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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.	**WATER**			
1.	**Water (Construction Purpose Only)**	pH	IS 3025 (Part 11, Clause 2.0)	2 to 12
		Suspended Matter	IS 3025 (Part 17)	10 mg/l to 3000 mg/l
		Organic matter	IS 3025 (Part 18)	10 mg/l to 1000 mg/l
		Inorganic matter	IS 3025 (Part 18)	10 mg/l to 4000 mg/l
		Sulphate Content	IS 3025 (Part 24, Clause 2.0)	10 mg/l to 500 mg/l
		Chloride Content	IS 3025 (Part 32, Clause-2.0)	10 mg/l to 2000 mg/l
		Acidity	IS 456 (Clause 5.4 (a)) IS 3025 (Part 22)	0.1 ml to 50 ml
		Alkalinity	IS 456 (Clause 5.4 (b)) IS 3025 (Part 23)	0.1 ml to 50 ml
II.	**BUILDING MATERIALS**			
1.	**Cement (33-43-43s-53-53s Grade OPC)**	Loss on Ignition	IS 4032	0.2 % to 15 %
		Silica	IS 4032	0.5 % to 30 %
		Ferric Oxide	IS 4032 (Clause 4.5.2)	0.1 % to 10 %
		Alumina	IS 4032 (Clause 4.5.1)	0.2 % to 15 %
		Calcium Oxide	IS 4032 (Clause 4.7.2)	0.5 % to 70 %
		Magnesium Oxide	IS 4032 (Clause 4.8.2)	0.5 % to 15 %
		Sulphuric Anhydride	IS 4032	0.1 % to 10 %
		Insoluble Residue	IS 4032	0.5 % to 10 %
		Chloride	IS 4032 (Amendment No. 2)	0.004 % to 5 %
		Alkalis as Sodium	IS 4032	0.01 % to 10 %
		Alkalis as Potassium	IS 4032	0.01 % to 10 %

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2.	**Cement (PPC)**	Loss on Ignition	IS 4032	0.2 % to 15 %
		Silica	IS 4032	0.5 % to 40 %
		Ferric Oxide	IS 4032 (Clause 4.5.2)	0.1 % to 10 %
		Alumina	IS 4032 (Clause 4.5.1)	0.2 % to 20 %
		Calcium Oxide	IS 4032 (Clause 4.7.2)	0.5 % to 70 %
		Magnesium Oxide	IS 4032 (Clause 4.8.2)	0.5 % to 15 %
		Sulphuric Anhydride	IS 4032	0.1 % to 10 %
		Insoluble Residue	IS 4032	0.5 % to 35 %
		Chloride	IS 4032 (Amendment No. 2)	0.004 % to 5 %
		Alkalis as Sodium	IS 4032	0.01 % to 10 %
		Alkalis as Potassium	IS 4032	0.01 % to 10 %
3.	**Cement Portland Slag Cement**	Loss on Ignition	IS 4032	0.2 % to 15 %
		Silica	IS 4032	0.5 % to 40 %
		Ferric Oxide	IS 4032 (Clause 4.5.2)	0.1 % to 10 %
		Alumina	IS 4032 (Clause 4.5.1)	0.2 % to 20 %
		Calcium Oxide	IS 4032 (Clause 4.7.2)	0.5 % to 70 %
		Magnesium Oxide	IS 4032 (Clause 4.8.2)	0.5 % to 15 %
		Sulphuric Anhydride	IS 4032	0.5 % to 10 %
		Insoluble Residue	IS 4032	0.5 % to 35 %
		Chloride	IS 4032 (Amendment No. 2)	0.004 % to 5 %
		Alkalis as Sodium	IS 4032	0.01 % to 10 %
		Alkalis as Potassium	IS 4032	0.01 % to 10 %
4.	**Pozollanic Material**	Loss on Ignition	IS 1727	0.2 % to 15 %
		Silica	IS 1727	0.5 % to 85 %
		Ferric Oxide	IS 1727	0.1 % to 15 %
		Alumina	IS 1727	1 % to 40 %
		Calcium Oxide	IS 1727	0.5 % to 10 %
		Magnesium Oxide	IS 1727	0.5 % to 10 %
		Sulphuric Anhydride	IS 1727	0.1 % to 10 %
		Chloride	IS 4032 (Amendment No. 2)	0.005 % to 5 %

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5.	**Concrete Admixture**	Chloride Content	IS 6925	0.001 % to 0.25 %
		pH Value	IS 9103	2 to 12
		Dry Material Content	IS 9103	1 % to 65 %
		Ash Content	IS 9103	0.5 % to 35 %
		Relative Density	IS 9103	1.0 to 1.5
III.	**SOIL AND ROCK**			
1.	**Soil**	pH Value	IS 2720 (Part 26,Clause 2.0)	2 to 12
		Sulphate	IS 2720 (Part 27)	0.1 % to 5 %
		Chloride	BS 1377 (Part 3, Clause 7)	0.1 % to 5 %
IV.	**METALS & ALLOYS**			
1.	**Steel Plain Carbon Low Alloy Steel**	Carbon	IS 228 (Part 1)	0.05 % to 2.5 %
		Sulphur	IS 228 (Part 9)	0.01 % to 0.25 %
		Phosphorus	IS 228 (Part 3, Clause 5.0)	0.001 % to 0.16 %
		Silicon	IS 228 (Part 8)	0.01 % to 5.0 %
		Manganese	IS 228 (Part 2)	0.1 % to 1.5 %

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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
I.	**SOIL AND ROCK**			
1.	**Soil /Flaysh/ Murom**	Natural Moisture Content	IS 2720 (Part 2)	5 % to 100 %
		Specific Gravity	IS 2720 (Part 3/Section1 & 2)	1 to 4
		Grain Size Analysis Sieve Analysis Sieve Analysis Pipette method Hydrometer Analysis	IS 2720 (Part 4, Clause 3) Clause 4 Clause 5.1 Clause 5.2	 125 mm to 4.75 mm 4.75 mm to 75 micron 75 micron to 2 micron
		Liquid & Plastic Limit	IS 2720 (Part 5)	5 % to 300 %
		Shrinkage Limit	IS 2720 (Part 6)	1 % to 30 %
		Light Compaction	IS 2720 (Part 7)	Moisture: 0.1 % to 50 % Density: 0.8 g/cc to 4 g/cc
		Heavy Compaction	IS 2720 (Part 8)	Moisture: 0.1 % to 50 % Density: 1 g/cc to 4 g/cc
		Unconfined Compression	IS 2720 (Part 10)	0.1 MPa to 2 MPa
		Triaxial Shear by Unconsolidated Undrained Method Without Measurement of Pore Water Pressure	IS 2720 (Part 11)	On Specimen Size: (38, 50, 75, 100) mm Cell Pressure: 0.01 MPa to 1 MPa Pore pressure Measurement: Upto 0.2 MPa
		Triaxial Shear by Consolidated Drained	IS 2720 (Part 12)	On Specimen Size: (38, 50, 75, 100) mm

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
		Method with Measurement of Pore Water Pressure		Cell Pressure: Upto 1 MPa Pore pressure Measurement: Upto 0.2 MPa
		Direct Shear Unconsolidated Undrained Consolidated Drained	IS 2720 (Part 13) Clause 5.1 Clause 5.2	Vertical stress: 0.005 MPa to 0.3 MPa Shearing stress: Upto 2500 N Strain: 25 mm
		Consolidation	IS 2720 (Part 15)	0.005 MPa to 1 MPa
		Laboratory California Bearing Ratio	IS 2720 (Part 16)	1 % to 100 %
		Permeability Constant Head Falling Head	IS 2720 (Part 17) Clause 5 Clause 6	 10^{-3} cm/s to 10^{-10} cm/s 10^{-3} cm/s to 10^{-10} cm/s
		Free Swell Index	IS 2720 (Part 40)	Upto 300 %
		Swell Pressure	IS 2720 (Part 41)	0.01 MPa to 0.78 MPa
2.	**Soil/Flyash**	Vane Shear	IS 2720 (Part 30)	Shear Strength 0.078 kg/cm^2 to 1.26 kg/cm^2
3.	**Rock / Building Stone**	Unconfined Compression	IS 9143 IS 1121 (Part 1)	1 MPa to 800 MPa. (NX size)
		Point Load	IS 8764	0.5 kN to 100 kN
		Slake Durability	IS 10050	Upto 100 %
		Split Tensile by Brazillian Method	IS 10082	1 MPa to 500 MPa
		Rock Hardness	IS 12608	1 to 9
		Permeability	IS 4348	0.1 MPa to 2.8 MPa (Pressure)
		Oblique Shear	SOP No. GS/MM/02	1 MPa to 200 MPa
		Modulus of Elasticity and Poisson's Ratio	IS 9221	E=1X10^2 to 10^6 MPa μ=0.01 to 0.6

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
		Triaxial Shear on Rock Specimen	IS 13047	C =0.5 MPa to 10 MPa Cell pressure Upto 1000 kN vertical load
		Water Absorption	IS 13030	1 % to 25 %
		Specific Gravity	IS 13030	1 to 4
		Wet/Dry Density	IS 13030	1 to 5
		Porosity	IS 13030	0.01 to 0.1
II.	**BUILDING MATERIAL**			
1.	**Aggregate (Coarse/Fine)**	Sieve Analysis	IS 2386 (Part 1)	0.075 mm to 4.75 mm 4.75 mm to 125 mm
		Silt/Clay Content	IS 2386 (Part 1)	0.10 % to 10 %
		Water Absorption Specific Gravity	IS 2386 (Part 3)	0.1 % to 25 % 2 to 4
		Soundness by Sodium Sulphate & Magnesium Sulphate	IS 2386 (Part V)	0.1 % to 18 %
		Deleterious Material & Organic Impurities	IS 2386 (Part 2)	Qualitative (Upto 10 % & Organic Impurities)
2.	**Aggregate (Fine)**	Bulking of Fine Aggregate	IS 2386 (Part 3)	5 % to 60 %
3.	**Aggregate (Coarse)**	Flakiness Index	IS 2386 (Part 1)	5 % to 70 %
		Elongation Index	IS 2386 (Part 1)	5 % to 70 %
		Crushing Value	IS 2386 (Part 4)	Upto 50 %
		Impact Value	IS 2386 (Part 4)	2 % to 50 %
		Los Angeles Abrasion	IS 2386 (Part 4)	1 % to 60 %
		10% Fine Value	IS 2386 (Part 4)	5 kN to 250 kN
		Bulk Density & Voids	IS 2386 (Part 3)	1 kg/l to 3 kg/l
		Striping Value	IS 6241	Qualitative

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
4.	**Bitumen (Paving/Industrial/ Modified)**	Penetration Value	IS 1203	1 $_{1/10}$ mm to 300 $_{1/10}$ mm
		Ductility	IS 1208	1 cm to 100 cm
		Softening Point	IS 1205	Up to 100 °C
		Specific Gravity	IS 1202	0.5 to 1.2
		Penetration after Thin Film Oven	IS 9382 IS 1203	5 mm to 100 mm
		Ductility after Thin Film Oven	IS 9382 IS 1208	10 mm to 1000 mm
		Flash & Fire Point by Cleveland Open Cup	IS 1448 (Part 69)	175 °C to 360 °C
		Kinematic Viscosity	IS 1206 (Part III)	200 centistokes to 700 centistokes
		Absolute Viscosity	IS 1206 (Part II)	600 poise to 6000 poise
5.	**Bituminous Mix**	Marshall Stability	Based on MS2 of Asphalt Institute Handbook	100/150 mm diameter 1 kN to 50 kN load 1 mm to 10 mm flow
		Bitumen content	IRC : SP 11 (Appendix C)	0.1 % to 15 %
6.	**Cement (OPC-33,43-43S,53-53S grade Slag Cement-PPC Cement)**	Fineness by Sieving	IS 4031 (Part 1)	1 % to 20 %
		Fineness by Blaine's air Permeability	IS 4031 (Part 2)	(50 sq. m/kg to 700 sq. m/kg)
		Soundness - By Le-Chatelier method By Autoclave Method	IS 4031 (Part 3)	0.1 mm to 10 mm ± 0.01 % to 5 %
		Normal Consistency	IS 4031 (Part 4)	20 % to 40 %
		Setting Time Initial	IS 4031 (Part 5, Clause 5.2)	30 minutes to 400 minutes
		Setting Time Final	Clause 5.3	60 minutes to 700 minutes
		Compressive Strength of Hydraulic cement Compressive strength of Masonry Cement	IS 4031 (Part 6) IS 4031 (Part 7)	0.4 MPa to 80 MPa

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
		Drying Shrinkage	IS 4031 (Part 10)	± 0.01 % to 5 %
		Density	IS 4031 (Part 11)	2.8 to 3.3
7.	**Flyash**	Fineness by sieving	IS 1727	Upto 75 %
		Specific Surface	IS 1727	50 sq. m/kg to 700 sq. m/kg
		Soundness - By Le Chattelier Method By Autoclave Method	IS 1727	0.1 mm to 10 mm ± 0.01 % to 5 %
		Consistency	IS 1727	20 % to 40 %
		Initial Setting Time	IS 1727	5 minutes to 300 minutes
		Final Setting Time	IS 1727	30 minutes to 600 minutes
		Compressive Strength	IS 1727	4 MPa to 60 MPa
		Drying Shrinkage	IS 1727	0.01 % to 5 %
		Lime Reactivity	IS 1727	1 MPa to 10 MPa
		Specific Gravity	IS 1727	1.7 to 3.3
8.	**Fresh Concrete**	Slump	IS 1199	upto 200 mm
		Compaction Factor	IS 1199	0.75 to 1 (Dimensionless ratio)
9.	**Concrete**	Compressive Strength	IS 516	1 MPa to 120 MPa
		Flexural Strength	IS 516	2 MPa to 15 MPa
		Hollow /Solid & Foam Cellular Concrete Block Density	IS 2185 (Part 1) IS 2185 (Part 4)	1600 kg/m^3 to 3000 kg/m^3
		Hollow /Solid & Foam Cellular Concrete Block Water Absorption	IS 2185 (Part 1) IS 2185 (Part 4)	1 % to 50 %
		Hollow/ Solid & Foam Cellular Concrete Block Compressive Strength	IS 2185 (Part 1) IS 2185 (Part 4)	1 MPa to 35 MPa
10.		Density	IS 6441 (Part 1)	200 kg/m^3 to 1400 kg/m^3

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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
	Autoclave aerated Concrete Block	Moisture Content	IS 6441 (Part 1)	1 % to 30 %
		Compressive Strength	IS 6441(Part 5)	1 MPa to 35 MPa
11.	**Burnt Clay Bricks/ Flyash Bricks/ Flyash Lime Bricks**	Compressive Strength	IS 3495 (Part 1)	1 MPa to 50 MPa
		Water Absorption	IS 3495 (Part 2)	1 % to 50 %
		Efflorescence	IS 3495 (Part 3)	Qualitative
		Dimension	IS 1077 IS 12894 IS 13757	10 mm to 5000 mm
12.	**Concrete Flooring Tiles**	Water Absorption	IS 1237	1 % to 25 %
		Wet Transverse Strength	IS 1237	1 MPa to 8 MPa
		Resistance to wear	IS 1237	0.1 mm to 10 mm
13.	**Glazed / Ceramic Tiles**	Water Absorption	IS 13630 (Part 2)	Upto 25 %
		Crazing Resistance	IS 13630 (Part 9)	Qualitative
		Resistance to deep Abrasion	IS 13630 (Part 11)	67 mm^3 to 227 mm^3
14.	**Ceramic Tiles**	Modulus of Rupture	IS 13630 (Part 6)	0.10 MPa to 50 MPa
		Scratch Hardness	IS 13630 (Part 13)	1 Mohs to 9 Mohs
15.	**Glazed Tiles**	Chemical Resistance	IS 13630 (Part 8)	Qualitative
16.	**Ceramic Unglazed Vitreous Acid Resisting Tiles**	Water Absorption	IS 4457	0.01 % to 5 %
		Flexural Strength	IS 4457	5 MPa to 75 MPa
		Resistance to Acid	IS 4457	0.10 % to 5 %
		Resistance to deep Abrasion	IS 4457	67 mm^3 to 227 mm^3
17.	**Integral Water Proofing compound**	Setting Time	IS 4031 (Part 5)	30 minutes to 700 minutes
		Compressive strength	IS 4031 (Part 6)	1 MPa to 80 MPa
18.	**Concrete Paving Blocks**	Compressive Strength	IS 15658	10 MPa to 95 MPa
		Water Absorption	IS 15658	1 % to 25 %
		Resistance to wear	IS 15658	2000 mm^3 to 15000 mm^3
		Flexural	IS 15658	1 MPa to 15 MPa

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
19.	**Timber**	Moisture Content	IS 1708 (Part 1)	Upto 25 %
		Specific Gravity	IS 1708 (Part 2)	0.6 to 3
20.	**Door Shutters**	Knife	IS 4020 (Part 14)	Qualitative
		Glue Adhesion	IS 4020 (Part 15)	Qualitative
		End Immersion	IS 4020 (Part 13)	Qualitative
		Dimension and Squareness	IS 4020 (Part 2)	10 mm to 3000 mm
		General Flatness	IS 4020 (Part 3)	0.10 mm to 10 mm
		Local Planeness	IS 4020 (Part 4)	0.10 mm to 10 mm
		Impact Indentation	IS 4020 (Part 5)	0.10 mm to 10 mm
		Flexure	IS 4020 (Part 6)	0.10 mm to 10 mm
		Edge Loading	IS 4020 (Part 7)	0.10 mm to 10 mm
		Shock Resistance	IS 4020 (Part 8)	Qualitative
		Buckling Resistance	IS 4020 (Part 9)	0.10 mm to 50 mm
21.	**Particle Board**	Water Absorption	IS 2380 (Part 16)	1 % to 50 %
		Swelling due to thickness	IS 2380 (Part 17)	1 % to 20 %
		Modulus of Rupture	IS 2380 (Part 4)	0.5 MPa to 25 MPa
		Density	IS 2380 (Part 3)	4 g/cc to 12 g/cc (400 to 1200 kg/cu.m)
		Moisture Content	IS 2380 (Part 3)	1 % to 30 %
		Resistance to steam	IS 12823 IS 2380	Qualitative
		Crack resistance	IS 12823	Qualitative
22.	**Granite / Marble & Stone**	Specific Gravity	IS 1124	2.5 to 5.0
		Water Absorption	IS 1124	0.10 % to 10 %
		Hardness by Mho's scale	IS 13630 (Part 13)	1 to 9
23.	**Chequered Tiles**	Water Absorption	IS 13801	1 % to 25 %
		Wet Transverse Strength	IS 13801	0.50 MPa to 10 MPa
		Resistance to wear	IS 13801	0.10 mm to 5 mm
III.	**MECHANICAL PROPERTIES OF METALS**			

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
1.	**Reinforcement Mild Steel & medium Tensile bars and hard drawn steel wires for concrete reinforcement. and HSD bars / Structural Steel**	Ultimate Tensile Strength	IS 1608	200 N/mm^2 to 800 N/mm^2
		Yield / 0.2 % Stress	IS 1608	200 N/mm^2 to 600 N/mm^2
		% Elongation	IS 1608	1 % to 50 %
		Nominal unit weights of steel reinforcement	IS 1786	1 N/m to 500 N/m
		Bend	IS 1599	Qualitative (6 mm to 32 mm 180°)
2.	**Reinforcement / Steel**	Re-Bend	IS 1599	Qualitative (6 mm to 32 mm 135° & 157.5°)

MECHANICAL TESTING

AT SITE				
I.	**SOIL & ROCK**			
1.	**Soil / Rock**	Plate Load	IS 1888	On Plate size 30, 45, 60 cm 5 kN to 1000 kN
		Cyclic Plate Load	IS 5249 (Clause 6)	On Plate size 30, 45, 60 cm 5 kN to 1000 kN
		Load Test on In-Situ Footing	IS 10042	50 kN to 4000 kN
		Standard Penetration	IS 2131	5 blows to 50 blows
		Dynamic Cone Penetration	IS 4968 (Part 1)	Using 50 mm Cone 0.5 m to 10 m in overburden

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
				1 blows to 35 blows for 100 mm
		Modulus of Subgrade Reaction	IS 9214	0.02 MPa/mm to 0.2 MPa/mm
		Field CBR	IS 2720 (Part 31)	On all types of soils 1 % to 100 %
		In Situ Density By Core Cutter By Sand Replacement By Water Replacement	IS 2720 (Part 29) IS 2720 (Part 28) IS 2720 (Part 33)	Soil 4.75 mm and below On any type Of Soil other than bouldery On Bouldery soil 15 kN/cu.m to 25 kN/cu.m
		Geophysical Investigation (by electrical resistivity method)	IS 1892 (Clause 3.2)	Qualitative
2.	**Foundation Stratum**	Block Vibration	IS 5249 (Clause 5)	Frequency: Upto 60 hz Amplitude: Upto 3000 µ
3.	**Cast-In-Situ RCC Concrete Piles**	In Situ Pile Load by Maintained Load Method Compression Pull Out Cyclic Loading Method	IS 2911 (Part 4) Clause 6.2 Clause 8 Clause 6.3	 Upto 2000 kN Upto 5000 kN Upto 2000 kN
4.	**WBM / Bituminous Surface**	Benkelman Beam	IRC 81	0.5 mm to 25 mm.
5.	**Rock Anchors / Foundation Bolts**	Pull-out	IS 11309	5 kN to 2000 kN

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NON - DESTRUCTIVE TESTING

Sl.	Product / Material of Test	Specific Test Performed	Test Method Specification against which tests are performed	Range of Testing / Limits of Detection
I.	**BUILDING MATERIALS - REINFORCED CONCRETE STRUCTURES**			
1.	**Reinforced Concrete / Reinforced Concrete Structural Members**	Rebound Hammer	IS 13311 (Part 2)	upto 65 R (10 MPa to 70 MPa)
		Ultrasonic Pulse velocity	IS 13311 (Part 1)	upto 6 Km/sec.
		Cover Depth	BS 1881 (Part 204)	1 mm to 80 mm
		Carbonation Depth	BS 1881 (Part 201, Clause 2.22)	Upto 200 mm
		Half-Cell Potential	ASTM C876	±1 mV to ±999 mV
		Load	IS 456 (Clause 17.6)	0.01 mm to 25 mm
		Concrete Resistivity	IAEA,VIENNA IAEA-TCS ISSN 1018-5518 Austrian Guide (SOP No : GS/MM/15 - 4.8)	Upto 99 kΩcm

Ram Ashray
Convenor

Birendra Prasad Murmu
Program Manager

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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
2.	**Reinforced Concrete / Steel Bridges**	Bridge Span	IRC : SP 51	0.1 mm to 25 mm

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Convenor

Birendra Prasad Murmu
Program Manager