

<b>Laboratory</b>	<b>Landmark Material Testing and Research Laboratory Pvt. Ltd., G-200, Mansarover Industrial Area, Jaipur, Rajasthan</b>		
<b>Accreditation Standard</b>	<b>ISO/IEC 17025: 2005</b>		
<b>Discipline</b>	<b>Mechanical Testing</b>	<b>Issue Date</b>	<b>26.11.2016</b>
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<b>S. No.</b>	<b>Product / Material of Test</b>	<b>Specific Test Performed</b>	<b>Test Method Specification against which tests are performed</b>	<b>Range of Testing / Limits of Detection</b>
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**AT LABORATORY**

**I. BUILDING MATERIALS**

**A. Aggregate**

<b>1.</b>	<b>Coarse Aggregate/ Ballast</b>	Sieve Analysis (Gradation)	IS: 2386 (Part-1)-1963 (RA 2016) IS: 383-2016	0.1 % to 100 % (2.36 mm to 125 mm)
		Impact Value	IS: 2386 (Part-IV)-1963 (RA 2016)	5 % to 60 %
		Los Angles Abrasion Value	IS: 2386 (Part-IV)-1963 (RA 2016)	5 % to 70%
		Water Absorption	IS: 2386 (Part-III)-1963 (RA 2016)	0.2 % to 20 %
		Crushing Value	IS: 2386 (Part-IV)-1963 (RA 2016)	5 % to 60 %
		10% Fine Value	IS: 2386 (Part-IV)-1963 (RA 2016)	5 Tonnes to 70 Tonnes
		Materials finer than 75 $\mu$	IS: 2386 (Part-I)-1963 (RA 2016)	0.1 % to 10 %
		Elongation Index	IS: 2386 (Part-I)-1963 (RA 2016)	5 % to 70 %
		Flakiness Index	IS: 2386 (Part-I)-1963 (RA 2016)	5 % to 70 %
		Stripping Value	IS: 6241-1971 (RA 2013)	1 % to 100 %

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	<b>Coarse Aggregate/ Ballast</b>	Soundness	IS: 2386 (Part-V)-1963 (RA 2016)	0.1 % to 25 %
		Bulk Density	IS: 2386 (Part-III)-1963 (RA 2016)	1 kg/L to 4 kg/L
		Clay Lumps	IS: 2386 (Part-II)-1963 (RA 2016)	0 to 5 %
		Soft Particles	IS: 2386 (Part-II)-1963 (RA 2016)	Qualitative
		Specific gravity	IS: 2386 (Part-III)-1963 (RA 2016)	2 to 4
<b>2.</b>	<b>Fine Aggregate</b>	Sieve Analysis (Gradation)	IS: 2386 (Part-1)-1963 (RA 2016) IS: 383-2016	% to 100 % (75micron to 10mm)
		Water Absorption	IS: 2386 (Part-III)-1963 (RA 2016)	0.2 % to 20 %
		Materials finer than 75 $\mu$	IS: 2386 (Part-I)-1963 (RA 2016)	0.1 % to 20 %
		Soundness	IS: 2386 (Part-V)-1963 (RA 2016)	0.1 % to 25 %
		Bulk Density	IS: 2386 (Part-III)-1963 (RA 2016)	1 kg/L to 4 kg/L
		Clay Lumps	IS: 2386 (Part-II)-1963 (RA 2016)	0 to 5 %

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	<b>Fine Aggregate</b>	Clay, Fine Silt & Fine Dust (Sedimentation Method)	IS: 2386 (Part-II)-1963 (RA 2016)	0.1 % to 5 %
		Specific gravity	IS: 2386 (Part-III)-1963 (RA 2016)	2 to 4
		Bulking	IS: 2386 (Part-III)-1963 (RA 2016)	10 % to 35%
<b>B.</b>	<b>Bricks &amp; Pre-casted blocks</b>			
<b>1.</b>	<b>Bricks/ Heavy Duty Burnt Clay Building Bricks/ Pulverized Fuel Ash-Lime Bricks</b>	Compressive Strength	IS: 3495 (Pt -I)-1992 (RA 2011)	2 N/mm <sup>2</sup> to 25 N/mm <sup>2</sup>
		Efflorescence	IS: 3495 (Pt -III)-1992 (RA 2011)	Qualitative
		Water Absorption	IS:3495 (Pt -II)-1992 (RA2011)	0.1 % to 30 %
		Bulk Density (Heavy Duty)	IS: 2180-1988 (RA 2011)	0.1 g/cm <sup>3</sup> to 5 g/cm <sup>3</sup>
		Dimensions (Heavy Duty)	IS:2180-1988 (RA2011)	30 mm to 310 mm
		Dimensions	IS:12894-2002 (RA 2012) IS 1077-1992 (RA 2011)	20 mm to 5000mm
<b>2.</b>	<b>Paver Block</b>	Compressive Strength	IS : 15658 : 2006 (RA 2011) Annex-D	5 N/mm <sup>2</sup> to 80 N/mm <sup>2</sup>
		Abrasion Resistance	IS : 15658 : 2006 (RA 2011) Annex-E	0.2 mm to 8.0 mm
		Water Absorption	IS : 15658 : 2006 (RA 2011) Annex-C	1 % to 15 %

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	<b>Paver Block</b>	<b>Dimensions</b> Length Width Thickness	IS : 15658 : 2006 (RA 2011) Annex-B	50 mm to 300 mm
		Thickness of wearing layer	IS : 15658 : 2006 (RA 2011)	0 to 10 mm
		Deviation from squareness	IS : 15658 : 2006 (RA 2011) Annex-B	0.05 mm to 3 mm
		Visual Inspection	IS : 15658 : 2006 (RA 2011)	Qualitative
<b>3.</b>	<b>Hollow &amp; Solid Concrete Block</b>	Block Density	IS: 2185 (Part-I) – 2005 (RA 2010) Annex-C	1000 kg/m <sup>3</sup> to 3000 kg/m <sup>3</sup>
		Compressive Strength	IS: 2185 (Part-I) – 2005 (RA 2010) Annex-D	2 N/mm <sup>2</sup> to 50 N/mm <sup>2</sup>
		Water Absorption	IS: 2185 (Part-I) – 2005 (RA 2010) Annex-E	0.1 % to 20%
		<b>Dimensions</b> Length Width Height	IS: 2185 (Part-I) – 2005 (RA 2010) Annex-B	200 mm to 600 mm 50 mm to 300 mm 100 mm to 200 mm
<b>4.</b>	<b>Autoclaved Cellular (Aerated) Concrete Products</b>	Bulk Density	IS: 6441 (Part-I)-1972 (RA 2012)	0.45 g/cm <sup>3</sup> to 1.0 g/cm <sup>3</sup>
		<b>Dimensions</b> Length Height Thickness	IS: 2185 (Part-III)-1984 (RA 2010)	100 mm to 600 mm

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	<b>Autoclaved Cellular (Aerated) Concrete Products</b>	Compressive Strength	IS: 6441 (Part-5)-1972 (RA 2012)	1 N/mm <sup>2</sup> to 10 N/mm <sup>2</sup>
		Moisture Content	IS: 6441 (Part-I)-1972 (RA 2012)	0.1 % to 15 %
<b>C.</b>	<b>Concrete</b>	Compressive Strength of Cubes Core	IS: 516-1959 (RA 2013)	5 N/mm <sup>2</sup> to 80 N/mm <sup>2</sup>
		Accelerated Curing of Concrete for Compressive Strength	IS: 9013-1978 (RA 2013)	5 N/mm <sup>2</sup> to 80 N/mm <sup>2</sup>
		Workability by Compaction Factor	IS: 1199-1959 (RA 2013)	0.75 to 1
		Workability by Slump Test	IS: 1199-1959 (RA 2013)	0 to 250 mm
		Flexural Strength	IS: 516-1959 (RA 2013)	1 N/mm <sup>2</sup> to 10 N/mm <sup>2</sup>
<b>D.</b>	<b>Bitumen (Industrial/Paving/Polymer Modified Bitumen)</b>			
<b>1.</b>		Specific Gravity	IS: 1202- 1978 (RA 2009)	0.9 to 1.1
		Softening Point	IS: 1205-1978 (RA 2009)	25 °C to 200 °C
		Penetration Test	IS: 1203-1978 (RA 2009)	1 mm to 100 mm
		Ductility Test	IS: 1208-1978 (RA 2009)	0.1 cm to 100 cm
		Flash Point	IS: 1209-1978 (RA 2009)	150 °C to 350 °C
		Absolute Viscosity at 60°C	ASTM-D 4402-13	100 poise to 8000 poise
		Kinematic Viscosity at 135°C	ASTM-D 4402-13	100 cSt to 1000 cSt
		Solubility in Trichloroethylene	IS: 1216 -1978 (RA 2009)	10 % to 100%

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	<b>Bitumen (Industrial/Paving/Polymer Modified Bitumen)</b>	Penetration of Residue , percent of original	IS: 1203 -1978 (RA 2009)	5 % to 90 %
		Test on residue from thin film oven	IS:1206 (Pt-2)1978 (RA 2009)	1 to 3
		i) Viscosity ratio at 60 <sup>0</sup> C	ASTM-D 4402-13	
		Loss on Heating	IS: 1212–1978 (RA 2009)	0.1 % to 20%
		<b>Thin Film Oven Test</b>		
		(a) Viscosity ratio at 60 <sup>0</sup> C	ASTM-D 4402-13	1 to 3
		(a) Loss in Mass	IS:9382-1979 (RA 2009)	0.01 % to 20%
		(b) Increase in Softening Point	IS:1205 -1978 (RA 2009)	1 <sup>0</sup> C to 20 <sup>0</sup> C
		) Reduction in Penetration of Residue	IS: 1203 -1978 (RA 2009)	5 % to 50 %
		(d) Elastic Recovery at 25 <sup>0</sup> C	IS: 15462–2004 (RA 2009)	1 % to 100%
	Elastic Recovery at 15 <sup>0</sup> C	IS: 15462 – 2004 (RA 2009)	1 % to 100%	
<b>2.</b>	<b>Bitumen Emulsion</b>	Coating ability and water resistance	IS : 8887 – 2004 (RA 2009) Annexure – F	Qualitative
	Storage stability	IS : 8887 – 2004 (RA 2009) Annexure – D	0.1 % to 5.0 %	
	Viscosity by Saybolt furol viscometer	IS : 3117 – 2004 (RA 2009)		
	(i) at 25 <sup>0</sup> C		10 sec to 250 sec	
	(ii) at 50 <sup>0</sup> C		10 sec to 400 sec	
	Particle Charge	IS: 8887 – 2004 (RA 2009) Annexure – E	Qualitative	
	Residue on 600 micron	IS : 8887 – 2004 (RA 2009)	0.01 % to 10 %	

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	<b>Bitumen Emulsion</b>	Coagulation of emulsion	IS : 8887 – 2004 (RA 2009) Annexure – C	Qualitative
		Miscibility with water	IS : 8887 – 2004 (RA 2009) Annexure – H	Qualitative
		Distillation	IS:1212-1978 (RA 2009)	10 % to 90%
		Water content	IS:1211-1978 (RA 2009)	5 % to 30 %
		Tests on Residue		40 % to 70 %
		i) Residue by Evaporation	IS : 8887-2004 (RA 2009) Annexure – J	40 mm to 250 mm
		ii) Penetration	IS:1203-1978 (RA 2009)	5 cm to 100 cm
		iii) Ductility	IS :1208-1978 (RA 2009)	90 % to 100 %
		Solubility in Trichloroethylene	IS:1216-1978 (RA 2009)	
		Stability with Mixing of Cement	IS: 8887 – 2004 (RA 2009) Annexure – G	0.01 % to 5%
<b>3.</b>	<b>Bituminous Mix/Core</b>	Bitumen Content	IRC SP -11 -1984	1 % to 7 %
		Marshall Stability	ASTM D-6927-2006 & MS-2	40 Kg to 3000 Kg
		Maximum Theoretical Specific Gravity ( $G_{mm}$ )	ASTM D-2041-00	2.00 to 2.90
		Density	ASTM D-2726-00	2.00 g/cc to 2.70 g/cc
		Tensile Strength Ratio	IRC SP-79-2008 Annex-E	50 % to 98 %
<b>4.</b>	<b>Bitumen Mastic Asphalt</b>	Hardness Number	IS: 1195-2002 (RA 2012) Annex-E	5 to 80

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<b>E.</b>	<b>Cement</b>	Compressive Strength	IS: 4031 (Pt-6) 1988 (RA 2014)	10 N/mm <sup>2</sup> to 70 N/mm <sup>2</sup>
		Consistency	IS: 4031 (Pt-4)-1988 (RA 2014)	10 % to 35 %
		Setting Time Initial Final	IS: 4031 (Part-5) 1988 (RA 2014)	10 Min to 800 Min
		Soundness (Le-Chatelier method)	IS: 4031(Pt-3) 1988 (RA 2014)	0.1 mm to 10 mm
		Fineness Test (Dry)	IS: 4031(Part-1) 1996 (RA 2011)	1 % to 30 %
		Fineness (By Blain Air)	IS: 4031 (Part 2): 1999 (RA 2013)	100 m <sup>2</sup> /kg to 500 m <sup>2</sup> /kg
		Soundness (Autoclave)	IS: 4031 (Part 3) : 1988 (RA 2014)	0.01 % to 5 %
		Density	IS: 4031 (Pt-11) 1988 (RA 2014)	2 gm/cc to 4 gm/cc
<b>F.</b>	<b>Fly ash</b>	Soundness (Autoclave)	IS: 1727-1967 (RA 2013)	0.01 % to 5 %
		Fineness (By Blain Air)	IS: 1727-1967 (RA 2013)	100 m <sup>2</sup> /kg to 800 m <sup>2</sup> /kg
		Soundness (Le-Chatelier method)	IS:1727-1967 (RA 2013)	0.1 mm to 10 mm
		Residue on 45 micron	IS:1727-1967 (RA 2013)	5 % to 50 %
<b>G.</b>	<b>Tiles</b>			
<b>1.</b>	<b>Cement Concrete Flooring Tile/ Chequered Tile/Ceramic Tile/Vitrified Tiles</b>	Abrasion Resistance Test	IS: 1237-2012 IS: 13801-2013 (RA 2013)	0.1 mm to 10 mm



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	<b>Cement Concrete Flooring Tile/ Chequered Tile/Ceramic Tile/Vitrified Tiles</b>	Straightness	IS: 1237-2012 IS: 13801-2013 (RA 2013) IS: 13630 (P-1)-2006 (RA 2012)	0.0 to 5 %
		Flatness	IS: 1237-2012 IS: 13801-2013 (RA 2013)	0.01 mm to 10 mm
		Water Absorption	IS: 1237-2012 IS: 13801-2013 (RA 2013) IS: 13630 (P-2)-2006 (RA 2012)	0.1 % to 20 %
		Perpendicularity/ Rectangularity	IS: 1237-2012 IS: 13801-2013 (RA 2013) IS: 13630 (P-1)-2006 (RA 2012)	0.01 % to 5 %
		Scratch Hardness of Surface (Mohs' Scale)	IS: 13630 (P-13)-2006 (RA 2012)	1 to 9
<b>H.</b>	<b>Doors &amp; Windows</b>			
<b>1.</b>	<b>Door Shutter</b>	Dimension & Squareness	IS: 4020 (Part-II)-1998 (RA 2013)	10 mm to 3000mm
		End Immersion Test	IS: 4020(Part-XIII)-1998 (RA 2013)	Qualitative
		Measurement of General Flatness	IS: 4020 (Part-III)–1998 (RA 2013)	mm to 10 mm
		(a) Measurement of Twist		mm to 10 mm
		(b) Measurement of Warping and Cupping		0.1 mm to 10 mm

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2.	<b>Wood/ Timber</b>	Moisture Content	IS : 1708 (Part-I- 1986 (RA 2010)	1 % to 30%
		Specific Gravity	IS : 1708 (Part-II)-1986 (RA 2010)	0.1 to 3
3.	<b>Plywood /Shuttering Plywood</b>	Density	IS: 303–1989 (RA 2013) IS: 1734 (Part-I)–1983 (RA 2013)	0.1 g/cc to 2.0 g/cc
		Moisture Content	IS: 303–1989 (RA 2013) IS: 1734 (Part-I)–1983 (RA 2013)	0.1 % to 30%
		Resistance to Dry Heat	IS: 303–1989 (RA 2013) IS: 1734 (Part-I)–1983 (RA 2013)	Qualitative
<b>I.</b>	<b>Plumbing &amp; Drainage Fittings</b>			
1.	<b>Thermoplastics Pipes &amp; Fittings PVC-U/UPVC Pipe</b>	Measurement of Dimensions	IS: 12235 (Part-1) -2004 (RA 2014)	39 mm to 320 mm
		Outside Diameter at any Point	IS: 12231:1987 (RA 2013)	
		Wall Thickness		1.5 mm to 9.0 mm
	Mean Outside Diameter		40 mm to 316 mm	
	<b>Thermoplastics Pipes &amp; Fittings PVC-U/UPVC Pipe</b>	Resistance to Internal Hydrostatic Pressure	IS: 12235 (Part-8) -2004 (RA 2014)	Qualitative
		Density	IS: 13360 (Part-3, Sec-1) -1995 RA 2008 (Method-B) IS: 12235 (Part-14) -2004 (RA 2014)	1.35 g/cc to 1.50 g/cc
2.	<b>GI Pipe</b>	<b>Dimensions</b> Outside Diameter Thickness	IS: 1239 (Part-1) -2004 (RA 2010)	9.5 mm to 167.0 mm 2.0 mm to 5.0 mm

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	<b>GI Pipe</b>	Nominal Mass	IS: 1239 (Part-1) -2004 (RA 2010)	0.35 kg/m to 10.0 kg/m
<b>II.</b>	<b>SOIL &amp; ROCK</b>			
<b>A.</b>	<b>Clays &amp; Soil</b>			
<b>1.</b>	<b>Soil/ Bentonite</b>	Grain Size Analysis		
		1. Sieve Analysis	IS: 2720 (Pt-IV)-1985 (RA 2010)	0.1 % to 100 % (4.75 mm to 125 mm)
		2. Wet Sieve Analysis	IS: 2720 (Pt-IV)-1985 (RA 2010)	0.1 % to 100 % (75micron to 2 mm)
		3. Hydrometer	IS: 2720 (Pt-IV)-1985 (RA 2010) (Clause 5.2)	0.1 % to 90 % (2micron to 75 micron)
		Atterberg's Limit		
		Liquid Limit	IS:2720 (Part 5)-1985 (RA 2010)	10% to 600 %
		Plastic Limit	IS:2720 (Part 5)-1985 (RA 2010)	10 % to 150 %
		Shrinkage Limit	IS:2720 (Part 5)-1985 (RA 2010) IS-2720 (Part VI)-1972 (RA 2011)	10 % to 50 %
		Water Content/Moisture Content	IS:2720(Part II) 1973(RA2010) IS:6186, 1986(RA2010)	0.5 % to 30 %
		Specific Gravity	IS:2720(Pt-III)Sec.1/2-1980(RA2011)	1 to 3
		California Bearing Ratio (CBR)	IS:2720(Part-16)1987(RA2011)	1 % to 90 %
		Free Swell Index	IS:2720(Part XL)-1977 (RA2011)	1 % to 200 %
		Compaction Test (Proctor compaction) for Light compaction & Heavy compaction	IS:2720(Part VII)-1980(RA2011) IS:2720(Part VIII)-1983(RA2010)	Moisture Content 5 % to 30% Density 1 to 3 g/cc Moisture Content 5 % to 30% Density 1 g/cc to 3 g/cc

<b>Laboratory</b>	<b>Landmark Material Testing and Research Laboratory Pvt. Ltd., G-200, Mansarover Industrial Area, Jaipur, Rajasthan</b>		
<b>Accreditation Standard</b>	<b>ISO/IEC 17025: 2005</b>		
<b>Discipline</b>	<b>Mechanical Testing</b>	<b>Issue Date</b>	<b>26.11.2016</b>
<b>Certificate Number</b>	<b>T-3215</b>	<b>Valid Until</b>	<b>25.11.2018</b>
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<b>S. No.</b>	<b>Product / Material of Test</b>	<b>Specific Test Performed</b>	<b>Test Method Specification against which tests are performed</b>	<b>Range of Testing / Limits of Detection</b>
	<b>Soil/ Bentonite</b>	Direct Shear Test	IS 2720 (Part-13) 1986 (RA 2011)	C = 0 to 0.2 kg/cm <sup>2</sup> Φ = 15° to 40°
		Consolidation Test	IS 2720 (Part-15) 1986 (RA 2011)	a <sub>v</sub> = 0.01 cm <sup>2</sup> / kg to 5.0 cm <sup>2</sup> / kg c <sub>v</sub> = 0.1 mm <sup>2</sup> /min to 50 mm <sup>2</sup> /min
		Unconfined Compressive Strength	IS 2720 (Part-10) 1991 (RA 2010)	0.1 N/mm <sup>2</sup> to 15 N/mm <sup>2</sup>
<b>2.</b>	<b>Soil/ Bentonite</b>	Tri-axial without pore water pressure measurement	IS 2720 (Part-11) 1993 (RA 2011)	C = 0.05 kg/cm <sup>2</sup> to 3 kg/cm <sup>2</sup> Φ = 0° to 40°
		Sand Content	IS: 6186 1986 (RA 2010)	0.50 % to 3.0%
		Swelling Power	IS: 6186 1986 (RA 2010)	10 ml to 100 ml
		Marsh Cone Viscosity	ASTM-D 6910-04	30 Second to 100 Seconds
		Fineness (Dry)	IS: 6186 1986 (RA 2010)	80 % to 100 %
<b>3.</b>	<b>Rock</b>	Unconfined compressive Strength Test	IS: 9143-1979 (RA 2011)	20 N/mm <sup>2</sup> to 500 N/mm <sup>2</sup>
		Relative Density	IS: 13030-1991 (RA 2011)	2 to 4
		Water Content	IS: 13030-1991 (RA 2011)	0.1 % to 25 %
		Point Load Strength Index	IS: 8764-1998 (RA 2014)	0 to 20 MN/m <sup>2</sup>
<b>4.</b>	<b>Natural Stone (Marble/ Granite/Slate/ Quartz)</b>	Compressive Strength	IS: 1121 (Part-1)-2013	50 kg/cm <sup>2</sup> to 2000 kg/cm <sup>2</sup>

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S. No.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
	<b>Natural Stone (Marble/ Granite/Slate/ Quartz)</b>	True Specific Gravity	IS: 1122-1974 (RA 2013)	2 to 4
		Apparent Specific Gravity	IS: 1124-1974 (RA 2013)	2 to 4
		Apparent Porosity	IS: 1124-1974 (RA 2013)	0.1 % to 5 %
		Water Absorption	IS: 1124-1974 (RA 2013)	0.1 % to 10 %
		Scratch Hardness of Surface (Mohs' Scale)	IS: 13630 (Part-13) 2006 (RA 2012)	1 to 9
		Ultrasonic Pulse Velocity Test	IS: 13311 (Part-1): 1992 (RA 2013)	1km/sec to 6000km/sec

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<b>S. No.</b>	<b>Product / Material of Test</b>	<b>Specific Test Performed</b>	<b>Test Method Specification against which tests are performed</b>	<b>Range of Testing / Limits of Detection</b>
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**AT SITE**

**I. BUILDING MATERIALS**

<b>1. Pavement</b>	Measurement of Surface Roughness by V <sup>th</sup> Wheel Bump Integrator	IRC SP:16-2004 (Clause 3.2)	500 mm/km to 5000 mm/km
	Deflection Measurement of Pavement using Benkelman Beam Deflection Test	IRC: 81-1997	0 to 10 mm

**II. SOIL & ROCK**

<b>2. Soil Testing</b>	Standard Penetration Test for Soils	IS: 2131- 1981 (RA 2011)	1 to 100 (N-Value)
	Rapid Determination of Water Content	IS 2720 (Part-II) 1973 (Section-5) (RA 2010)	1 % to 30 %
	In-Place Dry Density of Soils by Sand Replacement Method	IS 2720 (Part-XXVIII) 1974 (Section-1 & 2) (RA 2010)	1.0 g/cc to 2.5 g/cc
	In-Place Dry Density of Soils by Core Cutter Method	IS 2720 (Part-XXIX) 1975 (RA 2010)	1.0 g/cc to 2.0 g/cc

**-X-X-X-X-X-X-X-X-X-X-X-X-**