

Laboratory **Vardan Envirolab, Plot No. 24 & 25, Narayan Vihar, Block-B, Jaipur, Rajasthan**

Accreditation Standard **ISO/IEC 17025: 2005**

Certificate Number **TC-6652** Page 1 of 12

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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
<u>CHEMICAL TESTING</u>				
I.	WATER			
1.	Drinking, Swimming Pool, Boiler Water, Packaged Drinking Water, Ground Water & Construction Water	pH @ 25 ^o C	IS 3025 (Part-11):1983, RA 2017	2 to 12
		Total Dissolved Solid	IS 3025 (Part-16):1984, RA 2017	1.0 mg/l to 10000 mg/l
		Total Suspended Solid	IS 3025 (Part-17):1984, RA 2017	1 mg/l to 1000 mg/l
		Specific Conductivity	IS 3025 (Part-14):2013	1 μS/cm to 200mS/cm
		Turbidity	IS 3025 (Part-10):1984, RA 2017	1 NTU to 1000 NTU
		Acidity as CaCO ₃	IS 3025 (Part-22):1986, RA 2014	1 mg/l to 500 mg/l
		Alkalinity as CaCO ₃	IS 3025 (Part-23):1986, RA 2014	1 mg/l to 750 mg/l
		Total Hardness as CaCO ₃	IS 3025(Part 21):2009, RA 2014	1 mg/l to 1000 mg/l
		Calcium as Ca	IS 3025 (Part-40):1991, RA-2014	0.5 mg/l to 200 mg/l
		Magnesium as Mg	IS 3025 (Part-46):1994, RA 2014	1 mg/l to 100 mg/l
		Chloride Cl	IS 3025 (Part-32):1988, RA 2014	1.0 mg/l to 1000 mg/l
		Temperature	IS 3025 (Part-9):1984, RA 2017	25 °C to 60 °C
		Sulphate as SO ₄	APHA 23 rd Edition, 2017- Turbidity Method	1 mg/l to 300 mg/l
		Residual Chlorine	IS 3025 (Part-26):1986, RA 2014	0.2 mg/l to 5.0 mg/l
	Phosphate as PO ₄	IS 3025 (Part-31):1988, RA 2014 (Stannous Chloride Method)	0.02 mg/l to 25 mg/l	

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		Silica as SiO ₂	IS 3025 (Part-35):1988, RA 2014 (Molybdo silicate Method)	0.4 mg/l to 50 mg/l
		Iron as Fe	IS 3025 (Part-53) :2003, RA 2014 (Phenantroline Method)	0.05 mg/l to 10 mg/l
		Nitrogen Nitrate as NO ₃	IS 3025, (Part-34):1988, RA-2014 (Chromo tropic Acid Method)	1.0 mg/l to 75.0 mg/l
		Boron as B,	APHA 23 rd Edition, 2017/ 3500 B C (Carmine Method)	0.2 mg/l to 10 mg/l
		Fluoride as F	APHA 23 rd Edition, 2017/ 4500 F D	0.1 mg/l to 10 mg/l
		Dissolved Oxygen	IS 3025 (Part 38):1989, RA 2014	1.0 mg/l to 8.5 mg/l
		Sodium as Na	IS 3025 (Part 45):1993, RA 2014	1.0 mg/l to 500 mg/l
		Potassium as K	IS 3025 (Part 45):1993, RA 2014	1.0 mg/l to 200mg/l1
		BOD (3 days, 27 ^o C)	IS 3025, (Part-44) :1993, reaffirmed-2014	2 mg/l to 2000 mg/l
		COD	IS 3025 (Part 58):2006, reaffirmed-2017 (Open Reflux Method)	10 mg/l to 10000 mg/l
		Volatile Residue	IS 3025, (Part-18) :1984, RA -2017	5 mg/l to 2000 mg/l
		Fixed Residue	IS 3025, (Part-18) :1984, RA -2017	5 mg/l to 5000 mg/l
		Volume of 0.02N NaOH required to neutralize 100 ml sample of water	IS 3025 (Part-22):1986, RA 2014	0.1 mg/l to 100 ml
		Volume Of 0.02N H ₂ SO ₄ Required To Neutralize 100 MI Sample Of Water	IS 3025 (Part-23):1986, RA 2017	0.1 mg/l to 100 ml

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II.	POLLUTION & ENVIRONMENT			
1.	Waste Water (Effluent/ Sewage)	pH @ 25°C	IS 3025 (Part-11):1983, RA 2017	2 to 12
		Total Dissolved Solid	IS 3025 (Part-16):1984, RA 2017	5.0 mg/l to 50000 mg/l
		Total Suspended Solid	IS 3025 (Part-17):1984, RA 2017	1 to mg/l 20000 mg/l
		Specific Conductivity	IS 3025 (Part-14):2013	1µS/cm to 200 mS/cm
		Turbidity	IS 3025 (Part-10):1984, RA 2017	1 to 1000 NTU
		Chloride Cl	IS 3025 (Part-32):1988, RA 2014	1.0 mg/l to 2500 mg/l
		Temperature	IS 3025 (Part-9):1984, RA 2017	25 to 60°C
		Sulphate as SO ₄	APHA 23 rd Edition, 2017- Turbidity Method	1 mg/l to 500 mg/l
		Residual Chlorine	IS 3025 (Part-26):1986, RA 2014	0.2 mg/l to 10.0 mg/l
		Phosphate as PO ₄	IS 3025 (Part-31):1988, RA 2014 (Stannous Chloride Method)	0.2 mg/l to 100 mg/l
		Silica as SiO ₂	IS 3025 (Part-35):1988, RA 2014 (Molybdo silicate Method)	0.4 mg/l to 100 mg/l
		Iron as Fe	IS 3025 (Part-53) :2003, RA 2014 (Phenathroline Method)	0.2 mg/l to 50 mg/l
		Ammonical Nitrogen as NH ₃	IS 3025, (Part-34):1988, RA-2014 (Titrimetric Method)	1 mg/l to 200 mg/l
	Total Nitrogen as N	IS 3025, (Part-34):1988, RA -2014	1 mg/l to 200 mg/l	

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		Nitrogen Nitrate as NO ₃	IS 3025, (Part-34):1988, RA -2014 (Chromo tropic Acid Method)	1.0 mg/l to 50.0 mg/l
		Fluoride as F	APHA 23 rd Edition, 2017 4500 F D	0.10 mg/l to 10 mg/l
		Dissolved Oxygen	IS 3025 (Part 38):1989, RA 2014	1.0 mg/l to 8.5 mg/l
		Sodium as Na	IS 3025 (Part 45):1993, RA 2014	1.0 mg/l to 1000 mg/l
		Potassium as K	IS 3025 (Part 45):1993, RA 2014	1.0 mg/l to 200 mg/l
		BOD (3 days, 27°C)	IS 3025, (Part-44) :1993, reaffirmed-2014	2 mg/l to 50000 mg/l
		COD	IS 3025 (Part 58):2006, RA-2017 (Open Reflux Method)	10 mg/l to 100000 mg/l
		Oil & grease	IS 3025 (Part 39):1991, RA 2014	1.0 mg/l to 500 mg/l
2.	Soil	pH	IS 2720 (P-26), RA 2016 By pH Meter	1 to 14
		Conductivity	IS 14767-2000, RA 2016 By Conductivity Meter	0.001 mS/cm to 20 mS/cm
		Chloride	BS-1377 (Part 3) : 1990	0.005 % to 5 %
		Organic Matter	IS 2720 (Part -22),1972 RA 2015 Titrimetric Method,	0.05 % to 10 %
		Available Nitrogen	IS 14684-1999, RA 2014 Distillation Method	5 kg/hac to 1000 kg/hac
		Sulphate	IS 2720 (Part 27) 1977 RA 2015	1 mg/kg to 200 mg/kg
III.	ATMOSPHERIC POLLUTION			
1.	Ambient Air	PM _{2.5}	VEL/STP/01, STP-57 , Issue No.-01 & Issue Date- 15.05.2017	10 µg/m ³ to 150 µg/m ³

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		Particulate Matter (Particle Size less than 10 µm) or PM ₁₀	IS 5182 (Part-23):2006, RA 2017	5 µg/m ³ to 1000 µg/m ³
		Sulphur Dioxide	IS 5182,(Part-2):2001, RA 2017	5 µg/m ³ to 150 µg/m ³ .
		Nitrogen Dioxide	IS 5182 (Part-6):2006, RA 2017	5 µg/m ³ to 150 µg/m ³ .
		Ammonia	VEL/STP/01, STP-60 , Issue No.-01 & Issue Date- 15.05.2017	5 µg/m ³ to 500 µg/m ³ .
		Ozone	IS 5182 (Part-9):1974, RA 2014	5 µg/m ³ to 300 µg/m ³
2.	Stack Emission	Particulate matter	IS 11255 (Part – 1) :1985, RA 2014	5 mg/Nm ³ to 2000 mg/Nm ³
		Sulphur Dioxide	IS 11255 (Part – 2):1985, RA 2014	5 mg/Nm ³ to 1000 mg/Nm ³
		Nitrogen Dioxide	IS 11255 (Part-7):2005, RA 2017	5 mg/Nm ³ to 1000 mg/Nm ³
		Fluoride	IS 11255 (Part-5):1990, RA 2014	1.0 mg/Nm ³ to 100.0 mg/Nm ³
IV.	BUILDING MATERIALS			
1.	Cement (OPC, PPC, PSC, White Cement)	Loss on ignition	IS 4032: 1985, RA 2014	0.5% to 10%
		Silica (SiO ₂)	IS 4032: 1985, RA 2014	10% to 40%
		Alumina (Al ₂ O ₃)	IS 4032: 1985, RA 2014	2.0% to 20%
		Ferric Oxide (Fe ₂ O ₃)	IS 4032: 1985, RA 2014	0.5% to 10%
		Calcium Oxide (CaO)	IS 4032: 1985, RA 2014	35 %to 70%
		Magnesia (MgO)	IS 4032: 1985, RA 2014	0.1% to 10%
		Sulphuric Anhydride(SO ₃)	IS 4032: 1985, RA 2014	0.5% to 7%
		Insoluble Residue	IS 4032: 1985, RA 2014	0.1% to 35%
		Sodium Oxide (Na ₂ O)	IS 4032: 1985, RA 2014	0.0%5 to 2%
		Potassium Oxide (K ₂ O)	IS 4032: 1985, RA 2014	0.05% to 2%
	Chloride (Cl)	IS 4032: 1985, RA 2014	0.005% to 2%	

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2.	Admixture	Dry material content	IS 9103 : 1999, RA 2013	5 %to 50%
		Ash content	IS 9103 : 1999, RA 2013	2% to 35%
		Relative density	IS 9103 : 1999, RA 2013	0.5 to 1.5
		Chloride content	IS 6925-1973, RA 2013 Clause-5	0.001% to 1%
		pH	IS 9103:1999, RA 2013	5 to 9
3.	Aggregate (Coarse & Fine)	Sulphate (SO ₃)	IS 4032: 1985, RA 2013	0.005% to 3%
		Alkali Aggregate Reactivity (potential reactivity of aggregates)	IS 2386 (Part-7): 1963, RA: 2016 Clause 3	1 millimoles/l to 500millimoles/l 1 millimoles/l to 500millimoles/l
		i) Reduction in alkalinity		
		ii) Silica Dissolved		
		Organic Impurities	IS 2386 (Part II): 1963, RA.: 2016	Qualitative
		Chloride	IS 14959 (Part-2), 2001, RA 2016	0.02 % to 3 %
		pH	IS 2720 (Part 26): 1987, RA 2011	2 to 12
V.	METALS & ALLOYS			
1.	Steel (Mild Steel, Structural Steel, High Strength)	Carbon (C)	IS 228 (Part 1): 1987, RA 2018	0.05 % to 2.5 %
		Sulphur (S)	IS 228 (Part 9): 1989, RA 2014 (Evolution Method)	0.01 % to 0.25 %
		Phosphorus (P)	IS 228 (Part 3): 1987, RA 2018	0.01 % to 0.25 %
		Silicon (Si)	IS 228 (Part 8): 1989, RA 2014	0.05 % to 5 %

*NOTE: The Laboratory has demonstrated competence for the stated scope for **WATER**. This however **does not fully cover** the specification requirements of **BIS for the Packaged Drinking Water as per IS:14543 and the Packaged Natural Mineral Water IS:13428**.

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<u>MECHANICAL TESTING</u>				
I. BUILDING MATERIALS				
1.	Cement	Fineness by-Dry sieving method (% of Residue)	IS 4031(Part 1): 1996 (RA. 2016)	0.1 % to 10 %
		Fineness by-Blain's air Method	IS 4031 (Part 2):1999 (RA.2013)	100 m ² /kg to 500 m ² /kg
		Soundness by-Le-chatelier method	IS 4031 (Part 3):1988 (RA.2014)	0.5 mm to 10 mm
		Standard Consistency	IS 4031 (Part 4):1988 (RA. 2014)	20 % to 40 %
		Setting Time (Initial)	IS 4031 (Part 5):1988 (RA. 2014)	10 min to 200 min.
		Setting Time (Final)	IS 4031 (Part 5):1988 (RA. 2014)	60 min. to 800 min.
		Compressive Strength	IS 4031 (Part 6):1988 (RA. 2014)	10 N/mm ² to 80 N/mm ²
		Density	IS 4031 (Part 11):1988 (RA. 2014)	1.5 g/ cm ³ to 4 g/ cm ³
2.	Bricks	Compressive Strength	IS 3495 (Part 1):1992 (RA. 2016)	2 N/mm ² to 39 N/mm ²
		Water absorption	IS 3495 (Part 2):1992 (RA. 2016)	0.5 % to 30 %
		Efflorescence	IS 3495 (Part 3):1992 (RA. 2016)	Qualitative
		Dimension (Ordinary building bricks) Length Width Height	IS 1077 :1992 (RA. 2016) IS 12894 :2002 (RA. 2007)	3000 mm to 5000 mm 1000 mm to 3000 mm 1000 mm to 3000 mm
		Dimensions (Heavy duty bricks)	IS 2180 :1988 (RA. 2016)	

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		Length Width Height		170 mm to 210 mm 70 mm to 110 mm 30 mm to 110 mm
3.	Concrete	Workability by Slump Test (fresh Concrete)	IS 1199 :1959 (RA. 2013)	Upto 250 mm
		Workability by Compaction Factor	IS 1199 :1959 (RA. 2013)	0.7 to 1
		Accelerated Curing of Concrete for compressive strength	IS 9013: 1978 (RA. 2013)	10 N/mm ² to 80 N/mm ²
		Flexural Strength	IS 516: 1959 (RA. 2013)	3 N/mm ² to 10 N/mm ²
		Compressive Strength of Cubes	IS 516: 1959 (RA. 2013)	5 N/mm ² to 80 N/mm ²
4.	Paver Block	Dimensions Length Width Height	IS 15658-2006 (RA. 2017) Annex-B	50 mm to 400 mm 50 mm to 400 mm 40 mm to 130 mm
		Area	IS 15658-2006 (RA. 2017) Annex-B	25000 mm ² to 160000 mm ²
		Water Absorption	IS 15658: 2006 (RA. 2017) Annex-C	1 % to 20 %
		Compressive Strength	IS 15658: 2006 (RA .2017) Annex-D	5 N/mm ² to 80 N/mm ²
5.	Hollow & Solid Concrete Block	Block Density	IS 2185 (Part I): 2005 (RA. 2015)	1000 kg/m ³ to 3000 kg/m ³
		Compressive Strength	IS 2185 (Part I): 2005 (RA. 2015)	2 N/mm ² to 70 N/mm ²
		Water Absorption	IS 2185 (Part I): 2005 (RA. 2015)	1 % to 20 %
		Dimension Length width Height	IS 2185 (Part I): 2005 (RA. 2015)	200 mm to 600 mm 50 mm to 300 mm 100 mm to 250 mm
6.	Aggregates (Coarse)	Sieve Analysis (Gradation)	IS 2386 (Part-1) 1963 (RA. 2016)	80 mm to 4.75 mm (0 to 100%)

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		Water absorption	IS 2386 (Part-3) 1963 (RA. 2016)	0.1 % to 10 %
		Impact value	IS 2386 (Part-4) 1963 (RA. 2016)	10 % to 50 %
		Los Angles Abrasion value	IS 2386 (Part-4) 1963 RA. 2016	10 % to 60 %
		Crushing value	IS 2386 (Part-4) 1963 (RA. 2016)	10 % to 60 %
		Bulk density	IS 2386 (Part-3) 1963 (RA. 2016)	1 kg/l to 3 kg/l
		Specific gravity	IS 2386 (Part-3) 1963 (RA. 2016)	2.0 to 4.0
		Combined Elongation & Flakiness index	IS 2386 (Part-1) 1963 (RA. 2016)	5 % to 50 %
		10% Fines Value	IS 2386 (Part-4) 1963 (RA. 2016)	0.5 ton to 30 ton
		Stripping Value	IS 6241: 1971 (RA. 2017)	Qualitative
		Materials finer than 75 µm	IS 2386 (Part-1) 1963 (RA. 2016)	0.1% to 5 %
		Clay Lumps	IS 2386 (Part-2) 1963 (RA. 2016)	0.05% to 5 %
		Clay, Fine Silt & Fine Dust (Sedimentation Method)	IS 2386 (Part-2) 1963 (RA. 2016)	0.01 % to 5 %
7.	Aggregates (Fine)	Sieve analysis (Gradation)	IS 2386 (Part-1) 1963 (RA. 2016)	4.75 mm to 75 micron (0 to 100 %)
		Water absorption	IS 2386 (Part-3) 1963 (RA. 2016)	0.1 % to 10 %
		Bulk density	IS 2386 (Part -3) 1963 (RA. 2016)	1 kg/l to 3 kg/l
		Specific gravity	IS 2386 (Part-3) 1963 (RA. 2016)	2.0 to 4.0
8.	Aggregates (Coarse/Fine)	Materials finer than 75 µm	IS 2386 (Part-1) 1963 (RA. 2016)	0.1% to 20 %

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		Clay Lumps	IS 2386 (Part-2) 1963 (RA. 2016)	0.05 % to 5 %
		Clay, Fine Silt & Fine Dust (Sedimentation Method)	IS 2386 (Part-2) 1963 (RA. 2016)	0.01 % to 5 %
II.	MECHANICAL PROPERTIES OF METALS			
1.	Reinforcement Steel Bars & Steel Wires	Nominal Mass/Unit length	IS 1608-2005 (Part -1) (RA. 2018) / IS 1786-2008 (RA. 2013)	0.1 kg/m to 10 kg/m
		Cross sectional area	IS 1608-2005 (Part -1) (RA. 2018) / IS 1786-2008 (RA. 2013)	1 mm ² to 1000 mm ²
		Yield Stress	IS 1608-2005 (Part -1) (RA. 2018) / IS 1786-2008 (RA. 2013)	10 kN to 950 kN
		Tensile Strength	IS 1608-2005 (Part -1) (RA. 2018) / IS 1786-2008 (RA. 2013)	10 kN to 950 kN
		% Elongation	IS 1608-2005 (Part -1) (RA. 2018) / IS 1786-2008 (RA. 2013)	1 % to 40 %
		TS/YS Ratio	IS 1608-2005 (Part -1) (RA. 2018) / IS 1786-2008 (RA. 2013)	0.5 to 2.5
		Bend Test	IS 1599-2012 (RA. 2017) / IS 1786-2008 (RA. 2013)	Qualitative (Mandrel Diameters 6,8, 10, 12, 16, 20, 25,28, 32, 36, 40) mm
		Re-bend	IS 1786: 2008 (RA. 2013)	
2.	Reinforcement Couplers for Mechanical Splices of Bars in Concrete	Static Tensile Test (Tensile strength)	IS 16172-2014 (Cl. 9.2.1)	20 kN to 950 kN (Observation of Fracture/ Failure)

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III.	SOIL AND ROCK			
1.	Soil	Specific Gravity Grain Size Analysis	IS 2720 (Part-3) Sec.1:1980 (RA.2016)	1.5 to 3.5
		Dry Sieve Analysis	IS 2720 (Part-4) (Clause 3.0) 1985 (RA.2015) CL. 3	75 μ to 75 mm 0.1% to 100 %
		Wet Sieve Analysis	IS 2720 (Part-4) (Clause 4.3) 1985 (RA.2015) Cl. 4	(75 μ to 10 mm) 0.1 % to 100 %
		Compaction Test (Proctor compaction)		
		1. Light compaction Moisture Content Density	IS 2720 (Part-7) 1980 (RA. 2016)	4 % to 35 % 1.2 g/cm ³ to 2.5 g/cm ³
		2. Heavy compaction Moisture Content density	IS 2720 (Part-8) 1983 (RA.2015)	4 % to 30 % 1.2 gm/cm ³ to 3 gm/cm ³
		California Bearing Ratio (CBR)	IS 2720 (part-16) 1987 (RA. 2016)	1% to 100%
		Free Swell Index	IS 2720 (part-40) 1977 (RA 2011)	1% Max to 400 % Max
		Permeability	IS 2720 (Part 17): 1986 (RA 2011)	1 \times 10 ⁻³ cm/s to 10 ⁻⁷ cm/sec
		Swelling Pressure	IS 2720 (Part-41) 1997 (RA.2016)	Upto 2 kg/cm ²
		Water Content	IS 2720 (Part-2) 1973 (RA.2015)	0.1% to 40%
		Atterberg's Limit		
		Liquid Limit	IS 2720 (Part-5) 1985 (RA. 2015)	20% to 100%
		Shrinkage Limit	IS: 2720 (part-6) 1972 (RA 2016)	5% to 30%

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<u>NON DESTRUCTIVE TESTING</u>				
I.	BUILDING MATERIALS-REINFORCED CONCRETE STRUCTURES			
1.	Reinforced Concrete Structures	Rebound Hammer Test	IS 13311 (Part-2):1992 (RA 2013)	20 RN. to 80 RN
		Carbonation Test	BS:1881 (Part 201)-1986	Upto 75 mm