TECHNICAL SPECIFICATIONS OF

SUPPLY, ERECTION, INSTALLATION, TESTING & COMMISSIONING OF 33 kV TRANSMISSION LINE, 433 V LT DISTRIBUTION PANELS, AND ASSOCIATED CABLES AT MBRAPP SITE

TABLE OF CONTENT:

SITE SPECIFIC DETAILS

i. LOCATION AND GENERAL DETAILS

a. **MBRAPP Plant Site:** The Mahi-Banswara, proposed NPP site (MBRAPP) is situated on the right bank of the Mahi River, about 12.8 km radially upstream of Mahi-Bajaj Sagar dam. The nearest villages to the site are Napla, Rel, Adibheet and Sajwania. The site lies in Banswara district of Rajasthan state. Approximate geographical location of plant site is at 74°34'37" E longitude and 23°31'47" N latitude, covered in Survey of India toposheet (1:50,000 scale) no. F43C7.

b. **MBRAPP Township site:** The nearest village to the township site is Khandiyadev. The township is located in Abapura Tehsil, Banswara district, Rajasthan.

ii. SITE CONDITIONS

In the northern side of the site, topography is generally plain and ground levels are gradually increasing. In the eastern side, there are hillocks in the Sarwan Deri block forest with elevation going up to RL +420m (height of about 130m from site level). In the western side is the reservoir and topography in the southern side is generally plain. The mean wind speed varies from 1 to 9 km/hr round the year. The rainfall data (1976-82) indicates average yearly rainfall of 830 mm. Average ambient temperature at site is 30.40C, extreme maximum temperature is 44.80C and minimum temperature is 7.60C.

iii. ACCESS

Mahi-Banswara site can be accessed by following ways:

By Road

Mahi Banswara site is at a distance of approximately 28km from Banswara towards Ratlam (MP) on NH-927A. Ratlam city is at a distance of approximately 85km from Banswara via NH-927A. Jaipur, the state capital is about 550 km by road from the site.

Additionally, the site is located 48 km from the NE4 Delhi-Mumbai Expressway.

By Rail

The nearest broad-gauge rail head to the site is at Ratlam on the Kota-Ratlam section of Western Railway at a distance of about 60 km from the site.

By Air

Udaipur and Indore are the nearest Airports at road distances of 180 km and 210 km respectively.

MBRAPP Township site: Approximately 7Km from Site office in direction of Banswara on NH-927A

1. BRIEF SCOPE OF WORK:

1.1. Supply, Erection, Installation, Testing & Commissioning (SEITC) of 33 kV Transmission Line:

The work includes supply, erection, testing, and commissioning of a 33 kV overhead transmission line with all associated fittings and accessories as per relevant IS standards and approved drawings.

i. Supply and fixing of 33 kV pin insulators with galvanized steel pins, nuts, and conductor binding as per IS:731 / IS:1445.
ii. SITC of 33 kV disc insulators (minimum 3 per string) with ball & socket fittings for tension/angle poles as per IS:731 / IS:2486.
iii. Supply and stringing of ACSR DOG conductor (as per IS:398 (Part II)) with proper sag, tension, jumpering, and binding.
iv. Supply, fabrication, hot-dip galvanizing, transport, erection, alignment, and grouting of 36 Ft (≈11.0 m) self-supporting lattice steel tower (Type equivalent to 410-SP-55), conforming to IS:802 (Part 1/Sec 1), IS:5613 (Part 2/Sec 1), and IS:4759, complete with RCC foundation (M20), muffing (1:2:4), earthing (GI bolt/strip), and numbering, as per approved drawings and site instructions.
v. SITC and stringing of GI guard wire as per **IS:2276**, with proper earthing and tension at crossings.
vi. Execution of all necessary civil works required for the 33 kV overhead line.

1.2. Supply, Erection, Installation, Testing & Commissioning of 433 V LT Distribution Panels

Supply, installation, testing, and commissioning of a 433 V, 3-phase, 4-wire LT 100KW and 25KW Distribution Panels comprising MCCBs/MCBs, meters, busbars, and complete internal wiring. The enclosure shall be made of CRCA sheet steel, dust- and vermin-proof, conforming to IS:8623 / IS:13947, and shall include proper earthing, glanding, and identification markings as per TS

1.3. Supply of Cable, PVC Casing & Accessories

Supply of 1.1 kV grade, copper conductor, PVC insulated/sheathed cables and accessories conforming to IS:1554 (Part I) or IS:7098 (Part I):

i. 4 Core × 2.5 sq.mm Copper PVC Cable
ii. 3 Core × 2.5 sq.mm Copper PVC Cable
iii. 2 Core × 1.5 sq.mm Copper PVC Cable
iv. PVC casing, capping, elbows, junction boxes, and mounting accessories as per IS:14927

1.4. The contractor shall be responsible for all necessary tools, materials, labour, supervision, testing instruments, and quality control as required to complete the scope.

1.5. The contractor shall solely remain responsible for safe delivery of items including loading and unloading at the Purchaser's site.

1.6. It is important to note that the specifications provided are generalized. The execution of the work includes all minor details of design and construction that are inherently necessary for the project's completion, even if not explicitly mentioned in these documents. All work shall be carried out in accordance with standard engineering practices, the latest relevant Indian Standard codes, and the instructions of the Engineer-in-Charge.

1.7. The contractor shall submit the following documentation from the Original Equipment Manufacturer (OEM) of 36 FT LATTICE TOWER and Panel: Test Certificates, Drawings and Brand Catalogues, Minimum one year Warranty Certificates.

2. LIST OF IS CODE:

S. No.	Item Description	Applicable IS Code(s)
i.	33 kV Transmission Line	IS:5613 (Part 1 & 2) – Code of Practice for Design, Installation and Maintenance of Overhead Power Lines (up to and including 33 kV).
ii.	Pin Type Insulator with Fittings	IS:731 – Porcelain Insulators for Overhead Power Lines with Nominal Voltage Greater than 1,000 V. IS:1445 – Fittings for Porcelain Insulators of Overhead Power Lines.
iii.	Disc Type Insulator with Fittings	IS:731 – Porcelain Insulators for Overhead Power Lines with Nominal Voltage Greater than 1,000 V. IS:2486 (Part 1 to 3) – Insulator Fittings for Overhead Power Lines.
iv.	'DOG' ACSR Conductor	IS:398 (Part II) – Aluminium Conductors, Galvanized Steel Reinforced (ACSR).
v.	36Ft Lattice Tower	IS 802 (Part 1/Sec 1):1995 – Design; IS 5613 (Part 2/Sec 1):1985 – Erection; IS 800 – General Construction; IS 875 (Part 3):2015 – Wind Loads; IS 4759 – Galvanizing; IS 1367 – Fasteners; IS 2062 – Steel
vi.	Guard Wire	IS:2276 – Galvanized Stranded Steel Wire for Overhead Power Lines. IS:2629 – Recommended Practice for Hot-Dip Galvanizing of Iron and Steel.
vii.	433 V LT Distribution Board	IS:8623 (Part 1 & 2) – Low Voltage Switchgear and Control gear Assemblies — General Requirements. IS:13947 (Part 1–5) – Low-Voltage Switchgear and Control gear. IS:2147 – Degree of Protection Provided by Enclosures for Low-Voltage Switchgear.
viii.	1.1 kV Grade Copper PVC Insulated / Sheathed Cable (All sizes)	IS:1554 & IS:7098
ix.	PVC Casing, Capping & Accessories	IS:14927 (Part 1 & 2)

3. SUPPLY, ERECTION, INSTALLATION, TESTING AND COMMISSIONING OF 33KV TRANSMISSION LINE

3.1 Polymer Pin Insulator with Conductor Holding Fitting (33 kV)

Sr No	Specification	Value/Range
i.	Rated Voltage	33 kV
ii.	Creepage Distance	400–500 mm
iii.	Impulse Withstand Voltage	170 kV
iv.	Power Frequency Withstand Voltage	50 kV
v.	Max Mechanical Load	600–1000 kg
vi.	Pin Diameter	10–20 mm
vii.	Height	350 mm to 450 mm
viii.	Outer Diameter	160 mm to 200 mm
ix.	Material	Polymer (Silicone Rubber)
x.	Cantilever Strength	250–500 kg
xi.	Pollution Degree	Class 3
xii.	Standard Compliance	IS 731, IEC 61109
xiii.	Weather Resistance	UV, Ozone, and Weather Resistant
xiv.	Corrosion Resistance	High resistance to corrosion
xv.	Fitting Material	Galvanized forged steel or malleable iron
xvi.	Certifications	BIS Certification, Routine Test Certificate of OEM

3.2 Polymer Disc Insulator with Conductor Holding Fitting (33 kV)

Sr No	Specification	Value/Range
i.	Rated Voltage	33 kV
ii.	System Configuration	3-phase
iii.	Creepage Distance	400–500 mm
iv.	Impulse Withstand Voltage	170 kV
v.	Power Frequency Withstand Volt	50 kV
vi.	Max Mechanical Load	1000–1500 kg
vii.	Conductor Holding Fitting	Suitable for ACSR DOG Conductor
viii.	Material (Housing/Sheath)	Polymer (Silicone Rubber/EPDM)
ix.	Core Material	Fiberglass/Glass Fiber Reinforced Epoxy Resin
x.	Cantilever Strength	1500–2500 N
xi.	Pollution Degree	Class 3
xii.	Standard Compliance	IS 731, IEC 61109, IEC 60383
xiii.	Weather Resistance	UV, Ozone, and Weather Resistant
xiv.	Corrosion Resistance	High resistance to corrosion
xv.	Disc Diameter	180 mm to 250 mm
xvi.	Weight (per Disc)	Typically, 5–10 kg
xvii.	Conductor Size	Suitable for conductors up to ACSR 30 mm^2 or equivalent
xviii.	Conductor Holding Fitting Material	Steel or Aluminum Alloy
xix.	Applications	33 kV 3-phase overhead transmission and distribution lines
xx.	Breakdown Strength	≥ 120 kN
xxi.	Mechanical Test	20 kN cantilever test
xxii.	Certifications	BIS Certification, Routine Test of OEM

3.3 'DOG' ACSR Conductor

Sr. No.	Specification	Value
i.	Conductor Type	ACSR (Aluminium Conductor Steel Reinforced)
ii.	Conductor Name	DOG (Dragon) ACSR
iii.	Design	6 Aluminium Strands + 1 Steel Strand (6/4.72 mm + 1/4.72 mm)
iv.	Overall Conductor Diameter	14.15 mm (Approx.)
v.	Total Cross-Sectional Area	117 mm² (Al: 99.7 mm² + Steel: 17.8 mm²)
vi.	Approximate Weight	395 kg/km (Al: 315 kg/km + Steel: 80 kg/km)
vii.	DC Resistance at 20°C	0.272 Ω/km
viii.	Rated Tensile Strength (UTS)	13.3 kN (Approx.)
ix.	Current Carrying Capacity	235 A (at 75°C ambient, wind 1 m/s)
x.	Continuous Operating Temperature	Up to 75°C
xi.	Application Voltage	Suitable for 33 kV overhead lines
xii.	Standard of Manufacture	IS 398 (Part II): 1996 / IEC 61089
xiii.	Corrosion Resistance	Galvanized steel core ensures long-term corrosion protection
xiv.	Weather & UV Resistance	High resistance to UV and atmospheric conditions
xv.	Typical Span Length	100 – 150 m (depending on terrain and loading)
xvi.	Breaking Load (per conductor)	13 – 14 kN (Approx.)
xvii.	Connection/Connectors	All necessary connectors required for integrating the existing line with the new line shall be supplied and installed by the contractor. The scope include two connection as follows: a. Tee / Tap point connection, and b. Compression joint sleeve / mid-span joint as applicable.
xviii.	Certificates / Testing	BIS Certification, Routine Test Certificate, NABL accredited Lab Reports

3.4 36 FT LATTICE TOWER

Sr. No.	Description	Specification / Requirement
i.	Application	33 kV Single Circuit Transmission line
ii.	Type of Tower	Self-supporting, 4-leg, square-base lattice steel structure
iii.	Overall, Height	36 ft (≈ 11.0 m) from finished ground level to top hamper
iv.	Design Standards	
v.	Wind Design	Wind Zone IV – Basic wind speed 47 m/s (≈ 150 kg/m² pressure)
vi.	Seismic Design	IS 1893 Zone II / III as applicable to Rajasthan
vii.	Tower Geometry	Four-leg square base; Top width ≈ 0.8 m; Base width ≈ 0.8 m; Height ≈ 11 m
viii.	Main Leg Members	Angle L 50 × 50 × 6 mm (IS 2062 Gr. E250)
ix.	Bracing Members	Angle L 50 × 50 × 6 mm / L 45 × 45 × 5 mm
x.	Cross Arm	MS Channel 100 × 50 × 6 mm; Span 2120 mm; Weight ≈ 22 kg
xi.	Top Hamper	MS Flat 50 × 10 mm; Length ≈ 1015 mm; Weight ≈ 4 kg
xii.	Cleats / Brackets	MS Flat 50 × 6 mm; Cleat length 100 mm; Ø26 mm holes

xiii.	Welding	Continuous fillet welds (IS 9595); bracings welded to legs
xiv.	Bolt Holes	Ø17.5 mm for M16 bolts; spacing 230–294 mm c/c
xv.	Fasteners	Galvanized HT Bolts & Nuts (Grade 8.8 / IS 1367) with washers
xvi.	Material	Structural steel (IS 2062 E250 / Fe 410)
xvii.	Fabrication	Cutting, drilling, punching and welding as per approved drawings; parts numbered for erection
xviii.	Galvanizing	Hot-dip (IS 4759); min 610 g/m² (≈ 87 µm) zinc coating
xix.	Surface Finish	Smooth; no runs, lumps, or uncoated areas
xx.	Typical RCC Foundation Detail	Type: Isolated Pad Foundation (one per leg) Foundation Size: 0.9 m × 0.9 m × 1.2 m deep per leg (typical as required) Concrete Grade: M25 PCC Bed: 1:4:8 (100 mm thick) Reinforcement: 10 mm Ø @ 150 mm c/c (both ways, 2 layers) Stub / Anchor: L 50 × 50 × 6 mm – 462 mm long; projection ≈ 75 mm Backfilling with proper compaction and watering.
xxi.	Earthing	One 10 mm GI earthing stud per leg; resistance < 10 Ω on each Tower
xxii.	Weight of Structure	≈ 850 – 1000 kg (0.85 – 1.0 MT) including cross arm & hardware
xxiii.	Deflection Limit	≤ H / 150 ≈ 73 mm (max at top)
xxiv.	Verticality Tolerance	≤ H / 1500 ≈ 7 mm
xxv.	Conductor Attachment	Cross-arm drilled for 33 kV disc/pin insulators,
xxvi.	Guard/Ground Wire Provision	One hook at top hamper
xxvii.	Accessories	Step bolts, anti-climbing device (3 m barbed wire), danger/phase/number plates
xxviii.	Testing & Inspection	Visual, galvanizing thickness, bolt torque, trial assembly test
xxix.	Documentation	GA drawing, member list, foundation drawing, material certificates
xxx.	Warranty	5 years against material
xxxi.	Painting / Finish	Normally unpainted (fully galvanized); aviation paint if required (IS 1477)

3.5 SUPPLY AND INSTALLATION OF GUARD WIRE FOR 33 KV LINE

Sr. No.	**Description**	**Specification / Requirement**
i.	Material	High-quality Galvanized Iron (GI) wire conforming to IS 280.
ii.	Wire Gauge	8 SWG
iii.	Nominal Diameter	Approximately 3.264 mm (often specified as 4 mm nominal).
iv.	Type	Bare, round wire – not insulated.
v.	Finish	Bright, smooth, and uniformly hot-dip galvanized for corrosion resistance. Coating shall be continuous and adherent.
vi.	Galvanization	As per IS 4826 with minimum zinc coating of 270 g/m² (Class A).
vii.	Tensile Strength	Between 350 N/mm² and 550 N/mm² (≈ 56–95 kgf/mm²).
viii.	Elongation	Minimum 10% on a 250 mm gauge length test piece.

ix.	Breaking Load	Not less than 3.0 kN for 8 SWG GI wire.
x.	Shape & Tolerance	Round, smooth, uniform diameter within ±2.5% tolerance.
xi.	Electrical Conductivity	Not less than 10% of annealed copper at 20°C.
xii.	Installation	Guard wire shall be strung under specified tension, properly earthed at each support, and securely clamped to guard brackets with required sag and clearance as per IS 5613.
xiii.	Earthing	To be effectively earthed at each Tower using galvanized MS flat/earth wire and suitable clamps.
xiv.	Inspection & Testing	Material to be tested for diameter, tensile strength, coating, and adhesion as per IS standards. NPCIL reserves the right to inspect at manufacturer's works.

3.6 STAY WIRE WITH PIT AND ACCESSORIES (FOR 33 KV LINE)

Sr. No.	Description	Specification / Requirement
i.	System Voltage	33 kV
ii.	Stay Wire Material	Galvanized Mild Steel (G.I.) stranded wire, 7/3.15 mm or 7/4.0 mm (as per design requirement), confirming to IS 280.
iii.	Galvanization	Hot-dip galvanized as per IS 2629 / IS 4826 with minimum zinc coating of 300 g/m².
iv.	Stay Set Components	Each stay set shall comprise the following: • Stay wire (G.I.) of required length (typically 8–10 m for 11–33 kV lines) • Stay rod with eye/plate (dia = 16–20 mm, length = 1800 mm min.) • Stay insulator (porcelain or polymer type as per IS 5300) • Stay bow and thimble • Turn buckle / tensioning arrangement • Nuts, bolts, and washers (G.I.)
v.	Stay Rod & Anchor Plate	Stay rod: 16 mm (min), hot-dip galvanized, with threaded ends, complete with nuts, washers, and eye hook. Anchor plate: Mild Steel plate 300 × 300 × 6 mm (min), hot-dip galvanized, welded or bolted to rod as per design.
vi.	Stay Pit / Foundation	Excavation & PCC (Min M-25) size: Minimum 450 m × 450 m × 900 m with proper curing, Grouting and backfilling to ensure firm anchorage.
vii.	Stay Insulator	Porcelain type (egg insulator) as per IS 5300 / IEC 60383; mechanical strength ≥ 88 kN; suitable for 33 kV system. Polymer type (if used) shall conform to IEC 61109.
viii.	Installation	Stay shall be installed at the designed angle opposite to the direction of conductor strain. Proper tension to be maintained using turn buckle.
ix.	Protection & Earthing	Stay wire to be bonded and earthed as per standard practice for 33 kV lines to avoid induced potential.
x.	Painting / Finishing	All exposed mild steel components (except galvanized items) shall be cleaned, primed, and painted with two coats of aluminium paint over red oxide primer.
xi.	Typical Assembly	Stay rod with anchor plate grouted in RCC pit; stay wire connected to Tower through stay insulator, stay bow, and thimble arrangement with proper tensioning.

4. SUPPLY, ERECTION, INSTALLATION, TESTING AND COMMISSIONING OF 433V LT DISTRIBUTION PANELS

4.1 100 KW LT DISTRIBUTION PANEL

Sr. No.	Description	Specification
i.	System Voltage	433 V ±10%, 3-Phase, 4-Wire, 50 Hz AC supply
ii.	Type of Panel	Indoor, floor-mounted, free-standing, dust and vermin-proof, totally enclosed cubicle type LT Distribution Panel
iii.	Applicable Standards	IS 8623 / IEC 61439 (Low Voltage Switchgear Assemblies), IS 4237 (General Requirements), IS 13947 (Switchgear & Control gear)
iv.	Form of Construction	Form-2B (or higher as per site requirement), with segregated busbar, incoming, and outgoing compartments
v.	Rated System Capacity	Total connected load: 100 kW (at PF = 0.8)
vi.	Indicators	RYB Indicators, ON/OFF Indicators
vii.	Incoming Supply	433 V, 3-Phase, 4-Wire AC from 33/0.433 kV Transformer or MRSS LT Bus
viii.	Incoming Circuit Breaker	2 No. × 225 A, 4-Pole MCCB, 36 kA breaking capacity, adjustable thermal & magnetic trip, conforming to IS 13947-2
ix.	Outgoing Feeders	4 Nos. × 63 A, 4-Pole MCBs for 25 kW feeders each + 2 Nos. spare 4-Pole MCBs (each 63 A)
x.	Busbar Details	Copper busbar rated 225 A continuous, 3-phase & neutral, tinned electrolytic copper, air-insulated; min. cross-section 125 mm^2 (e.g., 40 mm × 3 mm)
xi.	Neutral Busbar	Full-rated copper neutral busbar, adequately sized for 100% of phase current
xii.	Earth Busbar	Two tinned copper strips of 25 mm × 3 mm running full length of panel with provisions for double earthing
xiii.	Cable Termination	Bottom entry suitable for aluminum/copper cable lugs with cable glands; adequate space for termination and maintenance
xiv.	Panel Enclosure	CRCA sheet steel, minimum 2.0 mm thick for load-bearing members and 1.6 mm for doors and covers; epoxy powder coated (Siemens grey or RAL 7032)
xv.	Ingress Protection	IP 52 (for indoor installation) as per IS 12063
xvi.	Metering & Indication	Digital multifunction meter (Volts, Amps, kW, PF, Frequency) on incoming feeder; R/Y/B indication lamps, voltmeter with selector switch
xvii.	Protection Features	Short-circuit, overload, earth fault, and under/over-voltage protection through MCCB/MCB trip units
xviii.	Busbar Supports	Non-hygroscopic, flame-retardant, high-strength DMC/SMC type supports
xix.	Earthing	Panel shall have two distinct earth terminals for double earthing as per IS 3043
xx.	Cable Supply	Suitable size copper conductor PVC insulated armoured cables for all interconnections (sized per IS 1554/7098)
xxi.	Testing & Inspection	Routine and type tests as per IS 8623/IEC 61439; insulation resistance test, high-voltage test, operational test before dispatch and after installation

xxii.	Painting & Finish	Seven-tank process followed by powder coating; shade RAL 7032/7035
xxiii.	Drawings & Documents	GA drawing, single line diagram, wiring diagram, component layout, and test certificates to be furnished for approval before fabrication
xxiv.	Installation & Commissioning	Includes complete installation, connection, testing, and commissioning of the panel, including termination of incoming/outgoing cables and earthing
xxv.	Warranty	Minimum 12 months from date of commissioning or 18 months from supply, whichever earlier
xxvi.	Make/Approved Manufacturers	L&T / Schneider / Siemens / ABB / C&S or equivalent approved make with approval of consignee
xxvii.	Certificates	OEM Authorization Certificate, BIS Certificate, NABL Certificate or Equivalent certificate

4.2 25KW LT DISTRIBUTION PANEL

Sr. No.	Description	Specification
i.	System Voltage	433 V ± 10%, 3-Phase, 4-Wire, 50 Hz AC Supply
ii.	Type of Panel	Indoor, floor-mounted, free-standing, dust and vermin-proof, totally enclosed cubicle-type LT Distribution Panel
iii.	Applicable Standards	IS 8623 / IEC 61439 (LV Switchgear Assemblies), IS 4237 (General Requirements), IS 13947 (Switchgear & Control gear)
iv.	Form of Construction	Form-2B or higher, with segregated compartments for busbar, incoming, and outgoing feeders
v.	Rated System Capacity	Total Connected Load: 25 kW (at PF = 0.8)
vi.	Incoming Supply	433 V, 3-Phase, 4-Wire AC from LT Bus / Transformer Secondary
vii.	Incoming Circuit Breaker	2 No. × 63 A 4-Pole MCB (10 kA min.) or MCCB (25 kA min.), as per design requirement
viii.	Outgoing Feeders	6 Nos. × Double-Pole (2-Pole) MCBs (10 kA), each feeding a single-phase 230 V load of 6 kW (≈ 26 A); 2 feeders per phase
ix.	Spare Feeders	1 No. × DP MCB (25 A rating) spare for future use
x.	Indicators	RYB Indicators, ON/OFF Indicators
xi.	Busbar Details	Copper busbar rated ≥ 63 A continuous; 3-phase & neutral, tinned electrolytic copper, air-insulated; cross-section ≈ 40 mm × 3 mm (≈ 120 mm^2)
xii.	Neutral Busbar	Full-rated neutral busbar made of tinned copper, rated for 100% of phase current
xiii.	Earth Busbar	Two nos. 25 mm × 3 mm tinned copper strips running full length of panel with terminals for double earthing
xiv.	Cable Termination	Bottom entry type, suitable for Cu/Al cables with proper lugs and cable glands; adequate space for termination
xv.	Panel Enclosure	CRCA sheet steel construction; 2.0 mm thick for load-bearing members and 1.6 mm for doors/covers; epoxy powder-coated (Siemens Grey RAL 7032)
xvi.	Ingress Protection	IP 52 (for indoor installation) as per IS 12063

xvii.	Metering & Indication	Digital multifunction meter (for V, A, kW, PF, Hz) on incoming feeder; R/Y/B phase indicator lamps; voltmeter with selector switch
xviii.	Protection Features	Overload & short-circuit protection through MCB/MCCB; provision for surge protection device (SPD) on incoming side
xix.	Busbar Supports	Non-hygroscopic, flame-retardant DMC/SMC insulating supports
xx.	Earthing	Panel shall be double earthed as per IS 3043; earth continuity provided to all doors and switchgear frames
xxi.	Cable Supply	Suitable size copper PVC insulated armoured cables for incoming (16 mm^2 Cu) and outgoing feeders (4–6 mm^2 Cu), as per IS 1554/7098
xxii.	Testing & Inspection	Routine and type tests as per IS 8623 / IEC 61439; insulation resistance, HV, and operational tests before dispatch and after installation
xxiii.	Painting & Finish	Seven-tank process followed by powder coating; shade RAL 7032/7035
xxiv.	Drawings & Documents	GA drawing, SLD, wiring diagram, and component layout to be submitted for approval prior to fabrication
xxv.	Installation & Commissioning	Complete installation, connection, testing & commissioning of panel including termination of all cables and earthing
xxvi.	Warranty	Minimum 12 months from commissioning or 18 months from supply, whichever earlier
xxvii.	Approved Makes	L&T / Schneider / Siemens / ABB / C&S / Legrand or equivalent approved manufacturer with approval of consignee
xxviii.	Certificate	OEM Authorization Certificate, BIS Certificate, NABL Certificate or Equivalent certificate.

5. SUPPLY OF CABLE, PVC CASING CAPPING & ACCESSORIES.

Sr. No.	Item Description	Technical Specification	Typical Make
5.1	1.1 kV, 4 Core × 2.5 sq.mm Copper PVC Insulated & Sheathed Cable	Conductor: Annealed Class 2 stranded copper as per IS:8130. Insulation: PVC Type A as per IS:5831. Sheath: PVC Type ST-1, black colour. Core Identification: R, Y, B, N. Voltage Grade: 1.1 kV. Conductor Resistance: ≤ 7.41 Ω/km at 20°C.	Havells, Polycab, Finolex, KEI, RR Kabel
5.2	1.1 kV, 3 Core × 2.5 sq.mm Copper PVC Insulated & Sheathed Cable	Conductor: Annealed flexible stranded copper, Class 5 as per IS:8130. Insulation: PVC Type A. Outer Sheath: PVC Type ST-1, grey/black. Core Identification: R, Y, B with reduced neutral. Voltage Grade: 1.1 kV.	Havells, Finolex, Polycab, KEI, RR Kabel
5.3	1.1 kV, 2 Core × 1.5 sq.mm Copper PVC Insulated & Sheathed Cable	Conductor: Fine stranded copper (Class 5) as per IS:8130. Insulation: PVC Type A, colour coded R & B. Sheath: PVC Type ST-1, Voltage Grade: 1.1 kV. Conductor Resistance: ≤ 13.3 Ω/km at 20°C.Temperature Rating: 70°C (continuous).	Havells, Polycab, Finolex, RR Kabel, KEI
5.4	PVC Casing, Capping, Elbows, Mounting Accessories	Material: Rigid uPVC suitable for surface wiring. Sizes: 25mm, Thickness: Min. 1.2 mm ±10%. Colour: White. Accessories (qty will be as per length of Casing) : Screw size 3.5 × 25 mm (CSK or pan head), Wall plug 6 mm plastic anchor, Elbows, bends, T-junctions, couplers, clips & saddles.	Anchor, Avon, Modi, RK Light, Finolex

ADDITIONAL TERMS AND CONDITIONS

NAME OF WORK: SUPPLY, ERECTION, INSTALLATION, TESTING & COMMISSIONING OF 33 kV TRANSMISSION LINE, 433 V LT DISTRIBUTION PANELS, AND ASSOCIATED CABLES AT MBRAPP SITE

1. The Contractor may visit the site as per the consignee address and shall submit the bid after duly assessing the site conditions if required. The quoted rates shall be deemed to include all costs towards transportation, handling, site constraints, and any other risks or contingencies associated with execution of the work.

2. The contractor's scope shall also include coordination with the Chief Electrical Inspector (CEI), DISCOM, or any other competent authority for obtaining all necessary approvals and clearances related to the installation, commissioning, and charging of the complete system, at no additional cost to ASHVINI.

3. **TRANSPORTATION**: The Contractor shall arrange all transportation required for execution of the work. No additional or separate payment shall be made for the same.

4. **SAFETY REQUIREMENTS:**

   4.1 Contractor shall provide proper Safety PPEs such as fluorescent jacket (over coats), Safety helmets, Electrical Gloves & Safety Shoes to staff and workers.
   4.2 For workforce involved with material handling, proper safety gloves shall be provided in order to give adequate protection to the hands.
   4.3 Contractor shall have to acquire work permission in Height.
   4.4 MBRAPP Site will issue the 'Project Instruction' Document on 'Industrial Safety Clauses and the same shall be complied during the execution of the contract.

5. **ELECTRICITY, WATER AND LAND AVAILABILITY:**
   5.1 Availability Electricity from Corporation: Not Available, The contractor shall make their own arrangements for water requirements.
   5.2 Availability of Water Supply by Corporation: Not Available, The contractor shall make their own arrangements at their own cost.
   5.3 Land / Space: Limited open land or space for office, storage, etc., may be allotted based on availability at ₹100/- per acre per year; otherwise, the contractor shall arrange their own.

6. **PAYMENT TERMS**: 100% Payment of PO after Completion of Work incl GST on completion of Erection, Installation, Commissioning and Testing of All items as per BOQ at Site against physical verification and certification of Consignee with submission of following documents:

i. E- Invoice
ii. GST Declaration
iii. Competition Certificate
iv. Consignee Receipt & Acceptance certificate.

7. QUALITY ASSURANCE AND INSPECTION

7.1 All materials shall be of approved make and conform to relevant IS/IEC standards.

7.2 The Engineer-in-Charge (EIC) reserves the right to inspect, test, or reject any material or workmanship not found in accordance with specifications.

7.3 The contractor shall provide OEM test certificates, calibration certificates of instruments, and maintain inspection registers at site.

8. COORDINATION AND APPROVALS

The contractor shall coordinate with CEA / DISCOM / local authorities for obtaining necessary statutory approvals, inspection for system energization.

9. HOUSEKEEPING AND WASTE DISPOSAL

9.1 The contractor shall maintain clean and orderly work areas and dispose of all waste materials as per site norms.

9.2 Scraps and rejected materials shall be removed from site within 15 days of completion or as directed by EIC.

10. LABOUR REGULATIONS

10.1 The contractor shall comply with all applicable **Labour Acts, Workmen Compensation Act, ESI, and EPF regulations.**

10.2 Deployment of **female workers** shall not be permitted between **1800 Hrs and 0700 Hrs** within the plant premises.

10.3 Employment of **minors or medically unfit persons** is strictly prohibited.

11. INSURANCE AND INDEMNITY

11.1 The contractor shall obtain and maintain valid Workmen Compensation, Third-Party Liability, and Equipment Insurance for the full contract period.

11.2 The contractor shall indemnify ASHVINI against all losses, damages, or claims arising from acts of negligence, default, or non-compliance.

12. WARRANTY AND DEFECT LIABILITY

12.1 The contractor shall provide a minimum one-year warranty from the date of commissioning or 18 months from supply, whichever is earlier.

12.2 Any defect found during the warranty period shall be rectified free of cost within 7 days of notification by the Purchaser.

13. SITE ACCESS AND WORK EXECUTION

The contractor shall obtain all necessary entry permits, vehicle passes, gate passes, and work permits from the MBRAPP authorities before commencement of work.

13.1 Entry Passes

i. Contractor's personnel shall submit biodata with photo, address, identification marks, and valid ID proof (Voter ID / Aadhaar / Passport / PAN / etc.) for issuance of a temporary pass (max. 15 days).
ii. Within 15 days, Police Verification and Medical Fitness Certificates must be submitted for issuance of regular photo ID passes.
iii. Minors or medically unfit persons shall not be deployed.
iv. Contractors shall abide by all site security regulations and shall not disclose any confidential information or take photographs without written approval.
v. Female workers are not permitted at site between 1800 hrs and 0700 hrs.

13.2 Gate Passes (Material Movement)

i. Materials, tools, and equipment brought inside shall be accompanied by proper challans and verified by Security at the gate.
ii. All entries and exits shall be recorded in the Material Entry/Exit Register.
iii. Gate passes for movement of materials within or outside MBRAPP premises shall be approved through ASHVINI / Site authorities.

13.3 Vehicle Entry

i. Vehicle entry/exit (trucks, cranes, JCBs, mixers, etc.) shall be controlled through vehicle passes.
ii. Vehicles must have valid registration, insurance, fitness, and driver's licence.

13.4 Mobile Passes

i. Mobile phones are not generally permitted inside the site.
ii. Mobiles without camera or internet may be allowed only with written approval of the competent authority through EIC.
iii. No photography of site or works is permitted without written consent.

13.5 Work Permit

i. Work inside plant areas shall be executed only after obtaining a valid work permit from EIC.
ii. Permits (hot/cold type) are to be applied at least 2 days in advance and shall remain valid for 7–15 days as per site decision.
iii. No permit will be issued without adequate safety arrangements and supervision.
iv. Separate approval is required for night or holiday works.