

REGISTERED NATIONAL STANDARD

UNIT OF COMPETENCY



Title:	Construct brick and block arches ¹				
TQF Level:	4	Credits:	5	Version:	1
National standard code:	NS159-04				
Associated qualification (and code):	National Certificate in Bricklaying and Blocklaying Level 4 QR-04-NQ-028-02-1005-26-01				
Approval date:	10 September 2026		Review date:	10 September 2031	
Purpose:	This unit describes the skills and knowledge required to construct a range of brick and block arches in both new and existing structures. It covers the preparation of work areas, construction of walls to the springing line, creation and installation of arch templates, and the cutting and laying of voussoirs and spandrels. The work involves using hand tools, power tools, measuring equipment and digital devices while complying with workplace safety, environmental requirements and relevant standards. The unit applies to bricklayers and blocklayers who are responsible for organising and completing their assigned tasks without close supervision. This unit supports bricklayers who are expected to take responsibility for assigned brick and block arch construction tasks and complete work independently while meeting Tonga National Building Code requirements. In successfully completing this unit standard, learners are able to: • Work safely and environmentally responsibly, following workplace procedures, hazard controls and OHS requirements. • Interpret construction drawings, specifications, and standards for brick and block arches construction. • Prepare the worksite, materials, tools, and equipment while following OHS and environmental procedures. • Calculate material quantities and arch dimensions using measurements and geometry • Set out the arch span, centre, and curve using full-size drawings where required				

¹ Due to safety issues inherent in working with electricity and combustible substances, all training and assessment activities must be in accordance with Tonga National Building Code.

	• Construct walls up to the springing line maintaining line, level, plumb, and gauge • Prepare and install arch templates (centres) accurately to required shape and support • Cut and shape voussoirs to required dimensions and joint angles • Lay voussoirs evenly around the arch centre to form the arch structure • Construct spandrels and adjoining masonry maintaining proper bonding and joint alignment • Ensure correct distribution of structural loads within the arch • Finish joints and brickwork surfaces to required standards • Apply finishing techniques and ensure compliance with Tonga National Building Code. • Carry out clean-up and maintenance of tools, equipment, and work areas
Learning Outcome 1 (LO1)	Prepare and organise work to construct brick and block arches
Performance standards	1.1 Read, interpret and apply brick and block arch construction requirements from current plans, specifications and codes; 1.2 Follow requirements in workplace safety and environmental documentation and workplace procedures; 1.3 Calculate material quantities required for the task. 1.4 Determine job priorities and sequence job tasks in consultation with others on site; 1.5 Identify potential hazards and determine and implement control measures; 1.6 Select and use personal protective equipment (PPE) appropriate for job; 1.7 Select and check condition of plant, equipment and tools and report damage or faults to relevant person; 1.8 Check conformity of materials against the specifications and place materials in preparation for the work.
Learning Outcome 2 (LO2)	Construct wall to springing line of brick and block arches
Performance Standards	2.1 Set out location of first course; 2.2 Determine span of brick and block arches; 2.3 Lay abutting walls maintaining plumb; 2.4 Gauge and level up to springing line to comply with standards and tolerances.
Learning Outcome 3 (LO3)	Set out brick and block arch template

Performance standards	3.1 Set out brick and block arch centre and curve and where appropriate produce a full-size drawing of arch; 3.2 Transfer shape to template materials and cut to shape; 3.3 Locate brick and block arch template to height of springing line and crown; 3.4 Adjust toms and wedges or adjustable metal props to ensure arch centre and springing line is level.
Learning Outcome 4 (LO4)	Cut and lay voussoirs
Performance standards	4.1 Use full size drawing to determine voussoir shape and size; 4.2 Mark, cut and test voussoirs for parallel joints; 4.3 Lay voussoirs around brick and block arch centre; 4.4 Cut and lay spandrels maintaining even collar joints.
Learning Outcome 5 (LO5)	Clean up arch construction work area
Performance standards	5.1 Clear the work area and dispose waste following environmental requirements; 5.2 Clean tools and equipment; 5.3 Check for serviceability and report damage or faults; 5.4 Store and secure tools and equipment following workplace procedures.
Pre-requisites	NS133-03 Apply <i>Occupational Health and Safety</i> (OHS) requirements, policies and procedures
Co-requisites	N/A
Underpinning skill and knowledge	The following skills and knowledge underpin this unit standard: <u>Skills:</u> Work Preparation • Selecting, fitting and using PPE appropriately. • Reading, interpreting and applying requirements from plans, codes and specifications. • Sequencing tasks and determining job priorities. • Identifying hazards and implementing appropriate control measures. • Checking plant, tools and equipment for serviceability. • Checking materials for conformity with specifications.

	Planning and Calculation • Calculating material quantities for arch construction. • Applying geometry and measurements to determine arch curves, spans and voussoir dimensions. • Developing full-size drawings and templates for arches. Construction Techniques • Setting out walls and laying abutments referring to the Tonga National Building Code. • Producing, cutting and locating arch templates correctly. • Marking, cutting, testing and laying voussoirs. • Laying spandrels while maintaining even collar joints. • Constructing at least four types of arches as required by the unit. Technology and Housekeeping • Using digital tools and devices to access job information and communicate. • Cleaning up work areas and managing waste in line with environmental procedures. <u>Knowledge:</u> Materials Selection • Characteristics, applications and limitations of materials used in masonry arch construction. Construction Processes and Techniques • Techniques for setting out and constructing various types of arches. • Methods for preparing, cutting and laying voussoirs. • Procedures for setting out, cutting, assembling and fitting arch templates. • Categories and terminology relating to arch construction. • Understanding structural and load-bearing forces applied to arches. Documentation and Specifications • Features of working drawings and specifications relevant to masonry arches. • Mortar ingredients, consistency requirements and appropriate applications.
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	Plant, Tools and Equipment • Functional features and safe operation of hand and power tools including battery-operated tools. Occupational Health and Safety • Job Safety and Environmental Analysis (JSEA). • Working safely at heights. • Erecting and dismantling work platforms. • Exposure risks (silica, loud noise) and control measures. Legislation and Codes • Key National Building Code requirements relevant to masonry arches. • Current standards related to brickwork tolerances. Environmental Requirements • Environmental considerations for workplace processes and disposal, reuse or recycling of materials.
Assessment requirements	<u>Assessment methods</u> may include more than one of the following: Direct Observation Assessment of learners while they are performing tasks in real time in a real simulated environment. • The learner performs practical tasks. • The assessor watches the learner complete these tasks against a checklist or performance standards. Assessor Requirements • Use a structured observation checklist aligned to performance standards • Observe multiple occasions to ensure consistency of competence. • Record evidence of safe work practices, correct use of equipment, etc. • Provide immediate feedback where appropriate. • Ensure conditions reflect real workplace standards. Oral Questioning Verbal questions asked to assess the learner's understanding of knowledge and reasoning. • Conducted during or after practical tasks. • Can be structured (planned questions) or informal (follow-up probing). Assessor Requirements

	• Ask questions that test underpinning knowledge • Use open-ended questions • Confirm learner understanding where practical performance is not enough. • Record responses clearly (notes or checklist). • Adjust language to suit learner literacy levels. Written Test A structured assessment requiring learners to provide written responses. • Short-answer questions, multiple choice, or case scenarios. • Typically conducted off-site or in a classroom environment. Assessor Requirements • Design questions that assess knowledge. • Ensure the test is clear, aligned to unit requirements and appropriate for language, literacy, numeracy levels • Mark responses using a marking guide or model answers. • Provide feedback and identify gaps in knowledge. • Ensure results reflect the learner’s independent performance. Work-Based Activity Assessment conducted in a real workplace while the learner performs actual job tasks. • Learners complete normal workplace duties. • Evidence is collected over time. Assessor Requirements • Coordinate with workplace supervisors. • Gather evidence such as - Observation reports, Supervisor feedback, etc. • Verify that tasks meet unit performance standards. • Ensure authenticity (learner’s own work). • Confirm competence across different situations and timeframes. Assessment should use a combination of the above methods to ensure sufficient, valid, authentic, and current evidence of competence in both skills and knowledge, in line with unit requirements. <u>Context of Assessment:</u>
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	Competency is to be assessed in the workplace or a simulated workplace environment that accurately reflects a real workplace setting. Assessment is to comply with relevant regulatory or relevant standards' requirements. Assessment of essential knowledge will usually be conducted in an off-site situation.
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. Unless specified elsewhere, external moderation is conducted by the National Qualifications unit of TNQAB for all unit components of a national qualification: a) Samples of assessed activities are submitted for moderation; b) Moderation (external) forms are available on request.
Resource requirements	1. Power point presentations 2. Trainer's Guide 3. Learner's Guide 4. Tonga National Building Code 5. Videos on brick or block arch construction 6. Plans and Specifications 7. Measuring and setting-out tools 8. Bricks or blocks suitable for arch construction 9. Cement 10. Sand 11. Lime 12. Water 13. Template materials (timber or metal for arches) 14. Support materials (props, wedges, toms) 15. Trowels 16. Brick hammer 17. Bolster chisel 18. Jointing tools 19. Tape measures

	20. Spirit levels 21. Squares 22. String lines 23. Cutting equipment for shaping voussoirs 24. Template fabrication tools 25. Hand and power tools (including battery-operated tools) 26. PPE's 27. Safety signage and barricades 28. JSEA (Job Safety and Environmental Analysis) 29. Structured assessment and evidence-collection tools 30. Trammel 31. First aid kit
Requirements to complete this unit	There are five (5) Learning outcomes and twenty-four (24) Performance Standards to measure competence. To demonstrate competence, the person studying this unit is: a. Required to demonstrate all LOs to the expected standards; b. Required to attain an Achieved Grade (Competent) to fulfil the requirements of the Unit Standard; c. 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 specific part of the assessment will require the person studying this Unit to re-enrol for the same Unit.
Important notes and definitions	<u>Notes:</u> 1. All training and assessment activities must be in accordance with Tonga National Building Code. 2. Assessors must comply with the Tonga national assessment and moderation requirements. <u>Definitions:</u> 1. <i>Arch</i> is a curved structural element used to span an opening and support loads.

2. *Arch Centre (Template)* refers to temporary support structure used to hold the arch in place during construction.
3. *Bull's Eye Arch* is a circular or near-circular arch.
4. *Crown* refers to the highest point of an arch.
5. *Gauge* refers to the vertical spacing of brick courses.
6. *Gothic Arch* is a pointed arch formed by two intersecting arcs.
7. *JSEA (Job Safety and Environmental Analysis)* refers to risk assessment process.
8. *Keystone* refers to the central voussoir at the apex (crown) of an arch that locks the structure together.
9. *Level* refers to horizontal alignment
10. *Line* refers to straight alignment
11. *Load Distribution* refers to the way forces are transferred through the arch to its supports.
12. *Multicentre Arch* refers to an arch constructed from multiple radii for complex shapes.
13. *OHS (Occupational Health and Safety)* refers to workplace safety regulations and practices.
14. *Plumb* - Vertical alignment
15. *PPE (Personal Protective Equipment)* refers to safety equipment such as helmets, boots, gloves, and high-visibility clothing.
16. *Segmental Arch* refers to an arch with a shallow curve forming a segment of a circle.
17. *Semicircular Arch* refers to an arch forming a half circle.
18. *Setting-Out Instruments* refer to tools used to measure and align structures (e.g., tape measures, spirit levels, automatic and laser levels)
19. *Silica dust* refers to hazardous dust produced during cutting masonry materials.
20. *Span* refers to the horizontal distance between the supports of an arch.
21. *Spandrel* refers to the area of masonry between the curve of the arch and the surrounding wall.

	22. <i>Springing Line</i> refers to the point at which the arch begins to curve from the supporting structure. 23. <i>Template</i> is a shaped guide used to ensure accurate construction of arches. 24. <i>Tolerance</i> refers to the allowable variation in dimensions or alignment according to standards 25. <i>Tonga National Building Code</i> refers to a set of technical provisions for the design and construction of buildings and structures in Tonga. 26. <i>Voussoir</i> is a wedge-shaped brick or block forming part of an arch. 27. <i>Work area</i> refers to the particular section where tasks are performed at the work site.
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.