

Model Curriculum

Outside Plant Fiber Installation, Testing and Commissioning Supervisor

SECTOR: TELECOM
SUB-SECTOR: PASSIVE INFRASTRUCTURE
OCCUPATION: OPERATIONS & MAINTENANCE
REF ID: TEL/Q4107, V1.0
NSQF LEVEL: 5



Certificate

CURRICULUM COMPLIANCE TO QUALIFICATION PACK – NATIONAL OCCUPATIONAL STANDARDS

is hereby issued by the

TELECOM SECTOR SKILL COUNCIL

for

MODEL CURRICULUM

Complying to National Occupational Standards of Job Role/ Qualification Pack:
'Outside Plant Fiber Installation, Testing and Commissioning Supervisor'
QP No. 'TEL/Q4107 NSQF Level 5'

Date of Issuance: **Nov 10th, 2017**

Valid up to*: **Nov 10th, 2021**

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



Authorised Signatory
(Telecom Sector Skill Council)

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Outside Plant Fiber Installation, Testing and Commissioning Supervisor

CURRICULUM / SYLLABUS

This program is aimed at training candidates for the job of a “Outside Plant Fiber Installation, Testing & Commissioning Supervisor”, in the “Telecom” Sector/Industry and aims at building the following key competencies amongst the learner.

Program Name	Outside Plant Fiber Installation, Testing & Commissioning Supervisor		
Qualification Pack Name & Reference ID.	TEL/Q4107, Version 1.0		
Version No.	1.0	Version Update Date	10-11-2017
Pre-requisites to Training	<ul style="list-style-type: none"> • Entry level 10+2 Pass or • Optical Fiber Technician (OFT) QP certified with one-year experience 		
Training Outcomes	<p>After completing this programme, participants will be able to:</p> <ul style="list-style-type: none"> • Handle cable constructs, performance and selection criteria of fiber cables – Identify cable construction, performance parameters and fiber types • Check fiber connectorisation and splicing – Examine types of connector, splicing types – ribbon, mechanical and fusion splicing • Follow procedures for outside plant cable installation – Pre-installation checks and cable installation types – direct buried, underground (duct) and aerial installation • Prepare cables for termination and splicing – Fiber cable preparation, and cable slack management • Test and troubleshoot outside plant fiber – Testing parameters, demonstrate test equipment and record the result • Practice safety precautions with fiber optics – Follow safety procedures while working with fiber optics 		

This course encompasses 6 out of 6 National Occupational Standards (NOS) of “Outside Plant Fiber Installation, Testing and Commissioning Supervisor” Qualification Pack issued by “TSSC: Telecom Sector Skill Council”

Sr. No.	Module	Key Learning Outcomes	Equipment Required
1.	<p>Introduction</p> <p>Theory Duration (hh:mm) 20:00</p> <p>Practical Duration (hh:mm) 00:00</p> <p>Corresponding NOS Code Bridge Module</p>	<ul style="list-style-type: none"> Recall the fundamentals of optical fiber and their applications Summarize the history of optical fiber Solve the challenges faced during handling of fiber optics Illustrate on working principles of optical fiber communication system Compare optical fiber performance parameters like attenuation, bending, dispersion, cut-off wavelength and mode-field diameter Explain the various fiber geometric parameters (core, clad and buffer) Infer the importance of cable jackets, strength members and moisture/water blocking compounds 	NA
2.	<p>Handling Fiber constructs, performance and selection criteria</p> <p>Theory Duration (hh:mm) 20:00</p> <p>Practical Duration (hh:mm) 25:00</p> <p>Corresponding NOS Code TEL/N4126</p>	<ul style="list-style-type: none"> Explain basics of optical fiber cable constructions Identify primary fiber cable differentiators – simplex and zip cords, distribution cable and break-out cables Classify the optical fiber cable types – ribbon fiber cables, underground/buried cables, aerial cables, underwater and submarine cables Relate cable identifiers and primary requirements List the fiber standard colour codes Identify the optical fiber cable selection criteria like pulling strength, rodent penetration, grounding and bonding Outline single mode optical fiber cable specifications and ITU-T standardisations 	Different types of optical fiber cables – Multi-tube single jacket duct fiber cable, multi-tube double jacket dielectric armoured fiber, uni-tube single jacket ribbon fiber cable, multitube single jacket armoured figure-8 cable, multitube double jacket ADSS fiber cable
3.	<p>Fiber connectorisation splicing and first level checks</p> <p>Theory Duration (hh:mm) 30:00</p> <p>Practical Duration (hh:mm) 50:00</p> <p>Corresponding NOS Code TEL/N4127</p>	<ul style="list-style-type: none"> Identify fiber connectors, their construction, connector ferrule shapes and polishes Identify the connector colour codes (TIA568) Compare the different types of connector – SC, ST, FC/PC, MT Examine the causes of attenuation on connectors Interpret criterion for fiber connector performance Analyse the effect of polish type on connectors (Flat, PC, UPC, APC) Elaborate the procedure for termination of connectors 	Cleaver, Mechanical and fusion Splicing kit, Protection Sleeves, Fiber Stripper, Fiber reinforced plaster

Sr. No.	Module	Key Learning Outcomes	Equipment Required
		<ul style="list-style-type: none"> Estimate the importance of connector inspection and cleaning Solve the challenges faced by single mode connectorisation Distinguish the different types of alignment mechanisms in mechanical splices Illustrate the processes of mechanical splicing Illustrate the processes of fusion splicing Illustrate the processes of ribbon splicing Evaluate the quality of splices – good splices or bad splices Test and troubleshoot issues related to splicing – not fused through, match heads, constriction, enlargement, bubble or inclusion Perform standard cleaning practices before beginning and during start of the splicing process Inspect the periodical checking and cleaning practices Compile the checklist of splicing process 	
4.	<p>Outside plant cable installation procedures and practices</p> <p>Theory Duration (hh:mm) 15:00</p> <p>Practical Duration (hh:mm) 45:00</p> <p>Corresponding NOS Code TEL/N4128</p>	<ul style="list-style-type: none"> Mark the pre-construction survey on the site Perform pre-testing with an OTDR Illustrate cable hauling process and pre-installation check with the following constraint check – maximum pulling tension, maximum bending radius, total cable length, splicing length requirement at end points Carry out duct rodding, testing and cleaning processes Select appropriate cables for installation procedures – direct buried installation (single jacket, dual jacketed cable), underground (duct) installation (“figure 8” demonstration), aerial installation (bending radius, placing tension) 	Cable blowing machines, Protection Sleeves, Fiber Stripper, OTDR, Different types of fiber cables (aerial, buried and underground), drum flanges
5.	<p>Preparing cable for termination and splicing</p> <p>Theory Duration (hh:mm) 10:00</p>	<ul style="list-style-type: none"> Pull the cable (by removing strength members in the cables) Construct armoured cable using ripcord Construct dual jacket plant cable using a Kellum’s grip Pull optic cable by placing the cable drum in upright position 	Different types of fiber cables, needle-nose pliers, scissors, slack brackets, shaft

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	Practical Duration (hh:mm) 30:00 Corresponding NOS Code TEL/N4129	<ul style="list-style-type: none"> Lift cable drums with a shaft without damage Handle fork-lift to keep the drums in upright position Roll the drums as per the direction marked on the drum flanges Measure the cable slack management based on cable bend radius 	
6.	Outside plant fiber testing and troubleshooting Theory Duration (hh:mm) 15:00 Practical Duration (hh:mm) 20:00 Corresponding NOS Code TEL/N4130	<ul style="list-style-type: none"> Compare the optical power measurement parameters (optical power, attenuation levels at fiber, connectors) fault location Calibrate the test equipment like OTDR, optical power meter, visual cable fault locator, OLTS, visual inspection test (using fiber tracer) Measure power levels for loss testing using Fiber optic power meters Measure optical loss or attenuation in fibers, cables or connectors from optical fiber test source Perform visual inspection test of connectors using microscope Measure the loss of fiber, connectors and connectorized cables using Optical loss test sets (OLTS) Visualise the phenomenon of back-scattering and find faults and optimize splices using Optical Time Domain Reflectometer (OTDR) Check cable continuity using visual cable tracers and fault locators Illustrate “one-cable”, “two cables” and “three cables” tests for loss measurement Identify the types of faults or failures in fiber cable Perform testing the installed fiber optic cable plant – continuity testing, insertion loss test Compare different types of OSP Network Testing – Chromatic dispersion cause, material dispersion, waveguide dispersion, chromatic dispersion 	Optical power meter, Fiber optic test source, OLTS, OTDR, Visual Cable tracer, attenuators
7.	Work Safety with fiber optics Theory Duration (hh:mm) 10:00	<ul style="list-style-type: none"> Perform fiber work safety in fiber optic installations Wear eye-safety to protect cornea or lens during work Handle safely bare fiber from broken ends of fibers and scraps of fibers during termination and splicing 	Safety glasses, safety hand-gloves, microscope with infrared filters, isopropyl alcohol, adhesives, class III optical amplifiers

Sr. No.	Module	Key Learning Outcomes	Equipment Required
	<p>Practical Duration (hh:mm) 10:00</p> <p>Corresponding NOS Code TEL/N4131</p>	<ul style="list-style-type: none"> Compare the manufacturer supplied material safety data sheet (MSDS) with on-ground materials Follow fire safety practices while using electric arc to make fusion splicers Comply and adhere electrical safety norms while working with fiber hardware connectivity Summarize the laser safety norms and applicable classes Record the health and safety instances 	
	<p>Total Duration</p> <p>Theory Duration 120:00</p> <p>Practical Duration 180:00</p>	<p>Unique Equipment Required:</p> <p>Projector, Laptop/PC, White Board, Marker, multi-tube single jacket duct fiber cable, multi-tube double jacket dielectric armoured fiber, uni-tube single jacket ribbon fiber cable, multitube single jacket armoured figure-8 cable, multitube double jacket ADSS fiber cable, cleaver, mechanical and fusion splicing kit, Protection sleeves, fiber stripper, fiber reinforced plaster, Cable blowing machines, OTDR, Different types of fiber cables (aerial, buried and underground), drum flanges, needle-nose pliers, scissors, slack brackets, shaft, Optical power meter, fiber optic test source, OLTS, OTDR, visual cable tracer, attenuators, safety glasses, safety hand-gloves, microscope with infrared filters, isopropyl alcohol, adhesives, class III optical amplifiers.</p>	

Grand Total Course Duration: **300Hours, 0 Minute**

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

Trainer Prerequisites for Job role: “Outside Plant Fiber Installation, Testing & Commissioning Supervisor” mapped to Qualification Pack: “TEL/Q4107, V1.0”

Sr. No.	Area	Details
1	Description	OSP Installation, testing and commissioning supervisor is responsible for on-site optical fiber installation activities adhering to the best practices for optical splicing, testing and safety compliances/measures on the field.
2	Personal Attributes	Good analytical skills, on-site problem-solving skills, attention to details and fair communication skills to interact with team members and higher-ups are required for the role.
3	Minimum Educational Qualifications	ITI/ Diploma
4a	Domain Certification	Certified for Job Role: “ <u>Outside Plant Fiber Installation, Testing and Commissioning Supervisor</u> ” mapped to QP: “ <u>TEL/Q4107</u> ”, Version No. 1.0 Minimum accepted score should be mentioned as 80%.
4b	Platform Certification	Recommended that the Trainer is certified for the Job Role: “ <u>Trainer</u> ”, mapped to the Qualification Pack: “ <u>MEP/Q0102</u> ”, Version No. 1.0 Minimum accepted score as per SSC guidelines is 80%.
5	Experience	<ul style="list-style-type: none"> The trainer should be certified by TSSC as ‘Train the Trainer’ and ‘Assessor’ Worked as Optical Fiber Technician for a minimum of 1 year

Annexure: Assessment Criteria

Assessment Criteria	
Job Role	Outside Plant Fiber Installation, Testing and Commissioning Supervisor
Qualification Pack	TEL/Q4107, V. 1.0
Sector Skill Council	Telecom

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	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: 600		
Assessment Outcomes	Assessment Criteria	Total Marks	Out Of	Theory	Skills Practical
TEL/N4126 Handling Fiber constructs, performance and selection criteria	PC1. identify fiber cable construct (core, clad, buffer coating)	100	5	2	3
	PC2. identify various cable components (fiber, strength members, jackets)		5	2	3
	PC3. identify and work with strengthening members, rip cords and armored fibers		5	1	4
	PC4. understand transmission principle for various types of fiber (multi-mode, single mode)		7	7	0
	PC5. identify key performance parameters for an optical fiber (attenuation, fiber size and bandwidth)		6	0	6
	PC6. gauge performance by reading characteristic chart/parameters		6	0	6
	PC7. identify causes of attenuation (scattering, absorption)		3	0	3
	PC8. understand cause and effect of reflection and dispersion (modal, chromatic, polarization)		3	1	2
	PC9. differentiate between speed and bandwidth		5	5	0
	PC10. co-relate between attenuation and wavelength		4	4	0
	PC11. understand relevance of cut-off wavelength		5	4	1
	PC12. identify and differentiate various fiber types as per their construction (zip cord, distribution, loose tube, breakout)		7	3	4
	PC13. identify and differentiate various fiber types as per use (armored, aerial, direct burial, underwater)		4	2	2
	PC14. deploy suitable fiber type based on deployment and its characteristics		7	4	3
	PC15. identify cables as per the standard colour codes		8	5	3
	PC16. select the appropriate cable as per the situation (pulling strength, water protection, rodent penetration)		10	5	5
	PC17. demonstrate grounding & bonding for armored cables		10	4	6
TOTAL		100	49	51	
TEL/N4127 Fiber connectorization, splicing and first level checks	PC1. identify connectors on basis of color code (TIA 568)		5	4	1
	PC2. select a particular type of connector (ST, SC, FC/PC, MT, LC) for a given use		3	1	2
	PC3. understand the effect of polish type (Flat, PC, UPC, APC) on the connector performance		5	5	0
	PC4. perform connector termination on field environment (use of termination tools, cable tools & test equipment) including connector inspection and cleaning		6	2	4

	PC5. demonstrate fiber preparation for splicing (strip jacket, dressing buffer tubes & fibers, strength members, removal of buffer coating)		3	0	3
	PC6. demonstrate fiber cleaning		3	0	3
	PC7. demonstrate fiber cleaving		3	0	3
	PC8. demonstrate mechanical splicing (Elastomeric)		4	0	4
	PC9. demonstrate fiber preparation for fusion splicing (as per PC 5,6,7 above)		5	0	5
	PC10. demonstrate use of splicing equipment, selection of correct splicing program, arc calibration, dust check and cleaning of clamp/groove	100	5	0	5
	PC11. demonstrate fusion splicing		6	0	6
	PC12. demonstrate fiber preparation for ribbon splicing (use of ribbon jacket stripper)		6	0	6
	PC13. demonstrate ribbon cleaving (using ribbon cleaver)		5	0	5
	PC14. demonstrate ribbon splicing		4	0	4
	PC15. demonstrate first level/immediate (post splicing) checks (using VFL, OTDR)		4	0	4
	PC16. demonstrate splice evaluation (white line, offset, diameter difference, bubble, bulge etc.		10	2	8
	PC17. identify common problems and likely causes, for an improper splicing		10	5	5
	PC18. comprehend the data recording and reporting formats		5	3	2
	PC19. perform basic documentation process like recording test results, performance parameters, cable & drum markings etc.		4	4	0
	PC20. submit the records & documents to appropriate authorities to inspect	4	2	2	
	TOTAL		100	28	72
TEL/N4128 Outside Plant Cable Installation procedures & practices	PC1. carry out pre-construction survey of the cable placing route and identify all probable pit-falls and account for them	100	4	2	2
	PC2. perform Pre-test of optical cable using a OTDR		3	1	2
	PC3. undertake pre-installation cable inspection to identify any visible damage or non-compliances		4	0	4
	PC4. confirm basic parameters like max pulling tension, max bending radius, total cable length, splicing length required at termination points		5	2	3
	PC5. demonstrate duct rodding, testing and cleaning process/procedure		4	2	2
	PC6. select appropriate cable for direct buried (single jacket, dual jacket) as per the sight requirements		6	3	3
	PC7. demonstrate armor bonding and grounding		4	1	3
	PC8. handle cable while bending and placing tension		6	0	6

	PC9. perform cable laying and trench compacting practices and placement of markers		8	2	6
	PC10. carry out reinstatements		2	0	2
	PC11. understand best practices in duct cable pulling using proper tools and accessories (pulling rope, cable pulling grip, breakaway swivel)		4	0	4
	PC12. demonstrate cable reel positioning and pulling		7	2	5
	PC13. demonstrate “figure 8” winding/storing of cable		5	0	5
	PC14. understand cable blowing process (wing compressed air)		6	0	6
	PC15. understand practices on duct integrity testing, duct fill ratio, co-efficient of friction and their effect on cable laying/longevity		5	2	3
	PC16. understand specific construction of aerial cables making them suitable for such deployment		8	2	6
	PC17. demonstrate cable handling practices for aerial cables (bending radius, placing tension)		6	2	4
	PC18. demonstrate use and uniqueness of messenger strand		6	3	3
	PC19. demonstrate deployment and use of self-supporting cables		2	2	0
	PC20. demonstrate deployment process for aerial cable		5	2	3
	TOTAL		100	28	72
TEL/N4129 Preparing Cables for termination and splicing	PC1. demonstrate cable preparation (removal of outer jacket, use of rip-cord, identifying and dressing strength member)	100	11	4	7
	PC2. demonstrate use of Kellum’s grip and armored cable cutter		12	6	6
	PC3. demonstrate use of armored cable cutter		10	4	6
	PC4. demonstrate correct cable drum position for pulling fiber cable		10	4	6
	PC5. understand cable handling procedure/process whilst lifting drums, shifting cables, handling with fork-lifts and placed in correct position		15	7	8
	PC6. demonstrate correct positioning and rolling of drums		12	3	9
	PC7. unloading and store the cable drums		10	2	8
	PC8. calculate the slack requirement as per standard practices		10	6	4
	PC9. demonstrate securing of slack in slack brackets		10	4	6
	TOTAL		100	40	60
TEL/N4130 Outside plant Fiber Testing	PC1. demonstrate measurement of optical parameters (optical power, attenuation (at fiber, cables, connectors), fault location)		10	4	6
	PC2. perform optical power and power loss measurement of an optical cable		10	4	6

and troubleshooting	PC3. demonstrate use of various devices (OTDR, optical power meter, visual cable fault locator, OLTS, visual inspection test (use of fiber tracer))	100	8	5	3
	PC4. perform visual inspection test of connectors using a microscope		8	4	4
	PC5. understand and demonstrate “two cables” and “three cables” tests for loss measurement		12	4	8
	PC6. understand and demonstrate insertion loss measurement using “patch cord test” and “double ended loss” technique		17	6	11
	PC7. record cable performance and test parameters like power, attenuation etc		11	5	6
	PC8. record cable inspection parameters as per the company policy/format provided		9	4	5
	PC9. ensure that documents are available to all appropriate authorities to inspect		15	8	7
	TOTAL			100	44
TEL/N4131 Work Safety practices whilst working with fiber optics	PC1. demonstrate eye-safety measures whilst at work	100	12	4	8
	PC2. demonstrate safe handling of bare fiber (broken ends of fiber and scraps)		14	6	8
	PC3. read and comprehend manufacturer supplied MSDS for safe handling of fiber		12	4	8
	PC4. demonstrate fire safety practices (whilst working with high voltage arc in fusion splicers)		12	4	8
	PC5. demonstrate electrical safety norms where fiber is placed along with electrical cables		12	6	6
	PC6. show awareness of laser safety rules		12	8	4
	PC7. demonstrate use of safety gloves and boots, in required situations		12	6	6
	PC8. complete any health and safety records legibly and accurately		14	6	8
TOTAL		100	44	56	