



Model Curriculum

Technician: Distribution Transformer Repair

SECTOR: POWER
SUB-SECTOR: DISTRIBUTION
OCCUPATION: Technician
REF ID: PSS/Q 3003, V1.0
NSQF LEVEL: 4



  

Certificate
COMPLIANCE TO
QUALIFICATION PACK- NATIONAL OCCUPATIONAL
STANDARDS

is hereby issued by the
POWER SECTOR SKILL COUNCIL

for
MODEL CURRICULUM

Complying to National Occupational Standards of
Job Role/ Qualification Pack: 'Technician: Distribution Transformer Repair' QP No. PSS / Q 3003

Date of issuance : October 10th 2018
Valid Upto : October 1st 2018

**Valid up to the next review date of the Qualification Pack or the 'Valid up to' date mentioned above (whichever is earlier)*


Authorised Signatory
(Power Sector Skill Council)



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Technician- Distribution Transformer Repair

CURRICULUM / SYLLABUS

This program is aimed at training candidates for the job of a “Technician: Distribution transformer Repair”, in the “Power” Sector/Industry and aims at building the following key competencies amongst the learner

Program Name	Technician- Distribution Transformer Repair		
Qualification Pack Name & Reference ID. ID	Technician –Distribution transformer Repair PSS/Q3003		
Version No.	1.0	Version Update Date	19-07-2018
Pre-requisites to Training	ITI in Electrical Trade		
Training Outcomes	<p>After completing this programme, participants will be able to:</p> <ul style="list-style-type: none"> • Gain Familiarity with Power system: overview especially Distribution Sector. Understand basics of electricity terms used while carrying activities related to testing, repair and maintenance • Carry out inspection: To ensure equipment are under healthy state with and to detect any types of faults • Perform testing activity: for any suspicious inspection testing of system to be done to detect any faults or working condition of equipment. • Repair, Overhaul and delivery of tested distribution transformer: carrying out repair and maintenance activity in damaged distribution transformer and ensure overall health of the distribution transformer. • Use basic health and safety practices for power related work: includes procedure & practices to follow to maintain healthy, safe & secure work environment covering safety of self, others, assets, and the environment • Work Effectively with others: covering basic etiquette and competencies to demonstrate in their behaviour and interaction with others at workplace 		

This course encompasses 4 out of 4 National Occupational Standards (NOS) of “Technician-Distribution Transformer- Repair” Qualification Pack issued by “Power Sector Skill Council”.

Sr. No.	Module	Key Learning Outcomes	Equipment Required
1	Introduction Theory Duration (hh:mm) 08:00 Practical Duration (hh:mm) 00:00 Corresponding NOS Code PSS/N 3005	<ul style="list-style-type: none"> Power sector scenario including generation, transmission, and distribution scenario of India. Functions of Power Distribution Companies Elements of power systems, transmission, distribution and generations. Familiarization with distribution network from substation to end consumer 	
2	Organizational context Theory Duration (hh:mm) 04:00 Practical Duration (hh:mm) 00:00 Corresponding NOS Code PSS/N 3005	<ul style="list-style-type: none"> Organization structure and reporting levels Duties and responsibilities of Technician (Distribution transformer repair) and career progression Relevant Legislation, Electricity act 2003, CERC, SERC. 	
3	Basics Of Electricity Theory Duration (hh:mm) 12:00 Practical Duration (hh:mm) 04:00 Corresponding NOS Code PSS/N 3005	<ul style="list-style-type: none"> Basic fundamentals of Electricals Transformer Fundamentals Under-standing of schematic drawings of various equipment's used in distribution substation, Single line diagrams and layout plans 	Voltmeter, Ammeter, Wattmeter, basic components, etc.
4	Testing and Inspection of Faults in Distribution Transformer Theory Duration (hh:mm) 32:00 Practical Duration (hh:mm) 80:00 Corresponding NOS Code PSS/N 3005	<ul style="list-style-type: none"> Transformer fundamentals-working principle, EMF build up & other physical fundamental's voltage and current transformation ratios Parts /components in a Distribution transformer Rating plate study and understand specifications Details and function of transformer auxiliaries: tap changer, explosion vent, oil temperature indicator, conservator, silica gel, breather etc. Distribution transformer workshop visit Testing parameters of distribution transformer Causes & Types of Distribution 	Screw driver, combination plier, phase tester, digital multi-meter, clip on meter, neon etc.,

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		<p>transformer failure</p> <ul style="list-style-type: none"> • Testing of Distribution transformer • Testing of distribution transformer auxiliaries for proper functioning • Inspection and maintenance schedule for transformer maintenance • check list for transformer assembling and maintenance • Monitoring of transformer performance and auxiliaries monitoring • Keep record card which contains the basic information like serial number, diagram & rating plate mounted on the tank location. • Keep running defect/repair record card which shows diagnostic record for avoiding future problems • Inspect nature of faults, connections in transformer, physical condition • - Inspect physical and mechanical condition visually for rust on body and on radiators. • Inspect all required grounding and shorting connections, perform insulation-resistance test • Failure report generation • - work plan for repair activities 	
5	<p>Repair, overhaul and delivery of teste distribution transformer Theory Duration (hh:mm) 27:00</p> <p>Practical Duration (hh:mm) 82:00</p> <p>Corresponding NOS Code PSS/N3006</p>	<ul style="list-style-type: none"> • Repair and overhaul of distribution transformer standard procedures, refer maintenance manual and circuit diagram • Repair activity and assembling • Demonstrate repair and maintenance compliance stated in the standard procedure manual in the organization and the general requirements of standards and 5S • record all the abnormalities and defects during repair • ensure that adequate spare parts should be kept on hand to replace the faulty parts. Get issued required faulty parts from store • Ensure complete transformer with its components are fitted and packed in its original shape. • Take advice from the manufacturer or suppliers if any major abnormalities or defects found during repair and maintenance • Energize distribution transformer at NO-LOAD only and checked for any abnormalities for the next 4 hours • -Confirm the entire test before delivery like Physical: leakage, low oil, silica in 	Screw driver, combination plier, phase tester, digital multi-meter, clip on meter, neon etc.,

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		breather, HV & LV bushing. <ul style="list-style-type: none"> • Electrical: IR value (HT to E, LT to E, HT to LT, oil BDV) • Energize distribution transformer at NO-LOAD only and checked for any abnormalities for the next 4 hours • -Confirm the entire test before delivery like Physical: leakage, low oil, silica in breather, HV & LV bushing. • Electrical: IR value (HT to E, LT to E, HT to LT, oil BDV) 	
6	Use Basic Health & Safety practices with power related work Theory Duration (hh:mm) 16:00 Practical Duration (hh:mm) 48:00 Corresponding NOS Code PSS/N 2001	<ul style="list-style-type: none"> • To understand basic health and safety practices covering CEA safety regulations 2010, issue of permit to work etc. • To study uses of PPE equipment's during at work site e.g. safety helmet, belt, shoes, protective glasses, earth rod, etc. • Retrieve and point out documentation that refers to safety, health policy and standard • Information to relevant authority for any abnormal situation/ behaviour of any equipment's • Good housekeeping practises and disposal of waste • Identify common hazard , Storage of flammable materials and oils safely • Possible causes of risk or accident • Safe working practises when working with tools and machines • Electrical safe working procedures such as Tag out, Lockout, Permit to work • Recognize any abnormalities in system installed , alarms, noticing parameters • Fire safety, causes and precautionary activities. Use of appropriate fire extinguishers on different types of fires • Demonstrate rescue techniques applied during fire hazard, correct method to move injured people during emergency • Various types of safety signs and what they mean • Lift, carry and transport heavy objects, and tools, safely, using correct procedures from storage to workplace and vice versa • Administer appropriate first aid to victims , bandaging heart attack, CPR, etc. • Demonstrate how to free a person from electrocution 	Helmet, Gloves, rubber mat, ladder, neon tester, safety rope, first aid kit etc

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		<ul style="list-style-type: none"> Respond promptly and appropriately to an accident situation or medical emergency in real or simulated environments Inform relevant authority about any abnormal situation Complete written accident report or dictate a report, send report to concern person responsible 	
7	Working effectively with others Theory Duration (hh:mm) 21:00 Practical Duration (hh:mm) 16:00 Corresponding NOS Code PSS/N 1336	<ul style="list-style-type: none"> Working effectively in a team. Demonstrate good interpersonal relation, discipline behaviour, developing a positive attitude and building self-confidence. Receiving information and instruction from supervisor and fellow workers, pass on information Assist others to maximize effectiveness Problem escalation Demonstrate responsible, disciplined behavior's at workplace Display appropriate communication etiquette while working Communication And Writing Skills and their importance Basic Computer application 	
	Total Duration Theory Duration 120:00 Practical Duration 230:00	Unique Equipment Required: Distribution transformer, Screw driver, Phase tester, Spanner set, Combination plier, neon tester, Digital multi-meter,	

Grand Total Course Duration: **350Hours, 0 Minutes**

(This syllabus/ curriculum has been approved by **POWER SECTOR SKILL COUNCIL**)

Trainer Prerequisites for Job role: “Technician- Distribution Transformer Repair” mapped to Qualification Pack: “PSSC/Q 3003, v1.0”

Sr. No.	Area	Details
1	Description	To deliver accredited training service, mapping to the curriculum detailed above, in accordance with the Qualification Pack “PSSC/Q 3003
2	Personal Attributes	Aptitude for conducting training, with relevant work experience. So, that competent candidate is produced at end of the training who are employable. Strong communication skills, interpersonal skills, ability to work as part of a team, a passion for quality and for developing others; well-organised and focused, eager to learn and keep oneself updated with the latest in the mentioned field.
3	Minimum Educational Qualifications	ITI in Electrical trade ; Preferably B.Tech(Electrical) or 3 year Diploma in Electrical Engineering,
4a	Domain Certification	Certified for Job Role: “ <u>Technician- Distribution Transformer Repair</u> ” mapped to QP: “PSSC/Q 3003 v1.0”., Minimum accepted score as per PSSC guidelines- 80% for Trainer and 90% for Master Trainer
4b	Platform Certification	Recommended that the Trainer is certified for the Job Role: “Trainer”, mapped to the Qualification Pack: “MEP/Q0102”. Minimum accepted score as per PSSC guidelines – 80% for Trainer and 90% for Master Trainer
5	Experience	Engineer B.Tech. (Electrical) with at least 1-year relevant experience in power distribution either in the Power Distribution utility or with the turnkey /EPC contractors of the power distribution companies carrying out the work of erection of power distribution lines and sub stations etc. 3 years Diploma in Electrical Engineering with at least 2-3 years’ relevant experience in power distribution either in the Power Distribution utility or with the turnkey /EPC contractors of the power distribution companies carrying out the work of erection of power distribution lines and sub stations etc. ITI Electrician with at least five-year relevant experience in power distribution either in the Power Distribution utility or with the turnkey /EPC contractors of the power distribution companies carrying out the work of erection of power distribution lines and sub stations etc.



Annexure: Assessment Criteria

Assessment Criteria	
Job Role	Technician –Distribution Transformer Repair
Qualification Pack	PSSC/Q 3003, v1.0
Sector Skill Council	Power

Sr. No.	Guidelines for Assessment
1	Criteria for assessment for each Qualification Pack will be created by the Sector Skill Council. Each Performance Criteria (PC) will be assigned marks proportional to its importance in NOS. SSC will also lay down proportion of marks for Theory and Skills Practical for each PC.
2	The assessment for the theory part will be based on knowledge bank of questions created by the SSC.
3	Individual assessment agencies will create unique question papers for theory part for each candidate at each examination/training centre (as per assessment criteria below) .
4	Individual assessment agencies will create unique evaluations for skill practical for every student at each examination/training centre based on these criteria.
5	To pass the Qualification Pack, every trainee should score a minimum of 70% in every NOS
6	In case of successfully passing only certain number of NOS's, the trainee is eligible to take subsequent assessment on the balance NOS's to pass the Qualification Pack

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
1. PSS/N3005 Testing and inspection of faults in Distribution transformer	PC1. Maintain a record card which contains the basic information of a DT like serial number, diagram, rating plate and other related aspects	100	4	1	3
	PC2. Maintain defect/repair record card which shows diagnostic records to assess the DT performance history		4	1	3
	PC3. prepare check list of parameters to be kept into consideration while doing testing and inspection of distribution transformer		4	2	2
	PC4. checking general appearance and leakage of oil to identify visual faults		2	0	2
	PC5. identify the nature of fault and damage of part/ component		5	2	3
	PC6. disconnect the winding connections from terminal bushing and earth connection between core and tank before lifting.		3	0	3
	PC7. inspect physical condition visually for rust on body and on radiators.		3	0	3
	PC8. verify correct connections of HT/LT side		5	2	3
	PC9. inspect bolt/lugs and solder of electrical connections		4	1	3
	PC10. inspect all required grounding and shorting connections, perform insulation-resistance test		5	2	3
	PC11. check the oil level in oil cap under silica gel breather		4	2	2
	PC12. check Bushing collar, gaskets and gaskets joints for any leakage of oil.		4	0	4
	PC13. check breathing holes in silica gel breather		4	0	4
	PC14. inspect color of silica gel in breather		4	0	4
	PC15. check condition of OLTC		5	2	3
	PC16. check leakage from gasket, gasket joint and flanges (Repeat)		4	0	4
	PC17. inspect porcelain insulator bushing for any damage, flash and hair crack		4	0	4
	PC18. identify faults arising due to: primary Winding burnt (one		5	2	3

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation				
				Theory	Skills Practical			
	phase, two phase or complete), braze /solder of LT winding joints melted, over heat, open circuit in internal wiring etc.							
	PC19. detect/ trouble shooting of excess humming noise due to loose fitting of silicon mixed steel alloys laminated core joints					4	1	3
	TOTAL					100	22	78
2.PSS/N300 6 Repair, overhaul and delivery of tested distribution transformer	PC1. demonstrate repair and maintenance compliance stated in the standard procedure manual	100	3	1	2			
	PC2. refer maintenance manual and circuit diagram		2	1	1			
	PC3. ensure all required tools and kits are in good condition		2	0	2			
	PC4. check that all testing kits are calibrated		2	1	1			
	PC5. record all the abnormalities and defects during repair		2	1	1			
	PC6. prepare work area as per standard repair procedure		2	1	1			
	PC7. ensure that adequate spare parts should be kept on hand to replace the faulty parts.		2	0	2			
	PC8. take oil samples from tank bottom, tank top and radiator for checking of Break-Down Voltage (BDV) test		3	1	2			
	PC9. remove core and windings from the tank for visual inspection		1	0	1			
	PC10. ensure core and winding in proper cover, dry and safe place after removal from tank		1	0	1			
	PC11. check status of core, primary winding, secondary winding, primary terminal connections, secondary terminal connections, insulation (fish paper, empire tape/cloth, wooden spacers, tags etc)		1	0	1			
	PC12. identify nature of fault and carry out repair and replacement.		3	1	2			

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	PC13. place complete core and winding block for heat treatment in vacuum chamber		1	0	1
	PC14. maintain voltage within prescribed limits by the use of an Off-Circuit Tap Selector (OCTS)		2	1	1
	PC15. test for variation appearing in the primary side supply voltage and the secondary side supply voltage		2	1	1
	PC16. check insulation resistance by Megger.		2	1	1
	PC17. check all loose bolts / screws / clamps, tighten the core joints, solder HT and LT terminal connections		2	0	2
	PC18. check and ensure that no sludge has been deposited on winding to block the oil ducts and opening passage		1	0	1
	PC19. check indoor and outdoor bushings for oil leakage and cracks or any other defects, replace the defective bushing		2	0	2
	PC20. check cooling radiators for any oil leakages along all the welded joints, gasket joints and plugs. Rectify the same from the radiators.		2	0	2
	PC21. check and ensure clamping of the conservator.		1	0	1
	PC22. check and clean all the oil gauges and replace the defective oil gauges.		2	0	2
	PC23. check the dehydrating breather and replace if saturated and color has changed.		3	1	2
	PC24. check that no foreign items have been left in the tank.		1	0	1
	PC25. repair oil leakage and sweating. Top- up oil as per instruction stated in the manual.		2	1	1
	PC26. check pressure release device and explosion vent.		2	0	2
	PC27. check sealing gaskets for cracks, tight nut and bolts and replace damage gaskets.		2	0	2
	PC28. check oil level in conservator tank gauge and thermometer.		2	0	2
	PC29. check OLTC switch for arcing welding and wearing and replace repair defective parts		2	0	2
	PC30. check and clean the radiator with compressed air or water		1	0	1
	PC31. check arcing horns for dent, welds or any defect and replace the same if found defective		1	0	1

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	PC32. check for any rust and damage of paint for external tank		1	0	1
	PC33. check oil temperature indicator (OTI) and winding temperature indicator (WTI)		2	1	1
	PC34. check air-release plugs of main tank, radiator, conservator, bushings, etc., are free of air pocket / bubbles.		2	0	2
	PC35. energize distribution transformer at NO-LOAD only and checked for any abnormalities for the next 4 to 8 hours		4	2	2
	PC36. take advice from the manufacturer or suppliers if any major abnormalities or defects found during repair and maintenance.		5	2	3
	PC37. ensure complete transformer with its components are fitted and packed in its original shape.		3	1	2
	PC38. confirm all the tests are done before delivery. All the test relevant to the performance of DT and ensure basic parameters like Physical: leakage, low oil, silica in breather, HV & LV bushing. Electrical: IR value (HT to E, LT to E, HT to LT, oil BDV)		4	2	2
	PC39. ensure vent pipe is sealed with aluminum foil (diaphragm), temperature gauge is fitted and all HV terminals are fitted with horn and double screws and washers.		1	0	1
	PC40. check list before delivery: oil level, No leakage of oil, tap position, silica gel in breather, radiator valve, thermometer packet, earth connection		3	1	2
	PC41. ensure that the inspected and tested component meets the specified operating conditions before issue of OK certificate.		4	2	2
	PC42. anticipate problems well in advance in order to rectify timely.		3	1	2
	TOTAL		100	26	74
3. PSS/N2001 Use basic health and safety practices for power related work	PC1. use protective clothing/equipment for specific tasks and work conditions.	100	3	0	3
	PC2. state the name and location of people responsible for health and safety in the workplace		2	0	2
	PC3. state the names and location of documents that refer to health		2	0	2

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	and safety in the workplace	100			
	PC4. identify job-site hazardous work and state possible causes of risk or accident in the workplace		3	1	2
	PC5. follow electrical safe working procedures such as Tag out/Lock out and display PTW (Permit To Work),		3	1	2
	PC6. follow warning signs (danger, out of service, etc.) while working with electrical systems		3	1	2
	PC7. use standard safe working practices when working at heights, confined areas and trenches		3	1	2
	PC8. test any electrical equipment and system using insulated testing devices before touching them		3	1	2
	PC9. ensure positive isolation of electrical equipment & system as per given standards		3	1	2
	PC10. recognize any abnormalities in electrical equipment or system installed alarm annunciation and/or noticing parameters from gauge/ indicator installed		3	1	2
	PC11. carry out safe working practices while dealing with hazards to ensure the safety of self and others		3	1	2
	PC12. state methods of accident prevention in the work environment of the job role		2	0	2
	PC13. state location of general health and safety equipment in the workplace		2	0	2
	PC14. inspect for faults, set up and safely use of scaffolds and elevated platforms and ladder		2	0	2
	PC15. lift, carry and transport heavy objects & tools safely using correct procedures from storage to workplace and vice versa		2	1	1
	PC16. inspect Grid station and its equipment routinely for any		2	0	2

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	signs of oil and water leakage	100			
	PC17. store flammable materials and machine lubricating oil safely and correctly		2	0	2
	PC18. check that the emission and pollution control devices are working properly in line with environmental policy standards		3	1	2
	PC19. apply good housekeeping practices at all times		3	1	2
	PC20. identify common hazard signs displayed in various areas		2	0	2
	PC21. retrieve and/or point out documents that refer to health and safety in the workplace		2	0	2
	PC22. inform relevant authorities about any abnormal situation/behavior of any equipment/system promptly		3	0	3
	PC23. use the various appropriate fire extinguishers on different types of fires correctly		2	1	1
	PC24. distinguish types of fire		3	1	2
	PC25. demonstrate rescue techniques applied during fire hazard		3	1	2
	PC26. demonstrate good housekeeping in order to prevent fire hazards		3	1	2
	PC27. demonstrate the correct use of a fire extinguisher		3	1	2
	PC28. demonstrate how to free a person from electrocution		3	1	2
	PC29. administer appropriate first aid to victims where required e.g. in case of bleeding, burns, choking, electric shock, poisoning etc.		3	0	3
	PC30. demonstrate basic techniques of bandaging	3	1	2	
	PC31. respond promptly and appropriately to an accident situation or medical emergency in real or simulated environments	3	1	2	
	PC32. perform and organize loss minimization or rescue activity during an accident	3	1	2	

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	in real or simulated environments				
	PC33. administer first aid to victims in case of a heart attack or cardiac arrest due to electric shock, before the arrival of emergency services in real or simulated cases		3	1	2
	PC34. demonstrate the artificial respiration and the CPR Process		3	1	2
	PC35. participate in emergency procedures Emergency procedures: raising alarm, safe/efficient, evacuation, correct means of escape, correct assembly point, roll call, correct return to work		3	1	2
	PC36. complete a written accident/incident report or dictate a report to another person, and send report to person responsible		3	1	2
	PC37. demonstrate correct method to move injured people and others during an emergency		3	1	2
	TOTAL		100	24	76
4. PSS/N1336 Work effectively with others	PC1. accurately receive information and instructions from the supervisor and fellow workers, getting clarification where required	100	10	3	7
	PC2. accurately pass on information to authorized persons who require it and within agreed timescale and confirm its receipt		10	3	7
	PC3. give information to others clearly, at a pace and in a manner that helps them to understand		10	3	7
	PC4. display helpful behavior by assisting others in performing tasks in a positive manner, where required and possible		10	3	7
	PC5. consult with and assist others to maximize effectiveness and efficiency in carrying out tasks		10	3	7
	PC6. display appropriate communication etiquette while		100	10	3

Assessable Outcome	Assessment Criteria	Total Mark (600)	Out Of	Marks Allocation	
				Theory	Skills Practical
	working				
	PC7. display active listening skills while interacting with others at work		10	3	7
	PC8. use appropriate tone, pitch and language to convey politeness, assertiveness, care and professionalism		10	3	7
	PC9. demonstrate responsible and disciplined behaviors at the workplace		10	3	7
	PC10. escalate grievances and problems to appropriate authority as per procedure to resolve them and avoid conflict		10	3	7
	TOTAL		100	30	70
	QP TOTAL		400	102	298



Power Sector Skill Council

Plot No.4, Institutional Area,
CBIP Building, Malcha Marg,
Chanakyapuri, New Delhi –
110021