Title	**Demonstrate knowledge of complex networks in telecommunications**		
Level	**4**	**Credits**	**20**

Purpose	This standard is intended for technicians who work on complex telecommunications networks. People credited with this unit standard are, for complex networks in telecommunications, able to demonstrate knowledge of: components; electrical principles; technologies and architectures; and TCP/IP networks.

Classification	Telecommunications > Telecommunications - Service Delivery

Available grade	Achieved

Guidance Information

1 Learning and assessment within this unit standard must be carried out in accordance with the following legislation, guidelines, and codes of practice, as relevant to role, and any subsequent amendments:
- New Zealand Telecommunications Forum Inc., Customer Complaints Code, available from https://www.tcf.org.nz/industry/resources/publications/industry-standards-guides/
- Health and Safety at Work Act 2015
- Privacy Act 2020
- Resource Management Act 1991
- Telecommunications Act 2001, all available from http://legislation.govt.nz/.

2 Definitions
Complex refers to three or more components and/or services used together in networks or enterprise solution systems.
Industry practice refers to practices that competent technicians within the industry recognise as current industry best practice.
TCP/IP network refers to Transmission Control Protocol/Internet Protocol network.

3 For the purpose of this unit standard, assessment can take place in a core network, access network, or wireless technology telecommunications work environment.

Outcomes and performance criteria

Outcome 1

Demonstrate knowledge of components of complex networks in telecommunications.

Performance criteria

1.1 Telecommunications hardware and services are explained in terms of the Open Standard Interface (OSI) model and applications network.

1.2 Transmission media employed in telecommunications is explained in terms of the general characteristics and applications.

1.3 Digital and analogue data transmission is explained in terms of bandwidth requirements, latency, errors, noise tolerance, cross talk and impedance matching.

1.4 Network services and network topologies are explained in accordance with industry practice.

1.5 A digital network is explained in terms of components.

Range services provided, equipment, multi-plexing functions and features, operation.

1.6 A TCP/IP network is explained in terms of hardware, configuration, interface, functions and features.

Outcome 2

Demonstrate knowledge of electrical principles of complex networks in telecommunications.

Performance criteria

2.1 Electrical conductors, insulators and semiconductors are explained in terms of atomic structure, use, insulator materials, resistance, and cable length.

2.2 Electromotive force is explained in terms of achieving the relative magnitude of the voltage produced and method of generation.

2.3 Batteries are explained in terms of electrical principles, applications, and safety requirements.

2.4 Construction and operation of the battery back-up system is explained in terms of industry practice.

2.5 Magnets and magnetism are explained in terms of applications, alternative and direct current, magnetic field, use in devices, and the transformer principle.

2.6 The purpose and application of magnetic screening are explained in terms of protecting sensitive meters and circuitry from magnetic interference.

2.7 Resistors and capacitors are explained in terms of construction, symbols, markings, connections, and applications.

2.8 Charged capacitors are explained in terms of safety precautions to prevent electric shock.

2.9 Semi-conductor diodes are explained in terms of type, terminals, behaviours, related terminology, and applications.

2.10 Diode testing is explained in terms of industry practice, interpreting results and potential for damage.

Outcome 3

Demonstrate knowledge of technologies and architectures for complex networks in telecommunications.

Performance criteria

3.1 The New Zealand transmission system is explained in terms of power station to consumer, and in accordance with industry practice.

3.2 Technologies and architectures for complex networks are explained in terms of function and operation, network configurations and network addresses.

3.3 Technologies and architectures for complex networks are explained in terms of connectivity.

3.4 Technologies and architectures to provide complex network services are explained in terms of specialist service entrance equipment and termination practices.

Range cable management, frames, cabinets, enclosures and terminals.

3.5 Complex network technologies are explained in terms of methods of providing redundancy.

3.6 Complex network technologies are explained in terms of their use in cellular radio systems.

Outcome 4

Demonstrate knowledge of TCP/IP networks for complex networks in telecommunications.

Performance criteria

4.1 The hardware to permit connection to an existing network is explained in terms of features provided.

Range hardware may include but is not limited to – router, switch, hub, wireless, modem, access point.

4.2 Configuration of TCP/IP hardware to permit connection to an existing network is explained in terms of industry practice.

Range hardware may include but is not limited to – IPv4, IPv6, address, netmask, subnet prefix, gateway, DNS server, DHCP, MAC address, WEP, WPA, SSID.

4.3 Physical data interfaces used for IP connections are identified in terms of connector used, application and transfer speeds.

Range interfaces may include but are not limited to – RJ11, RJ45, LC, SC, USB, DB9, DB25, GE, SFP port.

4.4 IP addresses are described in terms of host and network portions for a given netmask (IPv4) or subnet prefix (IPv6).

4.5 Network Address Translation is described in terms of the function of a border router.

4.6 Methods for establishing communication with equipment behind a firewall are described in terms of fixed IP, port forwarding, and IP forwarding.

Planned review date	31 December 2025

Status information and last date for assessment for superseded versions

Process	Version	Date	Last Date for Assessment
Registration	1	23 May 2019	N/A
Rollover and Revision	2	25 January 2024	N/A

Consent and Moderation Requirements (CMR) reference	0101

This CMR can be accessed at http://www.nzqa.govt.nz/framework/search/index.do.

Comments on this unit standard

Please contact Waihanga Ara Rau Construction and Infrastructure Workforce Development Council qualifications@waihangaararau.nz if you wish to suggest changes to the content of this unit standard.