What are Occupational Standards(OS)?

- OS describe what individuals need to do, know and understand in order to carry out a particular job role or function
- OS are performance standards that individuals must achieve when carrying out functions in the workplace, together with specifications of the underpinning knowledge and understanding

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Introduction

Qualifications Pack- Fiber to-the Home (FTTH/X) Installer

SECTOR: TELECOM

SUB-SECTOR: PASSIVE INFRASTRUCTRE

OCCUPATION: NETWORK (PASSIVE) INSTALLATION

REFERENCE ID: TEL/Q4200

ALIGNED TO: NCO-2015/7422.0803

Brief Job Description: Fiber to-the Home (FTTH/X) installer will undertake on-ground implementation of fiber cabling from drop point – Optical Line Terminals (OLTs) to the last mile connectivity i.e. customer premise (termination point). The work will include fiber splicing and termination at every distribution point. The work will follow the structured cabling norms and compliance to telecommunication cabling guidelines on the subject.

Personal Attributes: 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.

Job Details

Qualifications Pack Code	**TEL/Q4200**		
Job Role	**Fiber to-the Home (FTTH/X) Installer**		
Credits (NSQF)	**TBD**	**Version number**	**1.0**
Sector	**Telecom**	**Drafted on**	**17/04/2018**
Sub-sector	**Passive Infrastructure**	**Last reviewed on**	**17/10/2018**
Occupation	**Network (Passive) Installation**	**Next review date**	**17/10/2022**
NSQC Clearance on	**19/12/2018**		

Job Role	**Fiber to-the Home (FTTH/X) Installer**
Role Description	Fiber to-the Home (FTTH/X) Installer will undertake on-ground implementation of fiber cabling from drop point – Optical Line Terminals (OLTs) to the last mile connectivity i.e. customer premise (termination point). The work will include fiber splicing and termination at every distribution point. The work will follow the structured cabling norms and compliance to telecommunication cabling guidelines on the subject.
NSQF level	4
Minimum Educational Qualifications*	12th
Maximum Educational Qualifications*	NIL
Training (Suggested but not mandatory)	NIL
Experience	NIL
Minimum entry Job Age	18 Years
Experience	NIL
Applicable National Occupational Standards (NOS)	**Compulsory:** 1. TEL/N4128 (Outside Plant Cable Installation Procedure and Practices) 2. TEL/N6400 (Undertake splicing of Optical Fiber) 3. TEL/N4200 (Installation of passive FTTH/X components) 4. TEL/N4201 (In-building FTTH/X Cabling) 5. TEL/N4131 (Work Safety practices with Fiber Optics)
Performance Criteria	As described in the relevant OS units

Definitions

Keywords /Terms	Description
Sector	Sector is a conglomeration of different business operations having similar businesses and interests. It may also be defined as a distinct subset of the economy whose components share similar characteristics and interests.
Sub-sector	Sub-sector is derived from a further breakdown based on the characteristics and interests of its components.
Occupation	Occupation is a set of job roles, which perform similar/related set of functions in an industry.
Function	Function is an activity necessary for achieving the key purpose of the sector, occupation, or area of work, which can be carried out by a person or a group of persons. Functions are identified through functional analysis and form the basis of OS.
Job Role	Job role defines a unique set of functions that together form a unique employment opportunity in an organization.
OS	OS specify the standards of performance an individual must achieve when carrying out a function in the workplace, together with the knowledge and understanding they need to meet that standard consistently. Occupational Standards are applicable both in the Indian and global contexts.
Performance Criteria	Performance Criteria are statements that together specify the standard of performance required when carrying out a task.
NOS	NOS are Occupational Standards which apply uniquely in the Indian
Qualifications Pack Code	Qualifications Pack Code is a unique reference code that identifies a qualifications pack.
Qualifications Pack	Qualifications Pack comprises the set of OS, together with the educational, training and other criteria required to perform a job role. A Qualifications Pack is assigned a unique qualification pack code.
Unit Code	Unit Code is a unique identifier for an Occupational Standard, which is denoted by an 'N'.
Unit Title	Unit Title gives a clear overall statement about what the incumbent should be able to do.
Description	Description gives a short summary of the unit content. This would be helpful to anyone searching on a database to verify that this is the appropriate
Knowledge and Understanding	Knowledge and Understanding are statements which together specify the technical, generic, professional and organizational specific knowledge that an individual need in order to perform to the required standard.
Organizational Context	Organizational Context includes the way the organization is structured and how it operates, including the extent of operative knowledge managers have of their relevant areas of responsibility.
Technical Knowledge	Technical Knowledge is the specific knowledge needed to accomplish specific designated responsibilities.
Core Skills or Generic Skills	Core Skills or Generic Skills are a group of skills that are key to learning and working in today's world. These skills are typically needed in any work environment. In the context of the OS, these include communication related skills that are applicable to most job roles.

Acronyms

Keywords/Terms	Description
OTDR	Optical Time Domain Reflectometer
OLTS	Optical Loss Test Set
VFL	Visual Fault Locator
SM	Single Mode
MM	Multi-Mode
DFR	Duct Fill Ratio
ITU	International Telecommunication Union
MSDS	Material Safety Data Sheet
SHE	Safety Health & Environment
OHS	Occupational Health & Safety
OLT	Optical Line Terminal
ONT	Optical Network Terminal

National Occupational Standards

Overview

This unit is about outside plant installation procedures and practices for optical fiber cables.

National Occupational Standard

Unit Code	TEL/N4128
Unit Title (Task)	**Outside plant cable installation procedures and practices**
Description	This unit is about outside plant installation procedures and practices for optical fiber cables.
Scope	This unit/task covers the following: • pre-installation checks and processes • direct buried installation • underground (duct) installation • aerial installation
Performance Criteria (PC) w.r.t. the scope	
Element	**Performance Criteria**
Pre-installation checks and processes	To be competent, the user/individual on the job must be able to: PC1. carry out pre-construction survey of the cable placing route and identify all probable pit-falls and account for them PC2. perform pre-test of optical cable using an OTDR PC3. undertake pre-installation cable inspection to identify any visible damage or non-compliances PC4. confirm basic parameters like max pulling tension, max bending radius, total cable length, splicing length required at termination points PC5. demonstrate duct rodding, testing and cleaning process/procedure
Direct buried installation	To be competent, the user/individual on the job must be able to: PC6. select appropriate cable for direct buried (single jacket, dual jacket) as per the sight requirements PC7. demonstrate armor bonding and grounding PC8. handle cable while bending and placing tension PC9. perform cable laying and trench compacting practices and placement of markers PC10. carry out reinstatements
Underground (duct) installation	To be competent, the user/individual on the job must be able to: PC11. understand best practices in duct cable pulling using proper tools and accessories (pulling rope, cable pulling grip, breakaway swivel) PC12. demonstrate cable reel positioning and pulling PC13. demonstrate “figure 8” winding/storing of cable PC14. understand cable blowing process (wing compressed air) PC15. understand practices on duct integrity testing, duct fill ratio, co-efficient of friction and their effect on cable laying/longevity

Aerial installation	To be competent, the user/individual on the job must be able to: PC16. understand specific construction of aerial cables making them suitable for such deployment PC17. demonstrate cable handling practices for aerial cables (bending radius, placing tension) PC18. demonstrate use and uniqueness of messenger strand PC19. demonstrate deployment and use of self-supporting cables PC20. demonstrate deployment process for aerial cable
Knowledge and Understanding (K)	
A. Organizational Context (Knowledge of the company/ organization and its processes)	The user/individual on the job needs to know and understand: KA1. work and time management KA2. risk and impact of not following defined procedures/work instructions KA3. escalation matrix for reporting identified incidents, troubles and/or emergencies, e.g. system failures, fire and power failures KA4. clearances/in-building authority approvals that are required prior to carry out the installation work KA5. SHE and OHS guidelines and regulations as per company's norms
B. Technical Knowledge	The user/individual on the job needs to know and understand: KB1. various types of optical fiber cable constructs KB2. suitability of deployment of optical fiber cables given a specific requirement KB3. importance of safe/correct handling and negative effects on exceeding parameters like bend radius etc. KB4. handling of key equipment and their characteristics (blowing equipment, cable pulling tools etc.) KB5. need for proper trenching, ducting, aerial messages/supports and best practices
Skills (S) [Optional]	
A. Core Skills/ Generic Skills	**Writing Skills** The user/individual on the job needs to know and understand how to: SA1. record performance/test results SA2. document cable installation paths, position of markers, bends etc. **Reading Skills** The user/individual on the job needs to know and understand how to: SA3. read and understand technical documentation and specifications **Oral Communication (Listening and speaking skills)** The user/individual on the job needs to know and understand how to: SA4. communicate with stakeholders SA5. liaising and coordination among the team members
B. Professional Skills	**Decision making** Not applicable **Plan and Organize** The user/individual on the job needs to know and understand how to: SB1. plan and organize the work to meet the timeline

	Customer Centricity
	The user/individual on the job needs to know and understand how to: SB2. customer requirements SB3. understand customer interaction protocol SB4. understand basics of work ethics and behavior when interacting with customer
	Problem Solving
	The user/individual on the job needs to know and understand how to: SB5. handle generic on-ground/field problems whilst installing fiber optic cables
	Analytical Thinking
	Not Applicable
	Critical Thinking
	Not Applicable

NOS Version Control

NOS Code	TEL/N4128		
Credits (NSQF)	TBD	Version number	1.0
Industry	Telecom	Drafted on	27/06/2017
Industry Sub-sector	Passive Infrastructure	Last reviewed on	10/11/2017
Occupation	Operation & Maintenance	Next review date	10/11/2021

National Occupational Standards

Overview

The role involves carrying out efficient optical splicing and testing its effectiveness through OTDR and power meter tests.

National Occupational Standard

Unit Code	TEL/N6400
Unit Title (Task)	**Undertake Splicing of Optical Fiber**
Description	The role involves carrying out efficient optical splicing and testing its effectiveness through OTDR and power meter tests.
Scope	This unit/task covers the following: • Prepare cable for splicing operations • Ensure availability of tools and spares • Perform splicing operations • Testing effectiveness and perform joint closure • Health and safety • Report and record
Performance Criteria (PC) w.r.t. the Scope	
Element	**Performance Criteria**
Prepare cable for splicing operations	To be competent, the user/individual on the job must be able to: PC1. verify that cable is installed as per the installation plan and visually inspect cable for signs of sheath damage PC2. ensure minimum bend ratios are maintained according to manufacturer's specifications to prevent cable damage and signal degradation PC3. ensure cable is placed on stable jointing pit PC4. secure cable according to safe industry practice to avoid cable and sheath damage PC5. identify the appropriate fiber to be joined based on color coding and sequence PC6. identify appropriate place for the joint chamber location PC7. clean the fiber appropriately as per company/manufacturer's specifications
Ensure availability of tools and spares	To be competent, the user/individual on the job must be able to: PC8. ensure availability of test equipment like OTDR and Power meter for carrying out optical tests PC9. ensure availability of optical equipment like spool, joint closure, connectors, splicer and cleaver PC10. ensure that faulty equipment sent to logistics team for repair and replacement PC11. ensure availability of Optical Fiber joint kits, Pigtails, patch cords, 0dB connector, protection sleeves, heat shrinks PC12. ensure continuous power supply at site for the splicing operation by use of portable generators or stand-by heavy-duty batteries PC13. ensure availability of RCC joint chambers with covers as per specifications PC14. ensure availability of sand for filling the chambers PC15. ensure availability of one spare cable drum for emergency replacement of laid cables PC16. ensure calibration status of equipment to be used (e.g. splicing machine, OTDR, power meter, cleaver)

TEL/N6400 *Undertake Splicing of Optical Fiber*

Perform splicing operations	To be competent, the user/individual on the job must be able to: PC17. ensure clean environment for splicing operations PC18. ensure cables are stripped off their protective coating at areas where splicing must be performed as per the standard process PC19. ensure the fiber ends are cleaved with a precision cleaver and are inspected with magnifier to ensure appropriateness PC20. in case of fusion splicing - insert fibers strand to the fusion machine in accordance to product/equipment specifications PC21. in case of mechanical splice, align the fibers together by a precision-made sleeve and place the prepared fiber in mechanical splicing kit PC22. verify the spliced fiber for appropriate splicing in the magnifier window PC23. ensure appropriate splice protectors like heat shrink splice protectors are utilized to protect the splice
Test effectiveness and Perform Joint closure	To be competent, the user/individual on the job must be able to: PC24. test the fiber joint with OTDR to confirm conformance to design requirements PC25. ensure optical losses - reflectance, return and insertion are within the defined specifications/ limits PC26. ensure sealing of Joint closure through heat shrinking/ multi diameter seals/mechanical seals as appropriate PC27. ensure FRP - Fiber reinforced plastic is used to strengthen the joint as required PC28. test the fiber at both ends for instances of cross fiber using power source and power meter tests and ensure their elimination PC29. ensure joint is placed in the chamber properly PC30. ensure spare cable (loop) is coiled appropriately and placed inside the joint PC31. ensure that sand is filled in the chamber to the brim and the chamber covers are placed properly PC32. ensure that Joint indicator is planted 1 meter behind the chamber location (away from road) PC33. ensure that the indicator is painted proper color (for example yellow for joint)

TEL/N6400 *Undertake Splicing of Optical Fiber*

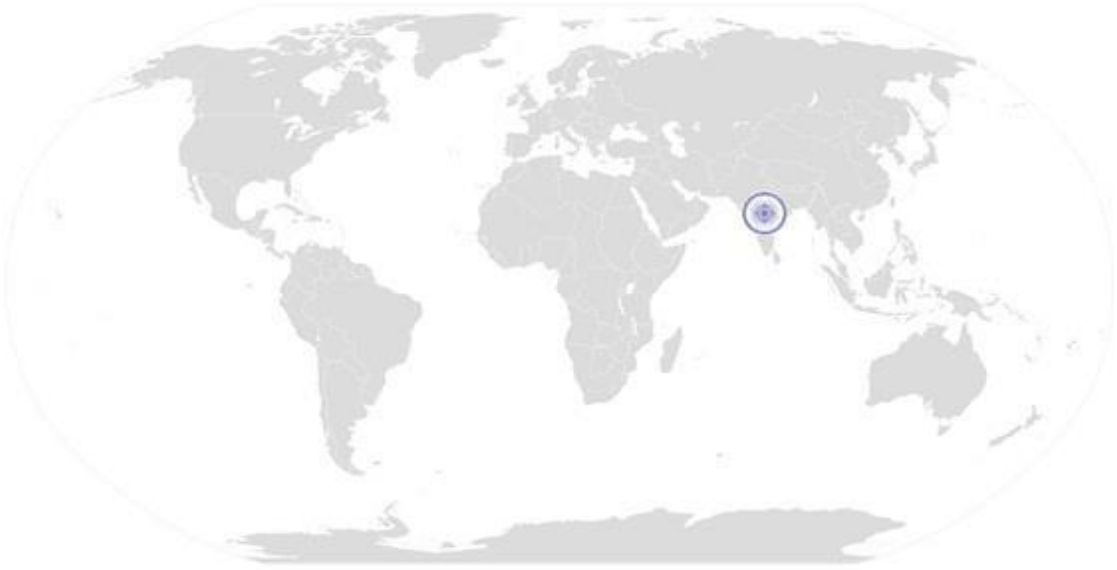
Health and Safety	To be competent, the user/individual on the job must be able to: PC34. ensure appropriate disposal of the cut fibers, sleeves and cable pieces PC35. ensure compliance with site risk control, OHS, environmental and quality requirements as per company's norms PC36. ensure that work is carried out in accordance to the level of competence and legal requirements PC37. ensure that sites are assessed for health and safety risk as per company's guidelines prior to commencement of work PC38. ensure compliance to health and safety guidelines by optical splicer and installation labor workers PC39. ensure that Personal protection equipment like helmets, knee pads, safety boots, safety glasses and trench guards are appropriately used as required PC40. ensure environmental conditions and hazards like Earth Potential Rise (EPR) are considered while carrying out the work PC41. ensure escalation of safety incidents to relevant authorities as per guidelines
Report & Record	To be competent, the user/individual on the job must be able to: PC42. ensure appropriate cable marking and Installation of chamber & route marker for direction and route identification PC43. ensure preparation of jointing record for future reference PC44. ensure that documents that are required to be updated are identified PC45. ensure completion of OTDR register showing complete record of jointing tests PC46. ensure that documents are available to all appropriate authorities to inspect
Knowledge and Understanding (K)	
A. Organizational Context (Knowledge of the company/ organization and its processes)	The user/individual on the job needs to know and understand: KA1. risk and impact of not following defined procedures/work instructions KA2. escalation matrix for reporting identified incidents, troubles and/ or emergencies e.g. system failures, fire and power failures KA3. types of documentation in organization and importance of the same KA4. records to be maintained and implications of non-maintenance of the same KA5. knowledge of spare management and repair & return process for faulty equipment KA6. SHE and OHS guidelines and regulations as per company's norms KA7. personal protection equipment like helmets, knee pads, safety boots, safety glasses and trench guards that are required to be used KA8. first aid requirements in case of electrical shocks, cuts, fall and other common injuries KA9. electrical and chemical, environmental related hazards and precautionary measures KA10. usage of fire safety equipment

B. Technical Knowledge	The user/individual on the job needs to know and understand: KB1. principles of optical transport media and OFC communication KB2. knowledge of Optical fiber characteristics like refraction, polarization, attenuation, dispersion KB3. bands in optical fiber and their usability, loss characteristics KB4. signal strength and quality KPIs – design values and margins KB5. functionality of optical equipment like cleaver, mechanical and fusion splicing kit, protection sleeves, fiber stripper, fiber reinforced plaster during splicing and jointing KB6. functionality of optical test equipment like OTDR and power meter KB7. optimal values of OTDR, Power meter and light meter test results KB8. utility of as made route diagrams KB9. standard trenching, cable laying, pit preparation, splicing, jointing, blowing and back-filling process for installation of OFC cables KB10. different types of OFC connectors based on the type of equipment KB11. standard process and need for performing duct integrity tests like air tightness KB12. tests and kink free tests
Skills (S) [Optional]	
A. Core Skills/ Generic Skills	**Basic Reading & Writing Skills**
	The user/individual on the job needs to know and understand how to: SA1. fill up appropriate technical forms, activity logs in required format of the company SA2. maintain proper records as per given format SA3. read and understand manuals, work orders, health and safety instructions, memos, reports etc. SA4. construct simple sentences and express ideas clearly through written communication
	Communication Skills
	The user/individual on the job needs to know and understand how to: SA5. liaise and coordinate with third party vendors SA6. communicate with supervisor and peers SA7. communicate in the local language
	Other Skills
	The user/individual on the job needs to know and understand how to: SA8. interpret test reports, as made route diagrams and other numerical data SA9. create and maintain effective working relationships and team environment SA10. maintain security of site records and other confidential data SA11. work in teams and take initiatives SA12. execute tasks in a high-pressure environment SA13. be flexible and accept changes in job requirements, schedules, or work environments
B. Professional Skills	**Equipment operating skills**

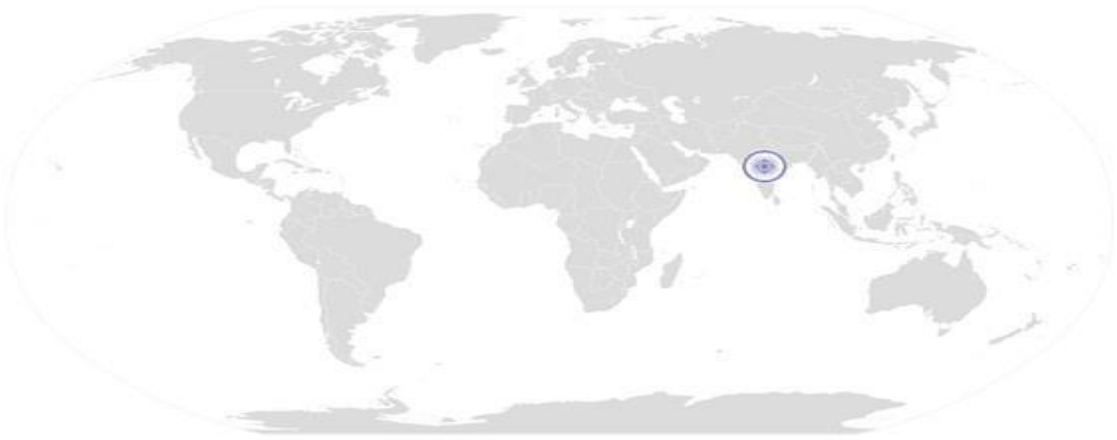
	The user/individual on the job needs to know and understand how to: SB1. operate fusion splicing machine: manual, automatic or handheld SB2. utilize appropriate optical splicing equipment like cleaver, mechanical and fusion splicing machine, protection sleeves, fiber stripper, fiber reinforced plaster, joint closure, heat shrink splice protectors SB3. operate splice sleeve heaters (within the machine and external to the splicing machine) SB4. operate optical test equipment like OTDR and power meter SB5. utilize fiber spool where appropriate while carrying out OTDR tests
	OFC splicing and splice testing skills
	The user/individual on the job needs to know and understand how to: SB6. splice in both indoor and outdoor environment SB7. utilize appropriate fiber like single mode and multi-mode optical fiber based on specific requirements SB8. lay duct using specially designed dispensers SB9. carry out both fusion and mechanical splicing in a manner ensuring minimum reflectance loss, optical return loss, insertion loss SB10. utilize appropriate optical test equipment like OTDR, power meter based on test requirements SB11. perform OTDR test as per standard process and summarize OTDR reports for records and review SB12. perform Power meter tests as per standard process and identify instances of cross-fibers SB13. appropriately mark/ tag cables to identify direction and route SB14. install and operate Installation Termination joint boxes (TJBs) SB15. install and operate the Fiber Distribution Frames (FDFs) with different types of 0dB connectors SB16. organized laying of Pigtails and patch cords and terminating them in TJB/ FDF etc.
	Technical Interpretation Skills
	The user/individual on the job needs to know and understand: SB17. identify appropriate cables for splicing based on sequence or color coding SB18. interpret as made documents and perform update based on actual cable routes, joints SB19. interpret OTDR and power meter test results to identify and localize faults and/or measure optical losses

NOS Version Control

NOS Code	TEL/N6400		
Credits (NSQF)	TBD	Version number	1.0
Industry	Telecom	Drafted on	17/06/2013
Industry Sub-sector	Network Managed Services	Last reviewed on	21/06/2018
Occupation	Operations & Maintenance–Optical	Next review date	31/03/2019



National Occupational Standards



Overview

This unit is about installation of passive FTTH/X components like splitters. These components are critical part of FTTH/X installation and enable multiple subscriber lines from single PON/OLT termination.

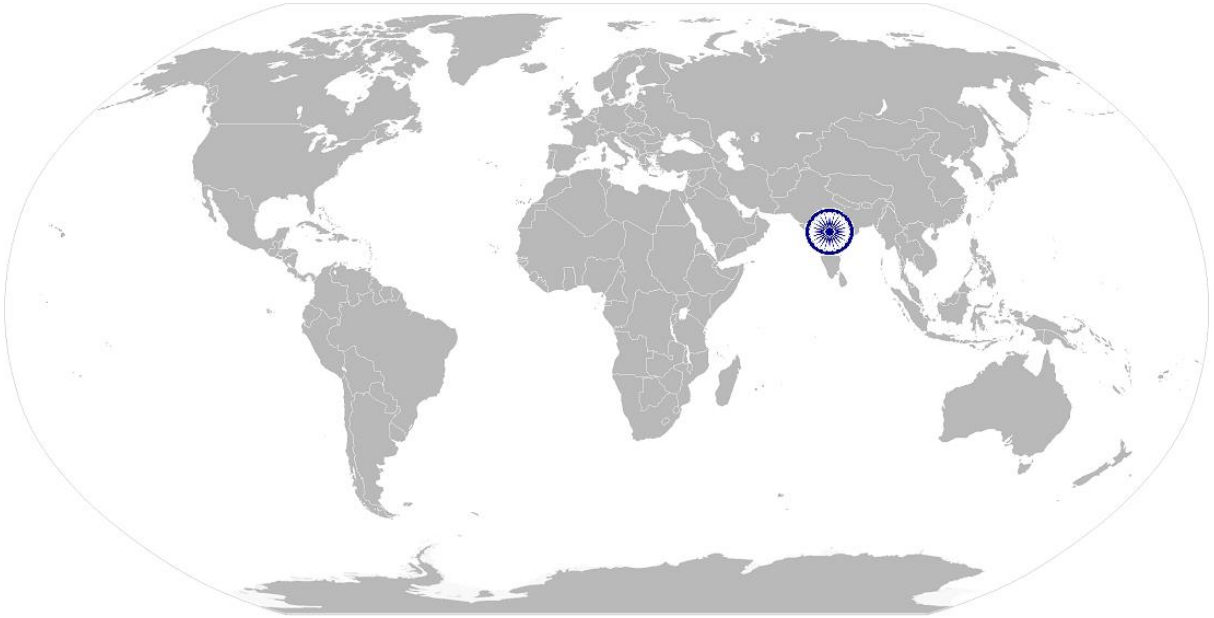
National Occupational Standard

Unit Code	TEL/N4200
Unit Title (Task)	**Installation of Passive FTTH/X components**
Description	This unit is about installation of passive FTTH/X components like splitters and undertaking basic installation checks.
Scope	This unit/task covers the following: • installation of passive FTTH/X components (Splitter) • end connections (single incoming/multiple outgoing) • power test
Performance Criteria (PC) w.r.t. the Scope	
Element	**Criteria**
Installation of passive FTTH/X components (Splitter)	To be competent, the user/individual on the job must be able to: PC1. identify components of passive devices (splitters) PC2. demonstrate installation practices for wall mount splitters (1x8, 1x16, 1x32) PC3. identify feeder and distribution ports on the devices
End connections (single incoming/ multiple outgoing)	To be competent, the user/individual on the job must be able to: PC4. identify feeder and distribution cables/pigtails PC5. demonstrate feeder and distribution connections
Power test	To be competent, the user/individual on the job must be able to: PC6. demonstrate insertion loss testing of optical splitters (OLTS and Light Source) PC7. demonstrate power output measurement at output port by use of power meter and light source (using OLTS & Light Source)
Knowledge and Understanding (K)	
A. Organizational Context (Knowledge of the company / organization and its processes)	The user/individual on the job needs to know and understand: KA1. risk and impact of not following defined procedures/work instructions KA2. escalation matrix for reporting identified incidents, troubles and/ or emergencies e.g. system failures, fire and power failures KA3. types of documentation in organization and importance of the same KA4. records to be maintained and implications of non-maintenance of the same KA5. knowledge of spare management and repair & return process for faulty equipment KA6. SHE and OHS guidelines and regulations as per company's norms
B. Technical Knowledge	The user/individual on the job needs to know and understand: KB1. passive network components and their deployment environment KB2. principle of operation of optical splitters KB3. concept of feeder and distribution connections in a splitter KB4. types of optical splitters and relative features/limitations KB5. power test procedure and principle
Skills (S) [Optional]	
	Basic Reading & Writing Skills

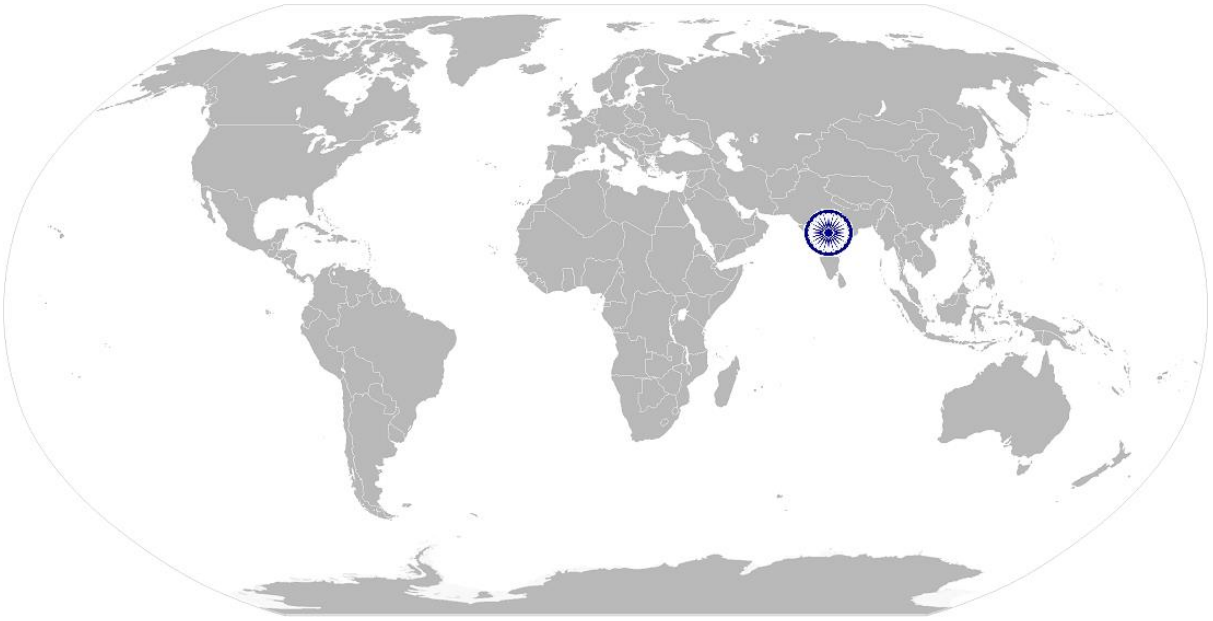
A. Core Skills/ Generic Skills	The user/ individual on the job needs to know and understand how to: SA1. read technical drawings and relate to on-ground situation SA2. maintain proper records as per given format SA3. read and understand manuals, work orders, health and safety instructions, memos, reports etc. SA4. draft work related technical communication (to vendors, superiors)
	Communication Skills
	The user/ individual on the job needs to know and understand how to: SA5. effectively communicate with the site team members (technicians, cable installers) SA6. liaise and coordinate with third party stakeholders
	Other Skills
	The user/individual on the job needs to know and understand how to: SA8. interpret test reports, as made route diagrams and other numerical data SA9. create and maintain effective working relationships and team environment SA10. maintain security of site records and other confidential data SA11. work in teams and take initiatives SA12. be flexible and accept changes in job requirements, schedules, or work environments
B. Professional Skills	**Decision making**
	Not applicable
	Plan & Organize
	The user/individual on the job needs to know and understand how to: SB1. operate field equipment like power meter, light source SB2. apply relevant standards and practices to the work being carried out at the site
	Customer Centricity
	The user/individual on the job needs to know and understand how to: SB3. work effectively in customer facing environment SB4. build and maintain a positive environment
	Problem Solving
	The user/individual on the job needs to know and understand how to: SB5. approach towards problem solving SB6. check points and problem isolation basics SB7. use tools/techniques to address the problem
	Analytical Thinking
	The user/individual on the job needs to know and understand how to: SB8. analyze test results SB9. analyze effect of results on performance and work out remedial measures SB10. analyze any abrupt test results and investigate the possible cause

NOS Version Control

NOS Code	TEL/N4200		
Credits NSQF	TBD	Version number	1.0
Industry	Telecom	Drafted on	17/04/2018
Industry Sub-sector	Passive Infrastructure	Last reviewed on	17/10/2018
Occupation	Network (Passive) Installation	Next review date	17/10/2022



National Occupational Standard



Overview

This unit is about in-building installation of fiber cables for FTTH/X deployment and the end termination at ONT (Optical Network Terminal). The start point is from the OSP (outside plant) fiber landing point in the building. The in-building routing can be through pre-existing/installed horizontal/vertical cable trays through building ducts or paths and/or through pre-existing/installed conduits, up to the ONT termination and further up to the TO (telecommunication outlet) in the customer premise.

National Occupational Standard

Unit Code	**TEL/N4201**
Unit Title (Task)	**In-building FTTH/X cabling**
Description	This unit is about in-building installation of fiber cables for FTTH/X deployment and the end termination at ONT (Optical Network Terminal). The routing of cables can be through pre-existing/installed horizontal/vertical cable trays through building ducts or paths and/or through pre-existing/installed conduits, up to the ONT termination and further up to the TO (telecommunication outlet) in the customer premise.
Scope	This unit/task covers the following: • cable installation through cable trays (horizontal/vertical) • cable installation through conduits • cable installation through false ceiling • terminations at ONT and TO

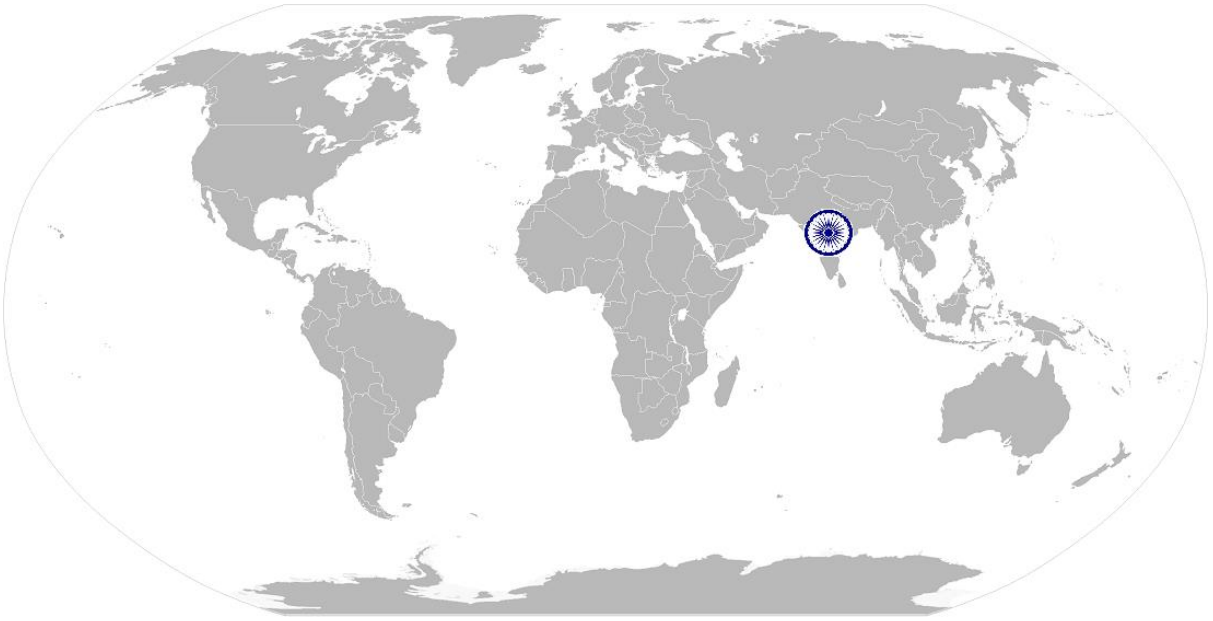
Performance Criteria (PC) w.r.t. the Scope	
Element	**Performance Criteria**
Cable installation through cable trays (horizontal/vertical)	To be competent, the user/individual on the job must be able to: PC1. inspect the site as per building lay-out plan PC2. identify the cabling path from the outdoor fiber landing point (in the building premises) up to the intended ONT installation point (this to include both the cable tray as well as conduit runs) PC3. calculate the horizontal and vertical cable length, accounting for the slack to be maintained PC4. ascertain the pre-existing load and post installation load compliance of the cable trays PC5. ascertain and account for existing cable services on the cable trays (power cables, other data/voice cables etc.) PC6. lay the fiber along the identified tray tracks using appropriate cable pulling method PC7. secure the fiber along the cable tray ensuring proper slack management (especially for the vertical run)
Cable installation through conduits	To be competent, the user/individual on the job must be able to: PC8. demonstrate fiber pulling through conduit using appropriate technique and tools (pulling through 'strength member' and using correct tools like 'fish tape') PC9. demonstrate proper coiling and securing of excess fiber (approx. 3 meter) at the termination end
Cable installation through false ceiling	PC10. demonstrate cable installation through false ceiling, using "figure 8" method PC11. demonstrate cable installation through conduits on false ceiling

Terminations at ONT and TO	To be competent, the user/individual on the job must be able to: PC12. demonstrate fiber termination and connectorisation at ONT PC13. demonstrate fiber termination at TO PC14. demonstrate powering and configuring of ONT PC15. test installed ONT using IP network PC16. undertake VFL (visual fault locator) for the installed fiber run PC17. test the live fiber using fiber detection meter
Knowledge and Understanding (K)	
A. Organizational Context (Knowledge of the company/ organization and its processes)	The user/individual on the job needs to know and understand: KA1. risk and impact of not following defined procedures/work instructions KA2. escalation matrix for reporting identified incidents, troubles and/ or emergencies e.g. system failures, fire and power failures KA3. types of documentation in organization and importance of the same KA4. records to be maintained and implications of non-maintenance of the same KA5. knowledge of spare management and repair & return process for faulty equipment KA6. SHE and OHS guidelines and regulations as per company's norms
B. Technical Knowledge	The user/individual on the job needs to know and understand: KB1. fiber optic cable types and characteristics for in-building deployments KB2. basic knowledge of electrical and electronic components KB3. fiber handling practices (bend radius) KB4. fiber cable components (strength members, cable sheath, core, cladding etc.) KB5. fusion splicing KB6. VLF principal and testing features KB7. importance and use of fiber pulling tools/equipment (fish tape) KB8. importance and relevance of managing cable slack and cable management KB9. documentation practices
Skills (S) [optional]	
A. Core Skills/ Generic Skills	**Basic Reading & Writing Skills** The user/individual on the job needs to know and understand how to SA1. read technical drawings and relate to on-ground situation SA2. maintain proper records as per given format SA3. read and understand manuals, work orders, health and safety instructions, memos, reports etc. SA4. draft work related technical communication (to vendors, superiors)
	Communication Skills The user/individual on the job needs to know and understand how to: SA5. effectively communicate with the site team members (technicians, cable installers) SA6. liaise and coordinate with third party stakeholders SA7. communicate with supervisor and peers
	Other Skills

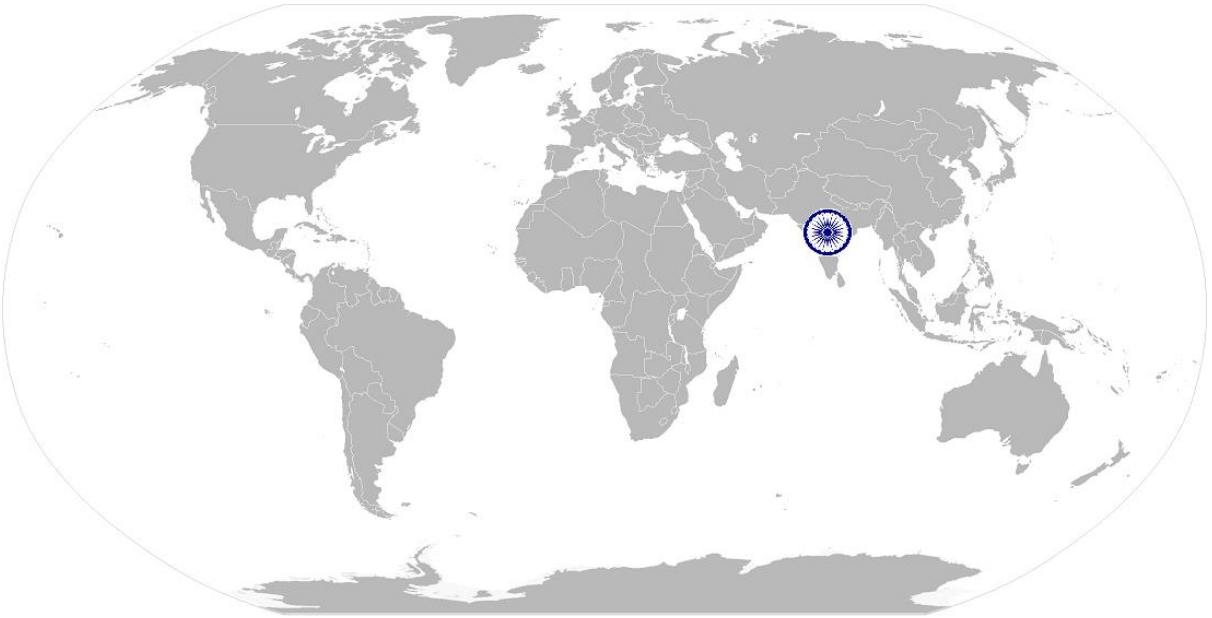
	The user/individual on the job needs to know and understand how to: SA8. interpret test reports, as made route diagrams and other numerical data SA9. create and maintain effective working relationships and team environment SA10. maintain security of site records and other confidential data SA11. work in teams and take initiatives SA12. be flexible and accept changes in job requirements, schedules, or work environments
B. Professional Skills	**Decision making**
	Not applicable
	Plan and Organize
	The user/individual on the job needs to know and understand how to: SB1. deploy fiber cables over cable trays and conduits SB2. use cable pulling tools (for vertical/horizontal runs and through conduits) SB3. work out most appropriate cable path/run with minimal overlap/ interference with existing infrastructure SB4. verify the cable runs post installation SB5. create "as deployed" drawing post installation
	Customer Centricity
	The user/individual on the job needs to know and understand how to: SB6. work effectively in customer facing environment SB7. build and maintain a positive environment
	Problem Solving
	The user/individual on the job needs to know and understand how to: SB8. approach towards problem solving SB9. check points and problem isolation basics SB10. use tools/techniques to address the problem
	Analytical Thinking
	The user/individual on the job needs to know and understand how to: SB11. analyze test results SB12. analyze effect of results on performance and work out remedial measures SB13. analyze any abrupt test results and look into the possible cause

NOS Version Control

NOS Code	**TEL/N4201**		
Credits NSQF	**TBD**	**Version number**	**1.0**
Industry	**Telecom**	**Drafted on**	**17/04/2018**
Industry Sub-sector	**Passive Infrastructure**	**Last reviewed on**	**17/10/2018**
Occupation	**Network (Passive) Installation**	**Next review date**	**17/10/2022**



National Occupational Standard



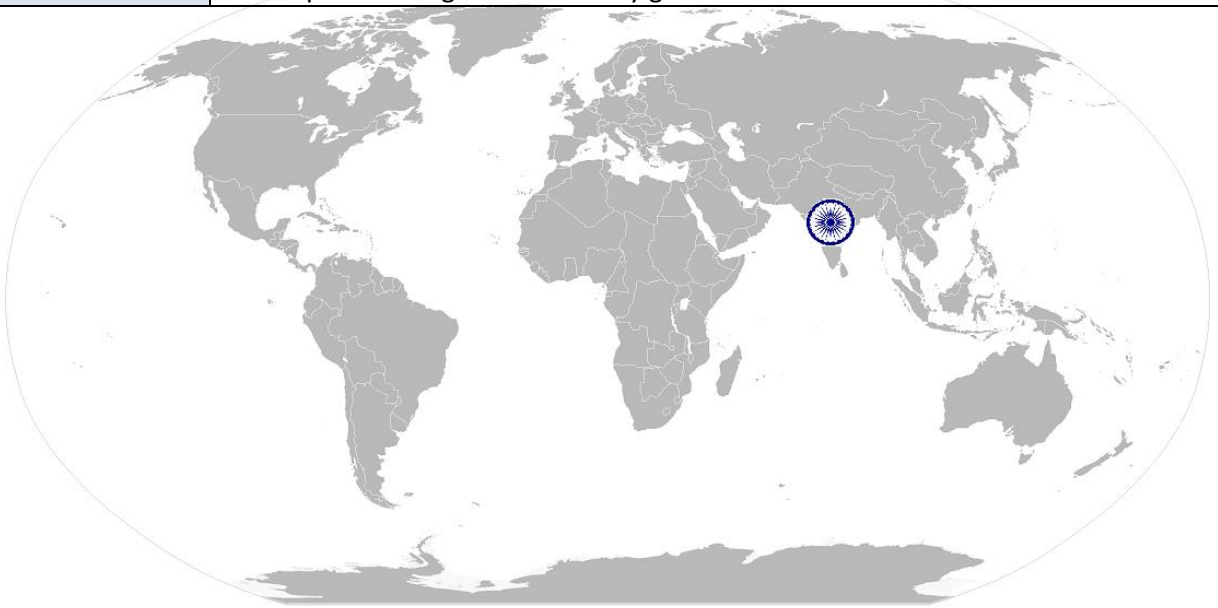
Overview

This unit is about work safety practices whilst working with fiber optics.

National Occupational Standard

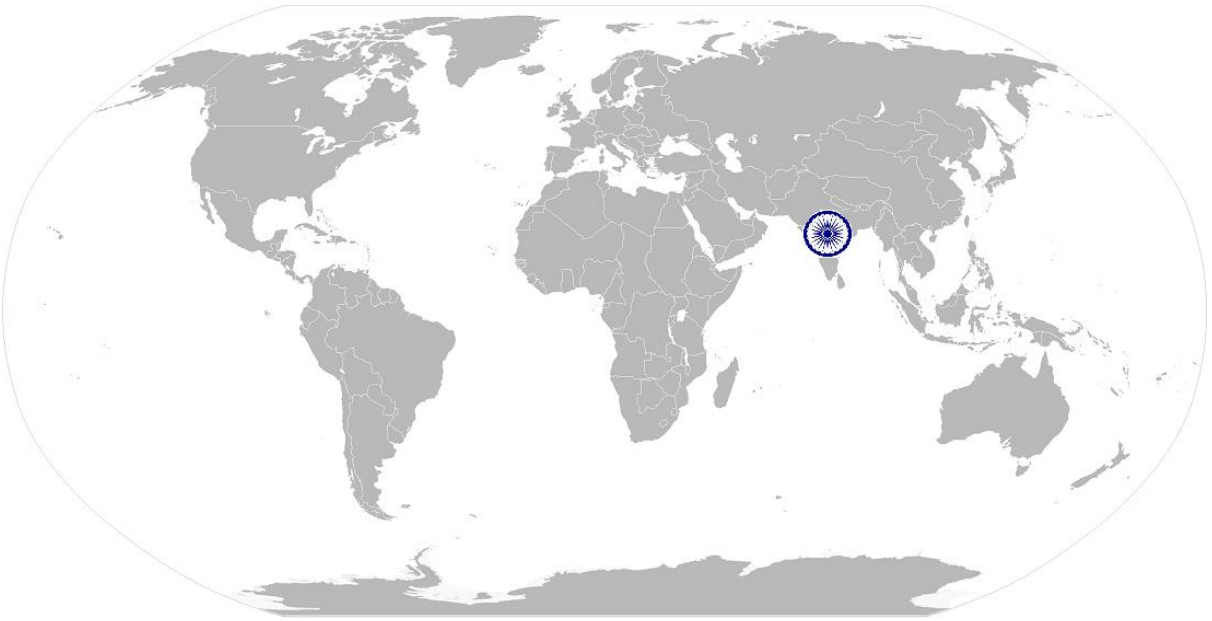
Unit Code	**TEL/N4131**
Unit Title (Task)	**Work safety practices with fiber optics**
Description	This unit is about work safety practices whilst working with fiber optics.
Scope	This unit/task covers the following: Work safety practices whilst working with fiber optics
Performance Criteria (PC) w.r.t. the Scope	
Element	**Performance Criteria**
Work Safety practices whilst working with fiber optics	To be competent, the user/individual on the job must be able to: PC1. demonstrate eye-safety measures whilst at work PC2. demonstrate safe handling of bare fiber (broken ends of fiber and scraps) PC3. read and comprehend manufacturer supplied MSDS for safe handling of fiber PC4. demonstrate fire safety practices (whilst working with high voltage arc in fusion splicers) PC5. demonstrate electrical safety norms where fiber is placed along with electrical cables PC6. adhere to laser safety rules PC7. demonstrate use of safety gloves and boots, in required situations PC8. complete any health and safety records legibly and accurately
Knowledge and Understanding (K)	
A. Organizational Context (Knowledge of the company / organization and its processes)	The user/individual on the job needs to know and understand: KA1. legislative requirements and organizations procedures for health, safety and security and role and responsibilities KA2. what is meant by hazard, including the different types of health and safety hazards that can be found in the workplace KA3. how and when to report hazards KA4. limits of your responsibility for dealing with hazards KA5. your organization's emergency procedures for different emergency situations and the importance of following these KA6. the importance of maintaining high standards of health, safety and security KA7. implications that any non – compliance with health, safety and security may have on individuals and the organization
B. Technical Knowledge	The user/individual on the job needs to know and understand: KA8. construction of the fiber and how to take precaution from getting it damaged KA9. safety features of protective equipment and gear KA10. limitations of safety gear KA11. government agencies in the area of safety, health and security and their norms and services along with their contact detail. KA12. layout of associated services in the work area (gas pipeline, electrical cables, sewage lines, water pipeline etc.) so as to avoid consequential damage.

Skills (S) [Optional]	
A. Core Skills/ Generic Skills	**Writing Skills**
	Not applicable
	Reading Skills
	The user/individual on the job needs to know and understand how to: SA1. read safety instructions and guidelines
	Oral Communication (Listening and Speaking Skills)
	The user/individual on the job needs to know and understand how to: SA2. listen effectively and orally communicate information accurately
B. Professional Skills	**Decision Making**
	The user/individual on the job needs to know and understand how to: SB1. use appropriate safety gear in a given situation/environment
	Plan and Organize
	The user/individual on the job needs to know and understand how to: SB2. plan and organize the safety gear before commencement of work



NOS Version Control

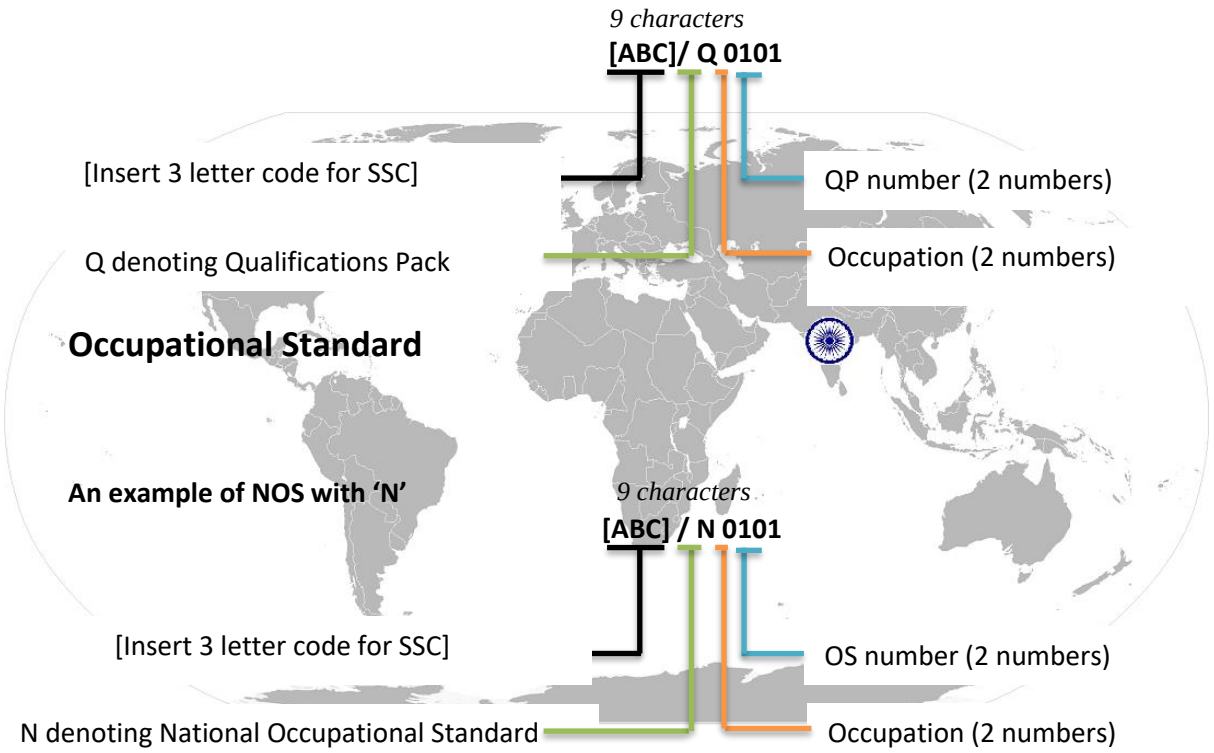
NOS Code	TEL/N4131		
Credits (NSQF)	TBD	Version number	1.0
Industry	Telecom	Drafted on	27/06/2017
Industry Sub-sector	Passive Infrastructure	Last reviewed on	10/11/2017
Occupation	Operations & Maintenance	Next review date	10/11/2021



Annexure

Nomenclature for QP and NOS

Qualifications Pack TEL/Q4200



Occupational Standard

An example of NOS with 'N'

The following acronyms/codes have been used in the nomenclature above:

Sub-sector	Range of Occupation numbers
Service	01- 20
Handset	21 – 40
Passive Infra	41 – 60
Network managed	61 – 80

Sequence	Description	Example
Three letters	Industry name	TEL
Slash	/	/
Next letter	Whether **Q**P or NOS	Q
Next two numbers	Occupation code	01
Next two numbers	OS number	01

CRITERIA FOR ASSESSMENT OF TRAINEES

Job Role **Fiber to-the Home (FTTH/X) Installer**

Qualification Pack **TEL/Q4200**

Sector Skill Council **Telecom**

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 Total Marks: 500			Marks Allocation		
Assessment Outcomes	**Assessment Criteria**	**Total Marks**	**Out Of**	**Theory**	**Skills Practical**
TEL/N4128 **Outside Plant Cable Installation Procedure & 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		6	2	4
	PC3. undertake pre-installation cable inspection to identify any visible damage or non-compliances		6	0	6
	PC4. confirm basic parameters like max pulling tension, max bending radius, total cable length, splicing length required at termination points		3	2	1
	PC5. demonstrate duct rodding, testing and cleaning process/procedure		2	0	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		4	0	4
	PC10. carry out reinstatements		4	2	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		10	4	6
	PC17. demonstrate cable handling practices for aerial cables (bending radius, placing tension)		7	3	4
	PC18. demonstrate use and uniqueness of messenger strand		6	3	3
	PC19. demonstrate deployment and use of self-supporting cables		2	0	2
	PC20. demonstrate deployment process for aerial cable		3	2	1
	TOTAL		**100**	**28**	**72**
TEL/N6400 **Undertake Splicing of Optical Fiber**	PC1. verify that cable is installed as per the installation plan and visually inspect cable for signs of sheath damage	**100**	2	2	0
	PC2. ensure minimum bend ratios are maintained according to manufacturer's specifications to prevent cable damage and signal degradation		5	2	3
	PC3. ensure cable is placed on stable jointing pit		3	2	1
	PC4. secure cable according to safe industry practice to avoid cable and sheath damage		3	0	3
	PC5. identify the appropriate fiber to be joined based on colour coding and sequence		6	2	4
	PC6. identify appropriate place for the joint chamber location		4	2	2
	PC7. clean the fiber appropriately as per company/ manufacturer's specifications		2	2	0
	PC8. ensure availability of test equipment like OTDR and Power meter for carrying out optical tests		1	1	0
	PC9. ensure availability of optical equipment like spool, joint closure, connectors, splicer and cleaver		1	1	0
	PC10. ensure that faulty equipment sent to logistics team for repair and replacement		2	1	1
	PC11. ensure availability of Optical Fiber joint kits, Pigtails, patch cords, 0dB connector, protection sleeves, heat shrinks		1	1	0
	PC12. ensure continuous power supply at site for the splicing operation by use of portable generators or stand-by heavy-duty batteries		1	1	0
	PC13. ensure availability of RCC joint chambers with covers as per specifications		1	1	0
	PC14. ensure availability of sand for filling the chambers		1	1	0
	PC15. ensure availability of one spare cable drum for emergency replacement of laid cables		1	1	0

PC16.	ensure calibration status of equipment to be used (e.g. splicing machine, OTDR, power meter, cleaver)	1	0	1
PC17.	ensure clean environment for splicing operations	2	2	0
PC18.	ensure cables are stripped off their protective coating areas where splicing must be performed as per the standard process	2	2	0
PC19.	ensure the fiber ends are cleaved with a precision cleaver and are inspected with magnifier to ensure appropriateness	6	2	4
PC20.	in case of fusion splicing - insert fibers strand to the fusion machine in accordance to product/equipment specifications	6	2	4
PC21.	in case of mechanical splice, align the fibers together by a precision-made sleeve and place the prepared fiber in mechanical splicing kit	6	2	4
PC22.	verify the spliced fiber for appropriate splicing in the magnifier window	1	1	0
PC23.	ensure appropriate splice protectors like heat shrink splice protectors are utilized to protect the splice	2	2	0
PC24.	test the fiber joint with OTDR to confirm conformance to design requirements	2	2	0
PC25.	ensure optical losses - reflectance, return and insertion are within the defined specifications/ limits	4	3	1
PC26.	ensure sealing of Joint closure through heat shrinking /multi diameter seals/mechanical seals as appropriate	3	2	1
PC27.	ensure FRP - Fiber reinforced plastic is used to strengthen the joint as required	3	2	1
PC28.	test the fiber at both ends for instances of cross fiber using power source and power meter tests and ensure their elimination	4	2	2
PC29.	ensure joint is placed in the chamber properly	1	0	1
PC30.	ensure spare cable (loop) is coiled appropriately and placed inside the joint	3	1	2
PC31.	ensure that sand is filled in the chamber to the brim and the chamber covers are placed properly	3	2	1
PC32.	ensure that Joint indicator is planted 1 meter behind the chamber location (away from road)	1	1	0
PC33.	ensure that the indicator is painted proper color (for example yellow for joint)	1	1	0
PC34.	ensure appropriate disposal of the cut fibers, sleeves and cable pieces	1	0	1
PC35.	ensure compliance with site risk control, OHS, environmental and quality requirements as per company's norms	1	1	0
PC36.	ensure that work is carried out in accordance to the level of competence and legal requirements	1	1	0

	PC37.	ensure that sites are assessed for health and safety risk as per company's guidelines prior to commencement of work		2	1	1
	PC38.	ensure compliance to health and safety guidelines by optical splicer and installation labor workers		1	1	0
	PC39.	ensure that Personal protection equipment like helmets, knee pads, safety boots, safety glasses and trench guards are appropriately used as required		1	0	1
	PC40.	ensure environmental conditions and hazards like Earth Potential Rise (EPR) are considered while carrying out the work		2	0	2
	PC41.	ensure escalation of safety incidents to relevant authorities as per guidelines		1	1	0
	PC42.	ensure appropriate cable marking and Installation of chamber & route marker for direction and route identification		1	1	0
	PC43.	ensure preparation of jointing record for future reference		1	1	0
	PC44.	ensure that documents that are required to be updated are identified		1	1	0
	PC45.	ensure completion of OTDR register showing complete record of jointing tests		1	1	0
	PC46.	ensure that documents are available to all appropriate authorities to inspect		1	1	0
		TOTAL		**100**	**59**	**41**
TEL/N4200 **Installation of passive FTTH/X components**	PC1.	identify components of passive devices (splitters)	**100**	10	4	6
	PC2.	demonstrate installation practices for wall mount splitters (1x8, 1x16, 1x32)		18	7	11
	PC3.	identify feeder and distribution ports on the devices		13	4	9
	PC4.	identify feeder and distribution cables/pigtails		12	5	7
	PC5.	demonstrate feeder and distribution connections		14	5	9
	PC6.	demonstrate insertion loss testing of optical splitters (OLTS and Light Source)		16	5	11
	PC7.	demonstrate power output measurement at output port by use of power meter and light source (using OLTS & Light Source)		17	4	13
		TOTAL		**100**	**34**	**66**
TEL/N4201 **In-building FTTX Cabling**	PC1.	inspect the site as per building lay-out plan		4	0	4
	PC2.	identify the cabling path from the outdoor fiber landing point (in the building premises) up to the intended ONT installation point (this to include both the cable tray as well as conduit runs)		8	2	6
	PC3.	calculate the horizontal and vertical cable length, accounting for the slack to be maintained		5	5	0

	PC4.	ascertain the pre-existing load and post installation load compliance of the cable trays		4	2	2
	PC5.	ascertain and account for existing cable services on the cable trays (power cables, other data/voice cables etc.)		4	0	4
	PC6.	lay the fiber along the identified tray tracks using appropriate cable pulling method		5	1	4
	PC7.	secure the fiber along the cable tray ensuring proper slack management (especially for the vertical run)		5	0	5
	PC8.	demonstrate fiber pulling through conduit using appropriate technique and tools (pulling through 'strength member' and using correct tools like 'fish tape')	**100**	8	2	6
	PC9.	demonstrate proper coiling and securing of excess fiber (approx. 3 meter) at the termination end		6	2	4
	PC10.	demonstrate cable installation through false ceiling, using "figure 8" method		8	2	6
	PC11.	demonstrate cable installation through conduits on false ceiling		8	2	6
	PC12.	demonstrate fiber termination and connectorisation at ONT		9	3	6
	PC13.	demonstrate fiber termination at TO		6	0	6
	PC14.	demonstration powering and configuring of ONT		5	2	3
	PC15.	test installed ONT using IP network		5	2	3
	PC16.	undertake VFL (visual fault locator) for the installed fiber run		6	3	3
	PC17.	test the live fiber using fiber detection meter		4	2	2
		TOTAL		**100**	**30**	**70**
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.	adhere to 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**