

| | | | |
|--------------|--|----------------|----------|
| Title | Demonstrate knowledge of farm water reticulation design methods | | |
| Level | 4 | Credits | 5 |

| | |
|----------------|--|
| Purpose | <p>This unit standard is for people working on farm water reticulation systems. It includes the underpinning knowledge required to design a farm water reticulation system and leads on to unit standard 21960.</p> <p>People credited with this unit standard are able to: demonstrate knowledge of water quality and safety, water treatment and backflow prevention, farm water requirements, design options, hydraulic theory and pipe selection, pump selection, designing complex systems.</p> |
|----------------|--|

| | |
|-----------------------|--|
| Classification | Mechanical Engineering > Dairy Systems Engineering |
|-----------------------|--|

| | |
|------------------------|----------|
| Available grade | Achieved |
|------------------------|----------|

| | |
|---|---|
| Recommended skills and knowledge | 29158, <i>Demonstrate knowledge of basic hydraulic theory for rural fluid systems</i> or demonstrate equivalent knowledge and skills. |
|---|---|

Explanatory notes

- References
 - Health Care Act 1956 and subsequent Amendments
 - The Health (Drinking Water) Amendment Act 2007
 - Ministry of Health 2008, Drinking-water Standards for New Zealand 2005. Revised 2008. Ministry of Health. ISBN 978-0-478-31809-8 (print) ISBN 978-0-478-318-4 (online). Generally referred to as DWSNZ.
 - New Zealand Food Safety Council
 - NZCP1: Code of Practice for the Design and Operation of Farm Dairies. Available at: <http://www.foodsafety.govt.nz/elibrary/industry/dairy-nzcp1-design-code-of-practice/amdt-2.pdf>
 - National Environmental Standard (NES) for Sources of Human Drinking Water . Available at <http://mfe.govt.nz/laws/standards/drinking-water-source-standard.html>
 - AS/NZS 3500.1:2015, Plumbing and drainage - Water services
 - AS/NZS 2032:2006, Installation of PVC pipe systems
 - AS/NZS 1477:2006, PVC pipes and fittings for pressure applications
 - Guidelines for Drinking-water Quality Management for New Zealand. Available at <http://www.health.govt.nz/publication/guidelines-drinking-water-quality-management-new-zealand>.

2 Definitions

Farm water reticulation system refers to the circulation of water throughout a farm for the purpose of providing water for farm dairy sheds, rural domestic dwellings, stock, and irrigation requirements; and for effluent and waste water systems.

3 Assessment

Candidates are encouraged to refer to and use relevant literature and text such as training manuals, relevant industry codes of practice, standards, Standard New Zealand/Australia farm water tables, graphs, and data.

Outcomes and evidence requirements**Outcome 1**

Demonstrate knowledge of water quality and safety requirements for human and stock consumption.

Evidence requirements

- 1.1 Water quality and treatment requirements for designing or installing water systems servicing fewer than 500 people are described.
- 1.2 Water quality and treatment requirements for existing water systems servicing fewer than 500 people are described.
- 1.3 The term potable water is defined.
- 1.4 The minimum microbial treatment requirements for small water supplies are explained.
- Range small water supplies may include - bore water, protected catchment areas, partially protected catchment areas, unprotected catchment areas.
Evidence of at least one supply is required.
- 1.5 Effects of high levels of nitrate on human health are explained.
- 1.6 The reasons why confirmed aquifers generally yield water of high quality are explained.
- 1.7 Common symptoms of poor water quality are stated and ways to treat them are described.
- Range symptoms include but not limited to - washing has black stains, tap water is brown, premature burn out of hot water cylinder elements, water from a new concrete tank tastes peaty and smells musty, green stains on sinks and bath surfaces.
Evidence of 5 symptoms and their treatment is required.
- 1.8 The biological, chemical, and aesthetic qualities of water from varying sources are stated.

Range water sources - roof, aquifer, river, stream, lake.

1.9 Recommended levels of total dissolved solids (TDS) are identified for different classes of stock.

Range classes of stock may include - sheep, beef, dairy cattle, horses, pig, poultry.
Evidence is required for one class of stock.

Outcome 2

Demonstrate knowledge of quality and safety requirements for plant (irrigation) water supply and the effects of poor irrigation water quality.

2.1 Water quality and treatment requirements for irrigation water supply are identified and stated.

2.2 Effects of irrigation water quality on soil, plants and water resources are stated.

Outcome 3

Demonstrate knowledge of processes and procedures used to rectify water quality problems identified by testing or from anecdotal evidence.

Evidence requirements

3.1 A water supply treatment schematic is prepared from given information detailing processes and procedures to rectify water quality problems.

3.2 Backflow prevention devices are described and their use in different dairy farm applications is explained.

Range evidence of a minimum of two dairy farm applications.

Outcome 4

Demonstrate knowledge of rainfall runoff and of water consumption requirements for stockwater, domestic dwellings, dairy sheds, and basic irrigation systems

Range consumption requirements - peak daily quantities, peak instantaneous flowrates.

Evidence requirements

4.1 Rainfall runoff from a dairy shed roof is calculated from given data.

4.2 Consumption requirements for a dairy shed are calculated from given data.

4.3 Consumption requirements for stockwater are calculated for a given number and type of stock.

4.4 Consumption requirements for a given household are calculated.

- 4.5 The volume of water required for irrigation purposes, and the required flowrate is calculated for a given farm.

Outcome 5

Demonstrate knowledge of pipe selection and design options for farm water supply systems.

Evidence requirements

- 5.1 A cost effective pipeline suitable for the intended operational parameters is determined from given data.
- Range evidence of a pipeline for a gravity fed and a pump fed system.
- 5.2 The relative merits of using different types of pipes for a farm water reticulation system are described.
- Range types of pipe include - low density polyethylene (LDPE), medium density polyethylene (MDP), high density polyethylene (HDPE), Unplasticised polyvinylchloride (uPVC), modified polyvinylchloride (mPVC), galvanised steel.
- 5.3 Comparison is made between a pumped system and a gravity fed system and the relative merits of each stated.
- 5.4 Trough lateral lines are determined from given information.
- Range evidence of lateral lines for a minimum of two troughs.
- 5.5 Hydraulic grade lines are drawn for given data, and factors that may impact on the design of a pipeline are explained.
- Range factors may include but not limited to negative pressure, air locks.

Outcome 6

Demonstrate knowledge of pump selection.

Evidence requirements

- 6.1 Compare Positive Displacement (PD) and centrifugal pumps in terms of their uses in farm water systems.
- 6.2 Total system head (TSH) is calculated for a given system, and the best pump selected.
- 6.3 Pump power required for a specified system is calculated.

Outcome 7

Demonstrate knowledge of design options for complex pipe systems.

Range complex pipe systems may include but not limited to – mainline and lateral lines, ring main, branched pipe, telescopic pipe.

Evidence requirements

7.1 Design considerations are described and the relative merits compared for a mainline and lateral lines, and ring main system for a given scenario.

Range design considerations may include but not limited to – cost, suitability for terrain, suitability for application.

7.2 Design considerations are described for a branched system for a given scenario.

7.3 Suitable applications and environments are described for complex pipe systems.

| | |
|----------------------------|------------------|
| Planned review date | 31 December 2020 |
|----------------------------|------------------|

Status information and last date for assessment for superseded versions

| Process | Version | Date | Last Date for Assessment |
|--------------|---------|-----------------|--------------------------|
| Registration | 1 | 15 October 2015 | N/A |

| | |
|--|----------|
| Consent and Moderation Requirements (CMR) reference | CMR 0013 |
|--|----------|

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

Please note

Providers must be granted consent to assess against standards (accredited) by NZQA, before they can report credits from assessment against unit standards or deliver courses of study leading to that assessment.

Industry Training Organisations must be granted consent to assess against standards by NZQA before they can register credits from assessment against unit standards.

Providers and Industry Training Organisations, which have been granted consent and which are assessing against unit standards must engage with the moderation system that applies to those standards.

Requirements for consent to assess and an outline of the moderation system that applies to this standard are outlined in the Consent and Moderation Requirements (CMR). The CMR also includes useful information about special requirements for organisations wishing to develop education and training programmes, such as minimum qualifications for tutors and assessors, and special resource requirements.

Comments on this unit standard

Please contact Competenz qualifications@competenz.org.nz if you wish to suggest changes to the content of this unit standard.