



**NEW ZEALAND CERTIFICATE IN
TELECOMMUNICATIONS (WITH
STRANDS IN ACCESS NETWORK
TECHNOLOGIES, CORE NETWORK
TECHNOLOGIES, RADIO/WIRELESS
TECHNOLOGIES, AND SIGNALS
AND COMMUNICATIONS (LEVEL 3)**

NZQF REF 2210 Version 1

**DETAILED
QUALIFICATION
CONDITIONS Version 2**

NEW ZEALAND CERTIFICATE IN TELECOMMUNICATIONS (WITH STRANDS IN ACCESS NETWORK TECHNOLOGIES, CORE NETWORK TECHNOLOGIES, RADIO/WIRELESS TECHNOLOGIES, AND SIGNALS AND COMMUNICATIONS (LEVEL 3)

– QUALIFICATION REQUIREMENTS

This document provides detailed requirements for programmes of training leading to the award of the **New Zealand Certificate in Telecommunications (with strands in Access Network Technologies, Core Network Technologies, Radio/Wireless Technologies, and Signals and Communications) (Level 3)** [Ref: 2210], and must be read in conjunction with the full qualification document registered on the New Zealand Qualifications Framework Taura Here Tohu Matauranga o Aotearoa available at www.nzqa.govt.nz. In order to promote consistency in outcomes, specific evidence requirements of assessment conducted towards the qualification are defined.

This document is subject to periodic review in order to maintain currency with industry best practice and changes to legislation and standards.

Any person or organisation may contribute to the review of this qualification by sending feedback to the qualification developer at reviewcomments@skills.org.nz

STRATEGIC PURPOSE STATEMENT

The purpose of this qualification is to provide the Telecommunications industry with people who are able to install and maintain telecommunications networks in either Access Network Technologies, Core Network Technologies, Radio/Wireless Technologies, or Signals and Communications. Graduates with the Signals and Communications strand will also be able to operate signals and communications equipment and networks.

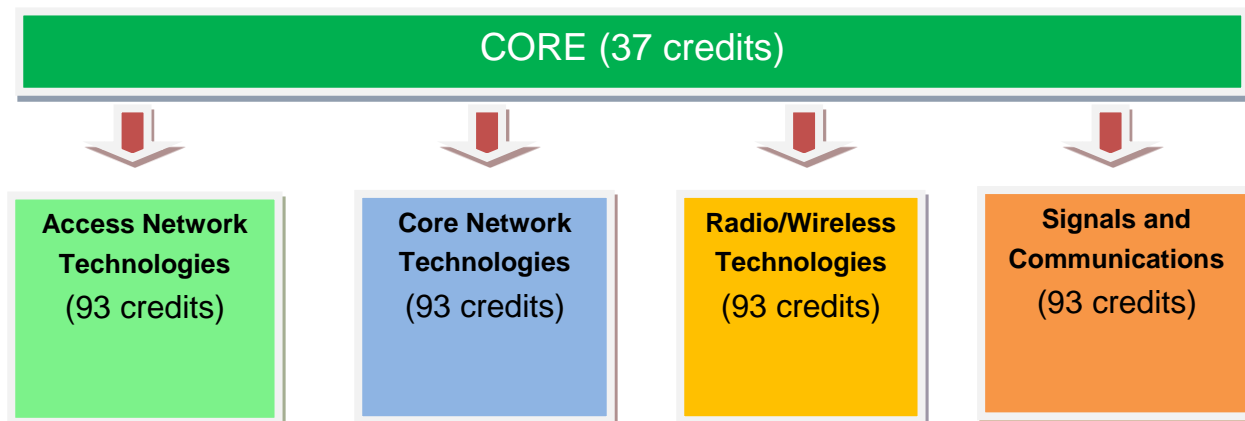
This qualification is suitable for people entering a career as a Telecommunications technician.

Graduates will contribute to an efficient, reliable, and secure telecommunication network and be able to operate as Telecommunications technicians at intermediate level under indirect supervision in their area of practice.

QUALIFICATION STRUCTURE

The New Zealand Certificate in Telecommunications (with strands in Access Network Technologies, Core Network Technologies, Radio/Wireless Technologies, and Signals and Communications) (Level 3) consists of a core component and strands in Access Network Technologies, Core Network Technologies, Radio/Wireless Technologies, and Signals and Communications. The qualification structure is shown in Fig.1.

Fig.1: Qualification structure



DETAILED CONDITIONS

Table 1 provides detailed conditions relating to specific graduate outcomes in the core and in each of the strands of the qualification.

Qualification Outcomes	Conditions - Mandatory	Recommended Unit Standards
<p>Apply fundamental knowledge and principles of telecommunications and related electrical theory and practice</p> <p>Credit value: 15</p>	<p>Programmes must include knowledge of, in accordance with AS/NZS 3000:2007, <i>Electrical installations</i>:</p> <ul style="list-style-type: none"> ▪ Networks and systems used in telecommunications including OSI models 0,1,2,3, transmission media, and digital transmission. ▪ Digital network services in terms of their operation and the services provided in terms of the OSI model ▪ Radio network services in terms of their operation, the services provided, and the key features of each service ▪ TCP/IP networks in terms of their operation and the services provided ▪ The equipment used in the network or system including Public Switched Telephone Network, customer premises equipment, and multiplexing ▪ Common communication technologies used in networks or systems. ▪ Services offered by telecommunications networks and systems ▪ Conductors, insulators and semiconductors, methods for e.m.f production, magnets, magnetism and the application of magnetism to generation, resistors and capacitors, semiconductor diodes ▪ Analyse and calculate values in simple a.c. and d.c. circuits ▪ Supply of electricity in New Zealand and the use of the MEN (Multiple Earth Neutral) system of supply. 	<p>27912 Demonstrate knowledge of electrical principles in an electrotechnology or telecommunications environment Level 2, 15 credits</p> <p>27913 Demonstrate basic knowledge of telecommunications concepts Level 2, 10 credits</p>

Qualification Outcomes	Conditions - Mandatory	Recommended Unit Standards
<p>Apply fundamental knowledge of information communications technology (ICT) systems and services. Credit value: 5</p>	<p>Programmes must include knowledge of:</p> <ul style="list-style-type: none"> ▪ Knowledge of the OSI model including, OSI layer names and layer function. ▪ ICT basic hardware components, including typical application, physical data interfaces, typical applications for data interfaces, expected data transfer speeds for data interfaces. ▪ Knowledge of network architectures including, terms of services offered, basic network typologies, Inter-network communication, NAT, methods of communicating with equipment behind a firewall. 	<p>27913 Demonstrate basic knowledge of telecommunications concepts Level 2, 10 credits</p>
<p>Communicate effectively with stakeholders Credit value: 5</p>	<p>Programmes must include knowledge of:</p> <ul style="list-style-type: none"> ▪ Identify stakeholders and their requirements within an telecommunications industry ▪ Demonstrate knowledge of stakeholder engagement principles including factors that enhance engagement and communication, and the need to ethical behaviour. ▪ Demonstrate knowledge of communication and service techniques to manage tensions during stakeholder engagement. ▪ Demonstrate knowledge of the escalation process. ▪ Communicate with stakeholders in a specified workplace including effective verbal and written communication both informal and formal. 	<p>27910 Demonstrate and apply knowledge of stakeholder engagement in an electrotechnology or telecommunications environment Level 3, 5 credits</p>
<p>Apply safe working procedures and practices; and identify and control hazards in a working environment Credit value: 10</p>	<p>Programmes must include knowledge of:</p> <ul style="list-style-type: none"> ▪ Hazardous nature of electricity. ▪ Health and Safety in Employment Act including scope, coverage and object. ▪ Safety management of electrical hazards including principles of risk assessment and control measures, reporting procedures, control measures to eliminate or minimise electrical hazards. ▪ General safety practices in the workplace including worker behaviour, Good housekeeping practices, Safety practices relating to working at height, Personal Protection equipment. ▪ Special hazards and fire including their harmful effects, typical occurrences, and components required to sustain combustion, Methods used in controlling combustion, Extinguishants used in relation to the types of fire. ▪ Safe use of tools and test equipment including general principles, identifying 	<p>27911 Demonstrate knowledge of workplace safety in an electrotechnology or telecommunications environment Level 2, 10 credits</p>

Qualification Outcomes	Conditions - Mandatory	Recommended Unit Standards
	<p>poor condition, and the need for insulated tools to be rated and manufactured to an approved standard.</p> <ul style="list-style-type: none"> ▪ Rules, procedures, and use of instruments relating to testing for electrical safety for service technicians including principles, procedures, and techniques used in testing for electrical safety, practices and limitations relating to the use of test instruments, safety and test procedures are demonstrated in relation to electrical wiring and fittings, and single phase appliances. 	
<p>Understand limitations of their knowledge and skills, and seek support when required</p> <p>Credit value: 2</p>	<p>Graduates must demonstrate that they understand their own limitations and seek support/guidance when this is researched to ensure that there is no negative impact on the organisation or industry.</p>	<p>27911 Demonstrate knowledge of workplace safety in an electrotechnology or telecommunications environment Level 2, 10 credits</p>
Telecommunications Access Network Technologies strand		
<p>Apply key concepts and skills, including installing, maintaining, and repairing telecommunications networks</p> <p>Credit value: 15</p>	<p>Programmes must include knowledge of, in accordance with AS/NZS 3080:2003 - <i>Telecommunications installations - Generic cabling for commercial premises, AS/NZS 3084:2003 - Telecommunications installations - Telecommunications pathways and spaces for commercial buildings and the recommended guidelines, The TCF Premises Wiring Code of Practice 2010.</i></p> <ul style="list-style-type: none"> • Regulatory requirements for installations including any acts of Parliament, regulations, standards, codes of practice and acceptable solutions that impact on installations. • Cabling and cable support installation practices including suitability of common telecommunications cables, Colour coding or labelling, used to identify cables or cable pairs, termination methods for common telecommunications cables including specialist tools, methods employed to join telecommunications cables, and their limitations, cable support and management system installation practices. • Installation requirements for telecommunications equipment including suitability of frames/cabinets, installation practises of equipment including the location, mounting methods and other consideration. • Power systems used in 	<p>27914 Demonstrate knowledge of installation practices and procedures for telecommunications network equipment, Level 3, 10 credits</p> <p>27915 Demonstrate basic knowledge of diagnostics and fault finding of telecommunications installations, Level 3, 5 credits</p> <p>27916 Install and maintain basic telecommunications systems and services, Level 3, 10 credits</p> <p>Note: Graduates that have completed either the Core Network Technologies strand or Radio/Wireless Technologies strand will have already achieved this outcome.</p>

Qualification Outcomes	Conditions - Mandatory	Recommended Unit Standards
	<p>telecommunications installations including, types of power systems and their purpose, protection devices used in telecommunications installations, termination methods for extra low voltage power cables.</p> <ul style="list-style-type: none"> • Commissioning telecommunications installations including reasons for performing commissioning tests, common commissioning testing and documentation required prior to handover of installation • Techniques to identify the location and cause of faults in telecommunication equipment including common techniques to isolate a component in a system, Possible external causes of a fault, and requirement for diagnostics to not affect the operation of other equipment. • Use of basic diagnostic equipment used for fault finding common telecommunications equipment including built in test equipment, testing tools for a simple LAN, testing tools for a simple installation, and storage, transport & handling of telecommunications service spares. • Maintenance and calibration requirements for fault finding, test and diagnostic tools and equipment used in telecommunications practice including importance of calibration and maintenance schedules for test and diagnostic tools and equipment and self-validation methods used for test and diagnostic tools and instrumentation. <p>These practical skills are to be assessed in a real work environment and include:</p> <ul style="list-style-type: none"> ▪ Select and install cable support systems and cables for basic telecommunication systems including support and mounting systems using management practices and considering environmental considerations. ▪ Install telecommunications equipment for basic telecommunication systems including frames and cabinets taking into consideration environmental considerations. ▪ Test and commission telecommunications installations including visual inspections, polarity, functional tests, end to end tests, remote access, completing all documentation required and preparation of site for handover to a satisfactory condition. 	

Qualification Outcomes	Conditions - Mandatory	Recommended Unit Standards
<p>Install and maintain the telecommunications network and related ICT system and services Credit value: 50</p> <p>Diagnose and repair network equipment and services Credit value: 25</p> <p>Develop and maintain knowledge of current and emerging technologies Credit value: 3</p>	<p>Programmes must include knowledge of:</p> <ul style="list-style-type: none"> ▪ Safety considerations when installing access technologies equipment including hazard identification, danger of, and potential sources of ground potential rise, PPE to be worn while installing and maintaining access networks and inspections to be performed before performing pole climbing operations ▪ Regulatory compliance for access networks including company requirements and procedures, environmental protection and management practices, necessary council/ utilities permits/consents ▪ Structure and properties of telecommunications cables including physical properties of commonly used cables, electrical and/or optical properties of cables and use of cable numbering systems in accordance with industry practice ▪ Structure and properties of telecommunications ducting including suitability of common telecommunications ducting and the colour coding systems used for telecommunications ducting ▪ Telecommunications access networks architecture including building frames, cabinets, enclosures and terminals, telecommunications service entrance equipment and termination practices, earthing and lightning protection practices and cable management in service enclosures ▪ Types of access networks technologies including access networks in terms of the services delivered and role of three components used in access networks ▪ Telecommunications access networks provisioning and restoration practices including underground enclosure construction and installation practices, duct installation practices, the principles and techniques for hauling copper and fibre cables and ducting for access networks, aerial plant construction practices and hardware, buried and ducted cable installation practices, CPE installation practices and best practice for location and identification of underground cables and services ▪ Telecommunications cable jointing and 	<p>27967 Demonstrate knowledge of telecommunications access networks technologies, Level 3, 15 credits</p> <p>27968 Demonstrate knowledge of telecommunications access networks service provisioning and restoration practices, Level 3, 15 credits</p> <p>27969 Provision, commission, restore and diagnose telecommunications access networks, Level 3, 40 credits</p>

Qualification Outcomes	Conditions - Mandatory	Recommended Unit Standards
	<p>splicing practices including preparation of copper cables for jointing, techniques for jointing and insulating copper cables, preparation for splicing fibre optical cables, techniques for splicing fibre optic cables, factors to be considered when splicing fibre optical cables, cable enclosure practices & procedures and cable pressurisation principles and techniques</p> <ul style="list-style-type: none"> ▪ Fault-diagnosis, location, and repair procedures for telecommunications access networks including basic test and measurement methods, and units of measurement, used to determine the quality of access network cables, results from cable tests (3 copper and 2 Fibre) to determine condition of cable, basic techniques used to determine location of fault and basic repair procedures for common faults ▪ Access network records and technical documentation in access networks including interpreting network records and technical documentation, update network records and technical documentation and the need for, and key items required in, a basic work plan ▪ Proactive and reactive maintenance for telecommunications access networks including purpose of proactive maintenance, benefits of proactive maintenance as opposed to reactive maintenance, minimum requirements for service pillar restoration and record keeping requirements for proactive maintenance ▪ Awareness of an emerging or converging technology in access networks <p>These practical skills are to be assessed in a real work environment and include:</p> <ul style="list-style-type: none"> • Obtain regulatory compliance while working on access networks including hazard identification and management practices, maintain a work site in accordance with regulations, requirements, and arrange, for required consents and perform work in accordance with conditions of issued consents • Perform provisioning of three installations, including one copper, and two fibre of network access services including prepare to provision, perform customer first contact and walkthrough, 	

Qualification Outcomes	Conditions - Mandatory	Recommended Unit Standards
	<p>Install ducting and support systems, Install cables in accordance with site specification & requirements, Install and configure CPE, perform network connection/configuration for provisioning, perform post installation commissioning testing, perform post installation site restoration</p> <ul style="list-style-type: none"> • Perform proactive maintenance of access network components including service pillar restoration, proactive maintenance of cabinets and pedestals, proactive maintenance of manholes, pits and associate components and proactive maintenance of aerial plant • Perform jointing and splicing of telecommunications cables including preparing cables for jointing, perform jointing and insulating of copper cables, prepare fibre optical cables for splicing, splice fibre optic cables and perform post jointing cable closures • Perform basic fault location of three different faults and routine maintenance tasks associated with maintenance of access network installations including preparation tasks undertaken, site arrival procedures, select and use appropriate test equipment, logical fault finding methodologies and operational tests after repair • Read, understand, interpret, and update access network records and technical documentation including network records and technical documentation, update network records and technical documentation, and basic written work plan. 	

Telecommunications Core Network Technologies strand		
<p>Apply key concepts and skills, including installing, maintaining, and repairing telecommunications networks</p> <p>Credit value: 15</p>	<p>Programmes must include knowledge of, in accordance with AS/NZS 3080:2003 - <i>Telecommunications installations - Generic cabling for commercial premises, AS/NZS 3084:2003 - Telecommunications installations - Telecommunications pathways and spaces for commercial buildings and the recommended guidelines, The TCF Premises Wiring</i></p> <ul style="list-style-type: none"> • Regulatory requirements for installations including any acts of Parliament, regulations, standards, codes of practice and acceptable solutions that impact on installations. • Cabling and cable support installation practices including suitability of common telecommunications cables, Colour coding or labelling, used to identify cables or cable pairs, termination methods for common telecommunications cables including specialist tools, methods employed to join telecommunications cables, and their limitations, cable support and management system installation practices. • Installation requirements for telecommunications equipment including suitability of frames/cabinets, installation practises of equipment including the location, mounting methods and other consideration. • Power systems used in telecommunications installations including, types of power systems and their purpose, protection devices used in telecommunications installations, termination methods for extra low voltage power cables. • Commissioning telecommunications installations including reasons for performing commissioning tests, common commissioning testing and documentation required prior to handover of installation • Techniques to identify the location and cause of faults in telecommunication equipment including common techniques to isolate a component in a system, Possible external causes of a fault, and requirement for diagnostics to not affect the operation of other equipment. • Use of basic diagnostic equipment used for fault finding common telecommunications equipment including built in test equipment, testing tools for a simple LAN, testing tools for a simple installation, and storage, 	<p>27914 Demonstrate knowledge of installation practices and procedures for telecommunications network equipment, Level 3, 10 credits</p> <p>27915 Demonstrate basic knowledge of diagnostics and fault finding of telecommunications installations, Level 3, 5 credits</p> <p>27916 Install and maintain basic telecommunications systems and services, Level 3, 10 credits</p> <p>Note: Graduates that have completed either the Core Network Technologies strand or Radio/Wireless Technologies strand will have already achieved this outcome.</p>

	<p>transport & handling of telecommunications service spares.</p> <ul style="list-style-type: none"> • Maintenance and calibration requirements for fault finding, test and diagnostic tools and equipment used in telecommunications practice including importance of calibration and maintenance schedules for test and diagnostic tools and equipment and self-validation methods used for test and diagnostic tools and instrumentation. <p>These practical skills are to be assessed in a real work environment and include:</p> <ul style="list-style-type: none"> ▪ Select and install cable support systems and cables for basic telecommunication systems including support and mounting systems using management practices and considering environmental considerations. ▪ Install telecommunications equipment for basic telecommunication systems including frames and cabinets taking into consideration environmental considerations. ▪ Test and commission telecommunications installations including visual inspections, polarity, functional tests, end to end tests, remote access, completing all documentation required and preparation of site for handover to a satisfactory condition. 	
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<p>Install and maintain the telecommunications networks and related ICT systems and services 50 Credits</p> <p>Diagnose and repair network equipment and services 25 Credits</p> <p>Develop and maintain knowledge of current and emerging technologies Credit value: 3</p>	<p>Programmes must include knowledge of:</p> <ul style="list-style-type: none"> • Regulations and standards impacting on core technology equipment installation including legislation impacting on core technology equipment installation, company requirements and procedures and limits of work imposed by the electricity act • Safety considerations when installing core technology equipment including hazards and Health and Safety considerations • Analogue and digital transmission for Core Networks including Layer 1 to Layer 4 hierarchies, concepts of data transmission, analogue to digital media converter principles, data interfaces with reference to their key features and applications, New Zealand digital service transmission network with reference to purpose, operation, major hardware components, and interfaces and function and operation of a typical NTU • Analogue and digital signalling, multiplexing and hierarchies including principles of digital multiplexing with reference to creating a 2Mb/s PCM frame and higher order PCM multiplexing systems, SDH and PDH hierarchies, principles of operation of different types of digital multiplexing systems, principles of WDM systems and concept of diversity • Fixed and mobile TDM Networks including function and associated features of fixed and mobile network technologies, indicating major functions the operation of any digital (TDM) exchange used in New Zealand, functional and physical elements of Core Networks, Access (Aggregation) Networks, Transport Networks, and Customer Networks with reference to the OSI model, functions and features basic principles of signalling systems used across core networks and network synchronisation principles • Core network test and measurement equipment and procedures including testing equipment to suit particular applications and environments, units of measure for given equipment, test equipment and tools used for commissioning of core network technology and services, test equipment and tools used for diagnosing faults in core network technology and services and testing methods and procedures for fault location and commissioning. 	<p>27970 Demonstrate knowledge of telecommunications core networks theory, Level 3, 15 credits</p> <p>27971 Demonstrate knowledge of telecommunications core network systems and services, Level 3, 15 credits</p> <p>27972 Provision, commission, diagnose and restore telecommunications core network technology and services, Level 3, 40 credits</p>
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	<ul style="list-style-type: none"> • Telecommunications bearer systems including characteristics and limitations of copper cable for use in POTS, xDSL, and PCM systems, principles of operation of digital subscriber line systems (xDSL), PCM bearer system principles and practices, and operation of a digital fibre transport system • Operation of broadcast systems including analogue and digital radio, analogue and digital TV • TCP/IP and Ethernet in core networks including protocols, hardware used in TCP/IP and Ethernet networks, software used to configure hardware and IP networking and configuration for three given situations • Typical network and element management and monitoring systems for telecommunications core networks including network operations centre and network administration activities, principles of operation of management networks and element management devices, proactive, reactive, and condition based maintenance practices, network incident management escalation hierarchy, with particular reference to the Tiered Structure, and network records and inventory systems and practices • Common power and engineering services support environment for telecommunications core networks including typical power supply systems with reference to battery backup and emergency generators, operation of security access and fire protection systems, purpose and operation of air-conditioning systems in relation to equipment rooms, purpose and operation of seismic infrastructure in relation to equipment rooms, purpose and operation of underground pits & ducts, telecommunications towers and masts, and passive and active roadside cabinets in relation to equipment housing and cable distribution practices in a telecommunications distribution room • Impact of an emerging or converging technology in core networks. 	
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	<p>These practical skills are to be assessed in a real work environment and include:</p> <ul style="list-style-type: none"> • Prepare to provision telecommunications core network technology and services including scope and timing of the provisioning, agree details for provisioning with customer and/or supervisor and develop three plans, obtain permits and/or consents in accordance, develop safety plans and notices in accordance • Provision three telecommunications core network technology and or services including mount hardware and install cabling and terminate Core network and complete equipment labelling, as-built documentation, and recording of installation progress • Principles of TCP/IP and Ethernet addressing are applied including select software as appropriate for the hardware to be configured, perform IP addressing to enable communication, Configure hardware equipment • Test and commission telecommunications core network technology and services including Select test equipment required for commissioning of core network technology and services, and the required tests completed, Evaluate test results and record, Complete and collate handover documentation • Carry out basic fault location and restoration or routine maintenance tasks including selecting test equipment and complete tests, evaluate remote restoration methods and procedures, identify and apply site arrival procedures, selecting appropriate diagnostic tools and or equipment, apply logical fault finding methods and procedures, Interpret test results, repair or replace faulty system components and complete and collate hand-back documentation • Handover or hand-back site to customer including restoring site to customer expectations following completion of provisioning or restoration and handover or hand-back support materials 	
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Telecommunications Radio/Wireless Technologies strand		
<p>Apply key concepts and skills, including installing, maintaining, and repairing telecommunications networks</p> <p>Credit value: 15</p>	<p>Programmes must include knowledge of, in accordance with AS/NZS 3080:2003 - <i>Telecommunications installations - Generic cabling for commercial premises, AS/NZS 3084:2003 - Telecommunications installations - Telecommunications pathways and spaces for commercial buildings and the recommended guidelines, The TCF Premises Wiring Code of Practice 2010.</i></p> <ul style="list-style-type: none"> • Regulatory requirements for installations including any acts of Parliament, regulations, standards, codes of practice and acceptable solutions that impact on installations. • Cabling and cable support installation practices including suitability of common telecommunications cables, Colour coding or labelling, used to identify cables or cable pairs, termination methods for common telecommunications cables including specialist tools, methods employed to join telecommunications cables, and their limitations, cable support and management system installation practices. • Installation requirements for telecommunications equipment including suitability of frames/cabinets, installation practises of equipment including the location, mounting methods and other consideration. • Power systems used in telecommunications installations including, types of power systems and their purpose, protection devices used in telecommunications installations, termination methods for extra low voltage power cables. • Commissioning telecommunications installations including reasons for performing commissioning tests, common commissioning testing and documentation required prior to handover of installation • Techniques to identify the location and cause of faults in telecommunication equipment including common techniques to isolate a component in a system, Possible external causes of a fault, and requirement for diagnostics to not affect the operation of other equipment. • Use of basic diagnostic equipment used for fault finding common telecommunications equipment including built in test equipment, testing tools for a simple LAN, testing tools for 	<p>27914 Demonstrate basic knowledge of diagnostics and fault finding of telecommunications installations, Level 3, 10 credits</p> <p>27915 Demonstrate basic knowledge of diagnostics and fault finding of telecommunications installations, Level 3, 5 credits</p> <p>27916 Install and maintain basic telecommunications systems and services, Level 3, 10 credits</p> <p>Note: Graduates that have completed either the Core Network Technologies strand or Radio/Wireless Technologies strand will have already achieved this outcome.</p>

	<p>a simple installation, and storage, transport & handling of telecommunications service spares.</p> <ul style="list-style-type: none"> • Maintenance and calibration requirements for fault finding, test and diagnostic tools and equipment used in telecommunications practice including importance of calibration and maintenance schedules for test and diagnostic tools and equipment and self-validation methods used for test and diagnostic tools and instrumentation. <p>These practical skills are to be assessed in a real work environment and include:</p> <ul style="list-style-type: none"> ▪ Select and install cable support systems and cables for basic telecommunication systems including support and mounting systems using management practices and considering environmental considerations. ▪ Install telecommunications equipment for basic telecommunication systems including frames and cabinets taking into consideration environmental considerations. ▪ Test and commission telecommunications installations including visual inspections, polarity, functional tests, end to end tests, remote access, completing all documentation required and preparation of site for handover to a satisfactory condition. 	
<p>Install and maintain the telecommunications networks and related ICT systems and services 50 Credits</p> <p>Diagnose and repair network equipment and services 25 Credits</p> <p>Develop and maintain knowledge of current and emerging technologies Credit value: 3</p>	<p>Programmes must include knowledge of:</p> <ul style="list-style-type: none"> ▪ Radio frequency theory including reactance and impedance, Vectors are used to show phase relationships of voltages and currents in series and parallel circuits, and to calculate their resultants, resonant frequencies for simple series and parallel circuits are calculated, operation of simple LCR filters. ▪ Radio theory including concepts of frequency, r.f. spectrum, wavelength, and bandwidth and conversions between frequency and wavelength of units, principles of transmission lines and cables at r.f, principles of modulation with the aid of waveform sketches, principles of propagation of radio waves are outlined in non-mathematical terms, waveguides with reference to how they guide a radio wave, physical construction, and termination requirements. ▪ Fibre optic cables including basic concepts of fibre optic cables, fibre patch cords and connectors, used in 	<p>27973 Demonstrate basic knowledge of telecommunications radio technologies, Level 3 15 credits</p> <p>27974 Demonstrate knowledge of telecommunications radio systems and services, Level 3 15 credits</p> <p>27975 Perform installation and maintenance of telecommunications radio systems and services, Level 3 40 credits</p>

	<p>radio applications in terms of colour coding and construction, requirement for fibre hygiene and fibre inspection and cleaning procedures, basic testing tools in terms of features, applications and limitations.</p> <ul style="list-style-type: none"> ▪ Digital multiplexing and hierarchies including principles of TDM multiplexing from speech to 64Kb/s channel (time slot) to a single E1 frame, PDH digital hierarchy from lower order to higher order MUX, SDH and PDH hierarchies in terms of what they are, application, and configurations, and the concept of path protection with reference to self healing rings and hitless switching. ▪ TDM Networks including function and associated features of radio networking technologies, principles of signalling systems used across a radio network and Network Synchronisation principles ▪ Regulations and standards impacting on radio equipment installation including legislation impacting on radio equipment installations, company requirements and procedures, and limits of work imposed by the electricity act. ▪ Testing and commissioning of radio frequency services including test equipment used in the commissioning of radio frequency services, effect of incorrect termination impedance on RF and test equipment, typical units of measurement for radio frequency test equipment and methods of performing antenna alignment, and the test equipment required ▪ Cellular radio including subsystems of a cellular network, principles of traffic management, principles of an air interface, principles of radio frequency planning and management of the network ▪ Radio systems and services including types of radio systems, construction and properties of commonly used antennas, supervisory systems for point-to-point radio systems and operation of customer premises equipment. ▪ TCP/IP and Ethernet in radio networks including TCP/IP and Ethernet protocols, hardware used in TCP/IP and Ethernet networks, software used to configure radio systems hardware and IP networking configuration data for three given situations ▪ Typical network and element management and monitoring systems for radio networks including network operations centre and network administration activities, principles of operation of management networks and element management devices, proactive, reactive, and condition based 	
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	<p>maintenance practices, incident management escalation hierarchy and network records and inventory systems and practices</p> <ul style="list-style-type: none"> ▪ Common cellular and radio support services including typical power supply systems, security and fire protection systems, purpose and function of ventilation and/or air-conditioning systems in relation to equipment rooms, purpose and function of seismic infrastructure in relation to equipment rooms, purpose and function of telecommunications towers and masts, and passive and active roadside cabinets in relation to equipment housing and cable distribution practices in a telecommunications distribution rooms ▪ Safety considerations when installing radio frequency equipment including New Zealand permissible public and occupational EMR exposure limits in accordance with NZS 2772.1, potential biological effects of overexposure to EMR are described in accordance with NZS 2272.1, three strategies for eliminating, minimising, or isolating on-site EMR hazards, safety considerations for working at heights and risk reduction strategies for working at heights ▪ Awareness of an emerging or converging technology in radio or cellular technologies. <p>These practical skills are to be assessed in a real work environment and include:</p> <ul style="list-style-type: none"> • Prepare for installation of radio, wireless or cellular systems and services including scope and timing of the provisioning, requirements of the installation and develop plans, arrange any required permits and/or consents and develop safety plans • Install radio, wireless or cellular systems and services including perform terminations of R.F connectors, perform feeder earthing and weather proofing, manage cables, perform mechanical fixing practices and perform labelling and complete as-built documentation, and recording of installation progress • Perform testing and commissioning of radio, wireless or cellular systems and services including select and use test equipment required to perform commissioning testing, select appropriate termination impedance, perform testing in a manner which does not impact on performance, compare test results against design specification, 	
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	<p>perform antenna alignment and complete and collate handover documentation</p> <ul style="list-style-type: none"> • TCP/IP and Ethernet addressing is used to perform configuration of radio, wireless or cellular systems and services including configure hardware, perform required IP addressing and configuration and configure installed hardware • Handover site to customer on completion of installation including restoring site to customer expectations and supply handover or hand-back support materials • Fault location and routine maintenance tasks associated with installation and maintenance of radio frequency equipment are performed including visual inspection tasks prior to installation, or during maintenance checks, preparation tasks to be undertaken prior to leaving, Identify and apply site arrival procedures, apply logical fault finding techniques, perform best practice procedures for replacement of faulty modules, perform site departure procedures and complete post job tasks. 	
Telecommunications Signals and Communications strand		
<p>Apply key concepts and skills, including installing, maintaining, and repairing telecommunications networks</p> <p>Credit value: 20</p>		<p>6745 Demonstrate and apply knowledge of single-user and multi-user computer operating systems, Level 4, 5 credits</p> <p>8195 Test and select batteries used in electronic applications and select suitable chargers, Level 3, 4 credits</p> <p>20615 Use electronic test equipment, Level 3, 6 credits</p> <p>26727 Describe and apply techniques for identifying and locating faults in electrotechnology products or systems , Level 3, 5 credits</p>

<p>Operate transmission reception equipment and communication networks to international standards</p> <p>33 Credits</p>	<p>Assessment is to be conducted in a NZ Defence environment in accordance with:</p> <ul style="list-style-type: none"> ▪ ACP 128; Allied Communications Publications – Allied Telecommunications Record System (ALTERS) Operating Procedures ▪ ACP 121; Communications Instructions - General ▪ ACP 124; Common Instructions Radiotelegraph Procedure ▪ ACP 125; Communication Instructions Radiotelephone Procedure ▪ New Zealand Information Security Manual (NZISM) <p>Assessment must include practical skills of:</p> <ul style="list-style-type: none"> ▪ Prepare and transmit messages using communication channels. ▪ Receive and distribute messages. 	<p>27976 Transmit, receive, and distribute defence communications to international standards, Level 3, 25 credits</p>
<p>Plan and monitor communications in accordance with agreed protocols</p> <p>30 Credits</p>	<p>Assessment is to be conducted in a NZ Defence environment in accordance with:</p> <ul style="list-style-type: none"> ▪ Standing Orders ▪ ACP 128; Allied Communications Publications – Allied Telecommunications Record System (ALTERS) Operating Procedures ▪ ACP 135; Distress and Rescue Procedures ▪ Maritime NZ Radio Handbook <p>Assessment must include practical skills of:</p> <ul style="list-style-type: none"> ▪ Provide portable and fixed communications facilities to end users including set up, testing of equipment and hand-over. ▪ Conduct Standard Operator Checks on all radio and visual resources. ▪ Implement communications plans including an understanding of a communication centre, implement point to point communication plan and implement network plan. ▪ Monitor distress and safety including recognising and responding to distress signals and integrating all safety precautions. 	<p>27977 Operate defence communication networks and implement communications plans, Level 3 20 credits</p> <p>27978 Maintain protocols and procedures including distress monitoring in a defence telecommunications environment, Level 3 25 credits</p>
<p>Ensure continuity and consistency of protocols and procedures at all times</p> <p>10 Credits</p>	<p>Assessment is to be conducted in a NZ Defence environment in accordance with:</p> <ul style="list-style-type: none"> ▪ Standing orders ▪ ACP 128; Allied Communications Publications – Allied Telecommunications Record System (ALTERS) Operating Procedures ▪ ACP 135; Distress and Rescue Procedures 	

	<ul style="list-style-type: none">▪ Maritime NZ Radio Handbook <p>Assessment must include practical skills of:</p> <ul style="list-style-type: none">▪ Maintain shift procedures and protocols including communicating with duty officer, signals confirm with protocols, communication systems are used correctly, situations are promptly reported and fatigue is managed.▪ Maintain shift change over procedures and protocols including mustering of equipment, handing over shift and operational state.	
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ARRANGEMENTS FOR MANAGING CONSISTENCY

For full details of The Skills Organisation arrangements for managing consistency, contact The Skills Organisation consistency@skills.org.nz.