

# Model Curriculum

## Telecom Board Bring-Up Engineer

**SECTOR:** Telecom  
**SUB-SECTOR:** Handset  
**OCCUPATION:** Terminal Equipment Application Developer  
**REF ID:** TEL/Q2302, V1.0  
**NSQF LEVEL:** 3



## Certificate

### CURRICULUM COMPLIANCE TO QUALIFICATION PACK – NATIONAL OCCUPATIONAL STANDARDS

is hereby issued by the

**TELECOM SECTOR SKILL COUNCIL**

for the

**MODEL CURRICULUM**

Complying to National Occupational Standards of  
Job Role/ Qualification Pack: '**Telecom Board Bring-Up Engineer**'  
QP No. '**TEL/Q2302 NSQF Level 3**'

Date of Issuance: **Jan 08<sup>th</sup>, 2015**

Valid up to\*: **Mar 31<sup>st</sup>, 2021**

*\*Valid up to the next review date of the Qualification Pack*



Authorised Signatory  
(Telecom Sector Skill Council)

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# Telecom Board Bring-Up Engineer

## CURRICULUM / SYLLABUS

This program is aimed at training candidates for the job of a “Telecom Board Bring-Up Engineer” in the “Telecom” Sector/Industry and aims at building the following key competencies amongst the learner.

<b>Program Name</b>	<b>Telecom Board Bring-Up Engineer</b>		
<b>Qualification Pack Name &amp; Reference ID.</b>	TEL/Q2302, Version 1.0		
<b>Version No.</b>	1.0	<b>Version Update Date</b>	29-03-2019
<b>Pre-requisites to Training</b>	10 <sup>th</sup> Pass		
<b>Training Outcomes</b>	<p><b>After completing this programme, participants will be able to:</b></p> <ul style="list-style-type: none"> <li>• Outline electronic components used in Printed Circuit Board (PCBs)</li> <li>• Test the bare board and assembled PCBs</li> <li>• Operate hardware and software validation tools</li> <li>• Demonstrate cleaning and inspection of PCBs as per the specified procedure and process</li> <li>• Illustrate repair and maintenance of PCB</li> <li>• Inspect the working area environment and assure it meets requirement for health, safety and security</li> </ul>		

This course encompasses 4 out of 4 National Occupational Standards (NOS) of “Telecom Board Bring-Up Engineer” Qualification Pack issued by “TSSC: Telecom Sector Skill Council”

Sr. No.	Module	Key Learning Outcomes	Equipment Required
1.	<p><b>Introduction to basic electronics and PCB</b></p> <p><b>Theory Duration</b> (hh:mm) 20:00</p> <p><b>Practical Duration</b> (hh:mm) 10:00</p> <p><b>Corresponding NOS Code</b> Bridge Module</p>	<ul style="list-style-type: none"> <li>Define basic electronics like active and passive components including resistors, capacitors, inductors and colour coding of capacitors and resistors</li> <li>Compare different kinds of diodes – switch and rectifier, transistors – amplifier and switch and logic gates</li> <li>Outline the functions of electronic circuits (transmitters, receivers, switches, power supplies, amplifiers, multiplexers, couplers, registers, memory and all RF circuits) in different telecom equipment</li> <li>Explain different types of Printed Circuit Boards (PCBs) like multi-layered PCB</li> <li>Illustrate the properties of Copper–Clad laminates (CCL), layout design and planning</li> <li>Illustrate cleaning of boards before soldering</li> </ul>	Copper Clad Board, sample components, basic electronic components – resistors, capacitors, diodes, PCB cleaning brush
2.	<p><b>Telecom PCB assembly and testing</b></p> <p><b>Theory Duration</b> (hh:mm) 20:00</p> <p><b>Practical Duration</b> (hh:mm) 35:00</p> <p><b>Corresponding NOS Code</b> TEL/N2307</p>	<ul style="list-style-type: none"> <li>Outline the bare board testing techniques</li> <li>Follow the test plans as provided by development team</li> <li>Match Bill-of-materials (BOM) list required for PCB assembly with actual components</li> <li>Construct jigs and fixtures for bare boards</li> <li>Illustrate standard soldering practices</li> <li>Compute PCB schematics and PCB layouts</li> <li>Operate equipment used for assembly and testing of PCB board</li> <li>Interpret test plans and procedures</li> <li>Demonstrate functional, electrical and parametric testing of assembled PCB</li> <li>Generate fault detection repair report of PCBs</li> </ul>	Bare-Boards, PCBs schematics and PCBs
3.	<p><b>Operate hardware and software validation tools</b></p> <p><b>Theory Duration</b> (hh:mm) 10:00</p>	<ul style="list-style-type: none"> <li>Develop hardware and software validation processes for a board</li> <li>Match the technical specifications for validation</li> <li>List the hardware and software tools used in board validation</li> </ul>	Validation software (FPGA), CAD, Schematic editor & simulator tools

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	<b>Practical Duration</b> (hh:mm) 40:00  <b>Corresponding NOS Code</b> TEL/N2308	<ul style="list-style-type: none"> <li>Operate tools used in hardware and software validation of boards</li> <li>Analyse the algorithm for software testing by priori analysis and posteriori testing methods</li> <li>Demonstrate functional, parametric, electrical and environmental tests</li> <li>Illustrate flash operation of firmware codes and download FPGA image</li> <li>Conclude software validation tests using what-if cases</li> </ul>	
4.	<b>Telecom PCB Repair and Maintenance</b>  <b>Theory Duration</b> (hh:mm) 20:00  <b>Practical Duration</b> (hh:mm) 35:00  <b>Corresponding NOS Code</b> TEL/N2309	<ul style="list-style-type: none"> <li>Review design supporting documents as provided by development team</li> <li>Implement debugging in sections for fault detection</li> <li>Mark all the faulty sections for disassembly</li> <li>Repair burnt, solder mask damage and connector faults</li> <li>Carry out testing of the circuit</li> <li>Debug of faults by adding wires</li> <li>Illustrate PCB reading of schematics and PCB layouts</li> <li>Operate equipment used for repair and rework on PCBs</li> <li>List the compile parts and requisition parts as required</li> <li>Assure quality maintenance for boards</li> </ul>	Soldering station, sample faulty boards, jumper wires.
5.	<b>Maintain a healthy, safe and secure working environment</b>  <b>Theory Duration</b> (hh:mm) 15:00  <b>Practical Duration</b> (hh:mm) 15:00  <b>Corresponding NOS Code</b> TEL/N4121	<ul style="list-style-type: none"> <li>Demonstrate general safety while handling electrical/electronic devices</li> <li>Classify proper use of PPE (Personal Protective Equipment)</li> <li>Analyze work environment area protection</li> <li>Perform circuit planning and create layout for circuit safety</li> <li>Follow Soldering safety guidelines</li> <li>Escalate safety incidents to relevant authorities as per guidelines</li> <li>Understand use of voltmeter</li> <li>Understand lead causes of fire in various equipment and prevent fire accidents</li> <li>Use of fire extinguishers at site</li> <li>Follow organization's emergency procedures promptly, calmly and efficiently</li> </ul>	Fire extinguishers, safety kit, Personal protective equipment like anti-static bands, harness, belts and helmets etc.

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		<ul style="list-style-type: none"> <li>Ensure work is carried out in accordance to the level of competence and legal requirements</li> </ul>	
6.	<p><b>Industrial Education</b></p> <p><b>Theory Duration</b> (hh:mm) 15:00</p> <p><b>Practical Duration</b> (hh:mm) 15:00</p> <p><b>Corresponding NOS Code</b> Bridge Module</p>	<ul style="list-style-type: none"> <li>Communicate with colleagues, peers and supervisor and stake holders</li> <li>Follow liaising and coordination skills</li> <li>Listen effectively and orally communicate information accurately</li> <li>Identify Quality Check (QC) tools</li> <li>Follow maintenance procedures and management</li> <li>Take part in routine, preventive predictive, break down maintenance and basic store management</li> <li>Summarize industrial act, company standards</li> <li>Maintain ERP and Log sheet/Log book</li> <li>Compile the importance of standard operating procedure</li> </ul>	NA
	<p><b>Total Duration</b></p> <p><b>Theory Duration</b> <b>100:00</b></p> <p><b>Practical Duration</b> <b>150:00</b></p>	<p><b>Unique Equipment Required:</b></p> <p>Copper Clad Board, sample components, basic electronic components – resistors, capacitors, diodes, PCB cleaning brush, Bare-Boards, PCBs schematics and PCBs, Validation software (FPGA), CAD, Schematic editor &amp; simulator tools, Soldering station, sample faulty boards, jumper wires, Fire extinguishers, safety kit, Personal protective equipment like anti-static bands, anti-static gloves etc., Projector, Laptop/PC, White Board, Marker, etc.</p>	

Grand Total Course Duration: **250Hours, 0 Minute**

(This syllabus/ curriculum has been approved by **TSSC: Telecom Sector Skill Council**)

## Trainer Prerequisites for Job role: “Telecom Board Bring-Up Engineer” mapped to Qualification Pack: “TEL/Q2302, V1.0”

Sr. No.	Area	Details
1	<b>Description</b>	Individual at this job role responsible for dealing with industry standard practices, flows and tools involved in assembly, test, debug, and enablement of Telecom Hardware boards and make them ready for system integration and commissioning
2	<b>Personal Attributes</b>	Good inter-personal skills, on-site problem-solving, eye for details, attention to compliance to work instructions & parameters and clear communication skills to interact with team members and higher-ups are required for the role
3	<b>Minimum Educational Qualifications</b>	ITI/ Diploma
4a	<b>Domain Certification</b>	Certified for Job Role: “Telecom Board Bring-Up Engineer” mapped to QP: “TEL/Q2302”, Version No. 1.0 Minimum accepted score should be mentioned as 80%
4b	<b>Platform Certification</b>	Recommended that the Trainer is certified for the Job Role: “Trainer”, mapped to the Qualification Pack: “MEP/Q0102”, Version No. 1.0 Minimum accepted score as per SSC guidelines is 80%.
5	<b>Experience</b>	<ul style="list-style-type: none"> <li>The trainer should be certified by TSSC as ‘Train the Trainer’ and ‘Assessor’</li> <li>Worked as PCB assembler for a minimum of 1 year</li> </ul>



## Annexure: Assessment Criteria

<b>Assessment Criteria</b>	
<b>Job Role</b>	<b>Telecom Board Bring-Up Engineer</b>
<b>Qualification Pack</b>	<b>TEL/Q2302, V 1.0</b>
<b>Sector Skill Council</b>	<b>Telecom</b>

<b>Sr. No.</b>	<b>Guidelines for Assessment</b>
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	Assessment will be conducted for all compulsory NOS, and where applicable, on the selected elective/option NOS/set of NOS
4	Individual assessment agencies will create unique question papers for theory and skill practical part for each candidate at each examination/ training center
5	To pass the Qualification Pack, every trainee should score a minimum 70% of aggregate marks to successfully clear the assessment
6	In case of unsuccessful completion, the trainee may seek reassessment on the Qualification Pack

Compulsory NOS			Marks Allocation		
			Total Marks: 400		
Assessment Outcomes	Assessment Criteria	Total Marks	Out Of	Theory	Skills Practical
<b>TEL/N2307</b>  <b>Telecom PCB assembly and testing</b>	PC1. use PCB test plans provided by development team	<b>100</b>	10	5	5
	PC2. construct jigs and fixtures for bare boards		10	2	8
	PC3. correlate BOM required for PCB assembly with actual components		4	2	2
	PC4. follow standard soldering practices		10	5	5
	PC5. read PCB schematics and PCB layouts		10	3	7
	PC6. operate equipment used for assembly and testing of PCB board		10	0	10
	PC7. interpret test plans and procedures		10	2	8
	PC8. perform tests for communication interfaces and protocols		10	4	6
	PC9. perform functional, electrical and parametric testing of assembled PCB		10	4	6
	PC10. do fault detection and repair of PCB		16	6	10
<b>TOTAL</b>			<b>100</b>	<b>33</b>	<b>67</b>
<b>TEL/N2308</b>  <b>Hardware-Software Bring-Up</b>	PC1. develop or Implement hardware validation methodology for a board	<b>100</b>	10	5	5
	PC2. operate tools used in hardware board bring-Up		20	5	15
	PC3. test set-ups for hardware validation of telecom boards		20	10	10
	PC4. undertake tasks related to functional, parametric, electrical & environmental tests		10	5	5
	PC5. develop or implement software validation methodology for a board		10	2	8
	PC6. operate tools used in software bring-up		15	5	10
	PC7. flash firmware codes & download FPGA image		5	2	3
	PC8. ensure use case & what-if scenario testing		10	2	8
<b>TOTAL</b>			<b>100</b>	<b>36</b>	<b>64</b>
<b>TEL/N2309</b>  <b>Telecom PCB Repair and Maintenance</b>	PC1. review all the design supporting documents provided by development team	<b>100</b>	10	5	5
	PC2. section wise debugging for fault detection		20	5	15
	PC3. mark all the faulty sections for disassembly		10	5	5
	PC4. repair burnt laminate, solder mask damage and connector		10	5	5
	PC5. add wires to test the circuit and debug faults		10	2	8
	PC6. read PCB schematics and PCB layouts		10	3	7
	PC7. operate equipment used for repair and rework of PCB board		5	2	3
	PC8. ensure best maintenance practice for longer life of equipment		5	2	3
	PC9. compile list of parts and requisition parts as needed		10	3	7
	PC10. ensure board quality assurance		10	2	8
<b>TOTAL</b>			<b>100</b>	<b>34</b>	<b>66</b>
	PC1. ensure that work is carried out in accordance to the level of competence and legal requirements		10	6	4

<b>TEL/N4121</b>  <b>Maintain a healthy, safe and secure working environment</b>	PC2. ensure that sites are assessed for health and safety risk as per company's guidelines prior to commencement of work	<b>100</b>	12	6	6
	PC3. ensure environmental conditions and hazards like Earth Potential Rise (EPR) are considered while carrying out the work		15	9	6
	PC4. identify and correct any hazards that you can deal with safely, competently and within the limits of your authority		15	10	5
	PC5. report any hazards that you are not competent to deal with to the relevant person in line with organizational procedures and warn other people who may be affected		12	7	5
	PC6. follow your organization's emergency procedures promptly, calmly, and efficiently		12	6	6
	PC7. identify and recommend opportunities for improving health, safety, and security to the designated person		14	8	6
	PC8. complete any health and safety records legibly and accurately		10	5	5
	<b>TOTAL</b>		<b>100</b>	<b>57</b>	<b>43</b>