Title	**Demonstrate knowledge of a.c. power and power factor**		
Level	**4**	**Credits**	**4**

Purpose	This unit standard is for people in the electrical industry who need to understand and calculate power and power factor in alternating current (a.c.) circuits. People credited with this unit standard are able to: – demonstrate knowledge of a.c. power; – demonstrate knowledge of a.c. power factor; and – calculate capacitance required to correct lagging power factor.

Classification	Electrical Engineering > Core Electrical

Available grade	Achieved

Guidance Information

1 This unit standard has been developed for learning and assessment off-job.

2 For assessment purposes
- a Candidates shall be supplied with formulae involving more than three quantities.
- b Use of a calculator during assessment is permitted.
- c Candidates are expected to express calculated values in the relevant Système International (SI) units, including multiples and sub-multiples (pico, nano, micro, milli, kilo, mega, etc) and be able to convert between them.

Outcomes and performance criteria

Outcome 1

Demonstrate knowledge of a.c. power.

Performance criteria

1.1 A.c power terms are defined according to industry practice, and their symbols and units are stated.

Range true power (P, Watts), reactive power (Q, volt-amps reactive or VAr), apparent power (S, volt-amps or VA).

1.2 A power triangle is derived from a phasor diagram.

Range impedance triangle is found first and the power triangle derived from it, power triangle is derived directly from voltage and current phasor diagrams.

1.3 Calculations involving power triangles are carried out from given data.

Range apparent power, true power, reactive power, phase angle.

Outcome 2

Demonstrate knowledge of a.c. power factor.

Performance criteria

2.1 The term *power factor* is defined with reference to impedance and power triangles.

2.2 The meanings of leading, lagging, and unity power factors are explained with reference to the loads producing them, and how they may be improved.

2.3 Effects of a low lagging power factor are stated.

Range low useful power, increased current for a given power, increased capacity of supply equipment required.

2.4 Phasor diagrams showing power factor improvement of a lagging circuit are drawn showing the uncorrected circuit, the addition of a capacitive component, and the resultant corrected circuit.

2.5 Methods of connecting corrective capacitors to single-phase and three-phase motors and to switchboards are explained.

2.6 Industry safety practice relating to working with capacitors is explained.

2.7 Practical limitations to improvement of power factor beyond 0.95 are explained in terms of value and physical size of corrective capacitors, and cost.

Outcome 3

Calculate capacitance required to correct lagging power factor.

Performance criteria

3.1 Power factor is calculated for given load conditions.

Range load conditions – incandescent lighting and heating, single-phase and three-phase motors with known apparent power and power factor.

3.2 Value of corrective capacitance is calculated for given load conditions and desired degree of improvement.

3.3 Reduction in supply current as a result of the improvement is calculated.

3.4 Capacitor ratings are determined in accordance with industry practice.

This unit standard is expiring. Assessment against the standard must take place by the last date for assessment set out below.

Status information and last date for assessment for superseded versions

Process	Version	Date	Last Date for Assessment
Registration	1	29 April 1994	31 December 2013
Review	2	23 April 1996	31 December 2013
Review	3	10 February 1999	31 December 2013
Review	4	26 May 2005	31 December 2027
Rollover and Revision	5	15 March 2012	31 December 2027
Revision	6	15 January 2014	31 December 2027
Rollover and Revision	7	28 January 2021	31 December 2027
Review	8	25 May 2023	31 December 2027

Consent and Moderation Requirements (CMR) reference	0003

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