REGISTERED
NATIONAL STANDARD

UNIT OF COMPETENCY

Title:	**Use drawings, diagrams, schedules, standards, codes and specifications for biogas systems** Note: 1) Due to safety issues inherent in working with combustible substances, all training and assessment activities must be in accordance with local industry and regulatory requirements; 2) This unit of competency has been adapted from the Pacific regional unit standard SE3303 (B) *Use drawings, diagrams, schedules, standards, codes and specifications*				
TQF Level:	3	**Credits:**	4	**Version:**	1
National standard code:	NS101-03				
Associated qualification (and code):	National Certificate in Sustainable Energy (Biomass) Level 3; (QR-03-NQ-018-03-0504-23-01)				
Approval date:	27 April 2023	**Review date:**	27 April 2028		
Purpose:	This unit standard involves working with biogas. It encompasses the rudiments for communicating with schematic, wiring and mechanical diagrams and equipment and cable/piping connection schedules, manuals, site and architectural drawings and plans showing the location of services, apparatus, plant and machinery and understanding the use and format of compliance standards and job specifications. Unless required by law, the application of the skills and knowledge described in this unit does not require a license to practice in the workplace. Persons credited with this unit standard are able to: 1. Prepare to use drawings, diagrams, schedules and manuals for biogas system design and installation; 2. Use drawings, diagrams, schedules and manuals to obtain biogas system job information; 3. Use biogas systems drawings, diagrams, schedules and manuals to convey information and ideas; and 4. Prepare to use compliance standards, codes and specifications for biogas system.				

Learning Outcome 1 (LO1)	Prepare to use drawings, diagrams, schedules and manuals for biogas system design and installation.
Performance standards	1.1. Identify and adhere to relevant *Occupational health and safety* (OHS) risk control measures and procedures; 1.2. Determine the need for drawings, diagrams, schedules or manuals for biogas work to be undertaken; 1.3. Identify and adhere to established routines and procedures to obtain drawings, diagrams, schedules or manuals required for the biogas system work to be undertaken; 1.4. Identify and resolve any uneasiness (with the handling and treatment of organic wastes) due to customs and taboos to ensure it does not become a constraint to the feasibility of a biogas system design.
Learning Outcome 2 (LO2)	Use drawings, diagrams, schedules and manuals to obtain biogas system job information.
Performance Standards	2.1 Select or prepare drawing conventions, diagrams, schedules and/or manuals, appropriate to the biogas system work being undertaken; 2.2 Interpret biogas system drawings, diagrams, schedules, drawing layouts, conventions and symbols; 2.3 Extract dimensions (measurements, sizes, forms, shapes, etc.) from drawings and diagrams for a biogas system work to be undertaken; 2.4 Determine the location of biogas system equipment from *equipment schedules* and *location diagrams*; 2.5 Review manuals to ascertain information relevant to biogas system work to be undertaken; 2.6 Interpret information given in manuals in relation to the biogas system work to be undertaken.
Learning Outcome 3 (LO3)	Use biogas system drawings, diagrams, schedules and manuals to convey information and ideas.
Performance standards	3.1 Identify clearly all drawing scales from relevant documentation; 3.2 Neatly make freehand drawings, using drawing conventions, to convey information and ideas to others involved in the biogas system work; 3.3 Neatly correct errors to original freehand biogas system job drawing, in accordance with drawing conventions, to show final 'as-installed' arrangement; 3.4 Submit corrected biogas system drawings to appropriate person(s) in accordance with established procedures;

Learning Outcome 4 (LO4)	Prepare to use *compliance standards, codes* and *specifications*.
Performance standards	4.1 Describe orally or in writing what *compliance standards, codes,* and *specifications* are; 4.2 Identify and obtain compliance standards, codes, and specifications that apply to biogas system works; 4.3 Describe the format of compliance standards, codes, and specifications that apply to biogas systems; 4.4 Review the format of compliance standards, and codes; 4.5 Describe the purpose and typical content of job specifications within biogas systems; 4.6 Review the purpose and typical content of job specifications in PS 4.5 in light of compliance standards and codes.
Pre-requisites	N/A
Co-requisites	N/A
Underpinning skills and knowledge	The following skills and knowledge are required: 1. Knowledge of basic operation of a biogas system; 2. Knowledge of basic civil works involved in biogas system installation and operation; 3. Knowledge of reading and interpreting technical diagrams of biogas designs and layouts; 4. Knowledge of the environmental and social impacts of biogas development; 5. Knowledge of *compliance standards, codes*, and *specifications* relevant to biogas systems.
Assessment requirements	**Methods of assessment:** A range of assessment methods should be used to assess students' knowledge and application of skills. These shall include but not restricted to the following: a) Direct observation of students performing a seminar or performing certain tasks stated under context of assessment b) Oral questions to test relevant skills and knowledge during seminar or observation (e.g. Interviews) c) Written assessment such as: 1) Review of schematics, manuals, drawings or diagrams;

2) Student Portfolios – containing other activities that demonstrate what a student can do – e.g. annotated photographs, video records, completed Activity logs, marked quizzes and assignments, etc., etc.

3) Reviews of workplace attachment reports (e.g. Supervisor/third party reports; testimonials from Project manager or supervisor)

Context of assessment:

To support student assessment and to ensure they are valid, reliable, flexible, and fair, a training provider is encouraged to make the necessary arrangements to involve the relevant key industry organisations such as *Tonga Electricity Commission* (TEC), *Tonga Power Limited* (TPL) and other trusted licensed private energy and electricity entrepreneurs in the assessment of the required competencies. Such collaboration between provider institutions and the industry may include but not restricted to the following:

- Experts from the industry contribute to the design and implementation of the curriculum and assessment activities;
- Experts from the industry are engaged as trainers, assessors, or assessment moderators;
- Students are placed in relevant industry organizations for workplace attachment;
- Industry experts act as supervisors of students on workplace attachment
- Etc.

To show that learners have the required competence they will need to **demonstrate** and **apply** their knowledge in the workplace (or in an environment that closely resembles the workplace) in relation to the unit's learning outcomes:

a) LO1: Prepare to use drawings, diagrams, schedules and manuals for biogas system design and installation.
b) LO2: Use drawings, diagrams, schedules and manuals to obtain biogas system job information.
c) LO3: Use biogas system drawings, diagrams, schedules and manuals to convey information and ideas.
d) LO4: Prepare to use compliance standards, codes and specifications.

Re-assessment

Candidates of assessment are eligible to three (3) attempts to achieve the required competency within 14 days of their first attempt:

1) Feedback must be provided to the candidate and sufficient time provided to prepare for re-assessment.
2) The trainer/assessor has the discretion to vary the assessment tasks used in each assessment attempt as long as the:
   a) same competencies are being assessed;
   b) principles of assessment are adhered to.

	Failure to achieve the required competency after three (3) attempts on the exam or specific part of the assessment will require the person studying this Unit to re-enrol for the same Unit.
Moderation arrangements	1. Training providers must have their own moderation system approved by TNQAB before accreditation is granted: a. Relevant internal moderation processes are documented; b. Assessment is planned for each unit, and moderation processes are integrated into such plan 2. External moderation is conducted by the national qualifications unit of TNQAB for all unit components of national qualifications; a. Samples of assessed activities are submitted for moderation; b. Moderation (external) forms are available on request from the National qualifications unit of TNQAB.
Resource requirements	1. Documented conventions for drawings, diagrams, schedules, standards, codes and specifications in biogas systems; 2. AutoCAD computer-aided design software; 3. Documents (such as manuals and wall-charts) showing relevant schematics, wiring and mechanical diagrams and equipment and cable/piping connection schedules, site and architectural drawings and plans showing the location of biogas system services, apparatus, plant and machinery. 4. Student computers with internet access; 5. Conventional classroom furniture and resources: White/blackboard, tables or benches, chairs, student notice boards;
Requirements to complete this unit	There are four (4) Learning Outcomes and twenty (20) Performance Standards to measure competence. To satisfy the competency requirement, the person studying this unit is: 1. Required to demonstrate ALL learning outcomes to the expected standards; 2. Required to attain an *Achieved* Grade (Competent) to fulfil the requirements of the Unit Standard; 3. Eligible to three (3) attempts to achieve the required competency within 14 days of the first attempt. Failure to achieve the required competency after three (3) attempts on the exam or specific part of the assessment will require the person studying this Unit to re-enrol for the same Unit.
Important notes and definitions	**Important notes:** 1. All activities associated with this unit standard must comply with the requirements of national codes of practice, regulations and legislation for

workplace health, safety, and environmental protection and any subsequent amendments.

2. Unless required by law, the application of the skills and knowledge described in this unit does not require a license to practice in the workplace.
3. Work presupposes compliance with gas, electrical, environmental and occupational safety requirements;
4. In the event that relevant legislations, standards and codes are not available locally, training providers are encouraged to use those which are currently used in either Australia or New Zealand for their training.

Definition

1. *Anaerobic* means 'no oxygen'.
2. *Anaerobic fermentation* is the process that breaks down organic matter in the absence of oxygen to produce biogas.
3. *Biogas* is a mixture of different gases (methane (CH_4), carbon dioxide (CO_2), hydrogen sulphide (H_2S), and water (H_2O) produced by the breakdown of organic matter in the absence of oxygen. Biogas can be produced from raw materials such as agricultural waste, manure, municipal waste, plant material, sewage, green waste or food waste. Biogas is a renewable energy source and, in many cases, exerts a very small carbon footprint
4. *Biogas system* refers to the complete unit required for biogas production (apparatus and materials from feedstock collection through biogas production to storage/end use - including digestate collection/end use and may also include the use of a compressor for transfer and storage of gas).
5. *Civil Works* refers to work that involves civil engineering and construction of concrete base and digester including ducting for the biogas system, construction of digestate collection tanks and livestock pens.
6. *Compliance* refers to the act of following set rules and guidelines;
7. *Compliance code* is a 'set of rules' (not a law) that must be followed or complied with. Each code specifies the minimum acceptable requirements for a process or performance. Codes exist for the purpose of safety, quality or other benefit. For example, electrical codes exist to ensure system reliability and that building occupants are safe from shock risks.
8. *Compliance standard* – a statement that describes acceptable level of quality which must be followed; a compliance standard tends to be more detailed elaboration, providing the 'nuts and bolts' of meeting a compliance code. A code tells you what you need to do, and a standard tells you how to do it.

	9. *Digestate* is the material that is left after anaerobic digestion (anaerobic fermentation); 10. *Equipment schedule* refers to a document that shows the exact location of all equipment, each identified by a specific numbered key or description. Equipment scheduling helps to organize and plan better, improving one's effectiveness. Before conducting a job (e.g. biogas system work), one needs to plan and prepare for it. This plan would include mapping out the project phases and considering the equipment, materials and assets necessary to accomplish the goal. 11. *Location diagram* – a diagram that indicates the location or position of something in relation to other things. 12. *Occupational health and safety* refers to the practice of dealing with all aspects of health and safety in the workplace, with a strong focus on preventing workplace hazards. 13. *Specification* - a specification provides specific requirements for a product or service. Unlike a **code** or **standard**, which can apply broadly to an industry and region, specifications outline the requirements of a specific company or product. Sometimes, a specification will also dictate a standard installation or design layout of those components.
Public comments on unit	Please contact TNQAB National Qualifications Unit (email EnquireNQ@tnqab.to or Telephone 28136) if you like to discuss or suggest changes to the details of this unit.