

**ELECTRICAL**



## QUALITY ASSURANCE PLAN

### Electrical Jobs

S. No.	DESCRIPTION OF ITEM	TYPES OF CHECK	CLASS	FREQUENCY	REF. DOC.	RECORDS MAINT.	ACCEPTABILITY
1	2	3	4	5	6	7	8
<b>A) TRANSFORMER</b>							
1	Check transformer foundation	Center lines and level			Manufactur e drawings		These should match with centerlines and level of drawings.
2	Check all civil activities are complete:	Cable trench GI pipe sleeves for power cable, marshelling box, and emergency push button.			Visual		
3	Erection	Crane capacity adequate. Erection personnel experienced. Rollers perfectly fitting in channel wheel chokes fixed.			Manufactur e drawings		
4	Position tank as per centerlines and level shown in AFC drawings.	Check centerline of the transformer tank. Check loose fittings supplied with packing list of vendor and ensure all the parts are available			Manufactur e drawings		Matching with drawings.



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5	Conservator	Ensure that the inside conservator is clean and dry. Mount the conservator along with associated pipe work on supporting structure provided on the transformer.			Visual		Shall be cleaned and free from any dirt.
6	Buchholz relay	Examine/ sight glass and mercury switches for damage and report			Visual		Damage/ cracks shall not be permitted. Replace
7	Float type relay	Floats  Check free operation of isolating valves (2 Nos.) of the Buchholz relay  Ensure arrow mark on the relay			Visual  Visual  Visual		Remove stings and check free movement of floats  Shall operate freely  Points towards conservator
8	Explosion vent	Examine vent body/ sight			Visual Visual		If found broken/ damage



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### Electrical Jobs

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		glass for any external damage and repot immediately. Check if gasket and diaphragm at					replace
		upper and lower end are intact. Remove blanking plate from opening on the tank cover. Mount explosion vent.					
9	Radiators	Examine very minutely the radiators for transit damage and repot immediately, if any  Ensure gasket on either side of isolating valves are intact and in good condition.			Visual  Visual		Repair/ replace as required  If damage, replace with fresh ones
10	Silicagel breather	Check colour of crystals  Check gasket and fit flange top. Fit breather to conservator pipe. Add clean transformer oil in the			Visual		If colour is not dark blue, remove flange top and take out.



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### Electrical Jobs

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		bottom.					
11	Magnetic oil level indicator	Remove packing from mercury switch provided during transit and operate manually to check making and breaking of contact by the mercury switch at the terminal chamber.			Visual		Replace if switch not operating.
12	Marshalling box	Clean inside of marshalling box. Mount the box at location indicated in G.A. Use brackets provided to support capillary. Avoid sharp bends in tubing. Do not cut capillary in case of excess length, coil it in diameter not less than 150mm.			Visual		Right tube is sharply bend.
13	Internal wiring	Wire up bouchholz relay, MOG, NCT, WCT (if required) contacts to marshalling box with cable provided by transformer			As per manufacture r's wiring diagram		



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		manufacturer.					
14	Topping of oil	Check dielectric strength of transformer oil in transformer tank/ drums.					If dielectric strength is satisfactory then oil from drum should be filled from top tank filter valve and opening both radiator valves, air vent plug open. One radiator should be filled with oil.
15	Filtration of oil:- pre-commissioning general checks:	<p>Inspect the transformer all over for oil leakage and check all flanged joints and fittings for oil leaks.</p> <p>Open all plug venting screws on radiators, bushings, bucholz relay and tank cover until oil appears and then close</p>			Visual		<p>In case transformer oil does not pass on and if found necessary, retighten the bolts. Welding on transformer tank can be done only after consulting manufacturer.</p> <p>Making sure that no air remains inside the transformer tank. Make sure that all thermometer pockets for oil and</p>



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		<p>them.</p> <p>Ensure that rating and diagram plate, silicagel breather, marshalling box and other equipments are mounted in position as shown in general arrangement drawing.</p> <p>In case transformer had been idle for more than one month after dehydration.</p> <p>Check that the colour of silicagel in breather is dark blue. Also oil in oil seal to be filled upto the level indicator check that the air passage of breather is not blocked.</p>			Visual		<p>winding temperature indicators are filled with transformer oil.</p> <p>Transformer oil has been given at least two circulations.</p> <p>Silica gel shall be deep blue</p>



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		<p>Control cabling carried out completely. Check the various protective devices (i.e. OTI, WTI, Buchholz relay, MOG etc.) and their signaling and tripping contacts for fool proof operation.</p> <p>Check that pointers for alarm and trip contacts on oil temperature and winding temperature indicators are set at the desired positions.</p> <p>Check incoming voltage and set the trapping switches on the corresponding tap position and lock it.</p> <p>Check whether transformer body and</p>			Manufacturer wiring diagram		Wiring shall be as per diagram only. Make sure that Buchholz relay floats, are not locked and the relay is set in service position.





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		<p>neutral area earthen properly by two independent earth connections on marshalling box, cable boxes, fans, etc.</p> <p>Check terminal clamps on brushing and cable end terminations on bushers etc. for proper connections and tightness.</p> <p>Check functioning of the breakers associated with transformer by actual operation of protective relay and supervisory equipments of the transformer.</p>					



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<b><u>B) QUALITY ASSURANCE PLAN FOR PANELS</u></b>							
1	Fabrication steel						
	Material specifications	As per specifications		Random			
	Dimensions	Actual measurement		Random			
	Surface finish	Visual		Random			
2	Air circuit breaker	Routine test	Critical	By test			



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### Electrical Jobs

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		Type test	Critical	By report			
3	Air breaker switches	Type test	Critical	By report			
		Routine test	Major	By test			
4	HRC fuse	Type test	Critical	By report			
		Routine test	Major	By test			
5	Relays	Type test	Critical	By report			
		Routine test	Critical	By test			
6	CTs	Type test	Major	By report			
		Routine test	Critical	By test			
7	PTs	Type test	Major	By report			
		Routine test	Critical	By test			
8	Air break contractors	Type test	Critical	By report			



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### Electrical Jobs

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		Routine test	Major	By test			
9	Indicating instruments	Verification as per agreements specifications.	Major	Visual			
		Type test	Major	By report			
		Routine test	Critical	By test			
10	Bus bars	Chemical composition	Major	By test report			
		Tensile strength	Major	By test report			
		Conductivity	Major	By test report			
11	Gasket	Dimensions and hardness	Major	By test report			
		Type test	Major	By test report			
12	Panel fabrication	Visual check of fitting and rusting of plates	Major	Visual			
		Pretreatment of sheet steel	Critical	Process			



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### Electrical Jobs

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		Dimensions after cubical fabrication	Critical	Measurement			
		Gaskets between doors	Minor	Visual			
13	Wiring	Wire size	Minor	Visual			
		Continuity as per wiring diagram	Critical	Verification by test			
14	Pre-erection	Check layout of cutout provided is as per SLD drawings			SLD and vendors drawings		Shall match with drawing, if there is any changes needed, that should be in consulting with the BPCL site engineer
		Check level and center-lines are as per SLD drawings of switchboard manufacture. Position levels and aligns and weld base channel to the inserts provided along the cutout as per switchboard vendor G.A. drawings.			SLD and vendors drawings		Shall match with drawings



## QUALITY ASSURANCE PLAN

### Electrical Jobs

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		<p>Check shipping section with challan of vendor to ensure correct sequence of transportation of panel from site to panel room</p> <p>Check sign of any damage to the panel. Verify components/ instruments with AFC BOQ of switch board vendor. In case of missing components/ instrument repot to BPCL immediately. (Check for quantity only at this stage)</p>			SLD and vendor drawings		<p>Shall match with drawings</p> <p>If any damage found, repot to vendor and rectify before commissioning</p>
		<p>Make main bus continuous by mean of fishplate.</p> <p>Make auxiliary bus, Control bus, and earth bus continuous with fishplate and nut/ bolts provided</p>			<p>Visual</p> <p>Visual</p>		<p>Fishplates shall have at least 10T over lap and two bolts on each side.</p> <p>Fishplates shall have at least 10T over lap and two bolts on each side.</p>



## QUALITY ASSURANCE PLAN

### Electrical Jobs

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		<p>with panel, PVC wires.</p> <p>Final welding of panel base frame to foundation base channel</p> <p>De-dust the panel thoroughly</p> <p>Ensure to plug all the unused cable entry openings.</p> <p>Check if panel inspection report is available</p> <p>Operation of all doors and ensure free.</p>			<p>Visual</p> <p>Visual</p>		<p>Shall be done only after bus duct erection, alignment and connection to incomer bus is completed.</p> <p>All openings to be plugged before.</p> <p>Panel installation report shall be signed by vendor/ BPCL at factory.</p> <p>Repair if necessary</p>
15	Pre-commissioning	Check CT, PT nameplate			Visual		Shall match with SLD



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### Electrical Jobs

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		<p>details for conformity with AFC drawings.</p> <p>Check mechanical and electrical (5 times) operation of ACB in isolated, test and service position with related interlock</p> <p>Fix Arc-chute over breaker poles. Ensure tightening of bus bar connection of main bus, auxiliary bus, control bus and earth bus.</p> <p>All controls and interlocks should be checked</p>			<p>(major report)</p> <p>N.A</p>		<p>Shall operate without trouble.</p> <p>Shall be less than 1.0m in all classes</p> <p>As per drawings.</p>
		IR of main power circuit, priming winding etc. should be checked with 1000 volts megger					As per acceptable limits.





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### Electrical Jobs

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<b>C) QUALITY ASSURANCE PLAN FOR CABLE LAYING</b>							
1	General	Fabrication of supports to be carried out by tested welders and fitters.			Visual dimension		To match with drawings given with tender.



## QUALITY ASSURANCE PLAN

### Electrical Jobs

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		<p>After fabrication of support to be cleaned and then painted with redoxide and get approval of the same.</p> <p>After approval it shall be painted with first coat of synthetic enamel paint and then cleaned for erection.</p> <p>During erection, proper level and alignment of the support to be got cleared before final full welding.</p> <p>After full welding and clearance of erection, final coat of synthetic enamel paint is to be applied.</p>			<p>Make of paint/ thickness</p> <p>Make of paint/ thickness</p> <p>Visual</p> <p>Tender schedule</p>		<p>As per tender specifications.</p> <p>As per tender specifications.</p> <p>Shall be in level as per agreed with contractor</p>
2	Cable trays	This shall be prefabricated hot dip galvanized sheet			Visual/ tender		Reject if not as per tender specifications.



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### Electrical Jobs

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		<p>hot dip galvanized cable tray shall be used for maximum support span of 200mm.</p> <p>Vertical supports for both the above types of tray shall be fabricated out of ISMC 100 and horizontal supports with ISA50x50x6 mm (angle iron)</p> <p>Cable routing.</p>			<p>documents</p> <p>dimensional check</p>		<p>All tray levels will be checked after erection and marked in as built drawings.</p> <p>Given on the layout drawings shall be checked in the field to avoid interference with structures, heat sources, drains, piping, air conditioning duct etc.</p>
3	Cable laying	High voltage, medium voltage and other control cables shall be separated from each other by adequate spacing or			As per approved drawings		Shall match with approved drawings



## QUALITY ASSURANCE PLAN

### Electrical Jobs

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		<p>running through independent pipes trenches or cable trays as applicable.</p> <p>Measurement of cable</p> <p>Arrangement</p>					<p>All cable routes shall be carefully measured and cable cut to the required length, leaving sufficient length of the cable for the final connection of the cable to the terminal of the equipment.</p> <p>Cables shall be neatly arranged in the trenches/ tray in such a manner so that crisscrossing is avoided and final takeoff to the motor/ switchgear is facilitated.</p>



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### Electrical Jobs

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		Identification of cable					Tags to be punched properly. All cables will be identified close to their termination point by cable tags made out of 2mm thick aluminum strips having cable numbers as per cable schedule punched on it.
		Protection					All temporary ends of cables must be protected against dirt and moisture to prevent damage to the insulation.
		Trenches					Shall be sufficient depth and width for accommodation of all cables correctly spaced and arranged.
		Handling of cable					Cable shall be handled carefully during



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### Electrical Jobs

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		Testing  Cable installed above the ground.			As per approved drawing		installation to prevent mechanical injury to the cable. Shall be not more than 1.0m  After laying of cables, insulation test will be done to ascertain whether any damage or defect is present in the laid cable.  Shall be run in trays, or run exposed along walls, columns or studs with proper clamping.
4	Cable termination	All PVC cables upto 1.1KV grade shall be terminated at the equipment means of double compression type cable glands.  Cable entries					Double compression glands fitting shall be perfect.  All cable entries shall be



## QUALITY ASSURANCE PLAN

### Electrical Jobs

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		Crimping					<p>through bottom only and top entry terminations will be made only after getting approval. In case of control cables their terminal numbers by means of PVC ferrules shall identify at all cores at the both ends.</p> <p>Shall be done by hand crimping/ hydraulically operated tool and conducting jelly shall be applied on the conductor. H.T. cable termination/ joints shall be done by skilled and experienced jointers duly approved by the Engineer-In-Charge with duly approved jointing kit.</p>
5	<u>Testing</u>						



## QUALITY ASSURANCE PLAN

### Electrical Jobs

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	Insulation	Measure the insulation resistance of directly buried cable circuit before and after the cables trenches are back filled.  For cable upto 1.1KV grade 1000 V meggar and for H.V cables 2.5KV meggar shall be used.					Recorded for following All 1.1 KV grade cables in which straight through joints are made.  All cable above 1.1 KV grade.





## QUALITY ASSURANCE PLAN

### Electrical Jobs

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<b><u>D) QUALITY ASSURANCE PLAN FOR LIGHTING</u></b>							
1	Lighting	The lighting installation will be carried out as per SLD drawings and specifications and as per BPCL standard for lighting.			SLD		As per tender schedule and SLD
		The installation of lighting fixture will be carried out with the approval of Engineer-In-Charge for any variation from drawings.			As per manufacture -r drawings		Shall be in line with installation drawing/ position. All hardware shall be galvanized or zinc passivated.
	Testing	Testing will be carried out as per instruction of the Engineer-In-Charge.					To ensure proper erection work and to ascertain any damage or defect during



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### Electrical Jobs

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							erection.
2	Earth conductor/strip	The earthing installation shall be done in accordance with AFC earthing drawings, specifications and standard			SLD approved drawings		As per tender schedule and approved SLD
		Drawings for reference as per the BPCL standard.  The main earth loop          Joints					- - -  Shall be laid at a depth of 500mm below ground level. Wherever cable trenches are available, the earth lead shall be laid in trenches. In process unit areas, the earthing strip/cable shall be run along cable trays as per specified in the layout drawings.  Shall be welded and coated with protective Tarplast or Epoxy coating



## QUALITY ASSURANCE PLAN

### Electrical Jobs

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3	Earth Electrodes	Earth pipe electrodes shall be installed as shown in the earthing layout drawings and in accordance with the standard drawings of reference and IS 3043.(Latest)			IS code/Drawing approved by the BPCL		Shall match
	Testing	<p>All earth electrodes shall be tested for earth resistance by means of standard earth test meter.</p> <p>The electrodes shall have a clean surface, not covered by paint, enamel, grease or other materials of poor conductivity.</p> <p>The disconnect facility shall be provided for individual earth pits to</p>			As per drawing		Resistance shall be $< 1$ Ohm. Provide water or salt solution and reduce to above mentioned value.



## QUALITY ASSURANCE PLAN

### Electrical Jobs

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		check their earth resistance periodically.					
4	Earth connection	<p>All electrical equipment is to be doubly earthen by connecting two points on equipment to a main earthing ring.</p> <p>The earthing ring</p> <p>The following equipments/structures shall be earthed:</p> <p>Transformer neutrals, CT/PT neutrals. Neutrals Grounding</p>					<p>Connected via links to all earth electrodes. The earth grid formed shall be a closed loop with earth electrodes connected to the grid with double strip connection.</p> <p>Contents shall be available</p> <p>&lt;4 for electrical systems</p>



## QUALITY ASSURANCE PLAN

### Electrical Jobs

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		Resisters. Transformer Housing.  Lightning Arrestors  All switch gear and their earth buses, bus duct.  Motor Frames  Pipe in which cable passes Non- current carrying metallic parts of electrical equipment such as switch gear, switch racks, panel boards, motor control centers, lighting power and instrument panels, push button stations, cable trays, pipes, conduits, terminal boxes etc. All fences, gates/enclosures housing electrical					and metallic structure <7 for storage tanks <1 for Grid connection <2 for individual electrodes



## QUALITY ASSURANCE PLAN

### Electrical Jobs

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		<p>equipment.</p> <p>All steel structures rails etc. including bounding between sections. Shield Wire.</p> <p>Structural Steel and Columns.</p> <p>Loading racks.</p> <p>Lighting Mast, Poles.</p> <p>Lighting rods (Mast)</p> <p>Tanks &amp; vessels containing flammable materials.</p>					
1	D.G Set On Receipt	Open the packing and do physical checking of the engine, alternator and			As per manufacturers packing		



## QUALITY ASSURANCE PLAN

### Electrical Jobs

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		panels as per packing list for the accessories like batteries, battery leads, battery charger, hoses, air filter, silencer etc.			list.		
2	Check DG-set foundation	Centerlines and level			Manufacturers drawing		
3	Check all civil activities are completed	a) Bolt grouting hole b) Cable Trench c) Proper ventilation d) Proper door opening			Manufacturers drawing  As per layout drawing		
4	Erection	Shift gently the set on foundation	Critical grouting bolts if required		Check for the alignment as per manufacturers recommendation (Radial &		



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### Electrical Jobs

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					Axial)		
5	Position of Fuel tank outside the DG- room	Check the installation  Check loose fittings supplied with packing list of vender and ensure all the parts are available.			As per recommendation.  As per manufacturers drawing and manual.		
6	Install Silencer	Check the installation as per vender recommendation  Provide support to exhaust pipe.  Provide lagging on the exhaust			As per recommendation.  As per recommendation.		
7	Check IR value of Alternator				Value should not be less than 5 Ohm.		





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### Electrical Jobs

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8	<b>Pre Commissioning</b>  Priming the fuel system  Earhting	In case of new engine, it is important for the fuel system to be "BLED" i.e. for all traces of air to be removed. Use recommended Lub. Oil  2 Nos. plate earhting for neutral and 2 Nos. pipe earhting for the body to be provided.					
	Cabling  Mounting equipment	Ensure that power cabling and control cabling carried out completely  Check functionally of all the safety equipment					



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Electrical Jobs

Blank