

	TECHNICAL SPECIFICATION		SPECIFICATION NO. PROJ-ELEC/C&I-TS-MSSS-0007
			REV NO : 00
	PRODUCT	11KV/433V MOBILE-SKID MOUNTED SUBSTATION	DATE : 24/04/2008
			SHEET 17 of 46
f)	Flexible copper connections between hinged doors and cubicle for earthing	:	To be provided
g)	Breaker accessories visible and accessible from outside	:	Mechanical breaker position - Breaker ON / OFF - Mechanical trip push Button accessible from Outside with panel door close. - Mechanical close push button
h)	Removable welded wire mesh behind the panel	:	To be provided wherever necessary.
i)	Danger notice boards and instruction plates	:	To be provided
j)	Operation counter	:	To be provided
k)	i) Components to be mounted on the front door of cubicle	:	Push buttons, control and selector switches (operating height shall not exceed 1800mm) lamps, meters, relays (all as per approved layout)
	ii) Components to be mounted on the outer door of Kioks	:	Nil
l)	Termination type at incomer	:	3 phase, cable termination for 1 No. (3 x 95sq. mm) XLPE cable cable entry from bottom
m)	Cable terminations for outgoing feeders	:	3 phase, cable termination for 1 No. (3 x 95sq. mm) XLPE cable
	Cable	:	Bottom cable entry at the rear Side of cubicle
	Control cable	:	Bottom cable entry at the rear Side of cubicle with necessary Shielding.

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 PSSR PROJECTS	TECHNICAL SPECIFICATION		SPECIFICATION NO. PROJ-ELEC/C&I-TS-MSSS-0007	
			REV NO : 00	
	PRODUCT	11KV/433V MOBILE-SKID MOUNTED SUBSTATION	DATE : 24/04/2008	
			SHEET 18 of 46	
x) Safety clearances in air between : 127mm (Minimum) phases and phase & earth xi) Control schemes : As per specification 1.1 <u>Breaker</u> i) System : 11 KV, 50Hz, 3Phase system neutral earthed ii) Highest system voltage : 12 KV iii) Design ambient : 50 deg C iv) Rated current in IP55 enclosure at 50 deg C ambient : 630A v) Symmetrical breaking capacity at 12 KV or less : 18.4 KA (RMS) vi) Making capacity and dynamic stability rating : 47 KA peak vii) Short time current rating : 18.4 KA for 3 sec viii) Operating duty : 0-3 min- co-3 min – co ix) Total break time : Less than 4 cycles x) Critical current : Shall be restrike free xi) Arc extinction medium : Vacuum xii) First pole to clear factor : 1.5 xiii) Operating Mechanism a) Type of closing : Spring charged stored energy manual independent closing b) Method of closing : Manual and electrical c) Rated voltage of shunt trip : 110 V DC				

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TECHNICAL SPECIFICATION

SPECIFICATION NO.
PROJ-ELEC/C&I-TS-MSSS-0007

REV NO : 00

DATE : 24/04/2008

SHEET 19 of 46

PRODUCT

11KV/433V MOBILE-SKID
MOUNTED SUBSTATION

- d) Operating range : 70 – 110% of rated voltage
- xiv) No. of poles / Phase : One
- xv) No. of breaks / pole : One
- xvi) Auxiliary contacts : 4 No + 4NC (Silver plated contacts)
- xvii) Rating of auxiliary contacts : 5A at 110 V AC
- xviii) Wiring of auxiliary contacts : All auxiliary contacts wired to terminal block, external to draw out truck.
- xix) Material of fixed and moving : Silver plated copper contacts with contacts self. Aligning feature having contact pressures
- xx) Interlock : Door interlock with breaker
- xxi) Breaker fully type tested as per : IEC – 56 and IS 2516
- xxii) There should be provision for shunt trip and series trip. Shunt coil should be rated for 110 V DC.

1.2 Current Transformer

- i) Type : Resin cast, bar primary
- ii) Ratio, burden accuracy class, cores : a) 50 / 25 / 5 / 5A, 15VA, class 1.0 for metering, 5P15 for protection for transformer feeder.
- iii) Short time rating : 18.4 KA for 3 sec.
- iv) Dynamic stability current : 47 KA peak
- v) Insulation level :
 - a) Impulse withstand voltage : 75 KV peak
 - b) PF withstand voltage : 28 KV (RMS)

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	TECHNICAL SPECIFICATION		SPECIFICATION NO. PROJ-ELEC/C&I-TS-MSSS-0007
			REV NO : 00
	PRODUCT	11KV/433V MOBILE-SKID MOUNTED SUBSTATION	DATE : 24/04/2008
			SHEET 20 of 46

vi) Thermal overload capacity : 120% continuous

vii) Applicable standard : IS 2705

1.3 Potential transformers

i) Type : Resin cast, natural air cooled

ii) Ratio : $\frac{11KV}{3} / \frac{110V}{3}$

iii) Connection : Three single phase PT with suitable power pack for DC shunt trip

iv) Rated burden : 20VA / Phase, class 1.0

v) Voltage factor : 1.1 continuous, 1.5 for 30sec

vi) Neutrals : Neutrals to be brought out for earthing on HV and LV side

vii) Insulation level :

a) Impulse withstand voltage : 75 KV (P)

b) PF withstand voltage : 28 KV RMS

viii) Protection

a) HV side : 2 Amp. HT HRC fuse for each phase

b) LV side : Link type HRC fuse

ix) Mounting of PT : Fixed type

x) Applicable standard : IS 3156

1.4 Indicating meters

i) Type of meters : Ammeters, voltmeters

ii) Type of movement : Taut band

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	TECHNICAL SPECIFICATION		SPECIFICATION NO. PROJ-ELEC/C&I-TS-MSSS-0007
			REV NO : 00
	PRODUCT	11KV/433V MOBILE-SKID MOUNTED SUBSTATION	DATE : 24/04/2008 SHEET 21 of 46
iii)	Size	:	96 x 96 mm
iv)	Dial finish	:	White painted dial with pointer type needle
v)	Mounting	:	Flush mounting
vi)	Accuracy Class	:	1.0
vii)	Voltage / current	:	110-V PT, 5A CT sec current
viii)	Range	:	As specified
ix)	Applicable standard	:	IS 1248
1.5	Auxiliary equipment		
(i)	Protection relays	:	Drawout type aux. Voltage 110 V DC
(ii)	Control switches	:	16A, 440V AC quick make quick break, flush mounted stayput / spring return, IS4064
(iii)	Push buttons	:	10A, 440V, 1NO +1 NC flush mounted, IS 1336
(iv)	Indicating lamps	:	110V AC, Clustered LED type.
(iv)	Control circuit protection Fuses	:	Link type HRC fuse with Insulating base with holder
(vi)	Control schemes	:	As per specification
1.6	11KV Load break switch		
(i)	Type of Load break switch (fixed /drawout)	:	Fixed
(ii)	Service (indoor / outdoor)	:	Outdoor
(iii)	Design ambient	:	50 deg C
(iv)	Application standard	:	IS 4710

10/2

 PSSR PROJECTS	TECHNICAL SPECIFICATION		SPECIFICATION NO. PROJ-ELEC/C&I-TS-MSSS-0007
			REV NO : 00
	PRODUCT	11KV/433V MOBILE-SKID MOUNTED SUBSTATION	DATE : 24/04/2008
			SHEET 22 of 46
(v) Installation : Integral part of the ring main switch board (vi) Rated voltage : 11 kV (vii) Rated frequency : 50 Hz (viii) Max. continuous voltage upto which load break switch can be used : 12 kV (ix) Rated current inside cubicle based at specified ambient temperature : 400A quick make and quick break ix) <u>Operating mechanism</u> a) Type of arc quenching : Air break b) Contact material : Silver plated copper c) Provision of stored energy spring charged mechanism : To be provided d) Mechanical trip push button : To be provided x) <u>Switching rating at rated voltage</u> a) Breaking capacity : 630 Amps, 0.7 PF b) Breaking capacity of magnetizing current of transformer : 15 Amps c) Capacitor switching capacity : 60 Amp, 12 kV d) Making Capacity : 47 kA (Peak) e) Electrodynamic withstand capability (without HRC fuses) : 47 kA (Peak) f) Short time rating : 18.4 kA for 1 sec			

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 PSSR PROJECTS	TECHNICAL SPECIFICATION		SPECIFICATION NO. PROJ-ELEC/C&I-TS-MSSS-0007
			REV NO : 00
	PRODUCT	11KV/433V MOBILE-SKID MOUNTED SUBSTATION	DATE : 24/04/2008
			SHEET 23 of 46

xii) Insulation level : Impulse with PF withstand
stand voltage kV
(1.2 / 50) kV (RMS)

- | | | | | |
|----|-------------------------------|---|----|----|
| a) | Across the isolating distance | : | 85 | 45 |
| b) | To earth & between poles | : | 75 | 35 |

xiii) Min. clearance in air in min

- | | | | |
|----|--------------------------|---|-----|
| a) | Between phases | : | 127 |
| b) | To earth & between poles | : | 127 |

II DRY TYPE RESIN CAST TRANSFORMER:

1.0 General

The transformer shall be 500 KVA, 11/0.433 KV, 3Ø, two winding, AN, Dyn 11 Transformer suitable for indoor installation with $\pm 5\%$ off circuit tap changer in steps of 2.5% as per Technical Specification and IS 2026 with all fittings and accessories enclosed. The transformer is fed from HT switchgear. On the LT side, it is connected to LT switchboard through busbar.

1.1 Transformer Rating and Over loading

- (i) Transformers shall be capable of delivering the rated current at a voltage equal to 105 percent of the rated voltage without exceeding the temperature limits.
- (ii) Transformer shall operate satisfactorily without injurious heating at rated kVA, at any voltage within $\pm 10\%$ of the rated voltage of the particular tap.
- (iii) Transformers shall be designed for 50 Hz. $+3\%$, -5% , unless otherwise specified in data sheet.
- (iv) Transformers for two or more limits of voltage or frequency or both shall operate satisfactorily at its rated kVA without injurious heating under all the rated conditions of voltage or frequency or both, provided increase in voltage is not accompanied by decrease in frequency.

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	TECHNICAL SPECIFICATION		SPECIFICATION NO. PROJ-ELEC/C&I-TS-MSSS-0007
			REV NO : 00
	PRODUCT	11KV/433V MOBILE-SKID MOUNTED SUBSTATION	DATE : 24/04/2008
			SHEET 24 of 46

- (v) Transformers shall be suitable for over loading as per IS 6600, unless specified otherwise. Off circuit tap switch, terminal bushings, other auxiliary components / equipment shall be designed for maximum permissible overloading. Short time over loading to the extent of 50% shall be considered for this purpose, for all transformers unless specified otherwise.

1.2 Short Circuit withstand capability

- i) Transformers shall be capable of withstanding thermal and mechanical stresses during 3 phase, line to line, double line to earth and line to ground dead short circuits at the transformer terminals, for a period specified, without any injury. Temperature of the windings prior to the short circuit to be considered for this shall be that corresponding to the maximum permissible value applicable to the overloading cycle specified.
- ii) For this purpose, infinite supply system and solidly earthed systems shall be considered.

1.3 Flux Density

- i) The maximum flux density in any part of the core and yokes at normal voltage and frequency, shall be such that the flux density under over voltage condition as per clause 4.1.2 shall not exceed the maximum permissible values for the type of laminations used and core construction adopted.
- iii) In case of transformers with variable flux, the voltage variation, which would affect flux density at every tap, shall be kept in view while designing the transformer.
- iv) Transformers shall be designed to withstand the following overfluxing conditions:

110% of maximum density : Continuous for all transformers corresponding to rated voltage.

1.4 Magnetic circuit

- (i) The cores shall be constructed from high grade, low loss, high permeability cold rolled non-ageing grain oriented silicon steel laminations.

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 PSSR PROJECTS	TECHNICAL SPECIFICATION		SPECIFICATION NO. PROJ-ELEC/C&I-TS-MSSS-0007
			REV.NO : 00
	PRODUCT	11KV/433V MOBILE-SKID MOUNTED SUBSTATION	DATE : 24/04/2008
			SHEET 25 of 46

- (ii) Thickness of laminations shall be 0.3 mm or less surface insulation of laminations shall be rust resistant and have high interlaminar resistance. Insulation shall withstand annealing temperature as high as 850 deg.C. The insulation shall be resistant to the action of hot cooling medium.
- (iii) The insulation structure for the core to bolts and core to clamp plates shall be such as to withstand a voltage of 2000V AC for one minute.
- (iv) Wherever the CRGO sheets are punched or sheared into laminations, laminations shall be annealed in a non-oxidising atmosphere to relieve stresses and restore the original magnetic properties of CRGO sheets. The laminations shall be free of all burrs and sharp projections.
- (v) The design of magnetic circuit shall be such as to avoid static discharges, development of short circuit paths within itself or to the earthed clamping structure and production of flux components at right angles to the plane of the laminations which may cause local heating.
- (vi) Ducts shall be provided where necessary to ensure adequate cooling. The winding structure and major insulation shall not obstruct the free flow of cooling medium through such ducts.
- (vii) All steel sections used for supporting the core shall be shot or sand blasted after fabrication.
- (viii) The finally assembled core and coil assembly shall be rigidly fixed to the tank to avoid shifting during transport, handling and short circuits. Adequate provision shall be made for lifting the complete core and coil assembly.
- (ix) The supporting frame work of the cores shall be so designed as to avoid the presence of pockets which would prevent complete emptying of the tank through the drain valve, or cause trapping of air during filling.

1.5 Windings

- (i) Transformers shall be suitable for solidly earthed neutral system.
- (ii) The coil clamping arrangement and the finished dimensions of any ducts shall be such as to not impede the free circulation of cooling media through the ducts.

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 PSSR PROJECTS	TECHNICAL SPECIFICATION		SPECIFICATION NO. PROJ-ELEC/C&I-TS-MSSS-0007
			REV NO : 00
	PRODUCT	11KV/433V MOBILE-SKID MOUNTED SUBSTATION	DATE : 24/04/2008
			SHEET 26 of 46

- (iii) The windings / and connection of transformer shall be braced to withstand shocks, which may occur during transport or due to short circuits, repeated peak loads and other transient conditions during service.
- (iv) Windings shall be subjected to a shrinkage treatment before final assembly, so that no further shrinkage occurs during service. Adjustable device shall be provided for taking up any possible shrinkage of coils in service if required.
- (v) The conductors shall be transposed at sufficient intervals in order to minimize eddy currents and equalize the distribution of currents and temperature along the windings.
- (vi) Coil clamping rings shall be of steel or of a suitable insulating material. Axially laminated material other than bakelite paper shall not be used.
- (vii) Completed core and winding assembly shall be dried in full vacuum to eliminate presence of moisture. After drying process, the full assembly shall be impregnated immediately.
- (viii) No strip conductor, wound on edge shall have a width exceeding six times its thickness.
- (ix) The winding material shall be copper
- (x) Windings shall not have sharp bends, which might damage insulation and / or produce high dielectric stresses.
- (xi) Coils shall be supported using dried and high – pressure compressed wedge type insulation spacers at frequent intervals.
- (xii) All threaded connections shall be locked. Leads from the winding to the terminal board and bushings shall be rigidly supported to prevent injury during short circuits / vibration.
- (xiii) Permanent current carrying joints in the windings and leads shall be welded or brazed.
- (xiv) Clamping bolts for current carrying parts inside the transformer shall be compatible with liquid under all service conditions.

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 PSSR PROJECTS	TECHNICAL SPECIFICATION		SPECIFICATION NO. PROJ-ELEC/C&I-TS-MSSS-0007
			REV NO : 00
	PRODUCT	11KV/433V MOBILE-SKID MOUNTED SUBSTATION	DATE : 24/04/2008
			SHEET 27 of 46

1.6 Tappings

- (i) Tapping as specified shall be provided on the higher voltage winding of each transformer and shall be arranged so as to maintain as far as possible the electromagnetic of the windings.
- (ii) The Taps shall be changed by links.

1.7 Temperature Measurement

- i) Winding temperature shall be monitored with RTD's. The RTD leads shall be brought out and connected to temperature scanner.
- ii) Each scanner shall have potential free Normally Open Contacts for alarm and trip contacts. Temperature setting of each contact shall be independently adjustable at site. A manual reset type maximum temperature indicator shall be provided for each scanner.
- iii) All contacts shall be rated to make 0.5 A (min) and break 0.2 A (min) at 110 V AC. All contacts shall be wired to marshalling box.

1.8 Internal earthing arrangements

All metal parts of the transformer with the exception of individual core laminations core bolts and associated individual clamping plates shall be earthed internally

1.9 Tests

All the transformers shall be subjected to the following routine tests and one transformer shall be type tested at the manufacturer's works. Test procedure as per IS-2026 shall be adopted.

i) Routine Tests

- 1 Transformer shall be fully assembled with all fittings and accessories including wheels to ascertain that all the parts fit correctly
- 2 Resistance of each winding of each phase at principal tap and at all other taps

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TECHNICAL SPECIFICATION

SPECIFICATION NO.
 PROJ-ELEC/C&I-TS-MSSS-0007

REV NO : 00

DATE : 24/04/2008

SHEET 28 of 46

3. Voltage ratio at all taps.
4. Checking of voltage vector relationship.
5. Impedance voltage at rated frequency and principal tap, lowest and highest taps.
6. Load loss at rated current.
7. Zero sequence impedance at principal tap, rated frequency.
8. No load loss and no load current at rated frequency and 100%, 110% of rated voltage on HV side. Test shall be repeated with 415V, 3 Phase supply connected to LV side (if the LV side rated voltage is more than 415V). No Load & Load Losses shall be as per CBIP / IS with tolerance.
9. One minute power frequency withstand voltage test.
10. Induced over voltage withstand test.
11. Polarity check, ratio check, measurement of secondary winding resistance, excitation, characteristic curve, insulation resistance of all bushing CTs.
12. Calibration of winding temperature indicators.

ii) Type test

13. Temperature rise test.
14. The Contractor shall submit Type Test certificates for similar capacity Transformer supplied by him elsewhere for (i) Short time withstand capability Test and (ii) Impulse Voltage withstand Test. In case Type Test certificates for similar equipment are not available the same will be conducted in the presence of the Purchaser or his Representative if Purchaser so desires without any financial implications to the purchaser.

2.0 Additional Requirements:

1. Fluorescent lamps for sufficient illumination shall be provided and for that power supply shall be provided from LT side of Substation.

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	TECHNICAL SPECIFICATION		SPECIFICATION NO. PROJ-ELEC/C&I-TS-MSSS-0007
			REV NO : 00
	PRODUCT	11KV/433V MOBILE-SKID MOUNTED SUBSTATION	DATE : 24/04/2008
			SHEET 29 of 46

2. DC Fluorescent lamps for emergency lighting shall be provided.

3.0 TECHNICAL PARTICULARS OF 11 / 0.433 kV Transformer

1. Power supply system in which transformer is to be used.
 - a) Primary side (HV) max. voltage : 12 kV
 - b) System earthing
 - Primary side (HV) : Solidly earthed
 - Secondary side (LV) : Solidly earthed
2. Max. and min. 3 phase and ground Fault levels
 - Primary side (HV) : 350 MVA
3. Direction of power flow : Bi-directional
4. Transformer application : industrial distribution
5. Transformer type
 - a) indoor / outdoor : Indoor
 - b) Dry type / oil filled : Resin cast, Dry type
 - c) Core type / shell type : Core type
6. Auto wound / Two winding / three Winding : two winding
7. Number of phases : Three
8. Rated frequency : 50Hz
9. Rated no load voltage :
 - HV winding : 11kV
 - LV winding : 0.415 kV

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	TECHNICAL SPECIFICATION		SPECIFICATION NO. PROJ-ELEC/C&I-TS-MSSS-0007
			REV NO : 00
	PRODUCT	11KV/433V MOBILE-SKID MOUNTED SUBSTATION	DATE : 24/04/2008
			SHEET 30 of 46

10 Cooling

- | | | | |
|----|-------------------|---|-----|
| a) | Cooling medium | : | Air |
| b) | Method of cooling | : | AN |

11	Rated kVA at no load voltage and Principle tap	:	500 kVA
----	--	---	---------

12	overloading as per IS 6600	:	Required
----	----------------------------	---	----------

13 Max. temp. rise at rated kVA and Principle tap

- | | | | |
|----|---|---|----------|
| a) | Top oil by thermometer method
Over design ambient temp of 50 Deg C | : | 50 deg C |
| b) | Any winding (HV & LV) by
resistance method over design
ambient temp. of 50 deg C | : | 55 deg C |

14 Permissible Variations

- | | | | |
|----|--|---|-------------------|
| a) | Percentage impedance
voltage at rated current
frequency, principle tap
tap 75 deg C | : | 4.5 % |
| b) | Frequency variation | : | +3%, -5% of 50 Hz |
| c) | Voltage variation
voltage | : | +/- 10% of rated |

15 Tappings

- | | | | |
|----|-----------------------|---|---|
| a) | Off-Circuit / ON load | : | Off Circuit |
| b) | Manual / Automatic | : | Manual, by changing
links, by isolating
Power |

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TECHNICAL SPECIFICATION

SPECIFICATION NO.
PROJ-ELEC/C&I-TS-MSSS-0007

REV NO : 00

PRODUCT

11KV/433V MOBILE-SKID
MOUNTED SUBSTATION

DATE : 24/04/2008

SHEET 31 of 46

- | | | |
|----|--|---------------------------|
| c) | No. of Steps
2.5% -5% | : +5%, +2.5%, +0 - |
| d) | Percentage variation / step | : 2.5 % |
| e) | Winding in which tapings are required | : HV |
| 16 | Short circuit withstand capability of transformer on any tapping for 3 phase and line to ground faults across LV winding | : Not less then 2 secs |
| 17 | <u>Insulation</u> | |
| a) | One minute power frequency withstand voltage | |
| | HV winding | : 28 kV RMS |
| | LV winding | : 2.5kV RMS |
| b) | 1.2 x 50 micro second impulse withstand voltage level | |
| | HV winding | : 75 kV Peak |
| c) | Induced over voltage withstand | |
| | HV winding kV (RMS) | : As per IS 2026 Part III |
| | LV winding kV (RMS) | : - do - |
| 18 | <u>Windings insulation category</u> | |
| a) | HV - uniform / non - uniform | : Uniform |
| b) | LVL - uniform / non - uniform | : Uniform |
| 19 | <u>Winding data</u> | |
| a) | No. of winding | : Two |

hdm

 PSSR PROJECTS	TECHNICAL SPECIFICATION		SPECIFICATION NO. PROJ-ELEC/C&I-TS-MSSS-0007
			REV NO : 00
	PRODUCT	11KV/433V MOBILE-SKID MOUNTED SUBSTATION	DATE : 24/04/2008
			SHEET 32 of 46

- | | | |
|----|-----------------------|--|
| b) | Winding material | Copper |
| c) | Winding connection | |
| | - HV winding | Delta |
| | - LV winding | Star with neutral brought out
fully insulated |
| d) | Vector groups (HV-LV) | Dyn 11 |

20 Core laminations

- | | |
|---------------|---------------|
| Type | CRGO |
| Material | Silicon steel |
| Thickness, mm | 0.3 |

21 Diagram required: yes

22. Parallel operation: Suitable for parallel operation

23. Transformer size & limitation & Construction data:

- | | |
|--------------------------|---|
| i. Type of installation: | Indoor |
| ii. Terminal Details: | HT & LT suitable for Bus bar connection |

iii. Fittings and accessories required:	Lifting lugs, name plate, terminal marking plate, bi-directional rollers, earthing lugs, winding temperature indicator with alarm and Trip contact
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24. Class of Protection:	IP23
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 PSSR PROJECTS	TECHNICAL SPECIFICATION		SPECIFICATION NO. PROJ-ELEC/C&I-TS-MSSS-0007
			REV NO : 00
	PRODUCT	11KV/433V MOBILE-SKID MOUNTED SUBSTATION	DATE : 24/04/2008
			SHEET 33 of 46

4.0 OTHER DETAILS:

1. **Temperature rise:** Temperature rise of the transformer above the cooling air temperature when tested at the rated KVA shall not exceed the limit in table 4 of IS 11171/1985 reaffirmed in 1991.

2. **General:** The transformer shall be suitable for continuous run and for all type of loads with high efficiency, the transformer shall confirm to IS 2026/1997 IEC 726 & IS 11171 / 1985 reaffirmed in 1991 for dry type transformers as amended up to date. The supplier should give sufficient spacing between various terminals so that it can be properly terminated.

3. **RTD'S:** RTD's shall be embedded in transformer winding (both primary and secondary side) and the lads shall be brought out. The bidder shall supply Temperature Scanner to read the winding temperature. The temperature scanner shall have provision for generating "winding temperature high" trip signal to HT switch gear. The temperature scanner shall be mounted in such a way that operator has access to monitor the temperature periodically.

III. LT SECTION

1.0 General

LT Cubicle shall consist of following:

- i. 1 No. 415V, 50 KA 3 pole ACB of suitable rating with shunt trip release, auxiliary contacts, manual operated type with in-built overload and short circuit releases (magnetic-thermal releases) along with all associated accessories for incomer to LT Distribution board.
- ii. Necessary Bus bar interconnections for LT panel with secondary terminals of the transformer.
- iii. 3 Nos. indicating lamps (R Y B) with necessary fuses and toggle switches, 1 No. 0-500 V voltmeter with selector switch and ammeter with selector switch of suitable rating with matching CTs along with necessary interconnections with suitable size PVC insulated multi strand copper conductor cable.

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 PSSR PROJECTS	TECHNICAL SPECIFICATION		SPECIFICATION NO PROJ-ELEC/C&I-TS-MSSS-0007
			REV NO : 00
	PRODUCT	11KV/433V MOBILE-SKID MOUNTED SUBSTATION	DATE : 24/04/2008
			SHEET 34 of 46

- iv. Energy Meter shall be provided.
- v. Outgoing feeders are indicated in the scheme provided.
- vi) The distribution board is intended to provide power supply feeders to various LT distribution Boards and to feed various contractors LT boards as shown in scheme.
- vii) The Board has MCCB as outgoing feeders.
- viii) The Board shall be of metal clad single busbar, fully compartmentalized,
- ix) The incomer and the associated items shall be housed in a partitioned panel, whereas the rest of the outgoing feeders shall be neatly distributed and compartmentally modular construction need to be adopted. However, it shall be ensured that sufficient working clearance and adequate space for cabling is provided.
- x) LT Side Instrument Transformers, indicating instruments, control circuits, Control Wiring and ferrules, inscription, shall be as per the specification indicated under HT switchgear.
- xi) The rated continuous current of the equipment and components shall be as given in the schemes. These ratings shall be obtained with the components mounted in their housing as in service without exceeding the permissible temperature rise.
- xii) Defeat interlock shall be provided for the units comprising of switch or moulded case circuit breaker as a means of isolation device, such that it is possible to open the door with device ON. It shall not be possible to close the door till the interlock has been reinstated.
- xiii) LT side shall be fitted with a fluorescent lamp.
- xiv) Bottom of LT Board shall have removable gland plates in two pieces to accommodate minimum 15 runs of LT Armoured cable, size varying from 120 sq. mm to 300 sq. mm
- xv) *Earth Fault relay (EFR) should be provided.*

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 PSSR PROJECTS	TECHNICAL SPECIFICATION		SPECIFICATION NO. PROJ-ELEC/C&I-TS-MSSS-0007
			REV NO : 00
	PRODUCT	11KV/433V MOBILE-SKID MOUNTED SUBSTATION	DATE : 24/04/2008
			SHEET 35 of 46

2.0 Busbar and Connections

- i) Busbars shall be made of E91E grade aluminum alloy. Cross section of bus bars selected shall ensure the thermal rating and dynamic stability for the short-circuit rating specified.
- ii) High tensile cadmium plated bolts with suitable spring washers shall be used busbar joints.
- iii) Busbars shall be polyeter sleeved with heat shrunk insulation. Wire mesh shall be provided wherever necessary to prevent inadvertent touching of busbars.
- iv) Bus bars shall be supported on non-hygroscopic and non-inflammable insulators of material such as glass reinforced moulded plastic material, epoxy cast resin etc. Separate supports shall be provided for each phase of the bus bars. Insulation level of neutral bus bar shall be same as that of phase bus bars.
- v) Bus bars shall be contained in a separate vermin-proof compartment within the Kiosk and shall have bolted sheet steel covers for providing suitable access.
- vi) Busbar clearances in the air shall be as per applicable standard for 500V, 3 phase system.
- vii) Temperature for busbars, droppers and connections shall not exceed 90°C for an ambient of 50°C while carrying maximum continuous current.
- viii) The busbar, busbar connections and supports shall have sufficient strength to withstand thermal and electromechanical stresses produced by the specified short circuit level of the system.
- ix) Busbars shall be capable of carrying the short time current. The duration of short-time current shall be 1 sec. For the specified current and duration, there shall be no damage to the equipment.
- x) Main busbars and connections shall be prominently marked and displaced for standard sequence counting from rear to front, top to bottom, or left to right as viewed from the switching device operating mechanism side.

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 PSSR PROJECTS	TECHNICAL SPECIFICATION		SPECIFICATION NO. PROJ-ELEC/C&I-TS-MSSS-0007	
			REV NO : 00	
	PRODUCT	11KV/433V MOBILE-SKID MOUNTED SUBSTATION	DATE : 24/04/2008	
			SHEET 36 of 46	

- xi) Busbars and connections shall be provided with colour coded PVC sleeves. All live parts shall be properly shrouded with insulating material.
- xii) Earth busbar shall be provided separately. Material of earth busbar shall be GI.

3.0 LT Circuit Breakers (ACB)

- i) The breaker which is provided in incomer shall be of triple pole, air break and of non-drawout type. All current carrying contacts or the breaker shall be silver plated. The main contacts shall have ample area and contact pressure for carrying the rated current of the circuit breaker. Arc chute shall be provided on each pole and so fitted that it can be easily removed for inspection of the main contacts.
- ii) The breaker shall have independent manual spring charged stored energy mechanism.
The operating mechanism shall be trip free and designed to reduce mechanical shocks to a minimum during operation. The operating mechanism shall operate normally even when the circuit breaker is closed on to fault.
- iii) All breakers shall be provided with mechanical trip push button, accessible from outside.
- iv) All mechanism shall be designed to give trouble free service over extended periods and shall not deteriorate with normal usage, require attention more often than every 1000 operations or once a year whichever is earlier. Each breaker shall be equipped with mechanical 'ON' 'OFF' indications visible from the front of the panel.
- v) ACB shall be provided with earth fault, earth leakage and over current protections.
- vi) ACB shall be of triple pole construction arranged for simultaneous three pole manual closing and opening and for automatic tripping at short circuit and overload. Neutral link shall be provided for Kiosks.
- vii) Operating mechanism shall be quick make, quick break and trip free system.

122

- viii) The ON, OFF & TRIP positions of the ACB shall be clearly indicated so as to be visible to the operator when mounted as in service. Operating handle shall be provided in front of the Kiosk.
- ix) ACB shall be capable of withstanding the thermal stresses caused by overloads and short circuits. The maximum tripping time under short circuit shall not exceed 20 milli seconds. Rated breaking capacity (rms) at 415 V is 10kA. Rated making current (peak) is 21kA.
- ix) ACB terminals shall be shrouded and designed to receive cable lugs for cable sizes relevant to circuit ratings.

4.0 MODULAR CASE CIRCUIT BREAKERS (MCCB):

- i) Modular case circuit breakers (MCCBs) shall be provided for use in lieu of switch fuse for Kiosk incomer.
- ii) MCCBs shall be of triple pole construction arranged for simultaneous three pole manual closing and opening and for automatic tripping at short circuit and overload. Neutral link shall be provided for Kiosks.
- iii) Operating mechanism shall be quick make, quick break and trip free system.
- iv) The ON, OFF & TRIP positions of the MCCB shall be clearly indicated so as to be visible to the operator when mounted as in service. Operating handle shall be provided on front of the Kiosk.
- v) MCCBs shall be capable of withstanding the thermal stresses caused by overloads and short circuits. The maximum tripping time under short circuit shall not exceed 20 milli seconds. Rated breaking capacity (rms) at 415 V is 10kA. Rated making current (peak) is 21kA.
- vi) MCCB terminals shall be shrouded and designed to receive cable lugs for cable sizes relevant to circuit ratings.

5.0 INDICATING METERS:

Shall be as per HT Switch Gear. Section 2 4; Page 4.

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 PSSR PROJECTS	TECHNICAL SPECIFICATION		SPECIFICATION NO. PROJ-ELEC/C&I-TS-MSSS-0007
			REV NO : 00
	PRODUCT	11KV/433V MOBILE-SKID MOUNTED SUBSTATION	DATE : 24/04/2008
			SHEET 38 of 46

6.0 CURRENT TRANSFORMERS:

Shall be as per HT Switch Gear. Section 5.1; Page 11.

7.0 CABLE GLANDS:

- i) Cable glands of suitable sizes shall be supplied for the following cables.
 - 3 ½ C x 120 sq. mm – 3 Nos.
 - 3 ½ C x 150 sq. mm – 3 Nos.
 - 3 ½ C x 180 sq. mm – 4 Nos.
- ii) Cable glands shall be single compression type of brass material.
- ii) Cable glands shall be Nickel plated.
- iv) Rubber components used in the gland shell of neoprene.
- i) Name/trade name of manufacturer, type no, and applicable range of outer diameter of cable shall be engraved/indelibly printed on the cable gland.

8.0 CABLE LUGS:

- i) Cable lugs of suitable sizes shall be supplied for the following cables.
 - 3 ½ C x 120 sq. mm – 5 sets.
 - 3 ½ C x 150 sq. mm – 4 sets.
 - 3 ½ C x 180 sq. mm – 4 sets.
- ii) Cable lugs shall be of tinned copper
- iii) Name/trade name and size of lug shall be engraved/indelibly printed on each cable lug.

ND

	TECHNICAL SPECIFICATION		SPECIFICATION NO. PROJ-ELEC/C&I-TS-MSSS-0007
			REV NO : 00
	PRODUCT	11KV/433V MOBILE-SKID MOUNTED SUBSTATION	DATE : 24/04/2008
			SHEET 39 of 46

9.0 Additional Requirements:

1. Fluorescent lamps for sufficient illumination shall be provided and for that power supply shall be provided from LT side of Substation.
2. DC Fluorescent lamps for emergency lighting shall be provided.

10.0 TECHNICAL PARTICULARS OF LT SWITCH BOARD

1.0 LT SWITCH BOARD

- | | | | |
|----|---|---|---|
| a) | Rated voltage and frequency | : | 415 V, 3 -phase , 4- wire , 50 Hz
maximum voltage :500 V |
| b) | Continuous current rating at design ambient temperature | : | 800 A at 50°C with IP52 enclosure with canopy. |
| c) | (i) Type of enclosure as per IS 2147 | : | IP52 with canopy |
| | (ii) Min. thickness of sheet steel | : | 2 mm, 3mm for outer surface |
| d) | Applicable standards | : | IS 2147, 8623 |
| e) | Design ambient temperature | : | 50°C |
| f) | 1 sec. Short time rating of switch board with min. busbars, feeder busbars kA (RMS) | : | 20 kA |
| g) | Dynamic through fault current with complete busbars, kA (Peak) | : | 47 kA |
| h) | Incoming termination of LT Switchboard | : | Cable 4 (3 ½ x 120) Aluminium |
| i) | Incoming termination top/ bottom | : | Bottom |

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TECHNICAL SPECIFICATION

SPECIFICATION NO.
 PROJ-ELEC/C&I-TS-MSSS-0007

REV NO : 00

PRODUCT

11KV/433V MOBILE-SKID
 MOUNTED SUBSTATION

DATE : 24/04/2008

SHEET 40 of 46

- j) Outgoing feeder cable entry: Bottom
top/bottom
- k) Min. clearances at front and: 1.5m/1m
back of switchboard
- l) Min. clearances in air in mm
 - i. Between phases : 25.4
 - ii. Between live parts and : 19.0
- m) 1 minute PF withstand : 2.5 kV
voltage
- n) Bus Bar
 - i. Busbar material : E91E grade aluminum
 - ii. Continuous rating at
Design ambient
temperature
 - (a) Main bus bars : 800A
 - (b) Bus connections to:
circuit breakers : As per rated currents of
breakers
 - (iii) Temp. rise at rated : 40 deg. C over 50 deg. C
Continuous current of
the bus bars in the
bus bar chamber
 - (iv) Type of bus bar : Resin cast / fibre glass
insulators
- 1.1 Breakers
 - (i) Type of breakers : Fixed type air breakers
 - (ii) Standards applicable : IS 2516

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PSR PROJECTS	TECHNICAL SPECIFICATION		SPECIFICATION NO. PROJ-ELEC/C&I-TS-MSSS-0007
			REV NO : 00
	PRODUCT	11KV/433V MOBILE-SKID MOUNTED SUBSTATION	DATE : 24/04/2008
			SHEET 41 of 46

- (iii) (a) Rated service voltage : 415V, 3 Ph. 50 Hz
- (b) Highest system voltage : 500V, 3 Ph. 50 Hz
- (iv) Rated current at design : 800 A
 ambient for breakers
- (v) Symmetrical breaking
 capacity in kA (RMS)
 - (a) at 415V, 0.25 PF : 20 kA RMS
 - (b) at 440V, 0.25 PF : 20 kA RMS
- (vi) Making capacity kA (peak) : 47 kA peak
- (vii) Capacitor breaking capacity:
 at 440V
 - Incomer : 600A (min.)
 - Outgoing : 300 A (min.)
- (viii) 1 sec. short time rating kA : 20 kA RMS
 (RMS)
 - (a) With release in any : 20 kA RMS
 setting
- (ix) Thermal release setting : 600-120 A
 ranges (temp.
 compensated)
- (x) (a) Short circuit release : 2-4/3-6kA
 range
 - (b) Short circuit release : 0.1 to 0.5 sec. mechanical
 timer setting range timer/static trip release
- (xi) Operating mechanism
 - (a) Fixed trip/trip free : Trip free
 - (b) Spring assisted /spring : Stored energy mechanism
 Charged stored energy

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TECHNICAL SPECIFICATION

SPECIFICATION NO.
PROJ-ELEC/C&I-TS-MSSS-0007

REV NO : 00

PRODUCT

11KV/433V MOBILE-SKID
MOUNTED SUBSTATION

DATE : 24/04/2008

SHEET 42 of 46

- c) Electrical operation / : Manual
Manual operation
- xv) Auxiliary contacts
- a) Type : Silver plate copper contents
- b) Number : 6 NO + 6 NC
- c) Breaking capacity at : 5A
440 V AC
- 1.2 MCCB
- (i) Type of MCCB : Fixed type air break
- (ii) (a) Rated service voltage : 415V, 3 Ph. 50 Hz
(b) Highest system voltage: 500V, 3 Ph. 50 Hz
- (iii) Rated current at design : 63A - 400A (as per scheme)
ambient for breakers
- (iv) Thermal release setting : 80% - 150%
ranges (temp.
compensated)
- (v) (a) Short circuit release : as per standard
range
(b) Short circuit release : 0.1 to 0.5 sec. mechanical
timer setting range timer/static trip release
- (vi) Operating mechanism
Electrical operation / : Manual
Manual operation
- (vii) Auxiliary contacts
- a) Type : Silver plate copper contents

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TECHNICAL SPECIFICATION

SPECIFICATION NO.
PROJ-ELEC/C&I-TS-MSSS-0007

REV NO : 00

PRODUCT

**11KV/433V MOBILE-SKID
MOUNTED SUBSTATION**

DATE : 24/04/2008

SHEET 43 of 46

b) Number : 2 NO + 2 NC

c) Breaking capacity at : 5A
440 V AC

1.3 Current transformers

- (i) Type : Resin cast / tape wound
- (ii) ratio : 1000 / 5A
- (iii) Accuracy class : 1.0
- (iv) Burden : 15 VA

1.4 METERS AMMETER VOLTMETER

- (i) Type Taut band Taut band
- (ii) Accuracy class 1.0 1.0
- (iii) Size 96 x 96 96 x 96

1.5 Indication lamp

- (i) Type : LED

1.6 Feeder Details

- (i) Incomer feeder

a) Fixed type ACB of specified rating

- Stored energy, spring charged closing mechanism,
manually operated

- Series trip direct acting temperature compensated thermal

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TECHNICAL SPECIFICATION		SPECIFICATION NO. PROJ-ELEC/C&I-TS-MSSS-0007	
		REV NO : 00	
PRODUCT	11KV/433V MOBILE-SKID MOUNTED SUBSTATION	DATE : 24/04/2008	
		SHEET 44 of 46	

release and magnetic short circuit release with mechanical timer.
Independently adjustable settings as specified

- Static trip release as alternative can also be quoted
- Mechanical ON/OFF indication

- (b) 3 CTs, class 1.0, resin cast, ALF-5 for metering with CT ratio as per drawing.
- (c) 96 x 96 mm, taut band, circular scale, ammeter, voltmeter to read phase and line voltages, class 1.5
- (d) 1 Nos. Ammeter with selector switch and 1 No. Voltmeter with selector switch with 'OFF' position to read line currents and voltages.
- (e) 3 Nos. tripped on fault/trip circuit healthy lamp (with push button).
- (f) Auxillary relays, control circuit protection, space heater, accessories for terminations, HRC fuses etc. as required.
- (ii) Outgoing feeders :MCCB's as specified below.
 - 400 A 3 Pole with thermal release setting : 2 Nos
 - 200 A 3 Pole with thermal release setting : 3 Nos
 - 100 A 3 Pole with thermal release setting : 2 Nos

GENERAL REQUIREMENTS:

GUARANTEED PERFORMANCE REQUIREMENTS:

- i) The vendor shall guarantee satisfactory performance of the equipment supplied under all conditions and requirement as laid down by this specification.

TESTING AND COMMISSIONING

- i) Routine tests as per relevant IS standards to be conducted at works and at site. Test certificates shall be provided.
- ii) Type test certificates for identical equipment shall be provided.
- iii) All fittings, fabrications, hard wares etc. as specified shall be inspected and tested in accordance with IS recommendation. Type test certificates from National Test House or from reputed agency shall be considered.

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 PPSR PROJECTS	TECHNICAL SPECIFICATION		SPECIFICATION NO. PROJ-ELEC/C&I-TS-MSSS-0007
			REV NO : 00
	PRODUCT	11KV/433V MOBILE-SKID MOUNTED SUBSTATION	DATE : 24/04/2008
			SHEET 45 of 46

iv) The testing shall be done in accordance with the applicable Indian Standards and codes of practice. The following test shall be specifically carried out for all lighting installation.

- a) Insulation resistance.
- b) Testing of earth continuity path.
- c) Polarity test of single phase switches.

3.0 PACKING:

The material shall be packed as per manufacturers standard. Packing procedure shall be to the purchasers approval.

4.0 OTHER REQUIREMENTS:

- i) Vendor shall submit the following only with offer for evaluation.
 - a) Quality plans (QP).
 - b) Bought out quantity (BOQ).
 - c) Proposed open general arrangement (OGA) of Kiosk.

5.0 DRAWINGS

The following drawings shall be submitted for approval as per agreed schedule.

- a. Dimensional GA drawings of switch board indicating busbar arrangement, foundation details, gland plate location.
- b. Front view of switchboard indicating component locations
- c. Single line schematic diagram indicating feeder details
- d. Component specification details
- e. List of inscriptions

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TECHNICAL SPECIFICATION

SPECIFICATION NO.
PROJ-ELEC/C&I-TS-MSSS-0007

REV NO : 00

PRODUCT

11KV/433V MOBILE-SKID
MOUNTED SUBSTATION

DATE : 24/04/2008

SHEET 46 of 46

- f. Internal wiring diagrams.
- g. Terminal plan and external connection diagram.
- h. Cross sectional drawings cubicle indicating details of busbar chamber, cable chamber, breaker chamber etc.
- i. Operation and maintenance manuals,

6.0 PAINTINGS

The switch unit cubicle shall be furnished with colour code to be indicated at the time of drawing approval conforming to IS 5-1961 latest. The sheet

metal parts shall be subjected to following pre-treatment before final painting.

- a) Degreasing
- b) Pickling for complete rust removal
- c) Phosphating
- d) Corrosion resistant primer painting. Two final coats spray painting shall be given.
- f) The cubicle shall be painted with colours as follows:-

Internal – Glossy white

External – dark Grey

M.LAZAR

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