

CLAUSE NO.	TECHNICAL REQUIREMENTS								
	detachable type, mounted on the tank. Each radiator shall be provided with a drain plug/valve at the bottom, an air release plug at the top, shut off valve at each point of connection to the tank. iii) The radiators shall be made of Hot Dipped Galvanized Steel conforming to ISO 12944-5, system no. A7.13 of paint and coating of the Table A.7. b) LT Auxiliary outdoor transformers up to and including 2500KVA, 33kV shall have maximum losses of STAR-2 rating or better as per latest BEE guideline. The outdoor transformer up to 2500KVA, 33kV shall also comply with latest IS:1180.								
1.04.00	DESIGN AND CONSTRUCTIONAL FEATURES								
1.04.01	Tank a) Tank shall be of welded construction & fabricated from tested quality low carbon steel of adequate thickness. b) The main tank body including tap changer, radiators (except for Auxiliary transformers) and coolers shall be capable of withstanding full vacuum. Tank shall be provided with suitable lifting lugs, minimum 4 jacking pads & haulage holes for wheeling in all four directions. c) FGD Tie Transformer and FGD HT transformers shall be mounted on detachable type bi-directional rollers for rail gauge of 1676mm. Auxiliary transformers shall have suitable bi-directional skids, however auxiliary transformers above 2 MVA shall be provided with four no. of bi-directional detachable flat rollers. Suitable locking arrangement shall be provided to prevent accidental movement of transformer. d) At least two adequately sized inspection openings, one at the each end of the tank for easy access to bushings and earth connections & suitable manhole shall be provided.								
1.04.02	Core <table><tr><th>Transformer</th><th>Requirement</th></tr><tr><td>FGD Tie Transformer & FGD HT transformer</td><td>Core shall be high grade, non-ageing, cold-rolled, super grain oriented silicon steel laminations known as Hi B grade steels or equivalent. The insulation of core to tank, tank to clamp and clamp to core shall be able to withstand a voltage of 2 KVRms for 1 min in air. To facilitate testing of above during pre-commissioning stage, the core/clamp earthing has to be done outside the tank with suitable bushings.</td></tr><tr><td>Auxiliary Transformers</td><td>Core shall be high grade non-ageing cold rolled super grain oriented silicon steel laminations of M4 grade or better quality. The core isolation shall be able to withstand a voltage of 2 kV (rms.) for 1 minute in air.</td></tr></table>			Transformer	Requirement	FGD Tie Transformer & FGD HT transformer	Core shall be high grade, non-ageing, cold-rolled, super grain oriented silicon steel laminations known as Hi B grade steels or equivalent. The insulation of core to tank, tank to clamp and clamp to core shall be able to withstand a voltage of 2 KVRms for 1 min in air. To facilitate testing of above during pre-commissioning stage, the core/clamp earthing has to be done outside the tank with suitable bushings.	Auxiliary Transformers	Core shall be high grade non-ageing cold rolled super grain oriented silicon steel laminations of M4 grade or better quality. The core isolation shall be able to withstand a voltage of 2 kV (rms.) for 1 minute in air.
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1.04.03	Insulating oil No inhibitors shall be used in the transformer oil. The oil supplied with transformers/reactor shall be new and previously unused and must conform to following while tested at supplier's premises and shall have following parameters.								
LOT-3 PROJECTS FLUE GAS FLUE GAS DESULPHURISATION (FGD) SYSTEM PACKAGE	TECHNICAL SPECIFICATIONS SECTION – VI, PART-B BID DOC NO : CS-0011-109(3)-9	SUBSECTION-II-E12 TRANSFORMERS/REACTOR AND ASSOCIATED MAINTENANCE, MONITORING & TESTING	PAGE 3 OF 20						

CLAUSE NO.	TECHNICAL REQUIREMENTS				
	S.No.	Property	Permissible values		
	1.	Kinematic Viscosity, mm ² /s	≤ 12 at 40 ° C ≤ 1800.0 at (-)30 ° C		
	2.	Flash Point, ° C	≥ 140° C		
	3.	Pour point, ° C	≤ (-)40 ° C		
	4.	Appearance	Clear , free from sediment and suspended matter		
	5.	Density kg/dm ³ at 20 ° C	≤ 0.895		
	6.	Interfacial Tension N/m at 25° C	≥ 0.04		
	7.	Neutralisation value, mgKOH/g	≤ 0.01		
	8.	Corrosive sulphur	Non Corrosive		
	9.	Water content mg/kg	≤ 30 in bulk supply ≤ 40 in drum supply		
	10.	Anti oxidants additives	Not detectable		
	11.	Oxidation Stability -Neutralization value, mgKOH/g -Sludge, % by mass	≤ 1.2 ≤ 0.8		
	12.	Breakdown voltage As delivered, kV After treatment, kV	≥ 30 ≥ 70		
	13.	Dissipation factor, at 90° C And 40 Hz to 60 Hz	≤ 0.005		
	14.	PCA content	≤1%		
	15.	Impulse withstand Level, kVp	≥ 145		
	16.	Gassing tendency at 50 Hz after 120 min, mm ³ /min	≤ 5		
Subsequently oil samples shall be drawn at:					
	Sr. No.	Parameters	Before filling in main tank at site & tested for	Prior to energization at site for following properties acceptance norms:	Applicability
	i)	BDV	60 kV (min)	60 kV (min)	Applicable for all Transformers
	ii)	Moisture content	10 ppm (max.)	10 ppm (max.)	
	iii)	Tan delta at 90 deg. C	0.005 (max.)	0.05 (max.)	Applicable for Transformers (16 MVA & above).
	iv)	Interfacial tension	0.04 N/m(min)	0.035 N/m (min)	
1.04.04	Windings The conductors shall be of Electrolytic grade copper. All Windings of 66kV and below shall have uniform insulation. The contractor shall ensure that windings are made in dust proof & conditioned atmosphere. All windings of FGD Tie Transformer, and HT transformers shall have Thermally upgraded paper covering insulation. For FGD Tie Transformer winding paper moisture shall be less than 0.5%.				
1.04.05	Oil preservation Main tank and OLTC (if applicable) shall be provided with conservator tanks of adequate capacity for expansion of oil from minimum ambient to 100 deg.C. The equipment rated 7.5MVA and above shall be provided with air bag breathing through indicating type cobalt free silica gel breather with transparent enclosure. However				
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