightness | IS 1237 | 0.1% to 5% |
| 8. | Chequered Cement Concrete Tiles | Surface Flatness of Tile Surface | IS 13801, Annex B | 0.1% to 5% |
| | | Perpendicularity | IS 13801, Annex B | 0.1% to 3% |
| | | Straightness | IS 13801, Annex B | 0.1% to 3% |
| | | Water Absorption | IS 13801, Annex E | 3% to 20% |
| | | Dimension | | |
| | | Length | IS 13801 | 150mm to 300mm |
| | | Width | | 150mm to 300mm |
| | | Thickness | | 150mm to 300mm |

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| 9. | Pressed Ceramic Tiles | Water Absorption | IS 13630 (Part-2) | 0.01% to 20% |
| | | Moisture Expansion | IS 13630 (Part-3) | 0.05mm to 300mm |
| | | Scratch Hardness of Surface (MOHS) | IS 13630 (Part-13) | 1 to 9 |
| 10. | Paving Bitumen | Breaking Strength | IS 13630 (Part-6) | 1N to 2000N |
| | | Specific Gravity | IS 1202 | 0.99 to 1.1 |
| | | % Water By Mass | IS 1211 | 0.1% to 5% |
| | | Flash Point | IS 1209 | 1°C to 400°C |
| | | Softening Point | IS 1205 | 0.1°C to 60°C |
| | | Penetration at 25°C | IS 1203 | 10 to 100 (1/10mm) |
| | | Ductility at 27° C | IS 1208 | 0.1cm to 100cm |
| 11. | Fly Ash | Matter Soluble in Trichloroethylene | IS 1216 | 90% to 100% |
| | | Fineness (Blain Air Permeability) | IS 1727 | 100m ² /kg to 700m ² /kg |
| | | Particles retained on 45micron IS Sieve (Wet Seiving) | IS 1727 | 1% to 25% |
| 12. | Precast Concrete Krebs, Channels, Edgings, Quadrants, And Gutter Aprons | Compressive Strength at 28 days | IS 1727 | 1N/mm ² to 70N/mm ² |
| | | Dimensions | IS 5758 | 50mm to 500mm |
| | | Length | IS 5758 | 50mm to 500mm |
| | | Width | IS 5758 | 50mm to 500mm |
| | | Height | IS 5758 | 50mm to 400mm |
| Water Absorption | IS 5758 | 1% to 20% | | |
| Compressive Strength | IS 516 | 1N/mm ² to 70N/mm ² | | |

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| 13. | Precast Concrete Paving Block | Dimensions | IS 15658 | 200mm to 600mm | |
| | | Length | | 100mm to 400mm | |
| | | Width | | 20mm to 200mm | |
| | | Thickness | | 1% to 20% | |
| | | Water Absorption | | 10N/mm ² to 80N/mm ² | |
| | | Compressive Strength | IS 516 | | |
| III. | WOOD AND WOOD PRODUCTS | | | | |
| 1. | Wood (Any Specie) | Moisture Content | IS 1737 (Part-1) | 1% to 50% | |
| | | Density | IS 1737 (Part-1) | 400kg/m ³ to 800kg/m ³ | |
| 2. | Plywood for General Purposes | Moisture Content | IS 1734(Part-1) | 5% to 50% | |
| | | Glue Adhesion | IS 1734(Part-4) | Qualitative | |
| | | Glue Shear Strength in Dry State | IS 1734(Part-4) | 100N to 2500N | |
| | | Mycological Shear Strength | IS 1734(Part-7) | 100N to 2500N | |
| 3. | Block Board | Water Resistance | IS 1734(Part-6) | 100N to 2500N | |
| | | Resistance To Water | IS 1659 Amendment-F | Qualitative | |
| | | Glue Adhesion | IS 1659 Annex-G | Qualitative | |
| | | Mycological Test | IS 1659 Annex-H | Qualitative | |
| 4. | Flush Door Shutters | Dimensions | IS 4020 (P-2) | 1000mm to 3000mm | |
| | | Height | | 100mm to 1500mm | |
| | | Width | | 10mm to 50mm | |
| | | Thickness | | 0.5mm to 5mm | |
| | | Squareness | | | |
| | | End Immersion | | IS 4020 (P-13) | Qualitative |
| | | Knife Test | | IS 4020 (P-14) | Qualitative |
| Glue Adhesion | IS 4020 (P-15) | Qualitative | | | |

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|------------|--|--|---|--|
| IV. | SOIL & ROCK | | | |
| 1. | Soil | Light Compaction | IS 2720(Part-7) | 1.2g/cc to 2.5g/cc MDD 1% to 25% OMC |
| | | Heavy Compaction | IS 2720(Part-8) | 1.30g/cc to 2.5g/cc MDD 1% to 25% OMC |
| | | Liquid Limit | IS 2720(Part-5) | 15%to 50% |
| | | Plastic Limit | IS 2720(Part-5) | 10% to 30% |
| | | CBR | IS 2720(Part-16) | 1% to 80% |
| IV. | PLASTICS AND PLASTIC PRODUCTS | | | |
| 1. | Unplasticised PVC Pipes for Portable water Supplies | Dimensions Outside Diameter | IS12235(Part-1) | 10mm to 3000mm |
| | | Mean Outside Diameter | | 10mm to 3000mm |
| | | Diameter at any Point | | 10mm to 3000mm |
| | | Wall Thickness | | 3mm to 25mm |
| 2. | UPVC/CPVC Pipes | Visual Appearance | IS 4985 / IS 13592 IS 15778 | Qualitative |
| | | Reversion | IS 12235(P-5) | 0.2% to 20% |
| | | Stress Relief | IS 12235(P-6) | Qualitative |
| | | Vicat Softening Temperature | IS 12235(P-2) | 50°C to 100°C |
| | | Resistance to Sulphuric Acid | IS 12235(P-7) | 0.0001 g to 1g |
| | | Hydrostatic Pressure | IS 12235(P-8) Sec-1 | Qualitative |
| | | Resistance to External Blows at 0°C/True Impact Rate | IS 12235(P-9) IS 4985 | Qualitative |

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|------------|-----------------------------------|--------------------------------|--|---|
| | | Sulphated Ash Content | IS 12235(P-17) IS 4985 | 0.1% to 20% |
| | | Tensile Strength | IS 12235(P-13) | 1N/mm ² to 100N/mm ² |

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ELECTRICAL TESTING

| LOCATION 1 | | | | |
|------------|---|------------------|---|-------------|
| I. | CABLES AND ACCESSORIES | | | |
| 1. | <p>PVC Insulated Unsheathed and Sheathed Cables/Cords with rigid and Flexible Conductor</p> <p>PVC Insulated /PVC Sheathed (HD) armored and unarmored Cables</p> <p>Paper Insulated Lead Sheathed Cables,</p> | Annealing | <p>IS 10810 (Part-1)</p> <p>IS 692 Cl. 24.1a</p> <p>IS 694 table 1</p> <p>IS 1554 (Part 2)</p> <p>IS 1554 (Part 1)</p> <p>Cl.18.1.a.1</p> <p>IS 2465 Cl.12.1.a</p> <p>IS 7098(part 2),19.1.1.a</p> <p>IS 8783 (Part-4)</p> <p>IS 9857 ,Cl. 10.1.a.1</p> <p>IS 9968(Part-2),Cl. 22.1.a.1</p> <p>IS 7098(Part-1)</p> <p>IS 9968(Part-1)</p> <p>IS 14255</p> <p>IS 9857</p> <p>IS 8783(Part-4) Sec-1</p> | 1N to 2450N |
| | Cross Linked Polyethylene(XLP E)Insulated, Thermoplastic Sheathed Cables | Tensile Strength | <p>IS 10810(Part-2)</p> <p>IS 14494,Cl. 25.2.a</p> <p>IS 692, Cl.24.1.b</p> <p>IS 694 Table 1</p> <p>IS 1554 (Part-2)</p> | 1N to 2450N |

Mandeep Kumar
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N. Venkateswaran
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|-----|---|-------------------------|---|--|
| | <p>PE Insulated cables, Cables for Motor Vehicle,</p> <p>Flexible Cables for lifts and other flexible connections,</p> <p>HR PVC Winding Wires for Submersible Motors,</p> | | <p>IS 1554 (Part 1) Cl.18.1.a.2 IS 7098(Part-2) ,Cl.19.1.1b IS 7098(Part-1) IS 9968(Part-2) Cl.22.1.a.2 IS 14255,Cl.10.1.a.1 IS 2465,Cl.12.1.e.1, 12.1.f.1 IS 7098(Part-1) IS 9968(Part-1) IS 14255 IS 9857 IS 8783(Part-4)/Sec1</p> | |
| | <p>Elastomer Insulated /Elastomer Sheathed Cables</p> <p>Elastomer Rubber Insulated Cables for use in Mines,</p> <p>Cross Linked Polyethylene (XLPE)</p> <p>Insulated Ariel Bunched Cables.</p> | Wrapping | <p>IS 10810 (Part-3) IS 692 Cl. 24.1c IS 694 Table 1 IS 1554 (Part-2) Cl. 18.1a.3 IS1554(Part-1) IS 1596 IS 7098(part 2) Cl. 15.1.a.3,19.1.1.c, IS 7098(Part-1) IS 9968(Part-2),Cl.22.1.a.3 IS 9968(Part-1) IS 14255,Cl.10.1.a.2 IS 14255</p> | Qualitative |

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| | Elastomer Covering Welding Cables | Conductor Resistance | IS 10810 (Part-5) IS 692 Cl. 24.1.d IS 694 Table1 IS 1554 (Part 2) Cl. 18.1.a.4 IS 1554 (Part-1) IS 2465 Cl.12.1.c IS 4289 (Part 1 &2) Cl.17.1.c, 18.1.a.2 IS 7098 (part 2) Cl.19.1.1.d, 19.1.a.2 IS 7098(Part-1) IS 8783 (Part-4) Cl.3.2.3 IS 9857 Cl. 10.1.a.2 IS 9968 (Part-2) Cl.22.1.a.4 IS 14255 IS 9857 IS 8783(P-4)/Sec-1 IS 9968(Part-1) IS 14494 Cl. 25.1.a II IS 14255 Cl.10.1.a.3 IEC 60227 ,Cl.2.1 IEC 60245, Cl.2.1 | 0.2 $\mu\Omega$ to 11 Ω and 19.99 Ω |
| | | Conductor Resistance | IEC 60502 (Part-1) Cl. 15.2,Pt 2 cl 16.2 IEC 60228 BS 6360 | 0.2 $\mu\Omega$ to 11 Ω and 19.99 Ω |

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| | | | IEC 60840, Cl.10.5 BS 7846, Cl.16.2 BS 6724, Cl.16.2 BS 6708 Cl.6.2 BS 7211, Cl.15.2 | |
| | | Physical Tests on Insulation & Sheath | | |
| | | Thickness of Insulation and Sheath / Over all Dimensions | IS 10810 (Part-6) IS 692 ,Cl. 24.1.e IS 694, Table1 IS 1554, (Part 2),Cl. 18.1.c IS 1554(Part-1) IS 2465,Cl. 12.1.d IS 4289 (Part 1 &2) Cl. 17.1.d , 18.1.b IS 7098 (part 2),Cl. 19.1.IV IS 8783 (Part-4),Cl.4.1 IS 9857, Cl. 10.1.b IS 9968, (Part-2), Cl. 22.1.c.1 IS 9968(Part-1) IS 7098(Part-1) IS 14494, Cl. 25.1.c IS 14255, Cl.10.1.e IS 14255 IS 8783(Part-4)/Sec-1 IEC 60227, Cl.1.9 IEC 60245 , Cl.1.9 | 0.01mm to 150mm |

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| | | Thickness of Insulation and Sheath / Over all Dimensions | IS 10810(Part-6) IS 7098(Part-1) IS 9968(Part-1) IS 8783(P-4)/Sec-1 IS 694 IS 1554(Part-1) IEC 60502 (Part-1) Cl. 18.1,& Pt 2, cl 17.5 IEC 60811 (Part-201) BS-EN 60811 (Part-201) IEC 60840 Cl.10.6 BS 7846, Cl.6.2, 11.2 BS 6724, Cl.6.2,11.2 BS 6708, Cl.6.4 BS 7211, Cl.7.3 | Upto 150mm |
| | | Tensile Strength & Elongation at Break of Insulation and Sheath | IS 10810 (Part-7) IS 692 Cl. 24.1.k.1 IS 694 ,Table 1 IS 1554 (Part 2) Cl. No.18.1.d.1 IS1554(Part-1) IS 2465 Cl. 12.1.e.1 IS 4289 (Part 1 & 2) Cl.17.1.e.1 , 18.1.c.1 IS 7098 (Part 2 & 3) Cl. 15.1.d.1,19.1.3.a IS 8783 (Part-4) Cl.3.3.3 IS 9857 ,Cl. 10.1.c.1 | 1N to 2450N 10% to 800% |

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|-----|----------------------------|---------------------------------------|---|---|
| | | | IS 9968(Part-2) Cl.22.1.c.2 IS9968(Part-1) IS 14494, Cl.25.1.d.1 IS 14255, Cl.10.1.c.1 IS 7098(Part-1) IS14255 IS9857 IS 8783(Part-4)/Sec-1 IEC 60227, Cl.3 IEC 60245, Cl.3 IEC 60502 (Part 1 & 2) Cl. 18.3, 19.5 IEC 60811,(Part-501) BS-EN 60811 (Part-501) IEC 60840, Cl.12.5.3 BS 7846, Cl. 6.1.1,11.1.1 BS 6724, Cl. 6.1.1,11.1.1 BS 6708, Cl. 6.3 BS 7211, Cl.7.1 | |
| | | Loss of Mass of Insulation and Sheath | IS 10810 (Part-10) IS 692 ,Cl. 24.1.k.2 IS 694, Cl.10.3.c.2 IS 1554 (Part 2), Cl.18.1.d.5 IS 1554(Part-1) IS 2465, Cl. 12.1.e.3 IS 7098(part 2) 19.1.6.c, | 0.1mg/cm ² to 10mg/cm ² |

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Laboratory

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|-----|----------------------------|---|--|---|
| | | | 19.1.g.2.3 IS 7098(Part-1) IS 9968(Part-2) Cl. 22.1.c.10 IEC 60227,Cl.3 IEC 60502 (Part 1 & 2) Cl. 18.6, 19.8 IEC 60811 (Part-409) BS-EN 60811(Part-409) IEC 60840,Cl.12.5.5 | |
| | | Ageing in Air Oven Insulation and Sheath | IS 10810 (Part-11) IS 694 Table 1 IS 1554 (Part 2) Cl. 18.1.d.2 IS 1554(Part-1) IS 2465 , Cl.12.1.e.2 IS 4289,(Part 1 & 2) Cl.17.1.e.2, 18.1.c.2 IS 7098(part 2) Cl.19.1.3.b IS 7098(Part-1) IS 8783, (Part-4),Cl. 3.3.4 IS 9857, Cl. 10.1.c.2 IS 9968(Part-2) Cl.22.1.c.3 IS 9968(Part-1) IS 14772 IS 14494, Cl.25.1.d.2 IS 14255, Cl. 10.1.c.2 | Room Temperature- 300°C 1N to 2450N |

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|-----|----------------------------|------------------------------------|--|---|
| | | | IS:14255 IS 9857 IS 8783(P-4)/Sec-1 IEC 60227, Cl.3 IEC 60245,Cl.3 IEC 60502, (Part 1& 2) Cl. 18.4, 19.5 IEC 60811 (Part-401) BS-EN 60811(Part-401) IEC 60840 ,Cl.12.5.3 BS 7846 ,Cl.6.1.2,11.1.2 BS 6724 ,Cl.6.1.2,11.1.2 BS 6708, Cl.6.3 BS 7211, Cl. 7.1 | |
| | | Shrinkage Insulation and Sheath | IS 10810 (Part-12) IS 692, Cl. 24.1.k.3 IS 694, Table 1 IS 1554 (Part 2) Cl. No.,18.1.d.3 IS 1554(Part-1) IS2465,Cl.12.1.e.6 IS 4289, (Part 2) Cl.18.1.c.5 IS 7098(part 2) Cl., 19.1.3.e, 19.1.5.c IS7098(Part-1) IS 8783, (Part-4) IS 9968(Part-2) Cl. 22.1.c.8 | Room Temperature- 250°C 0.01mm to 200mm |

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|-----|----------------------------|-------------------------------------|--|--|
| | | | IS 14255, Cl. 10.1.c.4 IS 14255 IS 8783(Part-4)/Sec-1 IEC 60502(Part 1& 2) Cl. 18.16, 19.18 IEC 60811, (Part-502&503) BS-EN 60811 (Part-502&503) IEC 60840, Cl.12.5.16 BS 7846 ,Cl. 18.4, 18.7 BS 6724, Cl.18.3, 18.6 BS 6708, Cl.6.3 BS 7211, Cl.17.6 | |
| | | Heat Shock Insulation and Sheath | IS 10810 (Part-14) IS 694, Table1 IS 1554 (Part 2) Cl.18.1.d.6 IS 1554(Part-1) IS 2465 Cl.12.1.e.5 IS 4289, (Part 2) Cl.18.1.c.4 IS 8783,(Part-4) IS 9968(Part-2) Cl. 22.1.c.11 IS 14772 IS 7098(Part-1) IS 8783(P-4)/Sec-1 IEC 60227, Cl.3 IEC 60811, (Part-509) | 1mm to 300mm |

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|-----|----------------------------|---|--|---|
| | | | BS EN 60811, (Part-509) IEC 60840, Cl.12.5.8 IEC 60502, (Part-1 & 2), Cl. 18.9, 19.11 | |
| | | Hot Deformation / Pressure at High Temperature Insulation and Sheath | IS 10810 (Part-15) IS 692, Cl. 24.1.k.4 IS 694, Table 1 IS 1554 (Part 2) Cl.18.1.d.4 IS 1554(Part-1) IS 2465, Cl.12.1.e.4 IS 7098(Part:2) Cl.15.1.e.5, 19.1.6.d IS 7098(Part-1) IS 8783, (Part-2) Cl. 3.3.8 IS 8783(Part-4)/Sec-1 IS 9968(Part-2) Cl. 22.1.c.9 IEC 60227, Cl.3 IEC 60502, (Part-1&2) Cl.18.7, 19.9 IEC 60811,(Part-508) BS-EN 60811,(Part-508) IEC 60840, Cl.12.5.6 BS 7846, Cl.11.1.5 BS 6724:, Cl.11.1.5 BS 7211, Cl.11.1 | Room Temperature- 300°C 1.5% to 90% |

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|-----|----------------------------|--|--|---|
| | | Thermal Stability | IS 10810 (Part-60) IS 694, Table 1 IS 1554 (Part:2) Cl. No.18.1.d.7 IS 1554(Part-1) IS 7098(Part-1) IS 4289, (Part-2) Cl. 18.1.c.6 IS 7098 (Part 2) Cl., 19.1.6.g IS 9968(Part-2) Cl. 22.1.c.12 IEC 60227 , Cl.3 IEC 60502, (Part-2) Cl. 19.19 IEC 60811, (Part-405) BS-EN 60811, (Part-405) | Room Temperature 250°C |
| | | Water Absorption (Gravimetric & Electrical) | IS 10810 (Part-33) IS 1554 (Part 2) Cl 18.1.d.8 IS 7098 (Part 2) Cl. 19.1.3.f IS 7098(Part-1) IS 8783 (Part 2 to 4) IS 9968(Part-2),Cl.22.1.m IS 14255,Cl. 10.1.c.5 IS 14255 IS 8783(Part-4)/Sec-1 IS 9968(Part-1) | 0.1mg/cm ² to 10mg/cm ² |

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|-----|----------------------------|---|---|--|
| | | | IEC 60502(Part-1) Cl. 18.13,& Pt 2 19.15 IEC 60811 (Part-402) BS-EN 60811(Part-402) BS 7846 Cl. 6.1.3 BS 6724, Cl 6.1.3 BS 7211, Cl. 7.1 | |
| | | Tensile Strength /Elongation after Ageing | IS 10810(Part-11) | 0-2450kN 5% to 800% |
| | | Tear Resistance | IS 10810 (Part-17) IS 4289 (Part 1),Cl. 17.1.f.4 IS 9968(Part-2) Cl. 22.1.c.7 IS 9968(Part-1) IS14494,Cl. 25.1.d.6 BS 7846,Cl. 11.1.6 BS 6724 ,Cl. 11.1.6 BS 6708 ,Cl. 6.3 BS 7211 ,Cl. 11.1 | 0.1N to 500N |
| | | Hot Set | IS 10810 (Part-30) IS 1596 IS 7098 (Part-2) Cl., 19.1.3.d, IS 7098(Part-1) IS 9968(Part-1) IS14255 IS 8783 (Part 2 to 4) | Room Temperature - 300°C |

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|-----|----------------------------|-------------------------|--|--|
| | | | IS 9857, Cl. 10.1.c.5 IS 9968 (Part-2) Cl. 22.1.c.5 IS 9857 IS14494 ,Cl. 25.1.d.4 IS 14255, Cl.10.1.c.3 IEC 60245, Cl. 4 IEC 60502 (Part 1&2) Cl. 18.11, 19.13 IEC 60811(Part-507) BS-EN 60811(Part-507) BS 7846: Cl. 6.1.4 BS 6724:Cl. 6.1.4 BS 6708 BS 7211,Cl. 7.1 | |
| | | Permanent Set | IS 10810 (Part-30) IS 1596 IS 7098 (Part-2) Cl., 19.1.3.d, IS 7098(Part-1) IS 9968(Part-1) IS14255 IS 8783 (Part 2 to 4) IS 9857, Cl. 10.1.c.5 IS 9968 (Part-2) Cl. 22.1.c.5 IS 9857 IS14494,Cl. 25.1.d.4 IS 14255 ,Cl.10.1.c.3 | 0.01mm to 150mm 0.05% to 100% |

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|-----|----------------------------|------------------------------------|--|---|
| | | | IEC 60245, Cl. 4 IEC 60502 (Part 1&2) Cl. 18.11, 19.13 IEC 60811(Part-507) BS-EN 60811(Part-507) BS 7846, Cl. 6.1.4 BS 6724, Cl. 6.1.4 BS 6708 BS 7211, Cl. 7.1 | |
| | | Ageing in Air Bomb/ Oxygen Bomb | IS 10810 (Part-56) IS 10810 (Part-16) IS 2465, Cl. 12.1.f.2&3 IS 4289: (Part 1) Cl. 17.1.e.2&3 IS 9857, Cl.10.1.c.3 IS 9968 (Part-2) Cl. 22.1.c.4 IS 9968(Part-1) IS 9857 IS14494, Cl. 25.1.d.3 IEC 60245, Cl. 4 IEC 60811(Part-412) BS-EN 60811(Part-412) IEC 60840, Cl. Table 5c | Room Temperature- 200°C 1N to 2450N |
| | | Oil Resistance | IS 10810 (Part-31) IS 2465, Cl. 12.1.m IS 4289 (Part 1&2) Cl. 17.1.f.3 IS 9857, Cl.10.1.c.4 | 1N to 2450N |

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|-----|----------------------------|---|--|---|
| | | | IS 9968 (Part-2) Cl. 22.1.c.6 IS 9968(Part-1) IS 14494,Cl. 25.1.d.5 IEC 60245, Cl. 4 IEC 60811(Part-404) BS EN 60811(Part-404) | |
| | | Vicat Softening Point | IS 10810 (Part-22) IS 14255 ,Cl. 10.1.d.4 | Room Temperature- 250°C |
| | | Bleeding & Blooming | IS 10810 (Part-19) | Room Temperature- 250°C 25mm |
| | | Oxygen Bomb on Sheath Tensile Strength %age Variation | IS 10810(Part-16) | 0 to 2450kN |
| | | Test on Cable | | |
| | | Insulation Resistance | IS 10810 (Part-43) IS 692 IS 694, Cl.10.3.e.2 IS 1554(Part-2) Cl.18.1.e IS 1554(Part-1) IS 4289(Part- 1 &2) Cl. 17.1.h, 18.1.e IS 7098 (Part-2) Cl., 19.1.11 IS 8783 (Part 2 to 4) Cl. 3.3.1 | 1 to 100x10 ⁶ M Ω at 500V |

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| | | | IS 9968 (Part-2) Cl. 22.1.d IS9968(Part-1) IS14494, Cl. 25.1.e IS 14255:, Cl.10.1.d.f IS 14772 IEC 60727, Cl.2.4 IRC 695-1 IEC 60245, Cl. 2.4 IEC 60502 (Part 1&2) Cl. 17.1.2/ 20.3 IEC 60811(Part-301 & 302) BS-EN 60811(Part-301 & 302) BS 7846 Cl. 6.1.5,18.7 BS 6724 Cl. 6.1.5,18.7 BS 6708, Cl. 6.3 BS 7211, Cl. 17.2 | |
| | | Volume Resistivity | IS 10810(Part-43) IS 694 IS 1554(Part-1) IS 7098(Part-1) IS 14255 IS 8783(Part-4)/Sec-1 | 1x 10 MΩ to 100x10 ⁶ MΩ |
| | | High Voltage (AC) at Room Temperature | IS 10810 (Part-45) IS 692 IS 694 ,Cl.10.3.e.3 | 0.1kV to 10 kV(A.C.) |

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| | | | IS 1554(Part-2),Cl.18.1.m IS 1554(Part-1) IS 2465, Cl.12.1.g IS 7098 (Part-2) Cl. 19.1.xiv IS 7098(Part-1) IS 9968 (Part-2) Cl. 22.3.C IS 9968(Part-1) IS14494, Cl. 25.1.k IS14772 IS 14255,Cl.10.1.g IEC 60227, Cl.2.3 IEC 60245, Cl. 2.3 IEC 60502 (Part 1&2) Cl. 15.3, 18.2.9 BS-EN 60811(Part-301 & 302) BS 7846, Cl. 16.3 BS 6724, Cl. 16.3 BS 6708 , CL6.13.3 BS 7211, Cl. 17.3 | |
| | | High Voltage (Water Immersion)AC/DC | IS 10810(Part-45) IS 694 IS1554(Part-1) IS 9968(Part-1) IS 9857 | 0.1kV to 10kV(AC) 0.1kV to 5kV (DC) |
| | | Flammability | IS 10810 (Part-53) IS 692 | 0.5mm to 600mm |

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|-----|----------------------------|------------------------------------|--|--|
| | | | IS 694, Cl.10.3.e.4 IS 1554(Part-2) Cl.18.1.n IS 1554(Part-1) IS 4289 (Part-1&2) Cl. 17.1.k, 18.1.g IS 7098 (Part-2) IS 7098(Part-1) IS 9857, Cl. 10.1.f IS 9968(Part-1) IS 9968 (Part-2), Cl.22.1.n IS 9857 IS 14494, Cl. 25.1.n IEC 60227, Cl. 3 IS 11731-II IEC 60245 Cl. 5 IEC 60502 (Part 1&2) Cl. 18.14, 19.16 IEC 60332(Part-1 &2) BS 4066 BS 7846, Cl. 17.2 BS 6724, Cl. 17.2 BS 6708, CL.6.13.5 BS 7211, Cl. 16.5 | |
| | | Test on Messenger Conductor | IS10810(Part-2) IS 14255(Part-1) | 0 to 1000kN |
| | | Breaking Load | | |
| | | Elongation | IS 14255(Part-1) | 1% to 200% |

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|-----|----------------------------|------------------------------------|--|--|
| | | | IS 10810(Part-2) | |
| | | Resistance | IS 10810(Part-5) | 0.2 $\mu\Omega$ to11 Ω |
| | | Flammability on Bunched Cables | IS 10810 (Part-62) IS 1554 (Part-1&2, A-1) Cl. 18.1.3.C1.C IS 7098 (Part-1&2) Cl.,19.1.1.c IEC 60332-3 IEEE-393 BS 4066 IEC 60502-1,Cl. 18.14 BS 7846, Cl 18.5 BS 6724, Cl 18.5 BS 7211, Cl. 17.5 | Up to 3.5m |
| | | Oxygen Index/ Temperature Index | IS 10810 (Part-58 & 64) ASTM D-2863 IS 694 IS 694,Cl.10.3.c, 11.12 IS 1554(Part-1) IS 1554(Part-2) Cl. 15.1.1, a.g,18.1.1ag, 18.1.3.C1.a IS 7098 (Part-1) IS 7098(Part-2) Cl. 15.1.1,a.g19.1.1&2 4a | 0.1% to 98% |
| | | Smoke Density | IS 10810(Part-63) IS 13360(Part-5)/Sec9 ASTM-D 2843 | 0.1% to 100% |

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| | | | IS 694 table 1©14&1(d)11 IS 13360 (P-6)/Sec9 IS 7098 (Part-1) IS 7098 (Part-2), Cl.20.14 IS 1554(Part-1) IS 1554(Part-2) A-1 Cl. 18.1.3.C2.f | |
| | | Diameter of Wire & Diameter of Solid Conductor | IS 8130 (Table-4) IS 9857 IS 8783(Part-4)/Sec-1 | 0.5mm to 1000mm |
| | | Fire Retardance Cat C,W,Z | IS 10810 (Part-61)/IS 694 IS 1554 (Part-1) IS 1554 (Part-2)A-1 Cl.18.1.3.C1.b IS 7098(Part-1) IS 7098(Part-2)Cl.20.11 IS 9968(Part-1) IEC 60331-11,21 BS 6387 BS 7846, Cl 17.4.2 BS 6724, Cl 17.4.2 | 1mm to 800mm 3amp-300V-1000V |
| | | Smoke Density of Electric Cables under Fire Conditions, Smoke emissions-3m ³ Chamber | IS 10810 (Part-63) IS 1554(Part-1) IS 7098(Part-1) IEC 61034(Part 1 &2) BS 6724,Cl. 17.3 BS 7846,Cl. 17.3 BS 7211,Cl. 16.6 | 1% to 100% |

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|-----|----------------------------|--|---|--|
| | | Flame Retardant on Single Cable(Sweedish Chimney) | IS 10810(P-61) IS 694 IS 1554(Part- 1) IS 1554(Part-2) CI 15.1.1.b IS 7098 (P-1) IS 7098(Part-2) CI 15.1.1.b, 19.1.1b | Upto 800mm |
| | | Amount of halogen acid gas evolved during combustion of Polymeric materials taken from cable (HCL) | IS 10810 (Part-59) IEC 60754(Part-1) IS 694,CI. 10.3.c.13 IS 1554 (Part-1) IS 1554(Part-2) , CI.18.1.3.C.2e IS 7098 (Part-1) IS 7098(Part 2) CI.20.13 BS 7846,CI. 18.5 BS 6724, CI 8.2 BS 7211, CI 7.4 | 0.1% to 30% |

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| Sl. | Product / Material of Test | Specific Test Performed | Test Method Specification against which tests are performed | Range of Testing / Limits of Detection |
|-----|----------------------------|-------------------------|---|--|
| | | Cold Impact | IS 10810 (Part-21) IS 694, Cl. 10.3.c.9 IS 1554(Part-1) IS 1554 (Part-2), Cl. 18.4 IS 7098 (Part-2) Cl. 15.4.b, 19.4 IS 7098(Part-1) IEC 60502(Part-1&Part2) Cl. 18.8, 19.10 IEC 60811 (Part-506) IEC 60840, Cl. Table 5.a BS 7846, Cl. 11.1.3 & 4 BS 6724, Cl. 11.1.3&4 BS 7211, Cl. 11.1 | Qualitative |
| | | Cold Bend | IS 10810 (Part-20) IS 694 IS 1554 (Part-1) IS 7098 (Part-1) | Qualitative |
| | | Static Flexibility | IS 10810(Part-54) IS 9857 IS 4289 (Part 1&2) IS 9857, Cl. 10.1.e IEC 60245, Cl 3.2 IEC 60227 , Cl 3.5 | 1mm to 1000mm |
| | | Bending | IS 10810(Part-50) IEC 60227 , Cl 3.2 IS 14255, Cl 11.4 | Qualitative |

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|-----|----------------------------|--|--|---|
| | | Durability & Legibility of Marking | IEC 60227, Cl 3.0 | Qualitative |
| | | UV | ASTM G-154-06 ASTM G-151 DIN 53387 | Wave Length 450 nm(Max) 0% to 800% 0 to 2.5 kN |
| | | Volume Resistivity of Semi Conducting Screen | IS 7098 (Part-2), Cl. 19.1.v.b IEC 60502(Part-2), Cl. 18.2.10 IEC 60840, Cl. 12.4.9 | 1MΩ to 100x10 ⁶ MΩ at 500 V |
| | | Persulphate | IS 10810 (Part-4) IS 694 IS 9968(Part-1) IS 9968 (Part-2), Cl.22.1.a.5 IS 2465, Cl. 12.1.b | 1mm to 150mm 1g to 180g |
| | | Carbon Black Content | IS 10810 (Part-32) IS 7098 (Part-2) Cl.19.1.6.h, Cl.19.1.g.3.1, IS 14255(Part-1), Cl.10.1.d.3 IEC 60502(Part-1&2) Cl. 18.15,19.17 IEC 60840, Cl.12.5.12 | 180g 1100°C |
| | | Test for armoring (Round/ formed Wire) | IS 7098(Part 2) Cl.19.1.2 IS 9968(Part-2, A-2) Cl. 22.1.b.2 IS 1554(Part-2) | Qualitative |

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|-----|----------------------------|-------------------------|--|--|
| | | | Cl. 16.2 IS 692 Cl. 24.1.h IS 14494 Cl. 25.1.b IEC 60840, Cl.10.8 BS 6724, Cl.10.3 BS 7846, Cl.10.3 | |
| | | Dimensions | IS 10810 (Part-36) IS 1554(Part-1) IS 7098(Part-1) IS 7098 (Part-2),Cl.19.1.ii IS 1554 (Part-2, A-1), Cl.16.3 IS 9968(Part-2, A-2), Cl.22.1.b.1 IS 14494,Cl. 25.1.b.1 IS 692,Cl. 24.1.h.1 IS 3975, Cl.7 IEC 60840, Cl.10.8 BS 6724, Cl. 10.3.a BS 7846 ,Cl 10.3.a BS 6708, Cl. 6.4 | 1mm to 150mm .001mm to 25mm |
| | | Tensile Strength | IS 10810(Part-37) IS 1554(Part-1) IS 7098(Part-1) IS 1554(Part-2, A-3), Cl.16.6.a IS 7098 (Part-2),Cl.19.1.ii IS 9968(Part-2, A-2) | 1N to 2450N |

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|-----|----------------------------|-------------------------|---|--|
| | | | Cl.22.1.b.2.1 IS 14494,Cl.25.1.b.2 IS 3975, Cl. 8 IS 692,Cl.24.1.h.2.1 | |
| | | Elongation | IS 10810(Part-37) IS1554(Part-1) IS 7098(Part-1) IS 1554(Part-2, A-3), Cl.16.6.b IS 7098 (Part-2), Cl.19.1.ii IS 9968(Part-2, A-2), Cl. 22.1.b.2.2 IS 14494,Cl.25.1.b.2 IS 3975, Cl. 8 IS 692,Cl.24.1.h.2.2 | 1N to 2450N |
| | | Torsion | IS 10810(Part-38) IS 1554(Part-1) IS 7098(Part-1) IS 1554(Part-2, A-3), Cl.16.6.c IS 9968(Part-2, A-2), Cl.22.1.b.2.3 IS 3975, Cl 8.2 IS 692,Cl.24.1.h.2.3 | 1mm to 300mm 5 turns to 1000 turns |
| | | Winding | IS 10810(Part-39) IS 1554(Part-1) IS 7098(Part-1) IS 1554(Part-2), Cl.16.6.d | 1mm to 25mm |

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|-----|----------------------------|--|--|--|
| | | | IS 9968 (Part-2, A-2), CI 22.1.b.4 IS 3975, CI 8.3 IS 692, CI.24.1.h.2.4 | |
| | | Electrical Resistance / Conductance of armor | IS 10810(Part-42) IS 1554(Part-1) IS 1554(Part-2, A-3) ,CI.16.6.g IS 7098(Part-1) IS 7098 (Part-2), CI.19.1.ii IS 14494 ,CI 25.1.b.5 IS 3975, CI.8.4 | 0.2 $\mu\Omega$ to 11 Ω and 19.99 Ω |
| | | Wrapping /Winding | IS 10810(Part-3) IS 3975, CI 8.3 IS 7098(Part-2),CI. 19.1.ii BS 6724,CI 10.3.c BS 7846,CI. 10.3.c BS 7211 | .001mm to 25mm Up to 300mm |
| | | Mass of Zinc Coating | IS 10810(Part-41) IS 1554(Part-1) IS 1554(Part-2, A-3) ,CI.16.6.f IS 9968 (Part-2, A-2) CI.22.1.b.2.6 IS 7098(Part-1) IS 7098(Part-2),CI. 19.1.ii IS 3975, CI. 9.1 IS 14494,CI 25.1.b.4 | 1g/m ² to 200g/m ² |

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|-----|--|--|---|--|
| | | | BS 6724 Cl.10.3.b | |
| | | Additional Ageing | IS 694, Cl-6.6 | Qualitative |
| | | Uniformity of Zinc Coating | IS 10810(Part-40) IS 1554(Part-1) IS 7098(Part-1) IS 1554(Part-2, A-3), Cl.16.6.e IS 7098(Part-2) Cl.19.1.ii | 1ml to 100ml 0.5ml |
| | | Resistivity and Conductance | IS 10810(Part-42) IS 1554(Part-1) IS 1554(Part-2) IS 7098(Part-1) IS 7098(Part-2) | 0.2 $\mu\Omega$ to 11 Ω and 19.99 Ω |
| | | Resistance for Armor | IS 10810(Part-5) IS 7098(Part-1) IS 1554 (Part-1) IS7098(Part-2) IS 1554(Part-2) | 0.2 $\mu\Omega$ to 11 Ω and 19.99 Ω |
| 2. | Aluminum Conductor for Overhead Transmission Purpose, Aluminum Conductors Galvanized Steel Reinforced | Surface Condition | IS 398(Part 2), Cl. 13.9 | 0 to 4000N 0 to 150mm |
| | | Ultimate Breaking Load on Standard Conductor | IS 398(Part 2) Cl. 13.10 | 0 to 4000N |
| | | Stress Strain | IS 398(Part 2), Cl. 13.11 | 0 to 4000N |

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| Sl. | Product / Material of Test | Specific Test Performed | Test Method Specification against which tests are performed | Range of Testing / Limits of Detection |
|-----|---|--|---|---|
| 3. | Aluminum Conductor for Overhead Transmission Purpose | Diameter of Aluminum Wire | IS 398(Part-1), Cl:12.2 | Upto150mm |
| | | Breaking Load of Individual Aluminum Wire | IS 398(Part-1), Cl:12.3 | 1Nto2450N |
| | | Wrapping for Aluminum Wire | IS 398(Part-1), Cl:12.4 | Qualitative |
| | | Conductor Resistance | IS 398(Part-1), Cl:12.5 | 0.2 $\mu\Omega$ to11 $\mu\Omega$ & 19.99 Ω |
| | | Lay Ratio | IS 398(Part-1), Cl:12.6 | Upto150mm |
| | | Diameter of individual Aluminum & Steel wire | IS 10810(Pt-2) Cl:13.2 | Upto 150mm |
| | | Breaking Load of Individual Al Wire & Steel wire | IS 398 (Part-2) Cl: 13.3 | 1Nto 2450N |
| | | Ductility /Elongation | IS 398 (Part-2), Cl: 13.4 | 5% to 800% |
| | | Wrapping | IS 398 (Part-2), Cl: 13.5 | Qualitative |
| | | Surface Condition | IS 398 (Part-2), Cl: 13.9 | Qualitative |
| | | Ultimate Breaking Load on Stranded Conductor | IS 398 (Part-2) ,Cl: 13.10 | 1N to 2450N |
| | | Stress Strain | IS 398 (Part-2), Cl: 13.11 | 0 to 400kN |
| | | Lay Ratio | IS 398 (Part-2), Cl: 13.8 | 0.1mm to 150mm |
| | | Mass of Zinc Coating | IS 398 (Part-2), Cl: 13.7 | 1g/m ² to 200g/m ² |
| | | Conductor Resistance | IS 398 (Part-2), Cl: 13.6 | 0.2 $\mu\Omega$ to11 $\mu\Omega$ &19.99 Ω |
| | | Conductor Diameter | IS 398 (Part-2) | 0.01 mm to 150mm |
| | | Chemical Composition of High Carbon | IS 398 (Part-2) Cl: 6.1.2, Annexure- C | C: 0.1 % to 1.3% Mg: 0.1 % to 2% P: 0.01% to 0.1% |

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|-----|--|-----------------------------------|--|--|
| | | | | S : 0.01% to 0.1% Si: 0.1% to 1.8% |
| | | Diameter of Wire | IS 398 (Part-4), Cl: 17.1 | 1mm to 150mm |
| | | Breaking load of Individual wire | IS 398 (Part-4), Cl: 12.2 | 1N to 2450N |
| | | Elongation | IS 398 (Part-4), Cl: 12.3 | 30% to 800% |
| | | Lay Ratio | IS 398 (Part-4), Cl: 9.2 | Upto 150mm |
| | | Conductor Resistance | IS 398 (Part-4), Cl: 12.4 | 0.2 $\mu\Omega$ to 11 $\mu\Omega$ & 19.99 Ω |
| 4. | Cross Linked Polyethylene Insulated Thermoplastic Sheathed for working 3.3kV upto and including 33kV Cables | Thermal Ageing for Complete Cable | IS 10810 (P-7) IS:7098(P-2) ,Cl 19.1 & 20.9 and Annexure :E | 0-300 $^{\circ}$ C 0 to 2450 kN, 0-800% |

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

ELECTRICAL TESTING

| LOCATION 2 | | | | |
|-------------------|---|---|--|--|
| I. | HIGH VOLTAGE TEST FACILITY | | | |
| 1. | H.T, XLPE Cable Single/ Three Core Upto 33kV | Partial Discharge | IS:10810(P-46) IS:7098(P-2),Cl.20.2 IEC.60502(Part-2) Cl. 16.3,18.2.5 | Up to 100kV, 1pC to1000pC |
| | | Bending | IS:10810(P-50) IS:7098(P-2) Cl.20.3 IEC.60502(Part-2) Cl. 18.2.4 | Qualitative |
| | | Tan delta/ Dielectric power factor & Capacitance measurement as a function of Voltage | IS:10810(P-48) IS:7098(P-2) Cl.20.4.1 | Voltage Upto 100kV Tan δ 0 to 100% Capacitance Upto 1 nf |
| | | Tan delta/ Dielectric power factor as a function of Temperature | IS:10810(P-48) IS:7098(P-2) Cl.20.4.2 IEC.60502(Part-2),Cl.18.2.6 | Voltage Upto100kV Tan δ 0 to 100% Minimum(0.00001) |
| | | Heating Cycle | IS:10810(P-49) IS:7098(P-2) Cl.20.5 IEC.60502(Part-2),Cl.18.2.7 | Upto 2000A |

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| Sl. | Product / Material of Test | Specific Test Performed | Test Method Specification against which tests are performed | Range of Testing / Limits of Detection |
|-----|--|---|---|--|
| | | Impulse Voltage | IS:10810(P-47) IS:7098(P-2) Cl.20.6 IEC 60502(Part-2) Cl. 18.2.8 | 5kVp to 300kVp 15kJ T1=1.2µsec T2=50 µsec |
| | | High Voltage | IS:10810(P-45) .IS:7098(P-2) Cl.20.7 IEC.60502(Part-2) Cl. 16.4,17.9,18.2.9,18.3.4 | Voltage Upto 200kV |
| 2. | H.T, PVC Cable Single/ Three Core Upto 33kV | Partial Discharge | IS:10810(P-46) IS:1554 (P-2),Cl.19.2 IEC.60502(Part-2) Cl.16.3,18.2.5 | 1pC to 1000pC |
| | | Bending | IS:10810(P-50) IS:1554 (P-2),Cl.19.3 IEC.60502(Part-2) Cl.18.2.4 | Qualitative |
| | | Dielectric power factor as a function of Voltage | IS:10810(P-48) IS:1554 (P-2),Cl.19.4a | Voltage Upto 100kV Tan δ 0 to 100% |
| | | Tan delta/ Dielectric power factor as a function of Temperature | IS:10810(P-48) IS:1554 (P-2) Cl.19.4.b Cl.18.2.6 of IEC.60502(Part-2) | Voltage Upto 100kV Tan δ 0 to 100% |
| | | Impulse Voltage | IS:10810(P-47) IS:1554 (P-2),Cl.19.6 IEC.60502(Part-2),Cl.18.2.8 | 5kVp to 300kVp 15kJ T1=1.2µsec T2=50 µsec |

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|-----|---|--|---|---|
| | | High Voltage | IS:10810(P-45) IS:1554 (P-2), Cl.19.7 IEC.60502(Part-2) Cl.16.4,17.9,18.2.9, 18.3.4 | Voltage Upto 200 kV |
| | | Heating Cycle | IS:10810(P-49) IS 1554(Part-2), Cl.19.5 IEC 60502(P-2), Cl.18.2.7 | Current Upto 2000A |
| 3. | H.T. Elastomer Cable Single/Three Core Upto 33kV | Partial Discharge | IS:10810(P-46) IS:9968 (P-2), Cl.23.2 IEC.60502(Part-2), Cl.16.3,18.2.5 | Voltage Upto 100 kV 1 pC to 1000pC |
| | | Bending | IS:10810(P-50) IS:9968 (P-2), Cl.23.3 IEC.60502(Part-2), Cl.18.2.4 | Qualitative |
| | | Dielectric power factor Test as a function of Voltage | IS:10810(P-48) IS:9968 (P-2), Cl.23.4.1 | Voltage Upto 100 kV Tan δ 0 to 100% |
| | | Tan Delta /Dielectric power factor Test as a function of temperature | IS:10810(P-48) IS:9968 (P-2), Cl.23.4.2 IEC.60502(Part-2) Cl.18.2.6 | Voltage Upto 100 kV Tan δ 0 to 100% |
| | | Heating Cycle | IS:10810(P-49) IS:9968 (P-2), Cl.23.5 IEC.60502(Part-2), Cl.18.2.7 | Qualitative |
| | | Impulse | IS:10810(P-47) IS:9968 (P-2), Cl.23.6 IEC.60502(Part-2), Cl.18.2.8 | 5kVp to 300kVp 15kJ T1=1.2 μ sec T2=50 μ sec |

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|-----|---|--|--|--|
| | | High Voltage | IS:10810(P-45) IS:9968 (P-2),Cl.23.7 IEC.60502(Part-2) Cl.16.4, 17.9, 18.2.9,18.3.4 | Voltage Upto 200 kV |
| 4. | Porcelain and Polymer Insulators 1kV to 33kV | Lightning Impulse Withstand Voltage | IS 731,Cl.10.3 IS 2544,Cl.9.3 IS 9431,Cl. 9.2 IEC 60168/IEC 61109 IEC 60383-1 IEC 60383-2 IEC 60660, Cl.4.5,11.1,13.9,3.3 | 5kVp to 300kVp 15kJ T1=1.2µsec T2=50 µsec |
| | | Lightning Impulse Voltage Flashover | IS 731,Cl.10.3.5 IS 2544,Cl.9.3.6 IS 9431,Cl.2.3 IEC 60168 IEC 61109 IEC 60383-1 IEC 60383-2,Cl.4.5,2.13,&9 | 5kVp to 300kVp 15kJ T1=1.2µsec T2=50 µsec |
| 5. | Porcelain and Polymer Insulators 1 kV to 33 kV | Dry& Wet Power frequency Voltage Withstand & Flashover | IS 9431 Cl. 9.3 IS 731,Cl. 10.4 IS 2544,Cl. 9.4 IS 5300, CL. 10.4, 9.5,7.3 IEC 60168, Cl. 4.8 IEC 61109 IEC 60383-1-1 IEC 60383-2 IEC 60437,Cl.3.6 & 3.7 | 1kV to 200kV AC |

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|-----------|---------------------------------------|--|--|--|
| | | Visible discharge | IS 2544 IS 731 | Upto 50kV(rms) Qualitative |
| | | Power Frequency Puncture Withstand Voltage | IS 731 IS 2544 IEC 60383 – 1-1 | Upto 200kV (rms) |
| 6. | Current Transformer Upto 33 kV | Lightning Impulse Voltage | IS 2705, Cl.9.8 IEC 61869-1 IEC 61869-2, cl 7.2.3 IEC 61869-4, Cl.7.2.3.2 IEEE Std C.57.13 Cl. 4.7 | 5kVp to 300kVp 15kJ T1=1.2µsec T2=50 µsec |
| | | Dry Power Frequency Voltage Withstand | IS 2705, Cl.9.3,9.4 IEC 61869-1, Cl 7.3.4 IEC 61869-2, Cl 7.3.1 IEC 61869-4, Cl.7.3.1 IEEE Std C.57.13 Cl. 4.7 | 1kV to 200kV |
| | | Wet Power Frequency Voltage Withstand | IS 2705, Cl.9.9 IEC 61869-1, (7.3.4) IEC 61869-2, (7.3.1) IEC 61869-4, Cl.7.2.4 IEEE Std C.57.13 Cl. 4.7 | 1kV to 200kV |
| | | Partial Discharge | IS 2705 IEC 61869-1 (7.3.4) IEC 61869-2 (7.3.1) IEC 61869-4 IEEE Std C.57.13 | Voltage Upto 100 kV 1 pC to 1000pC |
| | | | | |

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|-----|--|-------------------------------------|---|---|
| | | Lightning Impulse Voltage | IS 3156, Cl.9.6 IEC 61869-1 (7.3.4) IEC 61869-2 (7.2.3) IEC 61869-4 IEC 61869-5 IEC 60044-5, Cl. 7.2.3.2 IEEE Std C.57.13, Cl. 4.7 | 5kVp to 300kVp 15kJ T1=1.2µsec T2=50 µsec |
| | | Partial Discharge | IS 3156 IEC 61869-1 IEC 61869-3 IEC 61869-4. IEEE Std C.57.13 | 1pC to 1000pC |
| 7. | Distribution/ Dry Type Transformer 1kV to 33 kV (5 kVA to 50 kVA) | Full wave Lightning Impulse Voltage | IS 2026-3, Cl.13 IS 1180-1 IS 11171 Cl. 13,14,21.3(a) &16 IEC 60076-3 IEC 60076-11, Cl. 13&21 IEEE Std C.57.12.90, Cl. 10.5 IEEE Std C.57.12.60 Cl. 10.5 | 10kVp to 300kVp 15kJ T1=1.2µsec T2=50 µsec |
| | | Dry Power Frequency | IS 2026-3 Cl.9.3&9.4 13 IEC 61869-2 Cl.7.3.1, 7.3.4 IS 2026-3, Cl- 11 | 1 kV to 200kV |

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|-----|--|---------------------------------------|--|---|
| 8. | Reactor | Lightning Impulse Voltage | IS 5553-3, Cl. 9.10 IS 5553-4, Cl.9.10&8.9 IEC 60076-6 Cl.13 & 17.10 | 5kVp to 300kVp 15kJ T1=1.2µsec T2=50 µsec |
| 10. | Power Capacitors 1kV to 33 kV | Lightning Impulse Voltage | IS 13585-1,Cl.15 IS 11530.,Cl. 7.8 IEC 60831-1 IEC 60871-1,Cl. 15&15.1 CSA C22.2 No 190-M1985 Cl. 6.2.4 | 10kVp to 300kVp 15kJ T1=1.2µsec T2=50 µsec |
| | | Partial Discharge | IS:11530 ,Cl. 7.9 | 1 kV to 100kV 1 pC to 1000 pC |
| a. | Bus Duct 1kV to 33 kV | Lightning Impulse Voltage | IS 8084, Cl.7.1.1 | 10kVp to 300kVp 15kJ T1=1.2µsec T2=50 µsec |
| | | Dry Power Frequency Voltage Withstand | IS 8084, Cl.7.1.4 | 1kV to 200kV AC |
| b. | OLTC 1kV to 33 kV | Lightning Impulse Voltage | IEC 60214-1.Cl.5.2.8.5 | 10kVp to 300kVp 15kJ T1=1.2µsec T2=50 µsec |
| | | Dry Power Frequency Voltage Withstand | IEC 60214-1,Cl.5.2.8.5 | 1kV to 200kV |
| c. | Bushing (Suitable Tank with accessories will be provided) | Lightning Impulse Voltage | IS 2009, Cl.11.4 IEC 60137,Cl.8.3 | 5kVp to 300kVp 15kJ T1=1.2µsec T2=50 µsec |

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|-----|---|---|--|---|
| | by customer) Upto 33kV | Dry Power Frequency Voltage Withstand (Indoor) | IS 2009 IS 7421, Cl. 8.1 IEC 60137, Cl. 8.1 | 1kV to 200kV AC |
| | | Wet Power Frequency Voltage Withstand (Outdoor) | IS 2009 IS 7421, Cl. 8.2 IEC 60137, Cl. 8.1 | 1kV to 200kV AC |
| d. | Air Break Switch 1kV to 33 kV | Lightning Impulse Voltage | IS 9920-4, Cl. 6.2 & 3.1.6 IEC 60265-1 IEC 62271-103, Cl. 6 | 10kVp to 300kVp 15kJ T1=1.2µsec T2=50 µsec |
| | | Dry Power Frequency Voltage Withstand | IS 9920-1 IS 9920-4, Cl. 3.1.8 | 1kV to 200kV AC |
| | | Wet Power Frequency Voltage Withstand | IS 9920-1 IS 9920-4, Cl. 6.2 & 3.1.8 | 1kV to 200kV AC |
| e. | Horn Gap Fuse, Drop Out Fuse 1kV to 33 kV | Lightning Voltage | IS 9385-2, Cl. 7.3.5 | 10kVp to 300kVp 15kJ T1=1.2µsec T2=50 µsec |
| | | Dry Power Frequency Voltage Withstand | IS 9385-2, Cl. 7.3.6 | 1kV to 200kV AC |
| | | Wet Power Frequency Voltage Withstand Test | IS 9385-2, Cl. 7.3.7 | 1kV to 200kV AC |
| f. | Disconnecter (Isolator) and Earth Switch Upto 1kV to 33 kV | Lightning Impulse Voltage | IS 9921-4, Cl. 3.1.6 IEC 62271-203 IEC 62271-102 IEC 62271-1, Cl. 6.2 | 10kVp to 300kVp 15kJ T1=1.2µsec T2=50 µsec |
| | | Dry Power Frequency Voltage Withstand | IS 9921-4, Cl. 3.1.8 IEC 62271-203 | 1kV to 200kV AC |

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|-----|--|---------------------------------------|--|---|
| | | | IEC 62271-102 IEC 62271-1, Cl 6.2 | |
| | | Wet Power Frequency Voltage Withstand | IS 9921-4, Cl. 3.1.8 IEC 62271-203 IEC 62271-102 IEC 62271-1, Cl. 6.2 | 1kV to 200kV AC |
| 1. | High Voltage Insulation Material (Cable Boot, Ladder, Earthing Rod, Silicon Rubber Tube) Upto 1kV to 33 kV | Lightning Impulse Voltage | IS 2071-1 IS 2071-2, Cl.20&4.3 IEC 60060-1 IEC 60060-2, Cl.7 | 10kVp to 300kVp 15kJ T1=1.2µsec T2=50 µsec |
| | | Lightning Impulse Voltage Flashover | IS 2071-1 IS 2071-2, Cl.20&4.3 IEC 60060-1 IEC 60060-2, Cl.7 | 10kVp to 300kVp 15kJ T1=1.2µsec T2=50 µsec |
| | | Dry Power Frequency Voltage Withstand | IS 2071-1 IS 2071-2, Cl.8&3.2 IEC 60060-1 IEC 60060-2, Cl.6 | 1kV to 200kV AC |
| | | Wet Power Frequency Voltage Withstand | IS 2071-1 IS 2071-2, Cl.9&3.2 IEC 60060-1 IEC 60060-2, Cl.4&6 | 1kV to 200kV AC |
| | | Dry Power Frequency Voltage Flashover | IS 2071-1 IS 2071-2, Cl.17.2&3 IEC 60060-1 IEC 60060-2, Cl.6.3 | 1kV to 200kV AC |
| | | Wet Power Frequency Voltage Flashover | IS 2071-1 IS 2071-2, Cl.17.2&3 | 1kV to 200kV AC |

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|-----|--|---------------------------------------|--|---|
| | | | IEC 60060-1 IEC 60060-2, Cl. 4&6 | |
| a. | Circuit Breaker Upto 1kV to 33 kV | Lightning Impulse Voltage | IEC 62271-100 IEC 62271-1 IEC 62271-203 IEC 62271-106 Cl.6.2.6.2,6.2.5.1 | 10kVp to 300kVp 15kJ T1=1.2µsec T2=50 µsec |
| | | Dry Power Frequency Voltage Withstand | IEC 62271-100 IEC 62271-1 IEC 62271-203 IEC 62271-106 Cl.6.2.6.1,6.2 | 1kV to 200kV AC |
| | | Wet Power Frequency Voltage Withstand | IEC 62271-100 IEC 62271-1 IEC 62271-203 IEC 62271-106 Cl.6.2.6.1,6.2 | 1kV to 200kV AC |
| b. | H.T. Rod Upto 1kV to 33 kV | Lightning Impulse Voltage | IEC 62271-200 IEC 62271-1 Cl. 6.2.6.2 | 10kVp to 300kVp 15kJ T1=1.2µsec T2=50 µsec |
| | | Dry Power Frequency Voltage Withstand | IEC 62271-200 IEC 62271-1, Cl. 6.2.6.1 | 1kV to 200kV AC |
| | | Wet Power Frequency Voltage Withstand | IEC 62271-200 IEC 62271-1, Cl. 6.2.6.1 | 1kV to 200kV AC |

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|------------|--|--|---|--|
| II. | TRANSMISSION LINE EQUIPMENT AND ACCESSORIES | | | |
| a. | Porcelain Electrical Insulators Upto 1kV to 33 kV | Visual Examination | IS 731, Cl. 10.13 | Qualitative |
| | | Verification of Dimensions | IS 731, Cl. 10.5 | (0mm to 300mm) (0m to 15m) |
| | | Temperature Cycle | IS 731, Cl. 10.6 | 10°C to 100°C |
| | | Mechanical Failing Load | IS 731, Cl. 10.8 | 1 kN to 200kN |
| | | Electro Mechanical Failing Load (upto 22 kV) | IS 731, Cl. 10.7 | 1kN to 200kN |
| | | Mechanical Performance | IS 731, Cl. 10.9 | 1kN to 200kN |
| | | Thermal Mechanical Performance | IS 731, Cl. 10.9.2 | 1kN to 200kN |
| | | Porosity | IS 731, Cl. 10.11 | Qualitative Upto 2000kg/cm ² |
| | Galvanizing (Uniformity of Zinc Coating) | IS 731, Cl. 10.12 | Qualitative | |
| b. | Porcelain Post Insulators for System with Nominal Voltages greater than 1000V Upto 1kV to 33 kV | Visual examination | IS 2544, Cl. 9.12 | Qualitative |
| | | Verification of Dimensions | IS 2544, Cl. 9.7 | Up to 300mm 1m Scale/1mm 0mm to 15mm/2mm |
| | | Temperature Cycle | IS 2544, Cl. 9.8 | 10°C to 100°C |
| | | Mechanical Failing Tensile & Compression | IS 2544, Cl. 9.6.5.3 | 1 kN to 200kN |
| | | Bending | IS 2544, Cl. 9.6.5.1 | Qualitative |
| | | Torsion | IS 2544, Cl. 9.6.5.2 | 1kNm to 1000kNm |

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|-----------|---|---|---|--|
| | | Porosity | IS 2544, Cl. 9.10 | Qualitative Upto 2000kg/cm ² |
| | | Galvanising (Uniformity of Zinc Coating) | IS 2544, Cl. 9.11 | Qualitative |
| | | Temperature Cycle | IS 2544, Cl. 9.8 | 10°C to 100°C |
| c. | Indoor Post Insulators of Ceramic Material or Glass for Systems with Nominal Voltages greater than 1000V | Visual Examination | IEC 60168, Cl. 5.8 | Qualitative |
| | | Verification of Dimensions | IEC 60168 Cl. 5.1 | Up to 300mm 0mm to 15mm |
| | | Temperature Cycle | IEC 60168 Cl. 5.4 | 10°C to 100°C |
| | | Mechanical Failing Tensile & Compression | IEC 60168, Cl. 5.2.6& 5.2.7 | 1 kN to 200 kN |
| | | Bending | IEC 60168, Cl. 5.2.4 | Qualitative |
| | | Torsion | IEC 60168, Cl. 5.2.5 | 1kNm to 1000kNm |
| | | Porosity / Dye Penetration | IEC 60168, Cl. 5.8 IEC 62217 | Qualitative Upto 2000kg/cm ² |
| | | Galvanising (Uniformity of Zinc Coating) | IEC 60168, Cl. 5.7 | Qualitative |
| d. | Hollow Insulators for use in Electrical Equipment Upto 1kV to 33 kV | Visual Inspection | IEC 62155, Cl. 10.3 | Qualitative |
| | | Verification of Dimensions | IEC 62155, Cl. 7.1 | 0mm to 300mm 0mm to 15mm |
| | | Temperature Cycle | IEC 62155, Cl. 7.1 | 10 °C to 100 °C |
| | | Mechanical Failing Tensile & Compression | IEC 62155, Cl. 7.2.4&7.2.5 | 1 kN to 1000kN |
| | | Bending | IEC 62155, Cl. 8.3 | Qualitative |
| | | Torsion | IEC 62155, Cl. 7.2.3 | 1kNm to 1000kNm |

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|------------|-----------------------------------|--|--|---|
| | | Porosity | IEC 62155, Cl. 7.4 | Qualitative Upto 2000kg/cm ² |
| | | Internal Pressure | IEC 62155, Cl. 8.2 | Up to 70kg/cm ² |
| | | Temperature Cycle | IEC 62155, Cl. 7.1 | 10 °C to 100 °C |
| | | Mechanical Failing Test Tensile & Compression | IEC 62155:2005, Cl. 7.2.4&7.2.5 | 1 kN to 1000kN |

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

NON DESTRUCTIVE TESTING

| LOCATION 1 | | | | |
|-------------------|---------------------------------------|---------------------------|---------------|---|
| I. | BUILDING MATERIALS | | | |
| 1. | Reinforced Concrete Structures | Ultrasonic Pulse Velocity | IS 13311(P-1) | 0.15km/sec to 6km/sec Direct Transmission 0.4km/sec to 6km/sec for Surface Transmission |
| | | Rebound Hammer | IS 13311(P-2) | Rebound Number 20 to 100 |