Laboratory	**Structwel Designers & Consultants Pvt. Ltd., P-26, MIA House, MIDC Industry Area, Hingna Road, Nagpur, Maharashtra**		
Accreditation Standard	**ISO/IEC 17025: 2005**		
Certificate Number	**TC-7721**	**Page 1 of 13**	
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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
		CHEMICAL TESTING		
I.	**BUILDING MATERIALS**			
1.	**Cement - OPC**	Loss on Ignition	IS 4032:1985 (RA 2014)	1.0 % to 1.5 %
		Silica (SiO2)	IS 4032:1985 (RA 2014)	15 % to 30 %
		Ferric oxide (Fe_2O_3)	IS 4032:1985 (RA 2014)	3.0 % to 10 %
		Aluminum oxide (Al_2O_3)	IS 4032:1985 (RA 2014)	3.0 % to 10 %
		Calcium oxide (CaO)	IS 4032:1985 (RA 2014)	40 % to 70 %
		Magnesia (MgO)	IS 4032:1985 (RA 2014)	1.0 % to 10 %
		Sulphuric Anhydride (SO_3)	IS 4032:1985 (RA 2014)	1.0 % to 5.0 %
		Insoluble Residue	IS 4032:1985 (RA 2014)	0.5 % to 5.0 %
		Chloride	IS 4032:1985 (RA 2014)	0.01 % to 1 %
2.	**Cement - PSC**	Loss on Ignition	IS 4032:1985 (RA 2014)	1.0 % to 15 %
		Silica (SiO2)	IS 4032:1985 (RA 2014)	15 % to 50 %
		Ferric oxide (Fe_2O_3)	IS 4032:1985 (RA 2014)	1.0 % to 10 %
		Aluminium oxide (Al_2O_3)	IS 4032:1985 (RA 2014)	1.0 % to 20 %
		Calcium oxide (CaO)	IS 4032:1985 (RA 2014)	30 % to 70 %
		Magnesia (MgO)	IS 4032:1985 (RA 2014)	1.0 % to 10 %
		Sulphuric Anhydride (SO_3)	IS 4032:1985 (RA 2014)	1.0 % to 5.0 %
		Insoluble Residue	IS 4032:1985 (RA 2014)	0.5 % to 10 %
		Chloride	IS 4032:1985 (RA 2014)	0.01 % to 1 %
3.	**Cement - PPC**	Loss on Ignition	IS 4032:1985 (RA 2014)	1.0 % to 15 %
		Magnesia (MgO)	IS 4032:1985 (RA 2014)	1.0 % to 10 %
		Sulphuric Trioxide (SO_3)	IS 4032:1985 (RA 2014)	1.0 % to 5.0 %
		Insoluble Residue	IS 4032:1985 (RA 2014)	15.0 % to 50 %
		Chloride	IS 4032:1985 (RA 2014)	0.01 % to 1 %
4.	**Fly Ash**	Loss on Ignition	IS 1727:1967 (RA 2013)	0.1 % to 5.0 %
		Magnesia (MgO)	IS 1727:1967 (RA 2013)	0.5 % to 10 %
		Sulphuric Trioxide (SO_3)	IS 1727:1967 (RA 2013)	0.1 % to 5 %
		Chloride	IS 4032:1985 (RA 2014)	0.005 % to 0.5 %

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
5.	**Admixture**	Dry Material content	IS 9103:1999 (RA 2013)	5.0 % to 60 %
		pH	IS 9103:1999 (RA 2013)	4 to 12
		Chloride	IS 6925:1973 (RA 2008)	0.01 % to 2 %
		Relative Density	IS 9103:1999 (RA 2013)	0.7 to 1.5
		Ash content	IS 9103:1999 (RA 2013)	1 % to 20 %
6.	**Construction Water**	pH	IS 3025 (Part 11): 2004	4.0 to 12
		Sulphate	IS 3025 (Part 24): 1986 (by Gravimetric method)	5 mg/l to 2000 mg/l
		Chloride	IS 3025 (Part 32): 1988 (Argenometic method)	10 mg/l to 2000 mg/l
		Alkalinity (ml of 0.02N H_2SO_4 required to neutralize 100mL water)	IS 3025 (Part 23): 1986 (Indicator method)	0.1 ml to 100 ml
		Acidity (ml of 0.02N NaOH required to neutralize 100mL water)	IS 3025 (Part 22): 1986 (Indicator method)	0.1ml to 10 ml
		Hardness as $CaCO_3$	IS 3025 (Part 21): 2009 (EDTA method)	1 mg/l to 10000 mg/l
		Volatile Residue Fixed Residue	IS 3025 (Part 18): 1984	1 mg/l to 2000 mg/l 1 mg/l to 2000 mg/l
		Total Suspended solid	IS 3025 (Part 17): 1984	1 mg/l to 1000 mg/l
II.	**METALS AND ALLOYS**			
1.	**Carbon Steel (Low Carbon, Medium Carbon and High Carbon Steel)**	Carbon (C)	ASTM E 415:2017	0.02 % to 1.50 %
		Silica (Si)		0.05 % to 2.00 %
		Manganese (Mn)		0.10 % to 1.90 %
		Phosphorous (P)		0.005 % to 0.060 %
		Sulphur (S)		0.005 % to 0.060 %
		Chromium (Cr)		0.02 % to 1.60 %
		Nickel (Ni)		0.02 % to 3.50 %
		Molybdenum (Mo)		0.02 % to 0.50 %

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
		Vanadium (V)		0.02 % to 0.55 %
		Copper (Cu)		0.02 % to 0.50 %
		Niobium (Nb)		0.010 % to 0.25 %
		Titanium (Ti)		0.001 % to 0.030 %
		Aluminium (Al)		0.01 % to 0.06 %
2.	**Stainless Steel**	Carbon (C)	ASTM E 1086:2014	0.010 % to 0.20 %
		Silica (Si)		0.10 % to 1.00 %
		Manganese (Mn)		0.25 % to 2.00 %
		Phosphorous (P)		0.005 % to 0.050 %
		Sulphur (S)		0.005 % to 0.050 %
		Chromium (Cr)		1.0 % to 25.00 %
		Nickel (Ni)		0.005 % to 15.50 %
		Molybdenum (Mo)		0.10 % to 2.50 %
		Vanadium (V)		0.02 % to 0.5 %
		Copper (Cu)		0.02 % to 0.50 %
		Niobium (Nb)		0.005 % to 0.050 %
		Titanium (Ti)		0.002 % to 3.00 %
		Aluminium (Al)		0.0050 % to 0.10 %
3.	**Aluminum and Aluminum Alloys**	Silica (Si)	ASTM E 1251:2017	0.10 % to 8.0%
		Iron (Fe)		0.02 % to 5.00 %
		Manganese (Mn)		0.01 % to 0.20 %
		Magnesium (Mg)		0.25 % to 0.75 %
		Chromium (Cr)		0.02 % to 0.25 %
		Zinc (Zn)		0.02 % to 1.50 %
		Titanium (Ti)		0.01 % to 0.25 %
		Nickel (Ni)		0.01 % to 0.05 %
		Lead(Pb)		0.10 % to 0.20 %
4.	**Copper and its Alloys**	Zinc (Zn)	BSEN 15079:2015	0.02 % to 30.00 %
		Lead(Pb)		0.02 % to 5.00 %
		Tin (Sn)		0.02 % to 5.00 %
		Phosphorous (P)		0.002 % to 0.20 %
		Manganese (Mn)		0.002 % to 0.20 %
		Iron (Fe)		0.02 % to 0.50 %
		Nickel (Ni)		0.02 % to 2.00 %

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
		Silica (Si)		0.02 % to 0.20 %
		Arsenic (As)		0.001 % to 0.050 %
		Antimony (Sb)		0.003 % to 0.30 %
		Bismuth (Bi)		0.02 % to 0.10 %
		Aluminium (Al)		0.002 % to 0.20 %
III.	**CORROSION TEST**			
1.	**Ferrous Metals**	Salt Spray Test	IS 9844:1981 (RA 2016)	2 Hrs to 98 Hrs

MECHANICAL TESTING

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
AT LABORATORY				
I.	**BUILDING MATERIAL**			
1.	**Aggregate - Coarse**	Sieve Analysis	IS 2386 (Part 1): 1963 (RA 2016)	0.1 % to 100 % (4.75 to 40mm)
		Flakiness Index	IS 2386 (Part 1): 1963 (RA 2016)	1 % to 50 %
		Elongation Index	IS 2386 (Part 1): 1963 (RA 2016)	1 % to 50 %
		Specific Gravity	IS 2386 (Part 3): 1963 (RA 2016)	1.5 to 3.5
		Water Absorption	IS 2386 (Part 3): 1963 (RA 2016)	0.1 % to 15 %
		Bulk Density	IS 2386 (Part 3): 1963 (RA 2016)	1 kg/lit to 3 kg/lit
		Crushing Value	IS 2386 (Part 4): 1963 (RA 2016)	1 % to 60 %
		10 percent Fines Value	IS 2386 (Part 4): 1963 (RA 2016)	2 T to 50 T
		Impact Value	IS 2386 (Part 4): 1963 (RA 2016)	1 % to 60 %
		Abrasion Value - Los Angeles	IS 2386 (Part 4): 1963 (RA 2016)	5 % to 50 %
		Soundness - Na_2SO_4	IS 2386 (Part 5): 1963 (RA 2016)	1.0 % to 12 %
		Soundness - $MgSO_4$	IS 2386 (Part 5): 1963 (RA 2016)	1.0 % to 18 %
		Strpping value	IS 6241 (Part 1): 1971 (RA 2017)	80 % to 90 %

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
2.	**Aggregate-Fine**	Sieve Analysis	IS 2386 (Part 1): 1963 (RA 2016)	0.1 % to 100 % (0.15 mm to 4.75 mm)
		Material Finer than 75 Micron	IS 2386 (Part 1): 1963 (RA 2016)	1 % to 30 %
		Specific Gravity	IS 2386 (Part 3): 1963 (RA 2016)	1.5 to 3.5
		Water Absorption	IS 2386 (Part 3): 1963 (RA 2016)	1 % to 50 %
		Bulk Density	IS 2386 (Part 3): 1963 (RA 2016)	1 kg/L to 3 kg/L
		Soundness - Na_2SO_4	IS 2386 (Part 5): 1963 (RA 2016)	1.0 % to 12 %
		Soundness- $MgSO_4$	IS 2386 (Part 5): 1963 (RA 2016)	1 % to 18 %
		Dry Loose Bulk Density	IS 2386 (Part 3): 1963 (RA 2016)	1 kg/lit to 4 kg/lit
		Compacted Density	IS 2386 (Part 3): 1963 (RA 2016)	1 kg/lit to 4 kg/lit
3a.	**Hardened Concrete**	Compressive Strength-Core/Cylinder/Cube	IS 516:1959 (RA 2013)	5 Nmm^2 to 100 Nmm^2
		Flexural Strength - Beam	IS 516:1959 (RA 2013)	1 Nmm^2 to 10 Nmm^2
b.	**Hardened Concrete-Prism/ Cube/ Cylinder**	Water Permeability	Morth Section 17 17.7.5	1 mm to 50 mm
		Coefficient of Permeability	IS 3085-1965 (RA 2016)	10^{-3} to 10^{-10} cm/sec
4.	**Bricks**	Water Absorption	IS 3495 (Part 2): 1992 (RA 2016)	4 % to 40 %
		Compressive Strength	IS 3495 (Part 1): 1992 (RA 2016)	3.5 N/mm^2 to 40 N/mm^2
		Efflorescence.	IS 3495 (Part 3): 1992 (RA 2016)	Visual
		Dimension	IS 1077:1992 (RA 2016)	10 mm to 5000 mm
5.	**Concrete Masonry Blocks-Hollow / Solid**	Block Density - Solid	IS 2185 (Part 1): 2005 (RA 2010)	1800 kg/m^3 to 2500 kg/m^3

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
		Solid Concrete - Solid	IS 2185 (Part 1): 2005 (RA 2010)	1 N/mm^2 to 40 N/mm^2
		Water Absorption - Solid	IS 2185 (Part 4): 2005 (RA 2010)	1 % to 50 %
		Block Density - Hollow	IS 2185 (Part 4): 2005 (RA 2010)	1600 kg/m^3 to 3000 kg/m^3
		Water Absorption - Hollow	IS 2185 (Part 4): 2005 (RA 2010)	1 % to 10 %
		Compressive Strength - Hollow.	IS 2185 (Part 4): 2005 (RA 2010)	1 N/mm^2 to 35 N/mm^2
6.	**Autoclaved Cellular Aerated Concrete Block**	Block Density	IS 6441 (Part 1): 1972 (RA 2017)	300 kg/m^3 to 800 kg/m^3
		Compressive Strength	IS 6441 (Part 1): 1972 (RA 2017)	1 N/mm^2 to 10 N/mm^2
		Moisture Content	IS 6441 (Part 1): 1972 (RA 2017)	1 % to 30 %
7.	**Paver Block**	Dimension	IS 15658:2006 (RA 2011)	50 mm to 300 mm
		Water Absorption	IS 15658:2006 (RA 2011)	1 % to 25 %
		Compressive Strength	IS 15658:2006 (RA 2011)	5 to 70 N/mm2
		Abrasion Resistance	IS 15658:2006 (RA 2011)	0.01 mm^3 to 5.0 mm^3
		Flexural Strength	IS 15658:2006 (RA 2011)	1 to 25 N/mm^2
8.	**Concrete Tiles**	Water Absorption	IS 13801:2013 IS 1237:2012	0.1 % to 25 %
		Wet Transverse Strength	IS 13801:2013 IS 1237:2012	0.5 N/mm^2 to 5 N/mm^2
		Resistance to wear	IS 1237:2012	0.1 mm to 10 mm
9.	**Ceramic tiles**	Water Absorption	IS 13630 (Part 1 & Part 15): 2006 (RA 2017)	0.01 % to 20 %
		Modulus of Rupture	IS 13630 (Part 1 & Part 15): 2006 (RA 2017)	5 N/mm^2 to 60 N/mm^2
		Scratch Hardness (Moh's Scale)	IS 13630 (Part 1 & Part 15): 2006 (RA 2017)	1 to 9 on Moh's Scale
		Crazing Resistance	IS 13630 (Part 1 & Part 15): 2006 (RA 2017)	Qualitative

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
10.	**Cement**	Normal Consistency	IS 4031 (Part 4): 1988 (RA 2014)	20 % to 45 %
		Initial Setting Time	IS 4031 (Part 5): 1988 (RA 2014)	30 min to 300 min
		Final Setting Time	IS 4031 (Part 5): 1988 (RA 2014)	100 min to 600 min
		Soundness by Le-Chatelier	IS 4031 (Part 3): 1988 (RA 2014)	0.01 mm to 10 mm
		Density	IS 4031 (Part 11): 1988 (RA 2014)	2 g/cc to 4 g/cc
		Fineness	IS 4031 (Part 1): 1988 (RA 2014)	1 % to 10 %
		Compressive Strength	IS 4031 (Part 6): 1988 (RA 2014)	5 N/mm^2 to 80 N/mm^2
		Fineness by Specific Surface	IS 4031 (Part 2): 1988 (RA 2014)	200 m^2/kg to 700 m^2/kg
		Drying Shrinkage	IS 4031 (Part 10): 1988 (RA 2014)	0.05 % to 0.5 %
		Compressive Strength of Masonry cement	IS 4031 (Part 7): 1988 (RA 2014)	0.4 N/mm^2 to 80 N/mm^2
11.	**Fly Ash**	Soundness by Le-Chatelier	IS 1727:1967 (RA 2013)	0.01 mm to 10mm
		Initial Setting Time	IS 1727:1967 (RA 2013)	30 min to 200 min
		Final Setting Time	IS 1727:1967 (RA 2013)	100 min to 700 min
		Compressive Strength	IS 1727:1967 (RA 2013)	5 N/mm^2 to 80 N/mm^2
		Specific Surface	IS 1727:1967 (RA 2013)	50 m^2/kg to 700 m^2/kg
		Specific Gravity	IS 1727:1967 (RA 2013)	1.5 to 4
		Consistency	IS 1727:1967 (RA 2013)	20 % to 40 %
II.	**SOIL & ROCK**			
1.	**Soil**	Free Swell Index	IS 2720 (Part 40): 1977 (RA 2011)	1 % to 200 %

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
		Liquid Limit	IS 2720 (Part 5): 1985 (RA 2015)	5 % to 150 %
		Plastic Limit	IS 2720 (Part 5): 1985 (RA 2015)	Upto 100 %
		Grain Size Analysis	IS 2720 (Part 4): 1985 (RA 2015)	Upto 100 % (0.075 mm to 4.75 mm)
		Light Compaction	IS 2720 (Part 7): 1980 (RA 2011)	MDD: 1 g/cc to 3 g/cc & OMC: 2 % to 30 %
		Heavy Compaction	IS 2720 (Part 8): 1983 (RA 2015)	MDD: 1.5 g/cc to 3.5 g/cc OMC: 1 % to 30 %
		Direct Shear Test	IS 2720 (Part 13): 1986 (RA 2011)	C=0.01 t/m^2 to 10 t/m^2 ø=1° to 45º
		California Bearing Ratio	IS 2720 (Part 16): 1987 (RA 2011)	1 % to 100 %
		Consolidation Test	IS 2720 (Part 15): 1986 (RA 2011)	CV=2 to 200 $m2/yr \times 10^{-2}$
		Swelling Pressure	IS 2720 (Part 41): 1977 (RA 2011)	1 kg/cm^2 to 150 kg/cm^2
		Moisture Content	IS 2720 (Part 2): 1973 (RA 2015)	2 % to 100 %
		Specific Gravity	IS 2720 (Part 3/ Section1 & 2): 1980 (RA 2016)	1 to 4
		Shrinkage Limit	IS 2720 (Part 6): 1972 (RA 2016)	1 % to 30 %
		Unconfined Compressive Strength	IS 2720 (Part 10) : 1991 (RA 2015)	0.05 MPa to 20 Mpa
		Permeability - Constant Head	IS 2720 (Part 17): 1986 (RA 2016) Clause 5	10^{-3} cm/s to 10^{-10} cm/s
		Triaxial Compression	IS 2720 (Part 11): 1993 (RA 2016)	C=0.01 to 10t/m2 Φ=1 to 45º
2.	**Rock**	Unconfined Compressive Strength	IS 9143:1979 (RA 2016)	1 N/mm^2 to 100 N/mm^2
		Specific Gravity	IS 1122:1974 (RA 2013)	1 to 4

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
		Density	IS 13030:1991 (RA 2016)	1.5 g/cc to 5 g/cc
		Water Absorption	IS 13030:1991 (RA 2016)	0.1 % to 25 %
		Porosity	IS 13030:1991 (RA 2016)	0.1 % to 10 %
		Water Permeability	IS 4348:1973 (RA 2017)	10^{-3} to 10^{-10} cm/s
		Split Tensile by Brazillian Method	IS 10082: 1981 (RA 2016)	1 to 500 Mpa
		Hardness by Mho's scale	IS 13630 (Part 13): 2006 (RA 2017)	1 to 9
		Point Load Test	IS 8764:1998 (RA 2014)	1 N/mm^2 to 100 N/mm^2
III.	**MECHANICAL PROPERTIES OF METALS**			
1.	**High Strength Deformed Steel Bars and Wire for Concrete Reinforcement & Structural Steel**	Ultimate Tensile strength	IS 1608 (Part 1): 2018	200 N/mm^2 to 900 N/mm^2
		Yield strength	IS 1608 (Part 1): 2018	200 N/mm^2 to 800 N/mm^2
		Percent Elongation	IS 1608 (Part 1): 2018	5 % to 40 %
		Mass per Meter	IS 1786:2008 (RA 2013)	0.20 kg/m to 10.0 kg/m
		Bend Test	IS 1599:2012 (RA 2017)	Qualitative (Mandrel diameter: 12, 16, 18, 20, 24, 30, 32, 36, 40, 42, 48, 50, 56, 64, 70, 72, 75, 80, 84, 96, 100, 128, 160, 240 mm)
		Rebend Test	IS 1786:2008 (RA 2013)	Qualitative (Mandrel diameter: 12, 16, 18, 20, 24, 30, 32, 36, 40, 42, 48, 50, 56, 64, 70, 72, 75, 80, 84, 96, 100, 112, 120, 125, 128, 140, 150, 160, 175, 200, 224, 256 mm)

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2.	**Ferrous & Non Ferrous Alloys - Ferrous Metal**	Charpy Impact Testing V-Notch (at room temperature & -400 °C)	IS 1757:1988 (RA 2009)	1 Joules to 300 Joules
		Brinell- 2.5mm ball/ 187.5 kg Load	IS 1500:2013	100 BHN to 450 BHN
		Vickers- HV 30	IS 1501 (Part 1): 2013	370 to 750 HV 30
		Rockwell HRC	IS 1586 (Part 1): 2018	30 HRBW to 95 HRBW 30 HRC to 70 HRC
		Bend Test	IS 1599:2012	Qualitative
		Macroetch Test	IS 11371:1985 (RA 2003)	Qualitative

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

MECHANICAL TESTING

AT SITE				
I.	**SOIL & ROCK**			
1.	**Soil**	Dynamic Cone Penetration	IS 4968 (Part 1): 1976 (RA 2016)	1 to 35 blows for 100 mm
		Standard Penetration Test	IS 2131:1981 RA 2011	N=1 to 50
		Modulus Of Subgrade Reaction	IS 9214 : 1979 RA 2016	0.01 MPa/mm to 10 MPa/mm
		In Situ Density By Water Replacement	IS 2720 (Part 33): 1971 (RA 2015)	15 kN/m^3 to 25 kN/m^3
		Field Density by Core Cutter method.	IS 2720(Part 29): 1975 (RA 2015)	1000 kg/m^3 to 2000 kg/m^3
		Dry Density by Sand Replacement method	IS 2720(Part 28): 1974 (RA 2015)	1000 kg/m^3 to 2500 kg/m^3
		Plate Load Test	IS 1888:1982 (RA 2016)	1 tonne to 50 tonne & 0.01 mm to 50 mm
		Cyclic Plate Load	IS 5249:1992 (RA 2015) (Clause 6)	1 to 50 tonne & 0.01 to 50 mm
		Field California Bearing Ratio	IS 2720 (Part 31): 1990 (RA 2015)	1 to 100%
		Load Test On In-Situ Footing	IS 10042:1981 (RA 2016)	50 kN to 4000 kN

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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

NON - DESTRUCTIVE TESTING

I	**BUILDING MATERIALS - REINFORCED CONCRETE STRUCTURES**			
1.	**Reinforced Concrete Structures**	Ultrasonic Pulse Velocity	IS 13311 (Part 1): 1992 (RA 2013)	0.5 km/s to 5.0 km/s
		Rebound Hammer	IS 13311 (Part 2): 1992 (RA 2013)	10 R to 80 R
		Cover Meter	BS 1881 (Part 204): 1988	10 mm to 100 mm
		Carbonation	BS EN 14630:2006	1 mm to 50 mm
		Half-Cell Potential Difference	ASTM C 876-2015	(-) 100 mV to (-) 650 mV

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