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Regional Model Competency Standards:

Construction

Regional Office for Asia and the Pacific

Regional Model Competency Standards: Construction

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Preface

Asia is the largest regional construction market worldwide, accounting for 44 per cent of global construction spending in 2013 (AECOM, 2014). The region is predicted to maintain its position as global growth leader for some time, with an increasing emphasis on residential and infrastructure construction.

The majority of ASEAN Member States are prioritizing transport, construction and infrastructure, calling for an expansion of the supply of workers with sound competencies in engineering and construction skills such as welding, electrical wiring and bricklaying. An estimation model for the occupational demands in six ASEAN economies, (i.e. Cambodia, Indonesia, Lao PDR, Philippines, Thailand and Vietnam) for 2025 indicates the likely need for particular types of workers, including construction workers. The demand for construction workers will increase by 3.3 million in total, with two-thirds of that expansion in the Philippines and Viet Nam (ILO and ADB, 2014: 62). Therefore, the skills development and recognition of construction workers plays an important role in meeting this challenge.

The need to improve the quality and effectiveness of training systems remains a major challenge for many countries in the Asia-Pacific region. The skills of workers are a critical source of enterprises' productivity and competitiveness, as well as of workers' employability. Much effort has been made to improve the relevance of training systems, to ensure that the skills that workers possess meet the needs of the workplace.

The establishment of the ASEAN Economic Community (AEC 2015), with the goal of creating economic integration, a single market production base and a freer flow of skilled labour in the region, has increased the importance to sending and receiving countries of being able to recognize the skills of migrant workers.

To help accelerate the improvement of training systems and the mutual recognition of skills, the ILO has developed, in consultation with employers, governments and workers, the Regional Model Competency Standards (RMCS). These have been developed in identified priority areas and are in a simplified format.

Competency standards are a set of benchmarks that define the skills, knowledge and attributes people need to perform a work role. They are developed in consultation with industry, in order to ensure they reflect the needs of the workplace. These standards are primarily used to develop and implement training, to assess the outcomes of training, and to assess the level of a person's existing skills and competencies.

The RMCS are intended to be a regional reference for developing competency standards for those countries that are in the process of creating standards, or reviewing existing national standards. The RMCS can provide the basis for developing national competency standards in countries so they can avoid developing standards from scratch. By providing a regional reference for competency standards, I also hope that the RMCS can assist ASEAN regional integration by facilitating the mutual recognition of skills of workers across borders.

Tomoko Nishimoto
Assistant Director-General and Regional Director
for Asia and the Pacific

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Acknowledgements

The Regional Model Competency Standards (RMCS) for construction was produced as a result of a collaborative effort between a number of dedicated individuals who contributed their time and expertise through a consultative process.

The Regional Model Competency Standards (RMCS) for construction have mainly been modeled on the CPC08 Construction, Plumbing and Services Training Package, developed by the Construction and Property Services Industry Skills Council, owned and published by the Commonwealth of Australia. It was produced as a result of a collaborative effort between a number of dedicated individuals who contributed their time and expertise through a consultative process.

Ms Carmela Torres, ILO Senior Specialist on Skills and Employability, provided overall technical supervision of the RMCS. Ms Wendy Wyatt, ILO TVET consultant, provided expert content and editing on the final draft. We extend our thanks to Ms Alin Sirisaksopit and Ms Suttida Chaikitsakol for their assistance in drafting the RMCS. In addition, Ms Wilawan Wiseschinda and Ms Ruttiya Bhula-or formatted and finalized this publication.

Glossary

Attainment of competency

Competencies may be gained in a number of ways including through:

- Formal or informal education and training
- Experiences in the workplace
- General life experience, and/or
- Any combination of the above

Competency

The ability to perform particular tasks and duties to the standard of performance expected in the workplace, applying all relevant skills, knowledge and attitudes consistently over time in the required workplace situations.

Commission

To commission a service (for example a water service) is to put operation, in good working order.

Contingency

A contingency is a future event or circumstance which is possible but cannot be predicted with certainty.

Competency standards

Competency standards are made up of a number of units of competency each of which describes a key function or role in a particular job function or occupation.

Critical skills and essential knowledge

Brief statements that outline key skills and required knowledge for the job function covered by this unit. Knowledge identifies what a person needs to know to perform the work in an informed and effective manner. Skills describe how the knowledge is converted to a workplace outcome.

Dogging

Dogging is the act of either:

- Applying slinging techniques to lift a load, including selecting the method of lifting (by consideration of the nature of the load, its mass and its centre of gravity) and inspecting lifting gear (for suitability and condition), or
- Directing the operator of a crane or hoist in the movement of a load when the load is out of the view of the operator.

Elements of competency

These are the major functions and tasks that make up the competency.

Evidence guide

The evidence guide information to the assessor about how the competency may be demonstrated, such as conditions and context of assessment, suitable methods of assessment and resource implications.

Performance criteria

The performance standard or tasks that are involved in each of the relevant job functions.
Critical terms or phrases may be written in bold italics and then defined in range statement, in the order of their appearance in the performance criteria.

Elements of competency

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Performance criteria

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Critical terms or phrases may be written in bold italics and then defined in range statement, in the order of their appearance in the performance criteria.

Pointing

Pointing is the external part of mortar joints.

Range statement

Range statements are brief statements that clarify the scope and range of performance, including clarification on contexts, operations and equipment referred to in the performance criteria. As applicable, the meanings of key terms used in the performance criteria are also explained in the range statement.

Rigger

A rigger is a person or company that specializes in the lifting and moving of extremely large or heavy objects, often with the assistance of a crane or derrick.

Sarking

A layer of boards or bituminous felt placed beneath tiles or other roofing to provide thermal insulation or to prevent ingress of water.

SI System of measurement

The International System of Units (abbreviated to *SI* from *systeme internationale*) is the modern form of the metric system and is the world's most widely used system of measurement, used in both everyday commerce and science. Fundamental quantities are:

- Amount of matter (mole)
- Electric current (ampere)
- Electric current (ampere)
- Length (meter)
- Luminous intensity (candela)
- Mass (kilogram)
- Temperature (kelvin)
- Time (second).

Unit of competency

An agreed statement of the skills and knowledge required for effective performance of a particular job or job function.

Unit descriptor

A short statement giving a more detailed description of the job function covered by the unit.

Unit title

A short title that summarizes the main job function covered by the unit; accompanied by an alphanumeric code that follows ILO guidelines.

Introduction

National competency standards play an important and increasing role in skills development and recognition in the Asia-Pacific region, as they do in many other parts of the world. They are a guide to the range of skills and knowledge required for a whole industry. Competency standards can be flexibly combined into jobs and occupations. They are the common basis for training programmes, skills assessment and certification in many countries.

Competency standards, when recognized nationally, or across a cluster of nations, can form a key component in assisting the mobility of skilled labour. As part of a quality assurance system, the assessment of a person's skills against accepted benchmarks means those skills can be applied in other similar work. Potential employers can feel confident in the level of competencies workers claim to have. Workers returning from employment in other countries can have the skills they gained working there formally recognized. The Regional Model Competency Standards (RMCS) are the reference standards at the regional level that can be used in various ways to underpin efficient and effective skill development. In addition, they are considered to be essential tools to protect migrant workers, their rights and to ensure their better reintegration.

Labour mobility and the need for skills recognition

The labour market in Asia is characterised by a high level of worker migration, within the region and to external countries. In 2013, Asia accounted for 31 per cent of the global international migrant stock (UN, 2013). Many developing countries have come to rely heavily on remittances sent from individuals working abroad to their families at home. Remittances in the 2010s are now nearly three times the size of official development assistance and larger than private debt and portfolio equity flows to developing countries. The importance of remittances as a source of foreign currency earnings is increasing, particularly in South Asia (World Bank, 2013).

As the number of migrant workers is growing, many migrants do have skills that were acquired in their home country but not all of their skills are necessarily formally certified. This reduces their prospect for employment and better working conditions that correspond with their skills. Upon their return, there is little opportunity to have their newly acquired skills and work experience formally acknowledged. These are missed opportunities in capitalizing on the wealth of new learning and skills the workers bring back. This scenario impacts negatively on the individual worker's future employment prospects both within the region and outside. It also impedes their country's capacity to build a skilled and qualified workforce.

Training systems and the need for improvement

Training systems in the Asia and the Pacific region are often criticized on the basis that there is a mismatch between the skills offered and the needs of workers and employers. This means that some people are learning skills that are not needed by industry and training organizations and are wasting their limited resources receiving training that is not used. This is a serious problem for any country, as it holds back development and growth in productivity and employment.

The RMCS were developed in a simplified format so that they could be used in discussions between stakeholders to reduce this mismatch. The competencies are designed so that they can be modified to meet the specific requirements of an employer, job or workplace. Some competency elements will need to be added or deleted depending on the local requirements. This review process must take place to ensure the relevancy of any learning, training or assessment strategy based on the standards.

Construction industry

Asia is the largest regional construction market worldwide, accounting for 44 per cent of global construction spending in 2013(AECOM, 2014: 10) [1]. The region is predicted to maintain its position as global growth leader for some time, with an increasing emphasis on residential and infrastructure construction going forward. The majority of ASEAN Member States are prioritizing transport, construction and infrastructure calling for expanding the supply of workers with sound competencies in engineering and construction skills such as welding, electrical wiring and bricklaying. An estimation model for the occupational demands in six ASEAN economies, i.e. Cambodia, Indonesia, Lao People's Democratic Republic, Philippines, Thailand and Viet Nam, for 2025 indicates the likely need for particular types of workers, including construction workers. The demand for construction workers will increase 3.3 million in total, with two-thirds of that expansion in the Philippines and Viet Nam (ILO and ADB, 2014: 62). In addition, many Asian countries, especially Gulf Cooperation Council (GCC) countries, the share of foreign workforce in construction work is substantially high; for example, 99.8 per cent of workers in Qatar (M. Baldwin-Edwards, 2011: 23, Table 13[2]). There are up to 180 million construction workers worldwide with 90 per cent of firms have less than 10 workers (Building and Woodworkers International, 2006 [3]).

Given the huge number of construction workers in this region, the construction industry is a major source of pollution and construction workers are constantly exposed to chemicals and dusts. Construction work is difficult, often involving manual handling of heavy materials and equipment, and also dangerous, as it includes having to climb high scaffoldings or taking on otherwise risky physical activities. According to the Building and Wood Worker's International[4], at least 108,000 workers are killed on site every year, this figure represents about 30 per cent of all fatal occupational injuries.

[1] AECOM (2014) Asia Construction Outlook 2014, http://www.aecom.com/deployedfiles/Internet/Geographies/Asia/Asia%20News/Asia%20Construction%20Outlook_20140313_%20eng%20_%20final.pdf [accessed 15 July 2014].

[2] M. Baldwin-Edwards: Labour Immigration and Labour Markets in the GCC countries: National Patterns and Trends. Kuwait Programme on Development, Governance and Globalisation in the Gulf States, 15. (The London School of Economics and Political Science, London, UK. 2011) [accessed 24 Dec 2014]. http://www.lse.ac.uk/middleEastCentre/kuwait/documents/Baldwin-Edwards,%20Martin.pdf

[3] Building and Wood Worker's International (2006) Defending Workers Rights in Construction. Accessed on 15 July 2014 http://www.bwint.org/pdfs/WCProcurementFiona.pdf

[4] Building and Wood Worker's International (NA) Health and Safety - Global Picture, http://www.hazards.org/guf/bwi/toppriority.htm [accessed 24 Dec 2014].

These occupational deaths and injuries may be caused by a variety of work-related incidents such as falls, being struck by falling objects, the collapse of building or structure, electrocution, suffocation, and exposure to hazardous chemicals such as asbestos.

In view of the environmental impact of the industry and the considerable occupational safety concerns, these RMCS have specified both environmental and safety requirements of performance.

Purpose of these standards

These competency standards were developed as a basis for identifying skills needed in the workplace, so that training and assessment resources can be developed and individuals tested against the standards. Training resources might include a curriculum, test projects, learner guides, texts, references, teaching strategies, group activities and an assessment system that can be used to determine competence in each unit of competency.

The standards can also be used in many other ways as a reference material, for example, for recruitment and development of job descriptions. The complete sets of competency standards included in these RMCS, however, do not represent a common job description or expectation of the work performance of every construction worker. Each job of a construction worker should be negotiated as part of their employment contract and different levels and complexities of tasks and responsibilities should be reflected in working conditions including wages.

Different countries will have different customs and any training provided should reflect these different customs and expectations. Similarly, there will be different legislation and government regulations that apply in different countries and regions and these also must be taken into account in designing training programmes. It is, therefore, important that the effort in developing and updating national competency standards form not only a part of skills development initiatives for construction workers but also a part of the broader effort in promoting their decent work.

Content

The RMCS are grouped functionally and not along the line of jobs or occupations. This enables the users of the RMCS to tailor make their own ‘competency standards for construction workers’ by selecting and grouping the units of competencies from the RMCS to better fit their national and local understanding and situations.

The standards define a general framework for the critical skills, knowledge and attitudes that equip and/or certify workers to undertake construction work.

These RMCS should not be seen as complete sets of competencies needed for an industry, however. They are meant to be a starting point for discussions and should be modified to meet the specific requirements of a particular employer, job, workplace or country’s education and training system. Additional performance elements could be added or deleted to match the local requirements. Similarly, any special “performance standards” can be modified or added to match enterprise requirements or government regulations that apply in different countries and regions.

The RMCS for construction workers include both generic competencies (Functional Area A: Core Competencies), and vocational and technical competencies (Functional Areas B-H).

To avoid repetition and reduce the complexity the technical units of competency, requirements relating to ‘work safely’, ‘in an environmentally responsible manner’ and some core skills have been extracted and included in the following tables. These are to be included in the competency assessment of the technical units, i.e. units CS-B to CS-H.

Table 1 Critical skills and essential knowledge: Work safely

Precautions applicable to:
Emergency procedures - emergency shutdown and stopping use of fire equipment, first aid and evacuation
Manual handling of materials
Hazard identification and control
Hazardous materials and substances
Precautions applicable to use of tools, equipment and machinery
Precautions applicable working at heights
Precautions applicable working in confined spaces
Precautions applicable electricity, power cables, electrical services and appliances
Use of personal protective equipment (PPE) - Head protection covering, hearing protection, protective clothing, Protective boots, sun protection and safety harness for working at heights

Table 2: Critical skills and essential knowledge: Environmental safety

Precautions applicable to:
Clean-up management
Control of chemical residues, contaminants, wastes and pollution
Correct handling and disposal of hazardous materials
Disposal of waste material to ensure minimal environmental impact
Efficient energy and water use
Efficient use and recycling of material
Improving energy efficiency
Increasing use of renewable, recyclable and recoverable resources
Minimising noise, dust, light or odour emissions
Reducing emissions of greenhouse gases
Reducing energy use
Reducing use of non-renewable resources
Sedimentation control
Undertaking environmental hazard identification, risk assessment and control
Use of sustainable, water efficient products
Vibration
Waste management
Water quality protection

Table 3: Critical skills and essential knowledge: Core skills

Communication skills to follow and clarify instructions, listen actively, questioning techniques, share information, consult and report hazards and faults.
Interpersonal skills to work with others effectively and relate to people from a range of backgrounds and with a range of abilities.
Literacy skills to read and interpret specifications and drawings, follow organisational procedures technical manuals, manufacturer guidelines and work specifications.
Numeracy skills to estimate, calculate and record routine workplace measures and to apply processes for setting out and measuring and for calculating material requirements.
Problem solving skills to use available resources, manage contingencies, prioritise tasks and identify and manage hazards.
Organisational skills to plan and set out work.
Team work skills.

Table 4: Critical skills and essential knowledge: Core knowledge

Calculation of material requirements.
Construction terminology and relevant specific terminology - electrical, plumbing, steel working, dogging and rigging terminologies.
Job requirements and specifications.
Machinery, tools and equipment types, characteristics, uses and limitation.
Plans, drawings and specifications.
Quality requirements.
The International System of Units (SI) of measurement.
Workplace procedures and expectations.

Templates for the RMCS

The template used follows the model of unit description applied in various countries in Asia and the Pacific as well as the other RMCS developed by the ILO. Each unit of competency describes the skills a worker applies when performing the identified task or role, as well as the underpinning skills, knowledge and attitudes the worker needs to perform the task effectively.

Individual units define the competency outcomes necessary for a particular area of work. It is the combination of a number of units that describes a whole job role. The combination of units also captures the need to manage different tasks simultaneously and to adapt to different workplace environments and situations.

These RMCS have been divided into eight functional areas, which are comprised of 72 Units of Competency. These are summarized in the following table (Table 5).

Table 5: Units of competency, codes and functional areas

Functional area		Code	Unit title
A	Construction core skills	CS-A1	Communicate in the construction industry
		CS-A2	Use tools and equipment in the construction industry
		CS-A3	Undertake measurements and construction calculations
		CS-A4	Work from construction plans and specifications
		CS-A5	Plan construction tasks
B	Construct site report	CS-B1	Excavate a construction site
		CS-B2	Demolish structures
		CS-B3	Drain a construction work site
		CS-B4	Erect and dismantle formwork for footings and slabs
		CS-B5	Use and store construction materials and equipment
		CS-B6	Use leveling techniques
		CS-B7	Construction dogging
		CS-B8	Construction rigging
		CS-B9	Construction scaffolding
		CS-B10	Place and fix steel reinforcing
		CS-B11	Use oxy-LPG equipment
		CS-B12	Cut and install glass
C	Carpentry and framing	CS-C1	Construct wall framing
		CS-C2	Construct ceiling framing
		CS-C3	Erect roof trusses
		CS-C4	Erect roof trusses
		CS-C5	Install flooring systems
		CS-C6	Install windows and doors
		CS-C7	Install lining, panelling and moulding
		CS-C8	Install stairs
		CS-C9	Construct formwork for suspended slabs, columns, beams and walls
		CS-C10	Construct partitions
		CS-C11	Construct timber cabinetry
D	Block laying brick laying and concreting	CS-D1	Place concrete
		CS-D2	Finish concrete surfaces
		CS-D3	Cut and core concrete
		CS-D4	Resurface concrete
		CS-D5	Install flashings and damp-proof coursing
		CS-D6	Lay masonry
		CS-D7	Construct masonry steps and stairs
		CS-D8	Construct masonry curved walls and arches
		CS-D9	Construct structural masonry systems
		CS-D10	Construct using tilt panels
		CS-D11	Prepare subgrade, base and bedding course for paving

		CS-D12	Lay paving
E	Surface finishing, tiling and painting	CS-E1	Apply float and render to building surfaces
		CS-E2	Fix plasterboard walls and ceiling sheets
		CS-E3	Finish plasterboard joins and surfaces
		CS-E4	Cut and fix cornices
		CS-E5	Waterproof wet areas
		CS-E6	Prepare surfaces for tiling
		CS-E7	Lay floor tiles
		CS-E8	Surface finishing, tiling and painting
		CS-E9	Prepare surfaces for painting
		CS-E10	Paint by spray, brush and roller
		CS-E11	Apply stains and clear timber finishes
F	Roofing	CS-F1	Work safely on roofs
		CS-F2	Install metal roof sheeting and wall cladding
		CS-F3	Install curved metal roof
		CS-F4	Install roof drainage
		CS-F5	Tile roofs
		CS-F6	Repair or replace roof valleys, valley irons and flashings
G	Residential plumbing	CS-G1	Cut and join sheet metal
		CS-G2	Use oxyacetylene equipment for welding
		CS-G3	Fusion weld plastic pipe
		CS-G4	Install water pipes
		CS-G5	Flash plumbing penetrations through roofs and walls
		CS-G6	Install water-heating systems
		CS-G7	Fit sanitary fixtures
		CS-G8	Install discharge pipes and sanitary stacks
		CS-G9	Install sanitary and stormwater drainage systems
		CS-G10	Install fire-sprinkler systems
H	Electrical wiring and cabling	CS-H1	Read electrical drawings and diagrams
		CS-H2	Lay and install low-voltage wiring and communications cabling
		CS-H3	Test wiring systems
		CS-H4	Attach cords and plugs to electrical equipment
		CS-H5	Disconnect and reconnect low-voltage electrical equipment

Functional area A – Core construction competencies

CS-A1 Communicate effectively in the construction industry

Unit details	
Functional Area A	**Core construction competencies**
Unit title	**Communicate effectively in the construction industry**
Unit code	**CS-A1**

Description

This unit of competency describes the skills and knowledge required to communicate effectively with other workers in a construction workplace environment.

Elements of competency	**Performance criteria**
1. Gather, convey and receive information	1.1 Verbal and written instructions are received, interpreted and responded to with correct actions.
	1.2 Instructions to others are conveyed accurately.
	1.3 Information from a range of sources is accessed and interpreted using a variety of **communication modes**.
	1.4 Work **signs** are followed correctly.
	1.5 Questions are used to clarify understanding.
2. Conduct routine communication	2.1 Work instructions and messages are received and followed.
	2.2 Workplace procedures are conducted in communication with others.
	2.3 Verbal and written reporting is completed where required.
3. Conduct visual communication	3.1 Visual communication (example hand signs) is used that follows accepted conventions.
	3.2 Attention of other parties is obtained and intent of the visual communication is confirmed at each stage.
	3.3 Visual communication that is unclear is questioned or visually cancelled and followed up to clarify.
4. Participate in site meetings.	4.1 Correct process for onsite meetings is identified and followed to predetermined or agreed procedures.
	4.2 Responses are sought and provided to others in the group.

Evidence guide

To demonstrate competency in this unit the candidate must meet performance criteria and skills and knowledge requirements. The candidate must be able to:

- communicate a variety of work activities in a range of construction contexts;
- communicate effectively with others;
- convey pieces of information to other workers accurately;
- follow instructions to complete tasks;
- interpret all signage accurately; and
- locate, interpret and apply work-related information.

Critical skills and essential knowledge

The ability to:

- apply clear communication skills;
- read and interpret simple instructions and messages and signage;
- use and interpret non-verbal communication, such as hand signals; and
- use questioning to identify and confirm requirements.

Knowledge of:

- Common hand signals used in construction
- Communication techniques applicable to different modes of communication
- Construction terminology
- Interpretation of body language

Range statement

Communication modes includes:

- Active listening
- Group interaction
- Interpreting signage
- Meetings
- Questioning
- Verbal and written

Signs include:

- Directional signs
- Facility or location signs and hazards
- Site safety signs
- Traffic signs

Competency may be assessed through a combination of*:*

- Demonstration
- Practical exercises
- Written or oral short answer questions

Competency is to be assessed in the workplace or in simulated workplace environment.

CS-A2 Use Tools and Equipment in the Construction Industry

Unit details	
Functional area A	**Core construction competencies**
Unit title	**Use Tools and equipment in the construction industry**
Unit code	**CS-A2**

Description

This unit of competency describes the skills and knowledge required to safely and effectively use the hand and power tools, plant and equipment appropriate to the construction industry.

Elements of competency	Performance criteria	
1. Plan and prepare	1.1	Work instructions are confirmed with supervisor.
	1.2	Tools and equipment are selected as required, checked for serviceability and any faults are fixed or reported.
	1.3	Safety requirements, and warnings, including use of personal protective equipment, are observed throughout the work.
2. Identify and select hand, power and pneumatic tools	1.4	**Hand tools** and **power and pneumatic tools,** their functions, operations and limitations are identified and selected
	1.5	Safety requirements are applied when using hand, power and pneumatic tools.
	1.6	Pre-operational checks, including lubricants, hydraulic fluid and water, are completed according to manufacturer recommendations.
3. Use tools safely and effectively	3.1	Hand tools used are appropriate to the task and used effectively
	3.2	Power and pneumatic tools are safely and effectively used in accordance with manufacturer recommendations.
	3.3	Tools are sharpened and maintained.
4. Identify, select and use plant and equipment	4.1	**Plant and equipment** are selected and used consistent with OHS requirements and the needs of the job.
	4.2	Pre-operational checks, including lubricants, hydraulic fluid and water, are completed.
5. Clean up	5.1	Work area is cleaned and waste disposed of, reused or recycled in accordance with work specifications.
	5.2	Tools plant and equipment are cleaned, checked for faults and maintained and stored in accordance with workplace practices.

Evidence Guide

To demonstrate competency in this unit the candidate must meet performance criteria and skills and knowledge requirements. The candidate must be able to:

- identify and select hand, power and pneumatic tools for given tasks; and
- safely use and maintain a minimum of rule, tape, square, hammer, hand saw, hand plane, chisel, shovel, wheelbarrow, sledge hammer, pick, mattock and crow bar and pinch bar for given tasks.

Critical skills and essential knowledge

The ability to:

- apply pre-operational checks as specified in manufacturer's instructions;
- follow safety manuals and safety instructions of tools and equipment;
- identify and use personal protective equipment; and
- use tools and equipment safely and correctly.

Knowledge of:

- Construction terminology, particularly names of tools and equipment
- Manual handling and correct posture for tool and equipment use
- Personal protective equipment and reasons for its use
- Safety techniques for tool and equipment use
- Workplace and equipment safety requirements

Range statement

Hand tools may include

- Cutting, planning, boring, shaping, fixing, fastening and percussion tools
- Material shifting and holding tools
- Setting out, marking out and levelling tools.

Power and pneumatic tools may include:

- Portable, electrical, pneumatic and gas driven tools, including their leads and hoses

Plant and equipment include:

- 240v power supplied
- Compressors
- Generators
- Hand held or small single person operated equipment
- Pneumatic driven

Competency may be assessed through a combination of*:*

- Demonstration
- Practical exercises
- Written or oral short answer questions

Competency is to be assessed in the workplace or in simulated workplace environment.

CS-A3 Undertake measurements and construction calculations

Unit details	
Functional area A	**Core construction competencies**
Unit title	**Undertake measurements and construction calculations**
Unit code	**CS-A3**

Description

This unit of competency describes the skills and knowledge required to make measurements and perform simple calculations in order to determine task and material requirements for a job in a construction work environment.

Elements of competency	Performance criteria
1. Obtain measurements	1.1 Measurements are taken, accurate to 1 millimetre, using laser **equipment**, trundle wheels, a rule or measuring tape.
	1.2 Measurements, including **areas and volumes** are confirmed and recorded.
2. Perform calculations and estimate approximate quantities	2.1 Appropriate formulas for calculating quantities are selected to estimate quantities from measurements.
	2.2 **Calculations** for determining material requirements are made.
	2.3 Material quantities for the project are calculated, confirmed and recorded.

Evidence guide

To demonstrate competency in this unit the candidate must meet skills and knowledge requirements, plus safety and environmental requirements, as set out in the introduction to these RMCS. The candidate must be able to:

- calculate each of the following using a realistic construction task:
  - Area
  - Circumference
  - Conversion of metres to millimetres and millimetres to metres
  - Length
  - Number
  - Percentage
  - Perimeter
  - Ratio
  - Volume
- measure, calculate and determine quantities in a range of contexts; and
- measure five separate tasks within 1mm accuracy.

Critical skills and essential knowledge

The ability to:

- use basic calculators;
- measure accurately ; and
- determine quantities relevant to construction tasks.

Knowledge of:

- Basic calculators
- Care of measuring equipment
- Measuring, calculating, geometry and determination of quantities
- Tolerances

Range statement

Equipment may include:

- Calculators and laser equipment
- Rulers
- Tape measures
- Trundle wheels

Areas and volumes include calculating regular and irregular shapes, that represent calculations taken in a construction environment, such as:

- Circles
- Cones
- Cubes
- Pyramids and cylinders
- Rectangles
- Squares
- Trapeziums
- Triangles

Calculation factors are to include:

- Addition, subtraction, multiplication, division
- Grade
- Height, length, width, depth
- Mass, volume, weight
- Numbers
- Percentages, ratios, quantities
- Perimeters
- Scales

Competency may be assessed through a combination of*:*

- Demonstration
- Practical exercises
- Written or oral short answer questions

Competency is to be assessed in the workplace or in simulated workplace environment.

CS-A4 Work from construction plans and specifications

Unit details	
Functional area A	**Core construction competencies**
Unit title	**Work from construction plans and specifications**
Unit code	**CS-A4**

Description

This unit of competency describes the skills and knowledge required to read and interpret plans and specifications relevant to construction operations.

Elements of competency	**Performance criteria**
1. Identify types of drawings and their functions	1.1 Main types of **plans and drawings** used in the construction sector of the industry are identified.
	1.2 **Key features** and functions of each type of drawing are identified.
	1.3 Environmental requirements are identified from job plans and specifications.
2. Recognise amendments	2.1 **Project documentation** is checked to verify latest amendments to drawing.
	2.2. Amendments to **specifications** are checked to ensure currency of **information** and conveyed to others as appropriate.
3. Recognise commonly used symbols and abbreviations	3.1 Construction symbols and abbreviations are recognized.
	3.2 Legend is located on project drawings, and symbols and abbreviations are correctly interpreted.
4. Locate and identify key features on a site plan	4.1 Orientation of the plan with the site is achieved.
	4.2 Key features of the site are identified and located.
	4.3 On-site services, main features, contours and datum are identified.
5. Identify project requirements	5.1 Dimensions for project and nominated locations are identified.
	5.2. Construction types and dimensions for nominated locations are identified.
	5.3. Environmental controls and locations are identified.
	5.4. Location, dimensions and tolerances for ancillary works are identified.
6. Read and interpret job specifications	6.1 Job specifications are identified from drawings, notes and descriptions.
	6.2. Standards of work, finishes and tolerances are identified from the project specifications.
	6.3. Material attributes are identified from specifications.

Evidence guide

To demonstrate competency in this unit the candidate must meet skills and knowledge requirements. The candidate must be able to:

For a minimum of two different projects, read and interpret the project plans, including:

- confirmation of amendment status and drawings confirmed 'for construction;
- confirmation of six items of information from the title block of the project plans;
- for a minimum of two formal specifications, identify the dimensions, material requirements and processes to be followed;
- orientation of plans to the ground;
- six ancillary works dimensions, levels and locations from the project plans;
- six construction dimensions, levels and locations from the project plans; and
- six key features on both the plan and the site.

Critical skills and essential knowledge

The ability to:

- calculate dimensions from plan to actual, based on applying ratios;
- correctly orient a plan;
- identify key features of plans; and
- read and interpret drawings and specifications.

Knowledge of:

- Basic calculations of heights, areas, volumes and grades
- Commonly used construction symbols and abbreviations
- Construction terminology
- Drawing conventions
- Features of plans and elevations, including direction, scale, key, contours, symbols and abbreviations
- Processes for application of scales in plan preparation and interpretation
- Techniques for orienting/confirming the orientation of a plan

Range statement

Plans and drawings include:

- Construction plans
- Cross-sectional plans
- Dimensions and notes
- Illustrations
- Longitudinal plans
- Project specifications
- Site plans
- Structural detail and specifications with illustrations and dimensions

Key features of plans and specifications include:

- Characteristics
- Compatibility
- Construction
- Location
- Pattern dimension
- Quantities
- Sizes
- Type of product or service

Specifications include:

- Detail regarding materials and quality of work, quality assurance, nominated subcontractors, and provision of site access/facilities
- Details relating to performance, including:
    - Characteristics
    - Material types
    - Standards of work
    - Tolerances
- Treatments and finishes

Information includes:

- Diagrams or sketches and graphics
- Instructions issued by authorised organisational or external personnel
- Manufacturer specifications and instructions
- Maps

Competency may be assessed through a combination of*:*

- Demonstration
- Practical exercises
- Written or oral short answer questions

Competency is to be assessed in the workplace or in simulated workplace environment.

CS-A5 Plan construction tasks

Unit details	
Functional area A	**Core construction competencies**
Unit title	**Plan construction tasks**
Unit code	**CS-A5**

Description

This unit of competency describes the skills and knowledge required to plan and organize individual and group work activities on a construction site.

Elements of competency	**Performance criteria**
1. Plan and prepare	1.1 Work instructions are obtained and confirmed with the supervisor.
	1.2 Appropriate tools and equipment are selected, checked for serviceability and any faults repaired or reported before starting work.
2. Plan tasks and sequencing	2.1 Steps are planned, to complete tasks in conjunction with others.
	2.2 Work activity is organized with other involved for appropriate sequencing of tasks.
3. Complete planning process	3.1 All required documentation related to job planning is completed and recorded in accordance with workplace requirements.
	3.2 Planning and organizing of work activities is reviewed to ensure the effectiveness of the process.

Evidence guide

To demonstrate competency in this unit the candidate must meet skills and knowledge requirements, plus safety and environmental requirements, as set out in the introduction to these RMCS. The candidate must be able to:

- provide evidence of the ability to plan and organise a variety of work activities in a range of general construction contexts.

Critical skills and essential knowledge

The ability to:

- identify work requiring coordination with others; and
- plan work sequentially.

Knowledge of:

- Work activity that needs to be planned and organised
- Workplace personnel that are to be involved in planning and organising tasks
- Workplace reporting requirements

Range statement

Competency may be assessed through a combination of:

- Demonstration

- Practical exercises
- Written or oral short answer questions

Competency is to be assessed in the workplace or in simulated workplace environment.

Functional area B – Construction site competencies

CS-B1 Excavate a construction site

Unit details	
Functional area B	**Construction site competencies**
Unit title	**Excavate a construction site**
Unit code	**CS-B1**

Description

This unit of competency describes the skills and knowledge required to excavate and install trench and excavation support on a new or existing site, in order to make provisions for footings/slabs or to provide/repair/divert services.

Elements of competency	**Performance criteria**	
1. Plan and prepare	1.1	Work instructions are confirmed with supervisor.
	1.2	**Tools and equipment** are selected as required, checked for serviceability and any faults are fixed or reported.
	1.3	Material quantity requirements are calculated in accordance with specifications.
	1.4	**Materials** needed are obtained, checked for compliance and prepared.
2. Locate excavation site and erect safety equipment	2.1	Excavation site is located, and line and depth are established from site plans and instructions.
	2.2	Service points and the excavation limits are set and marked.
	2.3	Temporary drainage system is established to divert surface and sub-surface water.
	2.4	Service markers are identified and interference with underground services avoided.
3. Dig excavations	3.1	**Excavations** are safely dug with hand tools to ensure correct route, line and depth.
	3.2	Machine operator is assisted with excavation to ensure correct route, line and depth.
	3.3	Trench or excavation support is installed if required.
4. Perform clean up	4.1	Work area is cleaned and waste disposed of, reused or recycled in accordance with work specifications.
	4.2	Tools and equipment are cleaned, checked for faults and maintained and stored in accordance with workplace practices.

Evidence guide

To demonstrate competency in this unit the candidate must meet skills and knowledge requirements, plus safety and environmental requirements, as set out in the introduction to these RMCS. The candidate must be able to:

- effectively use tools, plant and equipment; and
- mark out and excavate site as to without damaging services.

Critical skills and essential knowledge

The ability to:

- follow plans and drawings;
- safely apply excavation techniques; and
- use tools and equipment correctly.

Knowledge of:

- Apply common skills and knowledge specified in the introduction to these RMCS
- Commonly used in-ground services
- Excavation materials
- Excavation techniques
- Plans, specifications and drawings

Range statement

Tools and equipment may include:

- Buckets
- Crow bars
- Hammers, hoses
- Levels – automatic, laser, hand
- Measuring tapes and rules
- Picks, profiles
- Saws, set out pegs, shovels, straight edges, string lines
- Wheelbarrows

Materials may include:

- Nails
- Pegs
- Sheet material shoring (timber and metal)

Excavations may include:

- Extension of existing structures, for new services and modify or repair existing services
- Provisions for footings/slabs to new structures
- Shoring (timber, metal or piling)
- Sloping ground, flat ground, wet ground, dry ground, loose ground or any type of foundation material, with mechanical assistance possibly required for rock
- Trench/excavation support using sheet material

Competency may be assessed through a combination of:

- Demonstration
- Practical exercises
- Written or oral short answer questions

Competency is to be assessed in the workplace or in simulated workplace environment.

CS-B2 Demolish structures

Unit details	
Functional area B	**Construction site competencies**
Unit title	**Demolish structures**
Unit code	**CS-B2**

Description

This unit of competency describes the skills and knowledge required to remove components from single storey buildings and structures using basic demolition techniques.

Elements of competency	**Performance criteria**
1. Plan for demolition	1.1 Work instructions and **construction type** are confirmed with supervisor.
	1.2 **Tools and equipment** are selected as required, checked for serviceability and any faults are fixed or reported.
	1.3 Material quantity requirements are calculated in accordance with specifications.
	1.4 Materials needed are obtained, checked for compliance and prepared.
2. Prepare and conduct demolition	2.1 Requirements of the site demolition plan are interpreted and **preparation of work areas** undertaken.
	2.2 Condition of work site and surrounding area is assessed prior to work starting, to prepare work areas.
	2.3 Confirmation is obtained that all existing services have been disconnected before commencing demolition.
	2.4 Hazardous material is identified for separate handling in accordance with workplace procedures.
	2.5 Demolition procedures are carried out safely and effectively
3. Perform clean-up	3.1 Work area is cleaned and waste disposed of, reused or recycled in accordance with work specifications.
	3.2 Tools and equipment are cleaned, checked for faults and maintained and stored in accordance with workplace practices.

Evidence guide

To demonstrate competency in this unit the candidate must meet performance indicators, all skills and knowledge requirements, including the safety, environmental and core requirements set out in the introduction to these RMCS. The candidate must be able to:

- complete demolition work to specification, without damaging services; and
- remove structures using correct selection and use of processes, tools and equipment.

Critical skills and essential knowledge

The ability to:

- use demolition techniques, tools equipment and machinery.

Knowledge of:

- Apply common skills and knowledge specified in the introduction to these RMCS
- Demolition techniques, tools and equipment

Range statement

Construction type may include:

- Block work, brick veneer, brickwork
- Concrete
- Light steel framed structures
- Timber framed structures

Tools and equipment may include:

- Angle grinders
- Bars (crow and pinch), bolt cutters
- Chisels, compressors, concrete saws
- Electric testers
- Hacksaws, hammers, handsaws
- Picks and mattocks, pliers, pneumatic tools, power drills and saws
- Shovels and spades, sledge hammers, spanners and wrenches
- Water hoses, wheelbarrows

Preparation of work areas may include:

- Assessing conditions of work site and surrounds
- Communicating with those who may be affected by the demolition task
- Identifying hazardous materials
- Identifying positions of hoses and cables, clear of hazards
- Locating signage and barricades

Competency may be assessed through a combination of:

- Demonstration
- Practical exercises
- Written or oral short answer questions

Competency is to be assessed in the workplace or in simulated workplace environment.

CS-B3 Drain a construction site

Unit details	
Functional area B	**Construction site competencies**
Unit title	**Drain a construction site**
Unit code	**CS-B3**

Description

This unit of competency describes the skills and knowledge required to remove excess water from a work site through stormwater and subsoil drainage systems and install water and sludge pumps, suitable for pumping unscreened water.

Elements of competency	Performance Criteria
1. Plan and prepare	1.1 Work instructions are confirmed with supervisor.
	1.2 **Tools and equipment** are selected as required, checked for serviceability and any faults are fixed or reported.
	1.3 Material quantity requirements are calculated in accordance with specifications.
2. Position sedimentation control	2.1 Stormwater connection points, sumps, wells and pumps are located from the drawings and plans.
	2.2 Sedimentation controls are positioned and constructed, in accordance with specifications.
3. Surface water is removed	3.1 Temporary drainage systems are established to drain or divert surface and sub-surface water.
	3.2 Site surface water is removed and/or directed to the temporary drainage system, using adequate fall.
	3.3 Surface holes and depressions are filled.
	3.4 Sump/wells are constructed at the lowest point to be drained to maximize pump efficiency.
4. Pumps are installed	4.1 Water is removed from sumps/wells, trenches and pits.
	4.2 **Pumps** are installed as close as practicable to the sump or well with pipework.
	4.3 Hoses are connected and fitted to the pumps and in accordance with the manufacturer's requirements.
	4.4 Pumps are activated to lower the water level as specified, and pump control systems are adjusted to meet specification requirements.
	4.5 Discharged water is dispersed using approved procedures.
5. Perform clean-up	5.1 Work area is cleaned and waste disposed of, reused or recycled in accordance with work specifications.

5.2 Tools and equipment are cleaned, checked for faults and maintained and stored in accordance with workplace practices.

Evidence guide

To demonstrate competency in this unit the candidate must meet skills and knowledge requirements, plus safety and environmental requirements, as set out in the introduction to these RMCS. The candidate must be able to:

- demonstrate consistent timely completion of the draining and dewatering of construction sites that meets required outcomes.

Critical skills and essential knowledge

- Apply common skills and knowledge specified in the introduction to these RMCS

Range statement

Tools and equipment may include:

- Hoses
- Pumps
- Shovels

Pumps may include:

- Sludge pumps
- Submersible pumps
- Sumps
- Surface pumps
- Vacuum pump

Competency may be assessed through a combination of*:*

- Demonstration
- Practical exercises
- Written or oral short answer questions

Competency is to be assessed in the workplace or in simulated workplace environment.

CS-B4 Erect and dismantle formwork for footings and slabs

Unit details	
Functional area B	**Construction site competencies**
Unit title	**Erect and dismantle formwork for footings and slabs**
Unit code	**CS-B4**

Description

This unit of competency describes the skills and knowledge required to erect and dismantle formwork to footings and slabs on ground, to establish levels and contain finished concrete.

Elements of competency	**Performance criteria**	
1. Plan and prepare	1.1	Work instructions are confirmed with supervisor.
	1.2	**Tools and equipment** are selected as required, checked for serviceability and any faults are fixed or reported.
	1.3	Material quantity requirements are calculated in accordance with specifications.
	1.4	**Materials** needed are obtained, checked for compliance and prepared.
2. Erect formwork	2.1	Design of footing/slab on ground is identified from job drawings/specifications and formwork is set out accordingly.
	2.2	Formwork shutters and/or edge boxing are constructed, erected and supported to site requirements.
	2.3	Block-outs and cast-in services are installed to the specified locations.
	2.4	Release agents are applied to formwork face, where specified, to manufacturer specifications.
3. Strip formwork	3.1	Edge boxing and bracing/strutting supports are removed sequentially.
	3.2	Timber components are de-nailed, cleaned and stored or stacked safely for reuse or removal from site.
	3.3	Damaged formwork components are safely discarded after stripping.
4. Clean-up	4.1	Work area is cleaned and waste disposed of, reused or recycled in accordance with work specifications.
	4.2	Tools and equipment are cleaned, checked for faults and maintained and stored in accordance with workplace practices.

Evidence guide

To demonstrate competency in this unit the candidate must meet skills and knowledge requirements, plus safety and environmental requirements, as set out in the introduction to these RMCS. The candidate must be able to:

- form up a slab on ground, incorporating an edge rebate and internal corner to specifications; and
- form up a step to a foundation excavation to specified masonry units.

Critical skills and essential knowledge

- Apply common skills and knowledge specified in the introduction to these RMCS

Knowledge of:

- Processes and materials used for erecting and dismantling formwork

Range statement

Tools and equipment may include:

- Air compressors and hoses
- Bevels
- Chisels
- Hammers, hand saws
- Levels – automatic, laser, spirit levels
- Marking equipment, measuring tapes and rules
- Nail guns
- Pinch bars, power drills and power saws
- Shovels, spanners, squares, string line.

Materials may include:

- Bolts and nuts, boxing, either timber, metal, masonry, fibre cement sheeting or reconstituted timber products
- Coach screws
- Metal brackets
- Nails and spikes
- Steel tie rods

Competency may be assessed through a combination of:

- Demonstration
- Practical exercises
- Written or oral short answer questions

Competency is to be assessed in the workplace or in simulated workplace environment.

CS-B5 Use and store construction materials and equipment

Unit details	
Functional area B	**Construction site competencies**
Unit title	**Use and store construction materials and equipment**
Unit code	**CS-B5**

Description

This unit of competency describes the skills and knowledge required to use, maintain and correctly construction materials and equipment.

Elements of competency	**Performance criteria**
1. Plan and prepare	1.1 Work instructions are confirmed with supervisor.
	1.2 **Tools and equipment** are selected as required, checked for serviceability and any faults are fixed or reported.
	1.3 Material quantity requirements are calculated in accordance with specifications.
	1.4 **Materials** needed are obtained, checked for compliance and prepared.
2. Manually handle, sort, stack and store construction materials	2.1 Construction materials are sorted to suit material type and size, and stacked for ease of retrieval for planned task sequence and job location.
	2.2 Construction materials and components are protected from physical and water damage and stored in convenient areas clear of access ways.
	2.3 **Hazardous materials** are identified and separated.
3. Prepare for mechanical handling of materials	3.1 Construction materials and components are stacked/banded for mechanical handling in accordance with the type of material, plant and equipment to be used.
	3.2 Construction materials and components are loaded, unloaded, moved and located at specified locations.
4. Clean-up	4.1 Work area is cleaned and waste disposed of, reused or recycled in accordance with work specifications.
	4.2 Tools and equipment are cleaned, checked for faults and maintained and stored in accordance with workplace practices.

Evidence guide

To demonstrate competency in this unit the candidate must meet skills and knowledge requirements, plus safety and environmental requirements, as set out in the introduction to these RMCS. The candidate must be able to:

- safely handle building and construction components and materials for one construction project; and
- safely handle, sort and stack varying lengths of timber, providing quick access and use.

Critical skills and essential knowledge

- Apply common skills and knowledge specified in the introduction to these RMCS

Knowledge of:

- Procedures for carrying, sorting, stacking and storing construction materials

Ranged statement

Tools and equipment may include:

- Banders
- Hammers
- Pallets, pinch bars
- Scaffolding
- Tin snips
- Wheelbarrows

Materials may include:

- Bagged, boxed, drummed, tinned materials
- Bricks
- Concrete/masonry or joinery units
- Floor and wall tiles, flooring materials
- Insulation and glass
- Lining materials
- Prefabricated elements
- Reconstituted timber products, roof trusses and tiles
- Sand, soil and aggregates, steel sections/components
- Timber

Hazardous materials may include:

- Non-toxic materials, including general building and construction materials
- Solvents, glues, coatings and inflammable materials

Competency may be assessed through a combination of*:*

- Demonstration
- Practical exercises
- Written or oral short answer questions

Competency is to be assessed in the workplace or in simulated workplace environment.

CS-B6 Use levelling techniques

Unit details	
Functional area B	**Construction site competencies**
Unit title	**Use levelling techniques**
Unit code	**CS-B6**

Description

This unit of competency describes the skills and knowledge required to carry out levelling in a single plane to establish the correct and accurate set out of building components.

Elements of competency	**Performance criteria**	
1. Plan and prepare	1.1	Work instructions are confirmed with supervisor.
	1.2	**Tools and equipment** are selected as required, checked for serviceability and any faults are fixed or reported.
	1.3	Material quantity requirements are calculated in accordance with specifications.
	1.4	Materials needed are obtained, checked for compliance and prepared.
2. Set up and use levelling device	2.1	Heights or levels to be transferred or established are identified from project plans or instructions for levelling procedures.
	2.2	**Levelling** devices are set up and tested in accordance with manufacturer instructions, including levelling device tolerance checks.
	2.3	Levelling staffs are accurately applied.
	2.4	Levels are shot and heights transferred to required location and marked to job requirements.
	2.5	Results of levelling procedure are documented to workplace requirements.
3. Clean-up	3.1	Work area is cleaned and waste disposed of, reused or recycled in accordance with work specifications.
	3.2	Tools and equipment are cleaned, checked for faults and maintained and stored in accordance with workplace practices.

Evidence guide

To demonstrate competency in this unit the candidate must meet skills and knowledge requirements, plus safety and environmental requirements, as set out in the introduction to these RMCS. The candidate must be able to:

- accurately record the results of each levelling procedure;
- conduct a two peg test with an automatic level to confirm it meets manufacturers' tolerances;
- transfer levels, record differences in height, and confirm accuracy of readings on one project, using:
    - A spirit level and straight edge
    - Laser levelling devices
    - Levelling with water technique
    - Optical levelling devices

Critical skills and essential knowledge

The ability to:

- apply techniques for measuring level.

Knowledge of:

- Apply common skills and knowledge specified in the introduction to these RMCS
- Basic mathematical techniques associated with levelling
- Interpreting engineering drawings and sketches
- Levelling device types, characteristics, technical capabilities and limitations
- Processes for setting out
- Requirements for line, level and plumb in construction projects

Range statement

Tools and equipment may include:

- Hammers
- Levelling devices – laser, optical, spirit level, water and automatic
- Marking equipment, measuring tapes and rules, spirit levels and straight edges
- Pegs - wooden and steel, plumb bobs
- Saws, bolt cutters and saw stools, string lines and laser targets.

Levelling activities may include:

- Positioning offsets and recovery pegs for construction projects
- Recording ground levels at critical set out points
- Recording of heights or level and the transfer of data points
- Recording or checking levels in drainage
- Recording slab or pad levels for placement of steel columns or masonry piers
- Shooting levels for concrete slabs
- Transferring levels/heights for formwork

Competency may be assessed through a combination of:

- Demonstration
- Practical exercises
- Written or oral short answer questions

Competency is to be assessed in the workplace or in simulated workplace environment.

CS-B7 Construction dogging

Unit details	
Functional area B	**Construction site competencies**
Unit title	**Construction dogging**
Unit code	**CS-B7**

Description

This unit of competency describes the skills and knowledge required to undertake basic dogging work, both in sight and out of sight of the crane operator, for the purpose of shifting loads mechanically.

Elements of competency	Performance criteria	
1. Plan and prepare	1.1	Work instructions are confirmed with supervisor.
	1.2	**Tools and equipment** are selected as required, checked for serviceability and any faults are fixed or reported.
	1.3	Material quantity requirements are calculated in accordance with specifications.
	1.4	Materials needed are obtained, checked for compliance and prepared.
2. Select dogging equipment	2.1	Job sequencing schedule is communicated with others to ensure coordination.
	2.2	Load mass is calculated and confirmed using load charts and standard calculations.
	2.3	Loads in **slings** and equipment are calculated to suit job requirements.
3. Sling loads	3.1	**Lifting devices** are assembled and erected to move load.
	3.2	Loads are slung to crane, using appropriate load slinging method.
4. Shift loads	4.1	Loads are shifted, ensuring stability and directed to landing position in compliance with work practices.
	4.2	Load is landed in required position on packing or bearers.
5. Remove dogging equipment	5.1	Dogging equipment is removed.
	5.2	Load shifting equipment is dismantled and inspected for wear.
	5.3	Logbook and site records are completed to company requirements.
6. Clean-up	6.1	Work area is cleaned and waste disposed of, reused or recycled in accordance with work specifications.

6.2 Tools and equipment are cleaned, checked for faults and maintained and stored in accordance with workplace practices.

Evidence guide

To demonstrate competency in this unit the candidate must meet skills and knowledge requirements, plus safety and environmental requirements, as set out in the introduction to these RMCS. The candidate must be able to:

- **sling**, load, direct and land loads in conjunction with a **slewing mobile crane** with a telescopic boom and a winch for:
  - A flexible load with a minimum of three lifting points
  - A rigid heavy load to two thirds capacity of the crane
  - **Luff** movements, boom retract and boom extend, slew right and slew left, winch up and down in combination.

Critical skills and essential knowledge

- Apply common skills and knowledge specified in the introduction to these RMCS

Knowledge of:

- Crane operations and limitations
- Designs and functions of lifting equipment
- Dogging equipment and techniques
- Elevated work platforms
- Safe working at heights and fall arrest
- Safe working load tags
- Weather and ground considerations

Range statement

Tools and equipment may include:

- Brick cages
- Kibbles
- Personnel cages
- Rescue cages
- Rubbish bins
- Spreader bars and beams

Sling:

- A flexible strap or belt used in the form of a loop to support or raise a hanging weight.

Slings may include:

- Chain
- Flexible steel wire rope
- Natural or synthetic fibre

Lifting devices may include:

- Eye bolts
- Lifting clutches
- Shackles
- Snatch blocks
- Tags

Slewing mobile crane

- A slewing mobile crane is mobile crane incorporating a boom **jib**, which is capable of being slewed (allowing rotation of the load whilst remaining in one place)

Jib

- The jib, is the operating arm that extends horizontally from a crane. A "luffing" jib is able to move up and down; a fixed jib has a rolling trolley that runs along the underside to move goods horizontally

Luff

- To raise or lower the boom of a crane

Competency may be assessed through a combination of*:*

- Demonstration
- Practical exercises
- Written or oral short answer questions

Competency is to be assessed in the workplace or in simulated workplace environment.

CS-B8 Construction rigging

Unit details	
Functional area B	**Construction site competencies**
Unit title	**Construction rigging**
Unit code	**CS-B8**

Description

This unit of competency describes the skills and knowledge required to erect/install and dismantle permanent steel structures and move or locate plant and equipment using a range of basic rigging and dogging techniques.

Elements of competency	Performance criteria	
1. Plan and prepare	1.1	Work instructions are confirmed with supervisor.
	1.2	**Tools and equipment** are selected as required, checked for serviceability and any faults are fixed or reported.
	1.3	Material quantity requirements are calculated in accordance with specifications.
	1.4	Materials needed are obtained, checked for compliance and prepared.
2. Select equipment	2.1	Lifting equipment is inspected according to manufacturer specifications.
	2.2	Lifting equipment inconsistent with specifications is labelled, and reported.
3. Connect equipment	3.1	Loads and slings are slung and loads secured to the sling and tested to ensure safe movement.
	3.2	**Slings,** or parts of slings, are attached to hook while the hoist wire is vertical.
	3.3	Tag lines are attached to the load where specified.
4. Move and position loads	4.1	Load destination is determined and landing area prepared.
	4.2	Lifting or pulling device is assembled and erected where specified.
	4.3	Load is safely moved to required destination and secured in position to job requirements.
	4.4	Standard communication signals are used to coordinate safe movement of the load.
5. Remove rigging equipment	5.1	Lifting/moving equipment and packing are dismantled, lowered and inspected for wear.

5.2 Logbook and site records are completed to workplace requirements.

Evidence guide

To demonstrate competency in this unit the candidate must meet skills and knowledge requirements, plus safety and environmental requirements, as set out in the introduction to these RMCS. The candidate must be able to complete at least one of the following:

- install and use a fall arrest system to sling, receive, place and brace a minimum 16 square metre module of structural steel, in the correct sequence, a minimum of 5 metres high;
- set up, place, install and brace perimeter safety screen and jump, for two floors and a loading bay; and
- skid, locate and install heavy industrial equipment using winches and creeper skids for at least one tonne of plant.

Critical skills and essential knowledge

The ability to:

- apply common skills and knowledge specified in the introduction to these RMCS.

Knowledge of:

- Basic rigging equipment and techniques
- Crane operations and limitations
- Designs and functions of lifting equipment
- Standard communication signals

Range statement

Tools and equipment may include:

- Angle grinders
- Drifts
- Elevated work platforms, explosive power tools
- Hammers
- Oxy-acetylene equipment
- Pneumatic tools
- Scaffolding, sledge hammers, spanners, spirit levels
- Tape measures
- Wedges, wrenches

Sling:

- A flexible strap or belt used in the form of a loop to support or raise a hanging weight.

Competency may be assessed through a combination of:

- Demonstration
- Practical exercises
- Written or oral short answer questions

Competency is to be assessed in the workplace or in a simulated workplace environment.

CS-B9 Construction scaffolding

Unit details	
Functional area B	**Construction site competencies**
Unit title	**Construction scaffolding**
Unit code	**CS-B9**

Description

This unit of competency describes the skills and knowledge required to erect and dismantle a range of modular scaffolding systems to provide work platforms for construction purposes.

Elements of competency	Performance criteria	
1. Plan and prepare	1.1	Work instructions are confirmed with supervisor.
	1.2	**Tools and equipment** are selected as required, checked for serviceability and any faults are fixed or reported.
	1.3	Material quantity requirements are calculated in accordance with specifications.
	1.4	Materials needed are obtained, checked for compliance and prepared.
2. Whip, tie, splice and inspect ropes	2.1	Ropes and cords are inspected for damage and wear.
	2.2	Designated rope ends are whipped and spliced in accordance with regulations and project specifications.
	2.3	Bends and hitches are applied and inspected in accordance with project specifications.
3. Erect scaffolding	3.1	Purpose for scaffolding is confirmed and associated work tasks are identified.
	3.2	Expected loading on scaffold and supporting structure is determined using load tables and manufacturer specifications.
	3.3	Scaffolding and components are selected and inspected, and damaged components are labelled and rejected.
	3.4	Sole board/base plate is selected in accordance with regulations, legislation, codes of practice and manufacturer specifications.
	3.5	Scaffolding is set out and erected in accordance with regulatory and manufacturer requirements.
	3.6	Static lines are erected and installed where specified in accordance with regulatory requirements.
	3.7	Lifting device is assembled and erected where specified.
4. Inspect, repair and alter erected scaffolding	4.1	Erected modular scaffolding is inspected for damage, corrosion, wear and compatibility.
	4.2	Current use of scaffolding is checked against original design and is in accordance with regulations and specifications.

	4.3	Scaffolding stability is inspected and confirmed.
	4.4	Alteration or repair is carried out where specified.
	4.5	Inspection log and handover is completed and dated, ready for signing by a certified scaffolder.
5. Dismantle scaffolding	5.1	Scaffolding is isolated and appropriately signed and barricaded to ensure safe dismantling.
	5.2	Scaffolding is dismantled using reverse procedure as for erection.
6. Clean-up	6.1	Work area is cleaned and waste disposed of, reused or recycled in accordance with work specifications.
	6.2	Tools and equipment are cleaned, checked for faults and maintained and stored in accordance with workplace practices.

Evidence guide

To demonstrate competency in this unit the candidate must meet skills and knowledge requirements, plus safety and environmental requirements, as set out in the introduction to these RMCS. The candidate must be able to:

- complete erect and dismantle a modular scaffolding system, in accordance with specifications, including a minimum of:
  - Three bays with an internal and external return
  - Three lifts, including ties
  - Ladder and stair access
  - Fall and edge protection
- complete whipping, splicing, tying and inspecting of five fibre ropes in accordance with regulations.

Critical skills and essential knowledge

- Apply common skills and knowledge specified in the introduction to these RMCS

Knowledge of:

- Scaffolding equipment and techniques

Range statement

Tools and equipment may include:

- Adjustable base plates
- Bends and hitches, box spanners, braces, bracket scaffolds (tank and formwork)
- Cantilevered hoists (materials only with maximum capacity of 500kg)
- Couplers and accessories
- Fibre ropes
- Gin wheels, guard rails
- Hammers
- Ledgers
- Mesh guards, mid rails, modular and prefabricated scaffolds
- Podgers hammers, prefabricated components
- Safety nets, scaffold belts, scaffolding planks shovels, spanners, spirit levels
- Stairs or ladders, standards, static lines, steel and aluminium tubes
- Tape measures, torpedo levels, transoms
- Wire nips, wrenches.

Competency may be assessed through a combination of:

- Demonstration
- Practical exercises
- Written or oral short answer questions.

Competency is to be assessed in the workplace or in simulated workplace environment.

CS-B10 Place and fix steel reinforcing

Unit details	
Functional area B	**Construction site competencies**
Unit title	**Place and fix steel reinforcing**
Unit code	**CS-B10**

Description

This unit of competency describes the skills and knowledge required to place and fix steel reinforcement for concrete work as part of construction processes.

Elements of competency	Performance criteria	
1. Plan and prepare	1.1	Work instructions are confirmed with supervisor.
	1.2	**Tools and equipment** are selected as required, checked for serviceability and any faults are fixed or reported.
	1.3	Material quantity requirements are calculated in accordance with specifications.
	1.4	Materials needed are obtained, checked for compliance and prepared.
2. Prepare for reinforcement	2.1	Formwork is checked for completion and conformity to receive reinforcement.
	2.2	**Reinforcement** bars are cut and bent to required set out and plans and specifications.
	2.3	Bars are tied to designed configuration from plans and specifications.
	2.4	Reinforcement sheets are cut to required sizes.
	2.5	Stiffening rods are attached to panels as required to facilitate handling processes.
	2.6	Bar chairs and spacers are located to requirements of reinforcement schedule and plans and specifications.
3. Place and fix reinforcement	3.1	Fabric reinforcement sheets are placed into position in accordance with specifications.
	3.2	Reinforcement bars are located and positioned in accordance with specifications.
	3.3	Reinforcement is located and placed using bar chairs, ligatures and spacers according to specifications.
	3.4	Reinforcement material is supported and secured into position in accordance with specifications.
	3.5	Cast-in items are secured to reinforcement in accordance with specifications.

	3.6	Ends of protruding reinforcement material are covered and protected in accordance with plans and specifications.
4. Check reinforcement prior to concrete pour	4.1	Location and position of reinforcement and fixing ties to reinforcement are checked for accuracy.
	4.2	Depth of coverage, clearance, spacing and overlap of reinforcement material are checked in accordance with job specification.
5. Clean up	5.1	Work area is cleaned and waste disposed of, reused or recycled in accordance with work specifications.
	5.2	Tools and equipment are cleaned, checked for faults and maintained and stored in accordance with workplace practices.

Evidence guide

To demonstrate competency in this unit the candidate must meet skills and knowledge requirements, plus safety and environmental requirements, as set out in the introduction to these RMCS. The candidate must be able to:

- place and fix reinforcement materials to specification on a minimum of three different jobs and involving deformed bars, rods and mesh sheets.

Critical skills and essential knowledge

- Apply common skills and knowledge specified in the introduction to these RMCS

Knowledge of:

- Reinforcement materials placement and fixing techniques
- Types, properties, uses and limitations of reinforcement materials

Range Statement

Tools and equipment may include:

- Bolt cutters
- General hand and power tools
- Manual Metal Arc Welding (MMAW) machines
- Measuring tapes and rules, mesh guillotines
- Oxy-acetylene setting and cutting attachments
- Reinforcement benders
- Tie wire reels
- Wire nippers

Reinforcement materials may include:

- Bar chairs
- Deformed bars
- Ligatures
- Mesh sheets of plain/deformed bars
- Pipe sections, plain rods
- Spacer/spreader assemblies
- Wire ties

Competency may be assessed through a combination of*:*

- Demonstration
- Practical exercises

- Written or oral short answer questions

Competency is to be assessed in the workplace or in simulated workplace environment.

CS-B11 Use oxy-LPG equipment

Unit details	
Functional area B	**Construction site competencies**
Unit title	**Use oxy-LPG equipment**
Unit code	**CS-B11**

Description

This unit of competency describes the skills and knowledge required to use oxy-LPG-acetylene equipment to carry out basic cutting of mild steel in support of plumbing applications and fabrication to meet ???

Elements of competency	**Performance criteria**	
1. Plan and prepare	1.1	Work instructions are confirmed with supervisor.
	1.2	**Tools and equipment** are selected as required, checked for serviceability and any faults are fixed or reported.
	1.3	Material quantity requirements are calculated in accordance with specifications.
	1.4	**Materials** needed are obtained, checked for compliance and prepared.
2. Set up and test equipment	2.1	Correct fire extinguisher is selected and positioned so as to be readily accessible prior to and during operations.
	2.2	Regulators are attached to the oxy and acetylene bottles in accordance with the manufacturer's specifications.
	2.3	Lines are purged according to the manufacturer's recommendations prior to lighting up.
	2.4	Equipment is tested for leaks, and corrective action taken or faults reported.
	2.5	Correct pressures and cutting tips are selected in accordance with material to be cut and manufacturer specifications.
3. Clean-up	3.1	Work area is cleaned and waste disposed of, reused or recycled in accordance with work specifications.
	3.2	Tools and equipment are cleaned, checked for faults and maintained and stored in accordance with workplace practices.
4. Bend materials	4.1	Material is accurately marked and securely clamped ready for cutting.
	4.2	Torch is lit correctly and safely according to manufacturer specifications.

	4.3	Heat is applied to the specified material, and any weakening effects of the heating process minimized.
	4.4	Material is bent to specification and cooled correctly.
5. Shut down	5.1	Torch is switched off according to the manufacturer's specifications.
	5.2	Gas supply is shut off according to manufacturer specifications.
6. Clean up	6.1	Work area is cleaned and waste disposed of, reused or recycled in accordance with work specifications.
	6.2	Tools and equipment are cleaned, checked for faults and maintained and stored in accordance with workplace practices.

Evidence guide

To demonstrate competency in this unit the candidate must meet skills and knowledge requirements, plus safety and environmental requirements, as set out in the introduction to these RMCS. The candidate must be able to:

- heat and bend a minimum of three bars to specification; and
- use both oxy-acetylene and LPG systems to cut to specification a range of bars.

Critical skills and essential knowledge

- Apply common skills and knowledge specified in the introduction to these RMCS

Knowledge of:

- Oxy acetylene and LPG heating and cutting equipment set-up and operating techniques
- Oxy acetylene and LPG heating and cutting equipment types, characteristics, uses and limitations
- Types and properties of steel-fixing materials

Range statement

Tools and equipment may include:

- Grinders and clamps
- Hand and power tools
- Measuring equipment
- Oxy welding equipment

Materials may include:

- LPG and acetylene gases
- Mild steel pipe and oxygen, mild steel sheet.

Competency may be assessed through a combination of:

- Demonstration
- Practical exercises
- Written or oral short answer questions

Competency is to be assessed in the workplace or in simulated workplace environment.

CS-B12 Cut and install glass

Unit details	
Functional area B	**Construction site competencies**
Unit title	**Cut and install glass**
Unit code	**CS-B12**

Description

This unit of competency describes the skills and knowledge required to handle and place glass when manually cutting regular and irregular shaped glass and holes within glass panels.

Elements of competency	Performance criteria	
1. Plan and prepare	1.1	Work instructions are confirmed with supervisor.
	1.2	**Tools and equipment** are selected as required, checked for serviceability and any faults are fixed or reported.
	1.3	Material quantity requirements are calculated in accordance with specifications.
	1.4	**Materials** needed are obtained, checked for compliance and prepared.
	1.5	Planning ensures glass sheets are used in the most economical layout.
2. Cut glass to a straight line	2.1	Type, size and thickness of glass are selected appropriate for application and location of cut is determined from specifications.
	2.2	Openings to receive glass are inspected for obstructions and clearances in accordance with workplace procedures.
	2.3	Glass is cut to specification on a line using straight edge and scoring and breaking to run cut to tolerance of ±1mm.
	2.4	Corrective action is taken where there are defects.
	2.5	Sharp edges are removed to provide safe edges to safely handle glass.
3. Circle and hole cutting	3.1	Type and thickness of glass is selected appropriate for application and center of the circle is set out using an edge, rule and permanent marking pen.
	3.2	Circles in glass are cut to specification, completing pre-cut checks before positioning circle cutter.
	3.3	Cutting defects are recognized and corrective action is made.
	3.4	Sharp edges are removed to provide safe edges to glass.

4. Cut glass to simple shapes	4.1 Template is marked and prepared to designed shape.
	4.2 Template is used to mark outline on glass with permanent marking pen.
	4.3 Glass is cut to shape and size to specification and glass off-cuts are removed safely.
	4.4 Cutting defects are recognized and corrective action is taken.
	4.5 Sharp edges are removed to provide safe edges to glass.
5. Clean-up	5.1 Work area is cleaned and waste disposed of, reused or recycled in accordance with work specifications.
	5.2 Tools and equipment are cleaned, checked for faults and maintained and stored in accordance with workplace practices.

Evidence guide

To demonstrate competency in this unit the candidate must meet skills and knowledge requirements, plus safety and environmental requirements, as set out in the introduction to these RMCS. The candidate must be able to:

- demonstrate sound and safe techniques to cut regular and irregular shaped glass and cut a hole in a glass panel;
- demonstrate sound techniques in selecting, handling and placing glass for cutting; and
- display sound and accurate techniques to set out glass or templates.

Critical skills and essential knowledge

- Apply common skills and knowledge specified in the introduction to these RMCS

Knowledge of:

- Material handling processes related to glass
- Measuring and setting out processes relevant to glass cutting
- Safe procedures for glass cutting
- Types of glass and their characteristics

Range statement

Tools and equipment may include:

- Dividers and wing compasses
- Glass cutters
- Measuring tapes and rules
- Pincers
- Squares, straight edges
- Tee squares.

Materials may include:

- Aluminium
- Glass
- Timber.

Competency may be assessed through a combination of:

- Demonstration
- Practical exercises
- Written or oral short answer questions.

Competency is to be assessed in the workplace or in simulated workplace environment.

Functional area C – Carpentry and framing

CS-C1 Construct wall framing

Unit details	
Functional area C	**Carpentry and framing**
Unit title	**Construct wall framing**
Unit code	**CS-C1**

Description

This unit of competency describes the skills and knowledge required to construct load bearing and non-load bearing wall frames for different types of loadings, as determined by the rooftop and bracing configuration.

Elements of competency	Performance criteria	
1. Plan and prepare	1.1	Work instructions are confirmed with supervisor.
	1.2	**Tools and equipment** are selected as required, checked for serviceability and any faults are fixed or reported.
	1.3	Material quantity requirements are calculated in accordance with specifications.
	1.4	**Materials** needed are obtained, checked for compliance and prepared.
2. Construct wall frames	2.1	Wall frame components are selected in accordance with specifications and the load-bearing requirements.
	2.2	Location of walls is set out on a slab or sub floor frame in accordance with specifications.
	2.3	Wall plates are set out and cut to length.
	2.4	Wall plates are marked to accommodate studs and openings and/or cladding and lining types.
	2.5	Pattern stud is set out.
	2.6	Studs, trimmers and noggings are cut to length.
	2.7	Wall frames are fabricated, including lintels and bracing.
	2.8	Wall frames are erected, fixed into place and aligned to specification.
	2.9	Erected walls are temporarily braced.
	2.10	Walls are straightened, plumbed and aligned.
3. Clean-up	3.1	Work area is cleaned and waste disposed of, reused or recycled in accordance with work specifications.

3.2 Tools and equipment are cleaned, checked for faults and maintained and stored in accordance with workplace practices.

Evidence guide

To demonstrate competency in this unit the candidate must meet skills and knowledge requirements, plus safety and environmental requirements, as set out in the introduction to these RMCS. The candidate must be able to:

- set out and erect framed walls to accommodate roofing to standard height and to a minimum of a full size one bedroom home or equivalent including window and door openings, bracing, an internal/external corner and a T junction to specifications involving both timber and metal frames.

Critical skills and essential knowledge

- Apply common skills and knowledge specified in the introduction to these RMCS

Knowledge of:

- Apply common skills and knowledge specified in the introduction to these RMCS
- Timber types, structural properties and uses including engineered timber products
- Wall frame construction techniques
- Wall framing materials

Range statement

Tools and equipment may include:

- Air compressors and hoses
- Clamps
- Docking saws and drop saws
- Hammers
- Jigs/stops
- Marking equipment, masonry drills, measuring tapes and rules
- Nail bags and nail guns
- Pop riveters, power drills, power saws
- Spanners, spirit levels, squares (combination/tri).

Materials may include:

- Bolts and nuts
- Masonry anchors, metal
- Nails and spikes
- Patented metal fasteners, pop rivets
- Screws
- Timber

Competency may be assessed through a combination of:

- Demonstration
- Practical exercises
- Written or oral short answer questions.

Competency is to be assessed in the workplace or in simulated workplace environment.

CS-C2 Construct ceiling framing

Unit details	
Functional area C	**Carpentry and framing**
Unit title	**Construct ceiling framing**
Unit code	**CS-C2**

Description

This unit of competency describes the skills and knowledge required to plan, prepare, set out, construct and erect ceiling frames to accommodate ceiling joists, hanging beams, strutting beams and composite beams.

Elements of competency	Performance criteria
1. Plan and prepare	1.1 Work instructions are confirmed with supervisor.
	1.2 **Tools and equipment** are selected as required, checked for serviceability and any faults are fixed or reported.
	1.3 Material quantity requirements are calculated in accordance with specifications.
	1.4 **Materials** needed are obtained, checked for compliance and prepared.
2. Locate ceiling joists	2.1 Ceiling frame components are identified and selected.
	2.2 Location of ceiling joists is set out on the top plate to specifications for spacings of roof and ceiling members.
	2.3 Ceiling joists and trimmers are cut to length, placed and securely fixed to locations in accordance with specifications.
3. Install hanging beams	3.1 Hanging beam sizes and spacings are checked in accordance with specifications.
	3.2 Hanging beams are installed.
	3.3 Hanging beams on external walls are placed alongside rafter locations where specified.
	3.4 Ceiling joists are connected to hanging beams using appropriate **connecting methods** to hanging beams.
4. Perform clean-up	4.1 Work area is cleaned and waste disposed of, reused or recycled in accordance with work specifications.
	4.2 Tools and equipment are cleaned, checked for faults and maintained and stored in accordance with workplace practices.

Evidence guide

To demonstrate competency in this unit the candidate must meet skills and knowledge requirements, plus safety and environmental requirements, as set out in the introduction to these RMCS. The candidate must be able to:

- complete construction tasks involving both timber and metal materials and components; and
- set out, construct and erect a ceiling incorporating a hanging beam, ceiling trimmers and strutting beam to specifications for a full size one bedroom home or equivalent.

Critical skills and essential knowledge

- Apply common skills and knowledge specified in the introduction to these RMCS

Knowledge of:

- Ceiling frame construction techniques
- Ceiling framing materials, including steel and their rated fire resistance
- Wall framing and roof construction, ceiling lining materials

Range statement

Tools and equipment may include:

- Air compressors and hoses
- Chisels
- Hammers, hand saws
- Marking equipment, measuring tapes and rules
- Nail bags and nail guns
- Power drills and power saws
- Roofing square
- Scaffolding, spirit levels, squares (combination/tri), string lines

Materials may include:

- Bolts
- Metal
- Nails
- Patented fasteners
- Reconstituted timber products
- Screws, synthetic materials
- Timber

Connecting methods may include:

- Metal straps
- Patented connectors
- Timber cleats

Competency may be assessed through a combination of:

- Demonstration
- Practical exercises
- Written or oral short answer questions

Competency is to be assessed in the workplace or in simulated workplace environment.

CS-C3 Erect roof trusses

Unit details	
Functional area C	**Carpentry and framing**
Unit title	**Erect roof trusses**
Unit code	**CS-C3**

Description

This unit of competency covers the process of erecting roof trusses, including erecting and bracing timber or metal gable, hip and valley and hip roof trusses for roof coverings.

Elements of competency	**Performance criteria**	
1. Plan and prepare	1.1	Work instructions are confirmed with supervisor.
	1.2	**Tools and equipment** are selected as required, checked for serviceability and any faults are fixed or reported.
	1.3	Material quantity requirements are calculated in accordance with specifications.
	1.4	**Materials** needed are obtained, checked for compliance and prepared.
2. Locate roof trusses	2.1	Location of roof trusses for hip and valley roofs are set out on wall top plates to plan layout and specifications.
	2.2	Steel frames are temporarily earthed during erection and are connected to permanent earthing system upon completion.
	2.3	**Roof trusses** are erected and fixed, including temporary bracing, to set out positions in correct sequence to line at apex and plumb.
	2.4	Top chord is installed above wall plate to be constant height above wall plate.
	2.5	Ceiling trimming and creeper rafter members are fixed to specifications.
	2.6	Bottom chord of truss is used to provide lateral support for internal walls.
	2.7	**Roof bracing** is provided through **h** construction, **valley** construction, diagonal metal tension or timber bracing or a combination of these, and fixed to specification.
	2.8	Lateral restraints to truss chords are fixed in position to manufacturer specifications.

3. Perform clean-up	3.1	Work area is cleaned and waste disposed of, reused or recycled in accordance with work specifications.
	3.2	Tools and equipment are cleaned, checked for faults and maintained and stored in accordance with workplace practices.

Evidence guide

To demonstrate competency in this unit the candidate must meet skills and knowledge requirements, plus safety and environmental requirements, as set out in the introduction to these RMCS. The candidate must be able to:

- set out and erect a roof comprising a minimum of one hip end, a valley and enough standard trusses to incorporate bracing for a full size roof in timber and metal.

Critical skills and essential knowledge

- Apply common skills and knowledge specified in the introduction to these RMCS

Knowledge of:

- Plans, specifications and drawings
- For roof trusses
- Roof bevels
- Roof calculations for lengths, quantities and pitch
- Roof load transfer
- Roof shape and geometry
- Roof truss erection and construction techniques
- Roof truss materials and installation, including fire control and separation materials
- Roof types and truss components
- Techniques for lifting and positioning of trusses
- Temporary and permanent bracing
- Timber types, structural properties and uses, including engineered timber products
- Truss set out

Range statement

Tools and equipment may include:

- Air compressors and hoses
- Clamps
- Hammers
- Marking equipment, measuring tapes and rules
- Nail bags, nail guns
- Power drills Power leads Power saws
- Saw stools, scaffolding, screwdrivers, spanners, spirit levels
- Squares (combination/tri), string lines
- Welding equipment.

Materials may include:

- Bolts, bracing material
- Nails
- Patented fasteners
- Screws, slotted brackets for truss movement
- Timber and metal trusses

Roof trusses can be:

- Fixed to timber or steel wall plates
- Timber or metal

Roof bracing may include:

- Elementary bracing principles for various shaped roofs

Hip and valley roofs*:*

- May include scotch valleys and hip ends
- May include dutch gables

Competency may be assessed through a combination of:

- Demonstration
- Practical exercises
- Written or oral short answer questions

Competency is to be assessed in the workplace or in simulated workplace environment.

CS-C4 Construct Carpentry and Framing eaves

Unit details	
Functional area C	**Carpentry and framing**
Unit title	**Construct Carpentry and Framing eaves**
Unit code	**CS-C4**

Description

This unit of competency describes the skills and knowledge required to prepare, set out and construct eaves, including the cutting and fixing of fascias and barges to provide a finish between the wall and the roof.

Elements of competency	Performance criteria	
1. Plan and prepare	1.1	Work instructions are confirmed with supervisor.
	1.2	**Tools and equipment** are selected as required, checked for serviceability and any faults are fixed or reported.
	1.3	Material quantity requirements are calculated in accordance with specifications.
	1.4	**Materials** needed are obtained, checked for compliance and prepared.
2. Install fascia and barge	2.1	Overhang of rafters is marked and cut to line, plumb and angle.
	2.2	Gable ends are trimmed for overhang where a verge rafter is not used.
	2.3	Fascia is fitted and fixed to roof structure overhang to line and level.
3. Construct framework for eaves or soffits	3.1	Framework structure for eaves type is identified, and eaves design is established and set out to drawings and specifications.
	3.2	Timber framework members are set out, marked and cut to lengths in accordance with methods of joining and proposed framework structure.
	3.3	Boxed **eaves** constructed with soffit bearers are fixed to wall frame or supported by hangers from rafters, to line and level.
	3.4	Boxed eaves structure is installed, clear of top of masonry walls in veneer construction to allow for frame shrinkage and settlement.
	3.5	**Eaves** structure members are securely fixed, including back blocking and trimmers.
4. Line and clad eaves and soffits	4.1	Eaves cladding and sheeting material is marked and cut to shape to suit task application and jointing methods.

	4.2	Eaves lining, cladding and sheeting are fitted, joined and fixed in accordance with type of material, task application and specifications.
	4.3	Moldings are fitted and fixed to specifications to finish eaves.
	4.4	Sloping eaves are fitted to underside of rafters or framing for fixing and joining of material.
5. Clean-up	5.1	Work area is cleaned and waste disposed of, reused or recycled in accordance with work specifications.
	5.2	Tools and equipment are cleaned, checked for faults and maintained and stored in accordance with workplace practices.

Evidence guide

To demonstrate competency in this unit the candidate must meet skills and knowledge requirements, plus safety and environmental requirements, as set out in the introduction to these RMCS. The candidate must be able to:

- completion of marking and cutting of roof members to line to accommodate plumb fascia and barge for three metres of overhand barge eaves, three metres of boxed eaves and three metres of raking eaves, ensuring correct selection and use of fire-rated materials and methods of construction. Each may include:
  - An apex junction on the barge
  - A junction between the barge and the plumb fascia
  - A junction at the valley
  - An eaves junction at the hip to a brick wall

Critical skills and essential knowledge

The ability to:

- apply common skills and knowledge specified in the introduction to these RMCS.

Knowledge of:

- Eaves construction techniques
- Eaves materials, including their rated fire resistance
- Levelling techniques
- Roof geometry and construction
- Timber types, structural properties and uses

Range statement

Tools and equipment may include:

- Air compressors and hoses
- Bevels
- Chisels
- Hammers, hand saws
- Marking equipment, measuring tapes and rules
- Nail bags, nail guns
- Power drills, power saws, protractors
- Scaffolding, spirit levels, squares (combination/tri), stair clips and tables
- Steel squares and fence, string lines

Materials may include:

- Beads
- Fibre cement sheeting
- Joining mould
- Metal
- Plaster
- Quads
- Reconstituted timber products
- Timber, timber battens, timber lining boards.

Eaves design:

- May include sloping soffits and boxed eaves
- May incorporate verandas, concealed gutters and open eaves.

Competency may be assessed through a combination of:

- Demonstration
- Practical exercises
- Written or oral short answer questions.

Competency is to be assessed in the workplace or in simulated workplace environment.

CS-C5 Install flooring systems

Unit details	
Functional area C	**Carpentry and framing**
Unit title	**Install flooring systems**
Unit code	**CS-C5**

Description

This unit of competency describes the skills and knowledge required to plan, prepare, set out and install timber flooring systems.

Elements of competency	Performance criteria
1. Plan and prepare	1.1 Work instructions are confirmed with supervisor.
	1.2 **Tools and equipment** are selected as required, checked for serviceability and any faults are fixed or reported.
	1.3 **Material** quantity requirements are calculated in accordance with specifications.
	1.3 Materials needed are obtained, checked for compliance and prepared.
2. Set out sub-floor frame	2.1 Support structure, posts, stumps and piers are positioned and installed to set out lines for building as determined from site drawings in accordance with specifications for **floor framing**.
	2.2 Check support structure, posts, stumps and piers for level and square prior to installation of bearers and joists.
3. Install timber bearers	3.1 Bearer material is marked and cut to lengths for joining over supports.
	3.2 Damp proof course and termite shield are installed where specified by regulation.
	3.3 Bearers are located and fixed in accordance with regulations, job drawings and specifications to square, line and level.
4. Install timber floor joists	4.1 Location for floor joists is set out to spacings from job drawings, specifications and regulations.
	4.2 Material lengths for floor joists are selected.
	4.3 Floor joists are selected for straightness, located, fitted and fixed to line and level.
	4.4 Block or herringbone strutting is installed to deep floor joists where specified in accordance with regulations.
	4.5 Blocks and trimmers are fitted and fixed around doorways and openings to provide support in accordance with specifications.
	4.6 Trimmers are cut, fitted and fixed to support sheet flooring joints where specified.

5. Install flooring	5.1 Flooring materials selected are appropriate for the intended room use and specifications.
	5.2 Floor measurements are confirmed and flooring materials are cut and prepared for installation with a minimum of loss.
	5.3 Flooring is installed and secured in accordance with manufacturer recommendations.
	5.4 Installed flooring is completed in preparation for the next process.
6. Perform clean-up	6.1 Work area is cleaned and waste disposed of, reused or recycled in accordance with work specifications.
	6.2 Tools and equipment are cleaned, checked for faults and maintained and stored in accordance with workplace practices.

Evidence guide

To demonstrate competency in this unit the candidate must meet skills and knowledge requirements, plus safety and environmental requirements, as set out in the introduction to these RMCS. The candidate must be able to, as a minimum:

- complete one bearer and joist system constructed on a support system (stumps, posts or piers) applicable to local conditions, to carry external walls and internal walls parallel to joists for a full sized home or equivalent;
- install a system of similar size as above with either a sheet or strip platform system; and
- install a tongue and groove fitted strip flooring surface and an approved wet area floor system to a bathroom area.

Critical skills and essential knowledge

The ability to:

- apply common skills and knowledge specified in the introduction to these RMCS.

Knowledge of:

- Damp proof systems
- Floor construction techniques
- Flooring system installation techniques
- Flooring system materials, including fire control and separation
- Flooring system types, characteristics, materials, uses and limitations
- Imposed loads
- Insulation products
- Setting out and levelling techniques

Range statement

Tools and equipment may include:

- Air compressors and hoses
- Floor cramps
- Hammers, hand saws
- Marking equipment, measuring tapes and rules
- Nail bags, nail guns, nail punches
- Power drills and power leads, power planes and optical levelling equipment
- Power saws, power screwdrivers
- Spanners, spirit levels, squares (combination/tri), string lines

Materials may include:

- Adhesives and patented metal fasteners
- Connectors
- Flooring materials, which may:
    - include strip, boards and sheet
    - be either fitted or platform construction
- Metal
- Nails
- Reconstituted timber products and piers
- Screws
- Timber

Floor framing may include:

- Conventional bearers and joists
- Drop in (or in-line or deep) joists construction
- Sub-floor frame, including timber or metal
- Types of sub-floor support construction, including:
    - Concrete stumps
    - Masonry piers
    - Patented adjustable supports
    - Steel posts
    - Timber or brick walls
    - Timber stumps

Competency may be assessed through a combination of:

- Demonstration
- Practical exercises
- Written or oral short answer questions

Competency is to be assessed in the workplace or in simulated workplace environment.

CS-C6 Install windows and doors

Unit details	
Functional area C	**Carpentry and framing**
Unit title	**Install windows and doors**
Unit code	**CS-C6**

Description

This unit of competency describes the skills and knowledge required to set out and install timber and metal window and door units of different types, with appropriate weather proofing, smooth access and good security.

Elements of competency	Performance criteria
1. Plan and prepare	1.1 Work instructions are confirmed with supervisor.
	1.2 **Tools and equipment** are selected as required, checked for serviceability and any faults are fixed or reported.
	1.3 Material quantity requirements are calculated in accordance with specifications.
	1.4 **Materials** needed are obtained, checked for compliance and prepared.
2. Install window units to frame	2.1 **Window** opening size is checked to be greater than overall window frame.
	2.2 **Reveals** are joined and fixed securely to frames where specified.
	2.3 Window unit is located to suit brickwork and eaves finish for veneer construction, whichever is applicable.
	2.4 Window unit is positioned in place so that head/sill is level and stiles are plumb and in wind, ensuring reveals or frame are finished flush with face of inside wall lining.
	2.5 Window is packed and fixed to wall frame through/to studs, in accordance with specified fixing and fastening methods.
3. Replace window units/door frames	3.1 Architraves and nosing are removed.
	3.2 Sill bricks or cladding are removed where specified.
	3.3 Fasteners are cut, packing removed and flashing detached from frame.
	3.4 Window unit/ doorframe is removed.
	3.5 Window unit/door frame and window components are installed to plumb, level and wind.
4. Architraves and mouldings are replaced	4.1 Prepare door opening, and construct and fix jamb.
	4.2 Doorframe opening size is checked to be greater than the overall door jamb width and height, allowing for plumbing of stiles, thickness of floor covering, levelling of door head and level of floor.

	4.3	Jamb stiles are marked and cut to length allowing for clearances according to specifications.
	4.4	Head is trenched to accommodate jamb stiles allowing for clearance according to specification.
	4.5	Jamb frame is assembled, squared and braced with rebates flush.
	4.6	Joints and rebates are cleaned and finished.
5. Install door and door unit	5.1	Door unit is positioned in place so that the head/sill is level and stiles are plumb and in wind, ensuring reveals or frame finished flush with face of inside wall lining.
	5.2	Door is fitted to jamb allowing for clearances according to specifications with lock stile door backed off to facilitate correct operation.
	5.3	Hinges are marked out on door and jamb.
	5.4	Hinges are fitted to door and jamb.
	5.5	Final adjustments of door are made.
	5.6	Door furniture components are fitted and fixed to manufacturer specifications
6. Perform clean-up	6.1	Work area is cleaned and waste disposed of, reused or recycled in accordance with work specifications.
	6.2	Tools and equipment are cleaned, checked for faults and maintained and stored in accordance with workplace practices.

Evidence guide

To demonstrate competency in this unit the candidate must meet skills and knowledge requirements, plus safety and environmental requirements, as set out in the introduction to these RMCS. The candidate must be able to:

- construct and fit one standard external rebated door jamb/frame to specifications;
- fit and hang one standard door, including the door furniture and a pair of doors with door jambs to specifications;
- install one standard window or glazed sliding door unit to specifications; and
- replace one standard window or glazed sliding door unit to specifications.

Critical skills and essential knowledge

The ability to:

- apply common skills and knowledge specified in the introduction to these RMCS.

Knowledge of:

- Flashing requirements and installation techniques
- Processes for setting out
- Window and door installation and replacement techniques
- Window and door materials

Range statement

Tools and equipment may include:

- Air compressors and hoses
- Bevels
- Chisels
- Drills
- Hammers, hand/power saws
- Marking equipment, measuring tapes and rules
- Nail guns
- Protractors
- Spirit levels, squares (combination/tri), steel squares and fences, string lines

Materials may include:

- Barrel bolts
- Cabin hooks closers
- Dead bolts
- Flash bolts, flashings
- Handles hinges (butt and parliament)
- Latches, locks
- Metal
- Night latches
- Passage sets
- Timber

Windows may include:

- All size windows
- Casement
- Double hung
- Glazed sliding doors, curved and bay
- Hopper
- Straight and sliding

Reveals*:*

- May or may not be fitted with windows.

Competency may be assessed through a combination of*:*

- Demonstration
- Practical exercises
- Written or oral short answer questions.

Competency is to be assessed in the workplace or in simulated workplace environment.

CS-C7 Install lining, panelling and moulding

Unit details	
Functional area C	**Carpentry and framing**
Unit title	**Install lining, panelling and moulding**
Unit code	**CS-C7**

Description

This unit of competency describes the skills and knowledge required to set out and install timber lining and paneling to either masonry or timber/metal framed walls.

Elements of competency	Performance criteria	
1. Plan	1.1	Work instructions are confirmed with supervisor.
	1.2	**Tools and equipment** are selected as required, checked for serviceability and any faults are fixed or reported.
	1.3	**Material** quantity requirements are calculated in accordance with specifications.
	1.4	Materials needed are obtained, checked for compliance and prepared.
2. Prepare surface for lining/panelling	2.1	Fixing procedures for specified **lining** materials are selected in accordance with specifications.
	2.2	Surface is set out to provide a balanced panel or board effect to width and height.
3. Install lining/panelling	3.1	Lining material is marked, cut to length and/or shape, fitted and positioned to specifications.
	3.2	Panelling/lining is secured and fixed to job and manufacturer specifications.
	3.3	Panelling/lining is installed to plumb, level and uniform plane.
4. Cut and fix standard architrave mouldings	4.1	Standard architraves for **edging** are marked, cut to length, positioned and fitted to specifications.
	4.2	Skirtings are marked, cut to length, positioned and fitted to specifications.
	4.3	Mitre joints are fitted flush to face and true without gaps.
	4.4	Scribed **joints** are marked, cut to length, positioned and fitted to specifications.
	4.5	Scotia return end is cut to profile shape and length as detailed for location in drawings and specifications.
	4.6	Standard pelmet **moulding** sections are marked to length, cut, fitted and assembled and fixed to specifications with mitres true without gaps.
	4.7	Raked moulding is set out to position and mould is shaped to pattern for each position.

5. Clean-up	5.1	Work area is cleaned and waste disposed of, reused or recycled in accordance with work specifications.
	5.2	Tools and equipment are cleaned, checked for faults and maintained and stored in accordance with workplace practices.

Evidence guide

To demonstrate competency in this unit the candidate must meet skills and knowledge requirements, plus safety and environmental requirements, as set out in the introduction to these RMCS. The candidate must be able to:

- complete cutting and fixing a profiled skirting with a minimum of one internal scribed joint and one external mitre joint with tight fitting joints;
- complete fitting profiled architraves to a minimum of one door or one window or a combination of both, with specified margins and tight fitting mitre joints;
- complete lining one wall to a minimum of 3 metres by 2.4 metres, with lining boards including one opening to specifications; and
- complete lining one wall to a minimum of 3 metres by 2.4 metres, with sheet panelling including one opening to specifications.

Critical skills and essential knowledge

The ability to:

- apply common skills and knowledge specified in the introduction to these RMCS.

Knowledge of:

- Commonly used timber profiles
- Geometry for making mouldings, stairs and roofing
- Lining, panelling and moulding materials and techniques

Range statement

Tools and equipment may include:

- Air compressors and hoses
- Bevels
- Chisels, coping saws, clamps, corking guns
- Docking saw, drop saw, hand saw
- Drills
- Hammers, hand planes
- Jigs/stops
- Marking equipment, measuring tapes and rules, metal straps, moulding planes
- Nail bags and guns
- Rebate planes, routers
- Saws, screwdrivers, saw stools, spanners, spirit levels and squares (combination/tri), straight edges, string lines
- Timber cleats

Materials may include:

- Lining, panelling, mouldings, nails, screws, adhesives and gap fillers
- Lining and panelling sheet materials, including lining boards, veneer panelling, plywood, hardboard, MDF board, particleboard and fibre cement board

Preparation of **surfaces** may involve:

- Fixing of additional noggings
- Fixing of battens to surface
- Packing of frame members
- Trimming of frame members to line

- Wedging of frame members

Surfaces may include:
- Built-in cupboards
- Built-in robes
- Ceilings
- Door frames and jambs
- Fitments
- Floors
- Stairs
- Walls
- Windows

Lining of framed walling or battened **surfaces** provides a finished surface and may include:
- All moulding applications where joining occurs at surface intersections and involves change of levels and mouldings running at a slope or rake
- Junctions of surfaces, which may be at right angles or obtuse or acute angles
- Lining boards, which may be vertical, horizontal or raked

Edging may include:
- Architrave
- Cornice
- Raking moulds
- Skirting

Joints may include:
- Butt or moulds (of plastic, metal or timber)

Moulding may include:
- Beading (flat, quad, cover strips and nosings)
- Bull nosed
- Multi-curved
- Ornate period profile
- Scotia
- Splayed
- Square

Competency may be assessed through a combination of:
- Demonstration
- Practical exercises
- Written or oral short answer questions

Competency is to be assessed in the workplace or in simulated workplace environment.

CS-C8 Install stairs

Unit details	
Functional area C	**Carpentry and framing**
Unit title	**Install stairs**
Unit code	**CS-C8**

Description

This unit describes the skills and knowledge required to assemble prepared components required for the assembly and installation of a timber stair to location.

Elements of competency	Performance criteria
1. Plan and prepare	1.1 Work instructions are confirmed with supervisor.
	1.2 **Tools and equipment** are selected as required, checked for serviceability and any faults are fixed or reported.
	1.3 **Material** quantity requirements are calculated in accordance with specifications.
	1.4 Materials needed are obtained, checked for compliance and prepared.
2. Select and prepare materials and components	2.1 Methods of assembling erected stairs are identified and **components** checked for appropriate locations in stair structure.
	2.2 Method of assembling and **fixing** are determined in accordance with stair design and location.
3. Assemble strings and newels	3.1 Specific position for stairs is identified, measurements are checked and adjustments made where applicable.
	3.2 Strings and newels are assembled to design and fixed to specification.
	3.3 Strings to be fixed to walls are temporarily supported or directly fixed in position to specification.
4. Install treads and risers	a. Assembled strings and newels are temporarily braced in vertical position.
	4.2 Treads and risers about newels are fitted and fixed to assembly and flight is checked for true and square.
	4.3 Intermediate treads and risers are fitted and wedged where applicable to fit tight to housings to specification.
5. Assemble and install landings	5.1 Bearers, where applicable, and joists are fitted and fixed to level according to fixing specification.
	5.2 Nosing and flooring are fitted and fixed to form landing to specified finish and fascia is fitted and fixed to landing according to finish specification.
6. Install handrail and balustrade	6.1 Balusters/intermediate railing and handrails are fitted to form stair balustrade according to specification, with balusters checked to ensure plumb fit.

		6.2 Newels are checked prior to final fixing to ensure plumb fit.
		6.3 Hand railings are fitted and fixed to wall in accordance with specifications.
7.	Install spiral stair and curved strings	7.1 Location of stair and first step is accurately marked on floor and central post is erected into true position, fixed at floor and temporarily braced at top.
		7.2 Initial string section is temporarily supported in place for assembly, and treads and risers are fitted and fixed into position to specification.
		7.3 Stair is progressively developed with the extending, supporting and fixing of curved string, and completed with head secured to floor/landing, balustrade installed and central post fixed to specifications.
8.	Secure stair to structure and line spandril area	8.1 Securing of stair to building is carried out during/on completion of assembly.
		8.2 Spandril, where applicable, is framed, lined and fixed out to specified finish.
9.	Clean-up	9.1 Work area is cleaned and waste disposed of, reused or recycled in accordance with work specifications.
		9.2 Tools and equipment are cleaned, checked for faults and maintained and stored in accordance with workplace practices.

Evidence guide

To demonstrate competency in this unit the candidate must meet skills and knowledge requirements, plus safety and environmental requirements, as set out in the introduction to these RMCS. The candidate must be able to:

- accurately set out stair location and check levels for adjustments on newels;
- adopt and use appropriate techniques to fit and fix balustrades;
- complete installation with stair true to plumb and level, and fixed securely to structure with surfaces finished free of marks;
- demonstrate safe and effective procedures in assembling strings and newels and installing landing bearers and joists;
- select and use appropriate processes, tools and equipment to assemble stair components; and
- select and use safe and efficient procedures in installing treads, risers, flooring and nosing.

Critical skills and essential knowledge

The ability to:

- apply common skills and knowledge specified in the introduction to these RMCS.

Knowledge of:

- Adhesives, fixings and fasteners related to stair construction
- Assembling procedures for stairs
- Levelling techniques
- Marking of components
- Materials and their characteristics, relevant to stair construction
- Measuring and setting out related to assembling and installing stairs
- Stair construction and joining methods
- Types of stairs

Range statement

Tools and equipment may include:

- Air compressors and hoses
- Chisels, clamps
- Drills
- Hammers, hand saws
- Measuring tapes and rules
- Nail guns
- Planers, routers
- Saws, screwdrivers, squares

Materials may include:

- Medium density fibreboard (MDF)
- Plastics, plywood
- Steel
- Timber

Components may include:

- Balusters
- Flooring
- Hand railing
- Landing bearers
- Landing joists
- Newels
- Nosing
- Risers
- Strings
- Treads

Fixing may include:

- Bolts and nuts
- Glue and wedging
- Glue blocks
- Handrail bolts
- Nailing
- Screws, including coach screws

Competency may be assessed through a combination of:

- Demonstration
- Practical exercises
- Written or oral short answer questions

Competency is to be assessed in the workplace or in simulated workplace environment.

CS-C9 Formwork for suspended slabs, columns, beams and walls

Unit details	
Functional area C	**Carpentry and framing**
Unit title	**Formwork for suspended slabs, columns, beams and walls**
Unit code	**CS-C9**

Description

This unit of competency describes the skills and knowledge required to erect and dismantle formwork to suspended slabs, columns, beams and walls to contain concrete in above ground construction.

Elements of competency	Performance criteria
1. Plan and prepare	1.1 Work instructions are confirmed with supervisor.
	1.2 **Tools and equipment** are selected as required, checked for serviceability and any faults are fixed or reported.
	1.3 **Material** quantity requirements are calculated in accordance with specifications.
	1.4 Materials needed are obtained, checked for compliance and prepared.
2. Erect formwork	2.1 Work area is cleared and surface prepared for safe erection of **formwork** for suspended slabs, **piers** and shutters.
	2.2 Formwork is set out to requirements of plans and specifications.
	2.3 Formwork is assembled to plans, specifications and class of surface finish, with support system set to correct height level and line.
	2.4 Bracing of formwork is placed according to support plans and specifications to maintain rigidity and stability.
	2.5 Formwork support system is sequentially erected according to initial set out to.
	2.6 Formwork shutters and/or edge boxing is constructed to designed form requirements and specified dimensions.
	2.7 Block-outs and cast-in services are installed to specified locations.
	2.8 Debris, sawdust and other waste materials are removed from completed formwork in accordance with waste management policy for the site.
	2.9 Release agent is applied to formwork face to manufacturer specifications where specified.

3.	Strip formwork	3.1 Formwork and bracing/strutting support are removed sequentially and safely.
		3.2 Timber components are de-nailed, cleaned and stored or stacked safely for reuse or removal from site.
		3.3 Steel components are cleaned, oiled and stored or stacked to manufacturers' maintenance recommendations.
		3.4 Damaged formwork components are safely discarded after stripping.
4.	Perform clean-up	4.1 Work area is cleaned and waste disposed of, reused or recycled in accordance with work specifications.
		4.2 Tools and equipment are cleaned, checked for faults and maintained and stored in accordance with workplace practices.

Evidence guide

To demonstrate competency in this unit the candidate must meet skills and knowledge requirements, plus safety and environmental requirements, as set out in the introduction to these RMCS. The candidate must be able to:

- set out and erect suspended slab formwork (slab size a minimum of 30 square metres), incorporating a beam and two different types of columns with a specified formwork system at a minimum height of 2.4 metres.

Critical skills and essential knowledge

- Application and requirements for line, level and plumb in construction projects
- Apply common skills and knowledge specified in the introduction to these RMCS
- Concrete properties
- Formwork materials and techniques
- Hydraulic pressures applied to formwork
- Plans, specifications and drawings
- Purpose, application and properties of commonly used release agents

Range statement

Tools and equipment may include:

- Air compressors and hoses, automatic levels
- Chisels
- Formwork equipment
- Hammers hand saws
- Ladders and scaffolding
- Marking equipment, measuring tapes and rules
- Nail bags, nail guns
- Pinch bars, power drills power grinders, power leads, power saws
- Saw stools, shovels, spanners spirit levels, squares (combination/tri)
- Steel squares, string lines

Materials may include:

- Bolts and nuts
- Coach screws
- Masonry anchors, metal brackets
- Nails and spikes
- Patented metal fasteners
- Steel tie rods
  Timber

Formwork*:*

- For construction of formwork it is critical to comply with regulations and specifications for height, level and loadings
- May include prefabricated or in situ, but is to be rigid to withstand the mass of wet concrete and actions imposed during placement
- May include timber, metal and prefabricated components

Piers may include:

- Cardboard
- Metal
- Timber

Competency may be assessed through a combination of:

- Demonstration
- Practical exercises
- Written or oral short answer questions

Competency is to be assessed in the workplace or in simulated workplace environment.

CS-C10 Construct partitions

Unit details	
Functional area C	**Carpentry and framing**
Unit title	**Construct partitions**
Unit code	**CS-C10**

Description

This unit of competency describes the skills and knowledge required to set out and assemble partitions for the purpose of dividing areas into useable spaces.

Elements of competency	Performance criteria
1. Plan and prepare	1.1 Work instructions are confirmed with supervisor.
	1.2 **Tools and equipment** are selected as required, checked for serviceability and any faults are fixed or reported.
	1.3 **Material** quantity requirements are calculated in accordance with specifications.
	1.4 Materials needed are obtained, checked for compliance and prepared.
2. Set out and cut components	2.1 Materials are obtained from the store or stack to quantity and specification requirements.
	2.2 Location is set out and marked for partitions in accordance with job plan and specifications.
	2.3 One or multiple components are accurately cut to size according to plans and specifications.
	2.4 Prefabricated or cut components are distributed and stacked to suit job location and sequence of construction.
3. Assemble partitions	3.1 Locations for member connections are marked and prepared to designed measurement spacings.
	3.2 Fixing and fastenings are installed to secure each junction of members tight together, flush on partition face and within ±2mm of set out.
	3.3 **Partitions** are assembled and secured square and plumb to specification.
4. Perform clean-up	4.1 Work area is cleaned and waste disposed of, reused or recycled in accordance with work specifications.
	4.2 Tools and equipment are cleaned, checked for faults and maintained and stored in accordance with workplace practices.

Evidence guide

To demonstrate competency in this unit the candidate must meet skills and knowledge requirements, plus safety and environmental requirements, as set out in the introduction to these RMCS. The candidate must be able to:

- set out and assemble a full height partitioning, including the set out of a corner which is internal/external and a T intersection, and may include a window and door panel to square and plumb.

Critical skills and essential knowledge

The ability to:

- apply common skills and knowledge specified in the introduction to these RMCS.

Knowledge of:

- Application and requirements for line, level and plumb in construction projects
- Fixing and fasteners
- Partition assembly techniques
- Partitioning materials
- Plans, specifications and drawings
- Processes for setting out

Range statement

Tools and equipment may include:

- Clamps, compressors, crimping tools
- Docking saws, drop saws
- Explosive power tools
- Hammers
- Laser levelling equipment, levels
- Marking equipment, masonry drills, measuring tapes and rules
- Nail guns, pop riveters, power drills
- Saw stools, scaffolding, screw guns, spirit levels
- Squares (combination/tri), steel squares, straight edges, string lines
- Templates, tin snips

Materials may include:

- Internal lining
- Nails, screws, pop rivets and patented fasteners
- Proprietary partition systems
- Timber or metal

Partitions*:*

- Can be non-structural timber, metal or fire-rated, including: cladding with plasterboard; fibre cement board: plastic; reconstituted timber products
- Types of partitions may include:
  - Pre-glazed panels
  - Lined or unlined door units
  - Modular and custom window units
  - Framed or solid

Competency may be assessed through a combination of:

- Demonstration
- Practical exercises
- Written or oral short answer questions.

Competency is to be assessed in the workplace or in simulated workplace environment.

CS-C11 Construct timber cabinetry

Unit details	
Functional area C	**Carpentry and framing**
Unit title	**Construct timber cabinetry**
Unit code	**CS-C11**

Description

This unit of competency covers the process required to set out component parts of cabinets, assemble and fit to complete the construction of a specified fitment.

Elements of competency	**Performance criteria**
1. Plan and prepare	1.1 Work instructions are confirmed with supervisor.
	1.2 **Tools and equipment** are selected as required, checked for serviceability and any faults are fixed or reported.
	1.3 Material quantity requirements are calculated in accordance with specifications.
	1.4 Materials needed are obtained, checked for compliance and prepared.
2 Develop set-out	2.1 Overall width, height and depth of **carcase construction** are marked out to specifications using set-out boards with benchtop length, thickness overhang and edge profile indicated as specified.
	2.2 Plinth/kicker is accurately depicted, including length, depth, set back, position of intermediate bearers and joint detail.
	2.3 Position and thickness of vertical carcase components are marked in to specifications with position of shelving, including thickness, depth and type (fixed/adjustable), accurately depicted on set-out and overall height of unit marked in to specified dimension.
	2.4 Drawer is detailed, including height, width, clearances and runner type as specified.
	2.5 Position, width and design of drawer fronts and doors are accurately marked in on set-out.
	2.6 Capital or bolection moulding detail and position are clearly indicated to specification and relevant joint detail is indicated as specified to allow accurate calculations of quantities.
	2.7 Height of drawer fronts and doors, including clearances, are accurately marked in.
	2.8 Position and dimensions of fixing rails are clearly defined as specified.

	2.9 Drawer detail, including height and clearance, is defined to specifications.
	2.10 Relevant joint detail is drawn in to specification.
3. Mark out material for components	3.1 Materials are selected and prepared to design requirements for components, including face and edge marked on each component. 3.2 Length and joint details are transferred from set-out to component material with marking out on each component checked in preparation for **machining.** 3.3 Set-out material is marked, where required, for appropriate identification of components.
4. Carry out manufacturing processes on components	4.1 Machines are set up and used to carry out machining processes of set-out component material, with overall sequence of assembly determined in accordance with carcase structure. 4.2 Components are prepared to set-out details, and joints are checked for design requirements prior to assembling.
5. Assemble carcase	5.1 Carcase is assembled in line with determined procedures, with faces and edges flush and joints secured to specified fixing.
	5.2 Carcase is squared and held square with temporary brace or back fixed into position, with shelves and mullions installed as specified in accordance with fitment design.
	5.3 Plinth/kicker is assembled to designed construction, square and out of wind with adjoining surfaces flush and face panels fitted kicker with all joints close fitting and adjoining surfaces flush.
	5.4 Plinth/kicker is positioned to specified location and screwed to carcase.
	5.5 External fixed panels are prepared to specifications for assembling and secured to carcase.
6. Assemble and fit bench tops	6.1 Bench/counter top components are assembled to specified design and finished in preparation for installation. 6.2 Bench/counter top is positioned on carcase to specified dimensions and fixed by specified fixing method and appropriate **fixings and fasteners**.
7. Assemble and install drawers	7.1 Drawers are assembled to specifications, with bottoms fitted and fixed.
	7.2 Drawer runner type is determined and installed to specified dimensions and manufacturer specifications.
	7.3 Drawers are installed parallel to carcase bottom showing specified clearances, and drawer fronts and doors are prepared for installation.

8.	Fit doors and drawer fronts	8.1 Door hinges are installed to plan and manufacturer specifications and doors are hinged and hung to carcase with faces flush and specified clearances allowed.
		8.2 Drawer fronts are secured to drawers by nominated method with specified clearances allowed and handles and catches accurately installed to specification.
		8.3 Unit is cleaned up and **surface edge finishes** are sanded to specified finish for proposed coated finish, where applicable.
9.	Clean-up	9.1 Work area is cleaned and waste disposed of, reused or recycled in accordance with work specifications.
		9.2 Tools and equipment are cleaned, checked for faults and maintained and stored in accordance with workplace practices.

Evidence guide

To demonstrate competency in this unit the candidate must meet skills and knowledge requirements, plus safety and environmental requirements, as set out in the introduction to these RMCS. The candidate must be able to:

- accurately and safely fit and secure drawers and doors;
- accurately apply set-out to mark each component correctly for length and machining processes and method of joining components;
- apply details and dimensions to make set-out;
- demonstrate sound techniques in checking and adjusting component joints for fitting;
- finish surfaces to specified requirement;
- identify fitment details and specifications;
- identify marking and stacking of different components;
- manufacture and assemble either a cabinet, showcase, wall unit, counter or workstation, providing evidence;
- safely and efficiently assemble and fix carcase and components parts; and
- safely and efficiently use hand tools and equipment and machines.

Critical skills and essential knowledge

The ability to:

- apply common skills and knowledge specified in the introduction to these RMCS.

Knowledge of:

- Adhesives, fixings and fasteners relevant to fitment construction
- Clearances associated with types of finishes to surfaces
- Drawings and specifications
- Handling of materials relevant to fitment construction
- Materials and their characteristics relevant to fitment construction
- Measurement and marking related to making set-out for fitments
- Methods of constructing fitments
- Setting out, assembling and fixing procedures for fitment construction
- Types of fitments
- Use of tools and equipment relevant to setting out materials, manufacturing and assembling processes for fitments

Range statement

Tools and equipment may include:

- Air compressor and hoses
- Bevels
- Chisels, clamps
- Hammers, hand saws
- Marking gauges, measuring tapes and rules
- Nail guns
- Power or manual - drills, planers, routers, saws, sanders
- Sash cramps, screwdrivers, set-out bench, squares, straight edge

Carcase construction*:*

- Materials may include:
  - Medium density fibreboard
  - Particle board
  - Plywood
  - Timber
  - Veneered particle board.
- Types may include:
  - Framed and panelled
  - Hollow frame flush
  - Solid core flush
  - Solid panel
  - Type and thickness of backing

Machining manufacturing processes may include:

- Band sawing to shape
- Cutting to lengths
- Dressing to shape
- Grooving and rebating
- Mortising
- Moulding to shape
- Sanding
- Trenching for housings

Fixings and fasteners used in assembling **fitments** may include:

- Brads
- Director screws
- Knockdown fittings
- Nails
- Self-tapping screws
- Wood screws

Surface edge finishes may include:

- Aluminium mouldings
- Plastic laminates
- Thermo plastics
- Timber veneers

Free standing **fitments** may be constructed of:

- Acrylic
- Glass
- Laminates

- Manufactured board
- Solid timber

Competency may be assessed through a combination of:

- Demonstration
- Practical exercises
- Written or oral short answer questions

Competency is to be assessed in the workplace or in simulated workplace environment.

Functional area D – Blocklaying, bricklaying and concreting

CS-D1 Place concrete

Unit details	
Functional area D	**Blocklaying, bricklaying and concreting**
Unit title	**Place concrete**
Unit code	**CS-D1**

Description

This unit of competency describes the skills and knowledge required to transport and place concrete and screed into the prepared formwork or foundations to establish a strong base for further building work.

Elements of competency	**Performance criteria**	
1. Plan and prepare	1.1	Work instructions are confirmed with supervisor.
	1.2	**Tools and equipment** are selected as required, checked for serviceability and any faults are fixed or reported.
	1.3	Material quantity requirements are calculated in accordance with specifications.
	1.4	Materials needed are obtained, checked for compliance and prepared.
2. Define and prepare work area	2.1	Concrete is received, checked for debris and discharged into wheelbarrow, kibble, pump or hopper.
	2.2	Location of concrete placement is determined from plans and specifications and is checked to be free of debris and waste.
3. Place, screed and level concrete	3.1	Concrete is placed in horizontal layers into location to marked out levels.
	3.2	Height of vertical drop of concrete is minimized to avoid **segregation of concrete** materials.
	3.3	Poured concrete is consolidated during process using compaction or vibration method**.**
	3.4	**Finished** levels are checked using appropriate levelling device.
	3.5	Concrete is screeded to correct levels and grades using appropriate straight edged tool/formwork-mounted screed.
4. Clean-up	4.1	Work area is cleaned and waste disposed of, reused or recycled in accordance with work specifications.

4.2 Tools and equipment are cleaned, checked for faults and maintained and stored in accordance with workplace practices.

Evidence guide

To demonstrate competency in this unit the candidate must meet skills and knowledge requirements, plus safety and environmental requirements, as set out in the introduction to these RMCS. The candidate must be able to:

- complete to specifications at least three concreting projects (each a minimum of two cubic metres of concrete), using different finishes, with at least one project containing angled formwork and bent reinforcement.

Critical skills and essential knowledge

The ability to:

- cold joints;
- compaction;
- concrete materials;
- concrete reinforcement techniques;
- concreting techniques;
- levelling techniques;
- mix specifications;
- segregation;
- slump testing.

Range statement

Tools and equipment may include:

- Chutes
- Line pumps
- Measuring tapes and rules, mechanised dumpers
- Rakes
- Screed boards, shovels, stipple devices
- Trowels trowelling machines
- Vibrators
- Wheelbarrows

Methods to avoid segregation of concrete may include:

- Minimising the height of a vertical drop
- Using a tremmie
- Using pumps with a flexible hose

Finishing techniques may include:

- Broom finished
- Brushed
- Mechanical trowelling machine
- Steel trowel
- Wood float

Competency may be assessed through a combination of:

- Demonstration
- Practical exercises
- Written or oral short answer questions

Competency is to be assessed in the workplace or in simulated workplace environment.

CS-D2 Finish concrete surfaces

Unit details	
Functional area D	**Blocklaying, bricklaying and concreting**
Unit title	**Finish concrete surfaces**
Unit code	**CS-D2**

Description

This unit of competency describes the skills and knowledge required to use manual or mechanical techniques to finish concrete surfaces that have been placed and screeded.

Elements of competency	**Performance criteria**
1. Plan and prepare	1.1 Work instructions are confirmed with supervisor.
	1.2 **Tools and equipment** are selected as required, checked for serviceability and any faults are fixed or reported.
	1.3 Material quantity requirements are calculated in accordance with specifications.
	1.4 Materials needed are obtained, checked for compliance and prepared.
2. Finish concrete	2.1 Float and trowel are applied after initial screeding to **assist in maintaining** a **level surface** and to correct inaccuracies.
	2.2 Mechanical trowelling is applied to consolidate and densify the setting concrete surface.
	2.3 Control joints are installed, **edges finished** and concrete trowelled to specifications.
	2.4 Final trowel/ **finish** is applied to concrete surface to specifications.
3. Clean-up	3.1 Work area is cleaned and waste disposed of, reused or recycled in accordance with work specifications.
	3.2 Tools and equipment are cleaned, checked for faults and maintained and stored in accordance with workplace practices.

Evidence guide

To demonstrate competency in this unit the candidate must meet skills and knowledge requirements, plus safety and environmental requirements, as set out in the introduction to these RMCS. The candidate must be able to:

- use a hand trowel and power trowel to finish a minimum of 100 square metres of concrete slab.

Critical skills and essential knowledge

The ability to:

- apply common skills and knowledge specified in the introduction to these RMCS.

Knowledge of:

- Concrete finishing techniques
- Concrete materials
- Concrete placement
- Curing times
- Levelling techniques
- Types, characteristics, uses and limitations of plant, tools and equipment

Range statement

Tools and equipment may include:

- Brooms, bull floats
- Channel trowels
- Edging tools
- Hoses
- Kerb
- Magnesium trowels
- Steel trowels, power trowels step readers stipple plates
- Wooden floats

Level surface is a concrete surface that has been placed and screeded to the reduced level in accordance with drawings and specifications.

Assistance in maintaining a level surface may include assessing the curing process to allow manual and mechanical trowelling to be applied. Control joints are may include in the concrete surface to control cracking.

Edge finishing types may include:

- Fine
- Rounded
- Straight edge

Finishing techniques may include:

- Broom finished
- Brushed
- Bull float
- Hand float (wooden, magnesium or composition)
- Mechanical trowelling machine
- Slip resistance
- Spraying and brushing to expose aggregate
- Steel trowel
- To specifications
- Wood float

Competency may be assessed through a combination of:

- Demonstration
- Practical exercises
- Written or oral short answer questions

Competency is to be assessed in the workplace or in simulated workplace environment.

CS-D3 Cut and core concrete

Unit details	
Functional area D	**Blocklaying, bricklaying and concreting**
Unit title	**Cut and core concrete**
Unit code	**CS-D3**

Description

This unit of competency describes the skills and knowledge required to cut and core concrete for the provision of service holes, core samples, construction joints and joining new components.

Elements of competency	Performance criteria
1. Plan and prepare	1.1. Work instructions are confirmed with supervisor.
	1.2. **Tools and equipment** are selected as required, checked for serviceability and any faults are fixed or reported.
	1.3. Material quantity requirements are calculated in accordance with specifications.
	1.4. **Materials** needed are obtained, checked for compliance and prepared.
2. Cut and core concrete	2.1 **Cutting** and **coring** requirements are identified and assessed.
	2.2 Equipment for sawing and drilling is selected according to the task.
	2.3 Sawn joint is cut to specifications and job requirements.
	2.4 Sawn joint is cut in to penetrate to specified depth.
	2.5 Cored hole is **drilled** to specifications and job requirements.
	2.6 Cored hole is drilled clear through the concrete to the specified diameter.
3. Clean-up	3.1 Work area is cleaned and waste disposed of, reused or recycled in accordance with work specifications.
	3.2 Tools and equipment are cleaned, checked for faults and maintained and stored in accordance with workplace practices.

Evidence guide

To demonstrate competency in this unit the candidate must meet skills and knowledge requirements, plus safety and environmental requirements, as set out in the introduction to these RMCS. The candidate must be able to:

- complete saw cutting a construction joint to a minimum of 3 metres straight or to the set line; and
- core a hole in a designated surface, clear through a minimum of 100mm in depth.

Critical skills and essential knowledge

- Apply common skills and knowledge specified in the introduction to these RMCS

Knowledge of:

- Concrete cutting and coring techniques
- Control joints
- Cooling drills and saws
- Calculation of joint requirements
- Substructure construction

Range statement

Tools and equipment may include:

- Concrete drilling equipment
- Concrete saws
- Coring equipment
- Diamond tip drill bits
- Bolt cutters
- Hoses
- Measuring tapes

Materials may include:

- Other specialist cooling agents
- Water as a cooling agent

Cutting and coring activities may include being applicable to:

- Columns
- Commercial buildings
- Driveways
- Foundations
- Gutters
- Hardstands
- Kerbs
- Pathways
- Pits
- Plinths
- Residential buildings
- Slabs
- Walls

Cutting of concrete may include:

- Anti-cracking joints
- Articulation joints
- Construction joints
- Control joints
- Expansion and contraction joints
- Joining new concrete components
- Structural joints

Coring of concrete may include:

- Providing for fixtures
- Providing holes to accommodate services
- Testing core samples

Drill types may include:

- Diamond tip drills.

Competency may be assessed through a combination of:

- Demonstration
- Practical exercises
- Written or oral short answer questions.

Competency is to be assessed in the workplace or in simulated workplace environment.

CS-D4 Resurface concrete

Unit details	
Functional area D	**Blocklaying, bricklaying and concreting**
Unit title	**Resurface concrete**
Unit code	**CS-D4**

Description

This unit of competency describes the skills and knowledge required to resurface existing concrete to repair, reface or decorate the surface of concrete components.

Elements of competency	Performance criteria
1. Plan for resurfacing	1.1 Work instructions are confirmed with supervisor.
	1.2 **Tools and equipment** are selected as required, checked for serviceability and any faults are fixed or reported.
	1.3 Material quantity requirements are calculated in accordance with specifications.
	1.4 **Materials** needed are obtained, checked for compliance and prepared.
2. Prepare for concrete resurfacing	2.1 Concrete is prepared for resurfacing technique to be applied.
	2.2 **Resurfacing** and preparation equipment is selected for the process.
	2.3 Retardant materials are prepared for application where specified.
	2.4 **Preparation technique** is performed using the selected application according to specifications.
	2.5 Existing control joints in the substrate are checked to ensure they are carried through and reflected in the proposed topping.
3. Cure/seal concrete	3.1 **Curing agents** and **curing techniques** are applied to concrete to specifications, following setting.
	3.2 Curing/sealing is maintained for period specified in accordance with specifications.
4. Clean-up	4.1 Work area is cleaned and waste disposed of, reused or recycled in accordance with work specifications.
	4.2 Tools and equipment are cleaned, checked for faults and maintained and stored in accordance with workplace practices.

Evidence guide

To demonstrate competency in this unit the candidate must meet skills and knowledge requirements, plus safety and environmental requirements, as set out in the introduction to these RMCS. The candidate must be able to:

- prepare, resurface and finish a minimum of 10 square metres of existing concrete to specifications.

Critical skills and essential knowledge

Ability to:

- apply common skills and knowledge specified in the introduction to these RMCS.

Knowledge of:

- Chemical stains and acid solutions
- Concrete resurfacing materials and techniques
- Concrete structures
- Control joints
- Mortar mix composition and additives
- Placing and finishing of concrete

Range statement

Planning and preparation may include:

- Assessment of conditions and hazards
- Equipment defect identification
- Work site inspection

Tools and equipment may include

- Brooms
- Concrete mixers
- Floats
- Grinders
- Hoses
- Polishers
- Power trowels
- Rollers
- Screeds
- Shovels
- Trowels
- Water blasters
- Wheelbarrows

Materials may include:

- Acid solutions for cleaning and etching
- Bonding agents
- Chemical stains
- Concrete
- Curing compounds
- Surface retardants

Resurfacing may include:

- Decorative finishes
- Placement of concrete
- Standard finishing techniques

Preparation techniques may include:

- Abrasive blasting (sand or grit)
- Acid etching
- Chemical staining
- Grinding
- Polishing
- Scabbling

Curing agents may include:

- Acrylic co-polymers
- Resin-based compounds
- Silicate compounds
- Water
- Water-based compounds

Curing techniques may include:

- Curing agents
- Hosing
- Plastic film
- Ponding
- Sprinklers

Competency may be assessed through a combination of:

- Demonstration
- Practical exercises
- Written or oral short answer questions

Competency is to be assessed in the workplace or in simulated workplace environment.

CS-D5 Install flashings and damp-proof coursing

Unit details	
Functional area D	**Blocklaying, bricklaying and concreting**
Unit title	**Install flashings and damp-proof coursing**
Unit code	**CS-D5**

Description

This unit of competency describes the skills and knowledge required to install flashings and damp proofing products to different **types** and styles of buildings.

Elements of competency	Performance criteria	
1. **Plan**	1.1	Work instructions are confirmed with supervisor.
	1.2	**Tools and equipment** are selected as required, checked for serviceability and any faults are fixed or reported.
	1.3	Material quantity requirements are calculated in accordance with specifications.
	1.4	Materials needed are obtained, checked for compliance and prepared.
2. Prepare surface	2.1	Type of flashing and damp proofing **material** are identified in accordance with and state of structure.
	2.2	Area of structure for damp proofing is identified from or site inspection and inspected for defects.
	2.3	Defects are corrected and **surface preparation** of structure requiring damp proofing is carried out to manufacturer specifications.
3. Install damp proof course	3.1	Damp proof is installed in accordance with work specifications.
	3.2	**Flashing or damp proof course** is laid and lapped in accordance with specifications.
	3.3	Damp proof material is applied with a consistent mortar bed on top and bottom.
	3.4	Damp proof course is folded to follow shape of surrounding structures.

4. Install moisture proof barrier or flashings	4.1	Flashing materials are **prepared for application** to surrounding structures in accordance with requirements.
	4.2	Flashing material is laid, lapped and joined to follow shape of surrounding structure.
	4.3	Flashings or moisture barrier material is formed and sealed around openings.
	4.4	Flashing and damp proof course are installed to project outside of mortar joint on external surface, and outside of brickwork in accordance with specifications.
5. Clean up	5.1	Work area is cleaned and waste disposed of, reused or recycled in accordance with work specifications.
	5.2	Tools and equipment are cleaned, checked for faults and maintained and stored in accordance with workplace practices.

Evidence guide

To demonstrate competency in this unit the candidate must meet skills and knowledge requirements, plus safety and environmental requirements, as set out in the introduction to these RMCS. The candidate must be able to, as a minimum:

- install, to specifications, flashings of suitable materials for cavity brickwork including internal and external corners, window and door heads and vertical flashings; and stepped and tray flashings to gables and/or parapets.

Critical skills and knowledge

Ability to:

- apply common skills and knowledge specified in the introduction to these RMCS.

Knowledge of:

- Characteristics and applications of materials to install flashings and DPC
- Techniques for installing flashings and DPC
- Waterproofing methods

Range statement

Type of construction may include:

- Blockwork
- Brickwork
- Reinforced in situ concrete and pre-cast concrete
- Stonework

Planning and preparation may include:

- Assessment of conditions and hazards
- Equipment defect identification
- Work site inspection

Tools and equipment may include:

- Brooms, brushes, buckets
- Concrete mixers
- Electric drills
- Hammers (brickies, club and scutch), hoses
- Knives or cutting blades
- Measuring tapes and rules margin or raking tools
- Rollers
- Scaffolds, shovels, spirit levels
- Trowels
- Vacuum cleaner
- Wheelbarrows

Damp proofing **materials** may include:

- Aluminium sheeting
- Bituminous sheeting
- Emulsions
- Lead and polyurethane sheeting
- Polyethylene sheeting

Surface preparation may include:

- Chipping or scraping of protrusions
- Cleaning free of dust

Flashing or damp proof course may include:

- Cavities
- Cavity gutters
- Lintels
- Roofs
- Windows

Prepared for application may include:

- Batching and mixing
- Checking quality and blends of sand used in mortar materials
- Cutting sheet material to length
- Folding materials to shape
- Mixing
- Stirring

Competency may be assessed through a combination of*:*

- Demonstration

- Practical exercises
- Written or oral short answer questions

Competency is to be assessed in the workplace or in simulated workplace environment.

CS-D6 Lay masonry

Unit details	
Functional area D	**Blocklaying, bricklaying and concreting**
Unit title	**Lay masonry**
Unit code	**CS-D6**

Description

This unit of competency describes the skills and knowledge required to lay and construct brick and masonry buildings.

Elements of competency	Performance criteria	
1. Plan work	1.1	Work instructions are confirmed with supervisor.
	1.2	**Tools and equipment** are selected as required, checked for serviceability and any faults are fixed or reported.
	1.3	Material quantity requirements are calculated in accordance with specifications.
	1.4	**Materials** needed are obtained, checked for compliance and prepared.
2. Set out brickwork/blockwork	2.1	Bricks/blocks are identified, selected and checked for conformity with specifications.
	2.2	Work platform is erected in accordance with workplace requirements.
	2.3	Location and structural details of brickwork/blockwork are identified from plans.
	2.4	Base brickwork construction, below and above floor is set out to location, dimensions and specifications.
3. Construct base brickwork/blockwork	3.1	Mortar mix is prepared and checked for conformity and bricks/blocks laid to set out to specification.
	3.2	Brickwork/blockwork gauge is determined and set out rod is prepared.
	3.3	Base brickwork/blockwork is constructed for veneer construction to requirements of regulations and specifications.
	3.4	Sub-floor ventilation is installed in accordance with specifications.
4. Construct veneer walls	4.1	Structural frame is checked to ensure it is ready for **brick or block veneer construction** maintaining minimum cavity.
	4.2	Damp proof courses are installed to specifications.
	4.3	Ventilation for veneer construction is built to specifications.
	4.4	Wall ties are positioned and correctly fixed to framework to specifications.

	4.5	Openings are constructed and flashings installed.
	4.6	Cavities are kept clear of mortar droppings and bridging.
	4.7	Lintels are installed.
	4.8	Top brickwork/blockwork is constructed to eaves/gable level in accordance with standards.
	4.9	Veneer gable is constructed as required by plans and specifications.
	4.10	Walls are built to gauge straight and true in plumb, line and level within standards tolerance.
	4.11	Control joints are formed in accordance with locations on job drawings and specifications.
	4.12	Weepholes, brick/block reinforcing and wall flashing are located and built in to.
	4.13	Sill bricks are cut where required and laid to line in accordance with work specifications.
5. Rake/rule joints and clean face	5.1	Joints of laid brickwork/blockwork are raked or ruled to correct depth and profile in accordance with work specifications.
	5.2	Brickwork/blockwork is brushed down prior to drying to remove unwanted mortar and face is cleaned.
	5.3	Excess mortar is removed from brick/blockwork surfaces and cavities are cleaned free of mortar and debris.
6. Clean-up	6.1	Work area is cleaned and waste disposed of, reused or recycled in accordance with work specifications.
	6.2	Tools and equipment are cleaned, checked for faults and maintained and stored in accordance with workplace practices.

Evidence guide

To demonstrate competency in this unit the candidate must meet skills and knowledge requirements, plus safety and environmental requirements, as set out in the introduction to these RMCS. The candidate must be able to:

- as a minimum, construct a section of a brick veneer building, including set out and gauge brickwork to a base; damp proof course (DPC) if applicable, weepholes, air vents, control joints and veneer ties; lintels and flashings; brick gables; and brick sills and flashings, completing all to specifications.

Critical skills and essential knowledge

Ability to:

- apply common skills and knowledge specified in the introduction to these RMCS.

Knowledge of:

- Brick and block expansion and growth, control and articulation joints
- Brick bond patterns
- Characteristics and applications of materials for masonry veneer construction
- Techniques of masonry veneer construction

Range statement

Tools and equipment may include:

- Bolsters, brick buggies and brick grabs, brooms, buckets, builders' lines
- Concrete mixers
- Dumpy levels
- Elevators
- Forklifts
- Hammers (brickies, club and scutch), hoses
- Jig saws, jointing tools
- Line blocks and line pins
- Margin or raking tools, masonry saws, masonry squares, materials hoists, measuring tapes and rules, mortar boards
- Pallet trolleys, plumb rules, profiles
- Scaffolds, shovels, small petrol or diesel engines and compressors, spirit levels, straight edges, string lines
- Trowels
- Wheelbarrows

Materials may include:

- Aggregates
- Cement
- Clay bricks
- Lime
- Masonry blocks
- Reinforcing materials
- Waterproofing materials

Brick or block veneer construction may include:

- Straight, square and plumb brick/block
- Wall ties and reinforcement
- Dampcourse and flashings
- Installation of sills to door and window openings and lintels installed over openings
- Sill flashings

Competency may be assessed through a combination of:

- Demonstration
- Practical exercises
- Written or oral short answer questions

Competency is to be assessed in the workplace or in simulated workplace environment.

CS-D7 Construct masonry steps and stairs

Unit details	
Functional area D	**Blocklaying, bricklaying and concreting**
Unit title	**Construct masonry steps and stairs**
Unit code	**CS-D7**

Description

This unit of competency describes the skills and knowledge required to construct masonry steps, stairs and wing walls for different types and styles of buildings.

Elements of competency	**Performance Criteria**
1. Plan work	1.1 Work instructions are confirmed with supervisor.
	1.2 **Tools and equipment** are selected as required, checked for serviceability and any faults are fixed or reported.
	1.3 Material quantity requirements are calculated in accordance with specifications.
	1.4 **Materials** needed are obtained, checked for compliance and prepared.
2. Set out brickwork/ blockwork	2.1 Work platform is erected in accordance with workplace requirements.
	2.2 Location and relative level of prepared footing are checked from job drawings and specifications.
	2.3 Rise and going of flight and individual steps are calculated to codes and workplace requirements.
	2.4 Flight and individual steps are set out from calculations and job drawings.
3. Lay bricks/blocks forming steps and wing walls	3.1 Mortar mix is prepared to required conformity and bricks/blocks are laid to set out according to specifications.
	3.2 Base brickwork is constructed to specifications.
	3.3 Steps are formed square, level, plumb and true and laid to specified bond.
	3.4 Profile of steps is constructed to bond and design, aligned and plumb to specifications.
	3.5 Parallel wing walls are formed to step alignment in accordance with specifications.
	3.6 Jointing is carried out to work specifications.
	3.7 Brickwork/blockwork is laid to line, set out with gauge and completed to work specifications.
	3.8 Brick/block faces are cleaned free of mortar.

4. Clean-up	4.1	Work area is cleaned and waste disposed of, reused or recycled in accordance with work specifications.
	4.2	Tools and equipment are cleaned, checked for faults and maintained and stored in accordance with workplace practices.

Evidence guide

To demonstrate competency in this unit the candidate must meet skills and knowledge requirements, plus safety and environmental requirements, as set out in the introduction to these RMCS. The candidate must be able to, as a minimum,

- construct a flight of stairs with a minimum of three pre-cast treads, to specifications; and
- construct a flight of three solid masonry treads with a parallel wing wall on one side to specifications.

Critical skills and essential knowledge

Ability to:

- apply common skills and knowledge specified in the introduction to these RMCS.

Knowledge of:

- Brick and block expansion and growth, control and articulation joints
- Brick bond patterns
- Characteristics and applications of materials for masonry steps and stairs construction
- Plans, specifications and drawings
- Techniques of masonry steps and stairs construction

Range statement

Tools and equipment may include:

- Bolsters, brick buggies and brick grabs, brooms, buckets, builders' lines
- Concrete mixers
- Dumpy levels
- Elevators
- Forklifts
- Hammers (brickies, club and scutch), hoses
- Jig saws, jointing tools
- Line blocks and line pins
- Margin or raking tools, masonry saws, masonry squares, materials hoists, measuring tapes and rules, mortar boards
- Pallet trolleys, plumb rules, profiles
- Scaffolds, shovels, small petrol or diesel engines and compressors, spirit levels, straight edges, string lines
- Trowels
- Wheelbarrows

Materials may include:

- Aggregates
- Cement
- Clay bricks
- Lime
- Masonry blocks
- Pre-cast concrete steps
- Waterproofing materials

Brick and block stair construction may include:

- Internal and external construction of steps and stairs
- Stairs involving straight flights, which may incorporate landings.

Competency may be assessed through a combination of:

- Demonstration
- Practical exercises
- Written or oral short answer questions

Competency is to be assessed in the workplace or in simulated workplace environment.

CS-D8 Construct masonry curved walls and arches

Unit details	
Functional area D	**Blocklaying, bricklaying and concreting**
Unit title	**Construct masonry curved walls and arches**
Unit code	**CS-D8**

Description

This unit of competency describes the skills and knowledge required to construct masonry arches within walls and above columns or attached piers.

Elements of competency	**Performance criteria**
1. Plan work	1.1 Work instructions are confirmed with supervisor.
	1.2 **Tools and equipment** are selected as required, checked for serviceability and any faults are fixed or reported.
	1.3 Material quantity requirements are calculated in accordance with specifications.
	1.4 **Materials** needed are obtained, checked for compliance and prepared.
2. Set out curve for construction of **curved masonry wall**	2.1 Planned curve points are plotted from job drawings and all trammel centres are established on footing slab .
	2.2 Curve of wall is planned to specified location from trammel or plotted points and marked on the footing slab.
3. Lay curved wall	3.1 Mortar is mixed to specifications.
	3.2 Bricks/blocks are laid for first course to planned set out for line and specified bond according to specifications.
	3.3 Gauge is maintained within standard tolerance at every course level.
	3.4 Vertical face alignment is maintained.
	3.5 Bricks/blocks are laid level over the length of the wall to the established plan profile.
	3.6 Bricks/blocks are laid to specified bond with perpendicular joints (perpends) maintained in a vertical line
	3.7 Construction is completed to requirements of job drawings and specifications.
4. Set out first course for **masonry arch**	4.1 Location and line of brickwork/blockwork wall are set out on concrete footing/slab to job drawings.
	4.2 pan of arch is determined from prepared allotted arch centre plus 4mm.
	4.3 Arch spans are set out to location for first course.

5. Prepare for arch construction	5.1 Mortar mix is prepared and bricks/blocks are laid to form wall to set out.
	5.2 Gauge of abutting walls is maintained within standard tolerance at each course level.
	5.3 Plumb and alignment of vertical wall face are maintained.
	5.4 Bricks are cut and laid level and to line over length of wall.
	5.5 Abutment jambs/piers are laid vertical up to springing line.
	5.6 Bricks/blocks are laid in stretcher bond to springing line of arch with perpendicular joints maintained in vertical line.
6. Construct arch centre	6.1 Arch centre is set out and curve is drawn up in accordance with specifications and plan.
	6.2 Plan is transferred to material and cut to shape.
7. Set up arch centre	7.1 Height to springing line is determined and height to crown of arch is confirmed to be within standard tolerance.
	7.2 Height of toms and wedges or adjustable metal props are determined to set up and support timber arch centre.
	7.3 Supports are adjusted to ensure arch centre is level at right angles to wall face and level across springing line.
	7.4 Props, toms, packers and wedges are located for easy removal.
	7.5 Position of central key brick/block is established for gauged arch and tape used to mark gauge.
8. Cut and lay bricks/blocks to form arch	8.1 Bricks and blocks are cut and laid on centre to form arch to specifications.
	8.2 Joints are maintained to equal size and parallel on the extrados of an arch.
	8.3 Same size wedge shape is maintained on face.
	8.4 Centreline of key brick/block wedge is maintained through vertical centre line of arch.
	8.5 Even joint thickness is maintained around extrados for cut brickwork and blockwork.
	8.6 All bricks are cut and laid to maintain even joints.
	8.7 All joints are struck evenly to depth and shape to specifications.
9. Finish joints	9.1 Excess mortar is removed from brick/blockwork surfaces in accordance with work specifications.
	9.2 Joints of laid brickwork/blockwork are raked or ruled to correct profile and depth to .
	9.3 Brickwork/blockwork is brushed down prior to drying.
10. Clean-up	10.1 Work area is cleaned and waste disposed of, reused or recycled in accordance with work specifications.
	10.2 Tools and equipment are cleaned, checked for faults and maintained and stored in accordance with workplace practices.

Evidence guide

To demonstrate competency in this unit the candidate must meet skills and knowledge requirements, plus safety and environmental requirements, as set out in the introduction to these RMCS. The candidate must be able to complete the following to specification:

- Construct a curved wall using an arc centre and trammel
- Construct a serpentine curved wall using the plotted points and template technique
- Construct five arches - three are in brick and two in block, including bull's eye, segmental and Gothic with the construction of the arch centre for one of the arches

Critical skills and essential knowledge

Ability to:

- apply common skills and knowledge specified in the introduction to these RMCS.

Knowledge of:

- Brick and block expansion and growth, control and articulation joints
- Brick bond patterns, types of joints and finishing
- Characteristics and applications of materials for masonry arch construction
- Construction and arch terminology
- Geometric calculations and drawing
- Plans, specifications and drawings
- Types of masonry arches and techniques of construction

Range statement

Tools and equipment may include*:*

- Adjustable metal props
- Bolsters, brick buggies and brick grabs, brooms, buckets, builders' lines
- Concrete mixers
- Dumpy levels
- Elevators
- Forklifts
- Hammers (brickies, club and scutch), hoses
- Jig saws, jointing tools
- Line blocks and line pins
- Margin or raking tools, masonry saws, masonry squares, materials hoists, measuring tapes and rules, mortar boards
- Pallet trolleys, plumb rules, profiles
- Scaffolds, shovels, small petrol or diesel engines and compressors, spirit levels, straight edges, string lines
- Trowels
- Wheelbarrows

Materials may include:

- Aggregates
- Cement and lime, clay bricks
- Lime
- Masonry blocks
- Plywood
- Reinforcing materials
- Timber
- Waterproofing materials

Curved masonry wall may include:

- Arc centre and trammel
- Plotted points and templates

Masonry arches may include:

- Arch rings gauged and bonded
- Bull's eye and wheel
- Camber/square
- Elliptical
- Four centred
- Gothic (equilateral, lancet and modified)
- Multi-ring arches
- Segmental
- Tudor.

Competency may be assessed through a combination of:

- Demonstration
- Practical exercises
- Written or oral short answer questions.

Competency is to be assessed in the workplace or in simulated workplace environment.

CS-D9 Construct structural masonry systems

Unit details	
Functional area D	**Blocklaying, bricklaying and concreting**
Unit title	**Construct structural masonry systems**
Unit code	**CS-D9**

Description

This unit of competency describes the skills and knowledge required to construct masonry load bearing walls, including articulated masonry joints, retaining walls, columns, surrounds of service openings and engaged and isolated piers.

Elements of competency	Performance criteria
1. Plan work	1.1 Work instructions are confirmed with supervisor.
	1.2 **Tools and equipment** are selected as required, checked for serviceability and any faults are fixed or reported.
	1.3 Material quantity requirements are calculated in accordance with specifications.
	1.4 Materials needed are obtained, checked for compliance and prepared.
2. Set out **masonry structures**	2.1 Location and structural details of masonry structures are determined from plans and specifications.
	2.2 Work platform is erected in accordance workplace requirements.
	2.3 Set out area is correctly located and footing is checked for conformity to dimensions and location as per drawings and specifications.
	2.4 Masonry structure is set out from drawings and specifications.
	2.5 Mortar materials are prepared and mixed in accordance with specifications.
3. Construct **load bearing walls**	3.1 Masonry load bearing wall structure is laid to set out for base and specified bond in accordance with specifications.
	3.2 **Structural masonry** wall is constructed maintaining bond, and is completed to specifications.
	3.3 Walls are to be straight, plumb and level within standard tolerances.
	3.4 Tie down and lateral support system structures are installed to walls in accordance with plans and specifications.

4. Construct load bearing walls with **piers**	4.1 Masonry blockwork is laid to set out on reinforced concrete footing slab and to specified bond.
	4.2 Masonry blockwork gauge is determined and set out rod is prepared to gauge dimensions in accordance with specifications.
	4.3 Masonry blocks are cut to work bond and control joints.
	4.4 Columns are formed using walls and attached/engaged piers, incorporating and maintaining bond and perpendicular intersections of both vertical surfaces.
	4.5 Reinforcement material is placed and secured to form tie down, bracing and vertical supports for roof structures.
	4.6 Cores and blocks are cleaned out in preparation for the installation of formwork for concrete core filling.
	4.7 Concrete grout is mixed, placed and compacted to hollow blocks in accordance with manufacturer recommendations and specifications.
	4.8 Completed wall is to be straight, plumb and level within standard tolerances.
5. Carry out articulated masonry construction	5.1 Design principles and methods of construction using **articulation joints** are identified.
	5.2 Locations of articulation joints are identified from drawings specifications
	5.3 Type of articulation method is identified and applied in accordance with drawings, manufacturer recommendations and specifications.
6. Clean and finish mortar joints	6.1 Joints to laid face brickwork are raked or ruled to correct profile and depth in accordance with specifications.
	6.2 Blockwork is brushed down prior to drying.
7. Clean-up	7.1 Work area is cleaned and waste disposed of, reused or recycled in accordance with work specifications.
	7.2 Tools and equipment are cleaned, checked for faults and maintained and stored in accordance with workplace practices.

Evidence guide

To demonstrate competency in this unit the candidate must meet skills and knowledge requirements, plus safety and environmental requirements, as set out in the introduction to these RMCS. The candidate must be able to, from plans and specifications:

Construct a block wall, including:

- A load bearing column (390mm x 390mm) of a minimum of 1m high, including a control joint and a service opening for a door jamb with a bond beam lintel
- Cleaning cores (for installation of formwork and pouring of concrete)
- Cleaning eyes and tie downs
- Completing all work to specification
- Confirming that starter bars are correctly positioned
- Finishing wall to specifications
- Mixing, placing and compacting concrete grout
- Reinforcing with horizontal and vertical steel

Critical skills and essential knowledge

Ability to:

- apply common skills and knowledge specified in the introduction to these RMCS.

Knowledge of:

- Articulated and pier construction
- Bonding patterns and block bonding techniques
- Brick expansion and growth
- Characteristics and applications of materials for constructing masonry structural systems
- Control joints for masonry structural systems
- Plans, specifications and drawings
- Reinforcing of structures and core filling of blockwork
- Techniques for constructing masonry structural systems

Range statement

Blocklaying and bricklaying tasks*:*

- May include all clay brick (wire cut/pressed) and concrete block (hollow and solid) masonry work
- May be performed on a new construction site, an existing structure being renovated or extended or an existing structure subject to service restoration or maintenance

Tools and equipment may include

- Bolsters, brick buggies and brick grabs, brooms, buckets, builders' lines
- Concrete mixers
- Dumpy levels
- Elevators
- Forklifts
- Hammers (brickies, club and scutch), hoses
- Jig saws, jointing tools
- Line blocks and line pins
- Margin or raking tools, masonry saws, masonry squares, materials hoists, measuring tapes and rules, mortar boards
- Pallet trolleys, plumb rules, pincers
- Scaffolds, shovels, small petrol or diesel engines and compressors, spirit levels, straight edges, string lines
- Trowels
- Wheelbarrows

Masonry structure may include:

- Articulated masonry joints
- Retaining walls
- Walls, columns and surrounds of service openings

Load bearing walls may include:

- Reinforced masonry retaining walls
- Walls directly supporting roof
- Walls/bracing walls for wind loads

Structural masonry may include:

- Lateral support systems and reinforcement
- Specified wall ties

Piers may include:

- Column at a control joint
- Corner column
- End of wall column
- Straight wall column

Articulation joints may include:

- Combined flexible panel and control joint
- Compressed foam filler rods
- Compressed foam joint filler
- Compressed foam joint strips
- Flexible panel
- Full height control joint

Competency may be assessed through a combination of:

- Demonstration
- Practical exercises
- Written or oral short answer questions

Competency is to be assessed in the workplace or in simulated workplace environment.

CS-D10 Construct using tilt panels

Unit details	
Functional area D	**Blocklaying, bricklaying and concreting**
Unit title	**Construct using tilt panels**
Unit code	**CS-D10**

Description

This unit of competency describes the skills and knowledge required to work in a team to set up, pour and place concrete panels to form internal and external walls for building structures and use formwork and reinforcing materials to maintain the integrity of the structure.

Elements of competency	Performance criteria	
1. Plan work	1.1	Work instructions are confirmed with supervisor.
	1.2	**Tools and equipment** are selected as required, checked for serviceability and any faults are fixed or reported.
	1.3	Material quantity requirements are calculated in accordance with specifications.
	1.4	**Materials** needed are obtained, checked for compliance and prepared.
2. Set out and prepare **formwork** for panel	2.1	Location and size of **tilt panel** are set out to requirements of job drawings and specifications.
	2.2	Casting bed formwork is erected to specifications.
	2.3	Edge formwork is prepared, placed and fixed with plumb and alignment to specification requirements and set out.
	2.4	Form release agent is applied to formwork with mop or brush and to specifications.
	2.5	Bond breaker is applied to casting bed face or casting form face of previous panel to create ease of panel separation.
3. Place and tie **reinforcement** and cast-in fittings	3.1	Reinforcement, accessories and **cast-in fittings** are checked for conformity with design and engineering specifications.
	3.2	Reinforcement and accessories are positioned to engineering specifications and tied or welded to correct position.
4. Place, finish and cure concrete	4.1	Concrete is evenly placed and consolidated to specification using approved vibration method.
	4.2	Concrete surface is screeded and **finished** to specification ensuring cast-in fittings are clear.
	4.3	**Curing** process is applied in accordance with specification.

	4.4	Edge formwork is stripped carefully ensuring no damage to panel.
5. Erect and secure panels	5.1	Poured or prefabricated panels are progressively erected to form the structure, working with the crane driver and rigger.
	5.2	Each panel is secured in position; plumb and square according to specifications and bond the edges.
	5.3	The structure is braced and checked to ensure it is square for the roof installation, with the roof ties placed according to drawings.
	5.4	Each panel base is bolted and bonded so that there is no lateral movement off the footings.
6. Clean-up	6.1	Work area is cleaned and waste disposed of, reused or recycled in accordance with work specifications.
	6.2	Tools and equipment are cleaned, checked for faults and maintained and stored in accordance with workplace practices.

Evidence guide

To demonstrate competency in this unit the candidate must meet skills and knowledge requirements, plus safety and environmental requirements, as set out in the introduction to these RMCS. The candidate must be able to:

- construct at least one tilt panel to a minimum size of 20 square metres, complying with specifications.

Critical skills and essential knowledge

The ability to:

- apply common skills and knowledge specified in the introduction to these RMCS.

Knowledge of:

- Formwork and reinforcing component
- Levelling techniques
- Lifting inserts and ferules positioning
- Placing, finishing and curing concrete
- Specifications
- Tensile strength of concrete panels
- Tilt panel construction materials and techniques
- Tilt panel erection and propping

Range statement

Tools and equipment may include:

- Air compressors and hoses
- Edging tools
- Formwork
- Hammers
- Measuring tapes and rules, Mechanical screeds
- Nail guns
- Power drills, power leads, power saws
- Screed boards, Shovels, Spanners, Spirit levels, Squares
- Trowels, power trowels
- Vibrators
- Wheelbarrows

Materials may include:

- Bond breaker and curing compound
- Concrete
- Ferrules
- Form release agents
- Lifters
- Steel bars
- Steel mesh

Tilt panels are:

- Pre-produced panels constructed either on site or in an off-site factory location.

Formwork may include:

- Edge form timber
- Plywood

Reinforcement components may include:

- Ligatures
- Mesh
- Reinforcement bars and rods

Cast-in fittings may include:

- Services and fixtures tied to the reinforcement

Placing methods for concrete may include:

- Kibble
- Pumping equipment
- Shovelling
- Tremmies
- Truck placed
- Vibrating
- Wheelbarrows

Finishing techniques for concrete may include:

- Broom finished
- Brushed
- Bull float
- Mechanical towelling machine
- Steel trowel
- Wood float

Curing may include:

- Applied moisture
- Coating with a membrane
- Curing compound
- Flooding
- Plastic sheeting
- Steam

Competency may be assessed through a combination of:

- Demonstration
- Practical exercises
- Written or oral short answer questions

Competency is to be assessed in the workplace or in simulated workplace environment.

CS-D11 Prepare subgrade, base and bedding course for paving

Unit details	
Functional area D	**Blocklaying, bricklaying and concreting**
Unit title	**Prepare subgrade, base and bedding course for paving**
Unit code	**CS-D11**

Description

This unit of competency describes the skills and knowledge required to prepare subgrade, base and bedding course in preparation for laying paving.

Elements of competency	Performance criteria	
1. Plan work	1.1	Work instructions are confirmed with supervisor.
	1.2	**Tools and equipment** are selected as required, checked for serviceability and any faults are fixed or reported.
	1.3	Material quantity requirements are calculated in accordance with specifications.
	1.4	**Materials** needed are obtained, checked for compliance and prepared.
2. Identify soil type	2.1	Class of soil is identified using soil class charts.
	2.2	Soil is assessed to determine its properties.
	2.3	Results of penetration tests are used to determine subgrade requirements.
3. Prepare subgrade	3.1	Drainage and other features are identified within the area to be paved.
	3.2	Remedial actions are used where required.
	3.3	Drainage needs are identified and drains put in place where required.
	3.4	Services are identified in work area.
	3.5	Damp proof courses are identified and paving is constructed so that it does not compromise them.
	3.6	Components are cleaned, stacked and stored for reuse or bundled for removal.
4. Identify soil type	4.1	Class of soil is identified using soil class charts.
	4.2	Soil is assessed to determine its properties.
	4.3	Results of penetration tests are used to determine subgrade requirements.

5. Prepare subgrade	5.1	Drainage and other features are identified within the area to be paved.
	5.2	**Remedial actions** are used where required.
	5.3	Drainage needs are identified and drains put in place where required.
	5.4	Services are identified in work area.
	5.5	Damp proof courses are identified and paving is constructed so that it does not compromise them.
	5.6	Components are cleaned, stacked and stored for reuse or bundled for removal.
6. Excavate the site	6.1	Site is excavated in preparation for paving to remove top soil, weeds and their root systems.
	6.2	**Factors that determine amount of excavation** are identified.
	6.3	Bulking factor for different soil types is calculated.
7. Install base course materials	7.1	Quantity of base course materials is calculated based upon the subgrade type and purpose of the paved area.
	7.2	Material is distributed over area, allowing for compaction.
	7.3	Area is compacted, taking care not to over-compact base materials.
	7.4	Compacting machinery is handled correctly.
8. Install bedding course materials	8.1	Suitable bedding course material is selected and any geotextile materials needed for drainage or separation layers.
	8.2	**Quantity of layer course materials** is calculated.
	8.3	Bedding course is stabilised for paths with slopes of greater than 1:15.
	8.4	Transverse concrete supports are installed for driveways with a sloping pavement of greater than 5 metres.
	8.5	Material is distributed over the area to be paved within tolerances stipulated by relevant standards.
	8.6	If using bedding sand, area is compacted taking care not to over-compact base materials, and allowance is made for compaction.
	8.7	Compacting machinery is handled correctly.
	8.8	If using concrete, area to be paved is framed and concrete is mixed to manufacturer's directions and spread to required depth.
9. Screed base materials	9.1	Base materials are screeded to levels as determined, and set out by stringlines or other mechanisms.
	9.2	Excess base materials are screeded to a specified area.
10. Clean-up	10.1	Work area is cleaned and waste disposed of, reused or recycled in accordance with work specifications.
	10.2	Tools and equipment are cleaned, checked for faults and maintained and stored in accordance with workplace practices.

Evidence guide

To demonstrate competency in this unit the candidate must meet skills and knowledge requirements, plus safety and environmental requirements, as set out in the introduction to these RMCS.

Critical skills and essential knowledge

The ability to:

- apply common skills and knowledge specified in the introduction to these RMCS.

Knowledge of:

- Principles of California Bearing Ratio (CBR)
- Properties of bedding course materials
- Properties of geotextile materials
- Stabilising bedding sand

Range statement

Tools and equipment *may* include:

- Compactors, concrete mixer
- Levelling devices
- Rakes
- Screed, shovels, stringlines
- Wheelbarrows

Materials may include:

- Aggregates
- Bedding sand
- Cement, concrete, crushed rock
- Road base
- Sand

Remedial actions may include:

- Installing a capping layer
- Making drainage improvements
- Soil stabilisation

Factors determining amount of excavation may include:

- Achieving a consistent subgrade
- Compaction measurements
- Cost factors

Quantity of layer course materials is based upon:

- Purpose of the paved area (pedestrian or vehicle access)
- Subgrade type
- Type of paver

Competency may be assessed through a combination of:

- Demonstration
- Practical exercises
- Written or oral short answer questions

Competency is to be assessed in the workplace or in simulated workplace environment.

CS-D12 Lay paving

Unit details	
Functional area D	**Blocklaying, bricklaying and concreting**
Unit title	**Lay paving**
Unit code	**CS-D12**

Description

This unit of competency describes the skills and knowledge required to lay pavers on level and inclined surfaces.

Elements of competency	Performance criteria
1. Plan work	1.1 Work instructions are confirmed with supervisor.
	1.2 **Tools and equipment** are selected as required, checked for serviceability and any faults are fixed or reported.
	1.3 Material quantity requirements are calculated in accordance with specifications.
	1.4 **Materials** needed are obtained, checked for compliance and prepared.
2. Set out work area	2.1 Location and area of **paved area** are identified from plans and specifications.
	2.2 Sub-soil and footing types are identified and classified according to standards.
	2.3 Underground services are located and avoided throughout work process.
	2.4 Location and shape of paving area are set out to dimensions from plans and specifications.
3. Lay paving	3.1 Area is excavated to required depth, allowing for base and thickness of unit and specified finish level.
	3.2 Drainage pipes are positioned in sub soil in accordance with plans and specifications.
	3.3 Mortar for masonry paving is mixed to specifications and standards.
	3.4 **Substrate** base material is spread and compacted to specifications.
	3.5 **Bedding material** is spread and screeded to designed level and alignment.
	3.6 Edge boards are positioned to set out and specifications.

	3.7	Paving surface is graded to fall evenly, without ponding, to outlets or surface run-off system.
	3.8	Initial starting line is determined and pavers are laid to line conforming with specified pattern.
	3.9	Paving units and segments are cut and laid to designed pattern and specifications, with joints to specifications and surface finish aligned.
	3.10	Finished level is maintained across junctions between different finishes.
	3.11	Paving installation is completed with **joints finished** to specifications.
	3.12	Paving surface is cleaned on completion to specifications.
4. Clean-up	4.1	Work area is cleaned and waste disposed of, reused or recycled in accordance with work specifications.
	4.2	Tools and equipment are cleaned, checked for faults and maintained and stored in accordance with workplace practices.

Evidence guide

To demonstrate competency in this unit the candidate must meet skills and knowledge requirements, plus safety and environmental requirements, as set out in the introduction to these RMCS. The candidate must be able to comply with specifications to:

- pave a level area of 3m x 5m with clay pavers, using sand as a bedding material on compacted crushed rock (closed finish with sand brushed in); and
- pave an area of 3m x 5m over a fall with clay bricks, incorporating control joints and using mortar as a bedding material on concrete (mortar joints finish).

Critical skills and essential knowledge

The ability to:

- apply common skills and knowledge specified in the introduction to these RMCS.

Knowledge of:

- Apply common skills and knowledge specified in the introduction to these RMCS
- Characteristics and applications of materials for laying pavers
- Corner geometry
- Paving bonds and patterns, joints and finishing
- Plans, specifications and drawings
- Techniques for laying pavers

Range statement

Tools and equipment may include:

- Bolsters,brick buggies, buckets, builders' lines, builders squares
- Concrete mixers

- Forklifts
- Hammers, hoses
- Line blocks, line pins
- Masonry saws, mason's squares measuring tapes and rules, mortar boards
- Pallet trolleys
- Rakes and brooms, rubber mallets
- Screed boards, shovels, small petrol or diesel engines, compressors or mixers, spirit levels, straight edges, string lines
- Trowels
- Vibrating plates
- Wheelbarrows

Materials may include:

- Bedding materials
- Clay bricks and clay pavers, concrete blocks, concrete pavers
- Mortar and sand
- Paving materials
- Slate (random and regular), stone segments
- Waterproofing materials

Paved areas may include:

- Cycle and walking tracks
- Footpaths
- Malls
- Patios
- Platforms
- Ramps and inclined surfaces
- Roads
- Sports arenas

Substrate may include:

- Compacted crushed rock
- Concrete

Bedding material may include:

- Adhesives
- Bedding sand
- Cement mortar
- Mortar with adhesive additive.

Joints finished may include:

- Closed joints
- Closed joints with sand brushed in
- Mortar joints

Competency may be assessed through a combination of:

- Demonstration
- Practical exercises
- Written or oral short answer questions

Competency is to be assessed in the workplace or in simulated workplace environment.

Functional area E – Surface finishing, tiling and painting

CS-E1 Apply float and render to building surfaces

Unit details	
Functional area E	**Surface finishing, tiling and painting**
Unit title	**Apply float and render to building surfaces**
Unit code	**CS-E1**

Description

This unit of competency describes the skills and knowledge required to prepare background surfaces to ready them for plastering.

Elements of competency	Performance criteria	
1. Plan and prepare	1.1	Work instructions are confirmed with supervisor.
	1.2	**Tools and equipment** are selected as required, checked for serviceability and any faults are fixed or reported.
	1.3	Material quantity requirements are calculated in accordance with specifications.
	1.4	**Materials** needed are obtained, checked for compliance and prepared.
2. Prepare templates for curved work or circular columns	2.1	Material is selected to manufacturer templates.
	2.2	Radiuses and shapes are established for curves and columns according to plans and specifications.
	2.3	Templates are manufactured and formed to suit job requirements.
3. Prepare background surface	3.1	Background surface is identified and wire-brushed if required.
	3.2	Dash coat is mixed and applied liberally to wetted surface.
	3.3	Bonding coats using patent products are applied to specifications.
	3.4	Metal beads are selected for external or squint arises.
	3.5	Metal beads are fixed to arises and checked for accuracy.
4. Apply floating and rendering to flat and curved surfaces	4.1	Screeding lines or guides are established to specified tolerances.
	4.2	Floating coat is applied and ruled off to screed.

		4.3 Surface is finished, plumbed and levelled to specified alignment tolerance.
		4.4 Heads, reveals and sills are finished square off to wall ace and back into opening.
		4.5 Internal angles, ceiling and floor lines are accurately cut.
5.	Apply floating and rendering coats to piers	5.1 Floating coat is applied using floating profiles and rules, and Dutch pins or hooks so that face of pier is plumb and ruled off.
		5.2 Face is squared off to form returns and reveals, rules are removed and arises are left square or radiussed as required.
6.	Apply floating coat within metal beading	6.1 Metal beading is fixed to base surface to form a panel with expansion joint so that panel is plumb and square to specified position.
		6.2 Panels are finished to true, flat surfaces, suitable for applying plaster and lime setting.
7.	Finish rendering coats on flat walls, piers and curved work	7.1 Walls are hand floated to fill slacks and voids.
		7.2 Walls are scoured and fined using water and hand float systems.
8.	Clean-up	8.1 Work area is cleaned and waste disposed of, reused or recycled in accordance with work specifications.
		8.2 Tools and equipment are cleaned, checked for faults and maintained and stored in accordance with workplace practices.

Evidence guide

To demonstrate competency in this unit the candidate must meet skills and knowledge requirements, plus safety and environmental requirements, as set out in the introduction to these RMCS.

The candidate must be able to float, render and finish to specification a minimum of three surfaces, including:

- A curved wall
- A ceiling
- A column

Critical skills and essential knowledge

The ability to:

- apply common skills and knowledge specified in the introduction to these RMCS.

Knowledge of:

- Apply common skills and knowledge specified in the introduction to these RMCS
- Flat and curved surface plastering floating, rendering and finishing techniques
- Plastering
- Solid plastering terminology
- Specifications
- Systems and techniques for safe handling of materials
- Types, characteristics, uses and limitations of solid plastering materials and components

Range statement

Scope of work may include:

- Background surfaces may include concrete, concrete blockwork, brickwork, stonework, and timber or metal lathing
- Bond coating may be applied using nozzle spray, roller or brush
- Cleaning and preparation of background surfaces may include wire brushing, grinding, washing down, chipping and blast cleaning
- Floating, rendering and finishing may include horizontal, vertical and curved surfaces, including walls, reveals, sills, piers and columns
- Templates may include those for curved work and circular columns
- Wash coating may be applied using trowel, brush or nozzle spray

Tools and equipment may include:

- Brushes, buckets
- Concrete mixers and scaffolding
- Floats
- Grinders
- Hammers, hawks
- Joint rules
- Measuring tapes and rules, metal files, mortar boards and stands
- Plumb bobs and mason's squares
- Screed boards, shovels, sieves, small tools, spirit levels, squares, straight edges
- Tin snips' trowels
- Wheelbarrows, wood saws

Materials may include

- Casing beads, corner beads
- Flat marine ply, flat sheet plain galvanised iron (PGI)
- Lime, lime putty
- Nails
- Plaster compounds and finish coats
- Render and setting coats mix composition, including additives such as plasticisers, colour and waterproofing agents
- Sand
- Timber

Competency may be assessed through a combination of:

- Demonstration
- Practical exercises

- Written or oral short answer questions

Competency is to be assessed in the workplace or in simulated workplace environment.

CS-E2 Fix plasterboard walls and ceiling sheets

Unit details	
Functional area E	**Surface finishing, tiling and painting**
Unit title	**Communicate effectively in the construction industry**
Unit code	**CS-A1**

Description

This unit of competency describes the skills and knowledge required to measure, cut and fix standard plasterboard, fibre-cement wall and ceiling sheets to internal wall and ceiling frames.

Elements of competency	Performance criteria	
1. Plan and prepare	1.1	Work instructions are confirmed with supervisor.
	1.2	**Tools and equipment** are selected as required, checked for serviceability and any faults are fixed or reported.
	1.3	Material quantity requirements are calculated in accordance with specifications.
	1.4	**Materials** needed are obtained, checked for compliance and prepared.
2. Identify work requirements	2.1	Wall framing and substrate are checked to confirm suitability for the fixing work.
	2.2	Ceiling framing is checked to ensure straightness of cornice line and problems reported.
	2.3	Wall sheets are matched to wall dimensions, fixed and back blocked in accordance with requirements.
	2.4	Celling sheets are lifted, placed, supported and fixed in accordance with requirements.
3. Cut and fix wallboard sheets	3.1	Sheets are cut using approved procedures, with waste minimized.
	3.2	Sheets are hung using manufacturer's recommended methods and fasteners and fixing processes are undertaken.
4. Cut and fix ceiling sheets	4.1	Ceiling dimensions are matched to sheet size.
	4.2	Cuts are planned to locate joints where the effect of light highlighting jointing is minimized.
	4.3	Sheets are fixed using manufacturer's recommended methods and fastening systems, including back blocking.

	4.4	Completed work is checked to ensure stop-up activities will be easily completed, appropriate fastening systems have been used and work will retain structural integrity.
5. Clean-up	5.1	Work area is cleaned and waste disposed of, reused or recycled in accordance with work specifications.
	5.2	Tools and equipment are cleaned, checked for faults and maintained and stored in accordance with workplace practices.

Evidence guide

To demonstrate competency in this unit the candidate must meet skills and knowledge requirements, plus safety and environmental requirements, as set out in the introduction to these RMCS.

A person who demonstrates competency in this unit must be able to explain the reasons for:

- Butt joins between studs and back blocking the join
- Drilling or sawing openings for power points and light switches
- Lifting wall sheets off the floor and clear of windows and door openings
- Marking wires without brackets as directed by the builder
- Positioning joins over windows and doors away from the corner of the opening
- Using paper tape
- Using temporary surface fixing of wallboard

Critical skills and essential knowledge

The ability to:

- apply common skills and knowledge specified in the introduction to these RMCS.

Knowledge of:

- Plasterboard adhesives and fixings
- Plasterboard fixing techniques
- Plasterboard materials

Range statement

Tools and equipment may include:

- Broad knives, brooms
- Electric screw guns
- Hand and power drills hand saws
- Keyhole saws
- Measuring tapes and rules
- Paintbrushes, plasterboard hammers, plasterer's trowels
- Scaffold planks
- T squares, taping knives, trestles

Materials may include:

- Beads
- Cement render
- Fibre cement sheets, finishing materials
- Plaster compounds, plasterboard, plaster glass sheets
- Water resistant plasterboard

Competency may be assessed through a combination of:

- Demonstration

- Practical exercises
- Written or oral short answer questions

Competency is to be assessed in the workplace or in simulated workplace environment.

CS-E3 Finish plasterboard joins and surfaces

Unit details	
Functional area E	**Surface finishing, tiling and painting**
Unit title	**Finish plasterboard joins and surfaces**
Unit code	**CS-E3**

Description

This unit of competency describes the skills and knowledge required to finish plasterboard joins to comply with manufacturer instructions and work specifications.

Elements of competency	Performance criteria
1. Plan and prepare	1.1 Work instructions are confirmed with supervisor.
	1.2 **Tools and equipment** are selected as required, checked for serviceability and any faults are fixed or reported.
	1.3 Material quantity requirements are calculated in accordance with specifications.
	1.4 **Materials** needed are obtained, checked for compliance and prepared.
2. Select materials, processes and equipment	2.1 Specifications and work requirements are compared and any variations identified.
	2.2 Equipment and processes are selected to match tasks.
	2.3 Base coat, cements and tapes compatible with system performance are selected from manufacturer specifications.
3. **Finish** joins	3.1 Joins are finished to specifications using techniques appropriate to the joint system, correctly following work sequencing and manufacturer recommendations.
	3.2 Completed work is checked to ensure work will meet specifications and workplace standards.
4. Clean-up	4.1 Work area is cleaned and waste disposed of, reused or recycled in accordance with work specifications.
	4.2 Tools and equipment are cleaned, checked for faults and maintained and stored in accordance with workplace practices.

Evidence Guide

To demonstrate competency in this unit the candidate must meet skills and knowledge requirements, plus safety and environmental requirements, as set out in the introduction to these RMCS. The candidate must be able to:

- plan and execute work within agreed timeframe and to a high standard; and
- select and use appropriate finishing materials and work methods.

Critical skills and essential knowledge

The ability to:

- apply common skills and knowledge specified in the introduction to these RMCS.

Knowledge of:

- Identify and read manufacturers' product installation procedures and work specifications
- Identify by name and function equipment, components and materials
- Identify faults in operation of equipment or materials quality

Range statement

Tools and equipment may include:

- Broad knives, brooms
- Electric screw guns
- Hand and power drills hand saws,
- Keyhole saws
- Measuring tapes and rules
- Paintbrushes, plasterboard hammers, plasterer’s trowels
- Scaffold planks
- T squares, taping knives, trestles

Materials may include:

- Beads
- Cement render
- Fibre cement sheets, finishing materials
- Plaster compounds, plasterboard, plaster glass sheets
- Water resistant plasterboard

Finishing techniques may include:

- Join finishing materials
- Processes for finishing system joins
- Quality checks for joint finishing
- Work sequence

Joint finishing specifications may include:

- Employer-approved manual handling techniques
- Manufacturer's recommended methods and materials

Competency may be assessed through a combination of:

- Demonstration
- Practical exercises
- Written or oral short answer questions

Competency is to be assessed in the workplace or in simulated workplace environment.

CS-E4 Cut and fix cornices

Unit details	
Functional area E	**Surface finishing, tiling and painting**
Unit title	**Cut and fix cornices**
Unit code	**CS-E4**

Description

This unit of competency describes the skills and knowledge required to measure, cut and fix paper-faced cornices to interior walls and ceiling joins.

Elements of competency	Performance Criteria
1. Plan and prepare	1.1 Work instructions are confirmed with supervisor.
	1.2 **Tools and equipment** are selected as required, checked for serviceability and any faults are fixed or reported.
	1.3 Material quantity requirements are calculated in accordance with specifications.
	1.4 **Materials** needed are obtained, checked for compliance and prepared.
2. Plan and measure for cornice work	2.1 Style of paper-faced cornice to be fitted is determined from work instructions.
	2.2 Cornice length for each work area is determined and noted.
3. Cut cornice lengths	3.1 Noted measurements are transferred to cornice stock, allowing for mitre requirements.
	3.2 Cornice is cut using workplace-approved guides and cutting methods.
4. Fix cornice	4.1 Cornice is held temporarily in place at the wall or ceiling junction are planned and used following workplace-approved procedures.
	4.2 Adhesive is prepared according to manufacturer instructions and applied to cornice.
	4.3 Cornice is fitted following workplace-approved practices.
5. Clean-up	5.1 Work area is cleaned and waste disposed of, reused or recycled in accordance with work specifications.
	5.2 Tools and equipment are cleaned, checked for faults and maintained and stored in accordance with workplace practices.

Evidence guide

To demonstrate competency in this unit the candidate must meet skills and knowledge requirements, plus safety and environmental requirements, as set out in the introduction to these RMCS. The candidate must be able to:

- explain the reasons for use of cornice reinforcing systems;
- identify problems in fitting cornices and suggest appropriate alternative rectifications; and
- select and use appropriate cornice materials and work methods.

Critical skills and essential knowledge

The ability to:

- apply common skills and knowledge specified in the introduction to these RMCS.

Knowledge of:

- Application of product and process knowledge
- Identifying by name and general application paper-faced and handmade cornices
- Identifying faults in materials
- Manufacturers' procedures and specifications for mixing adhesives, and fixing and cutting cornices

Range statement

Tools and equipment may include:

- Broad knives, brooms
- Electric screw guns
- Hand and power drills hand saws
- Keyhole saws
- Measuring tapes and rules
- Paintbrushes, plasterboard hammers, plasterer’s trowels
- Scaffold planks
- T squares, taping knives, trestles

Materials may include:

- Beads
- Cement render
- Fibre cement sheets, finishing materials
- Plaster compounds, plasterboard, plaster glass sheets
- Water resistant plasterboard .

Competency may be assessed through a combination of:

- Demonstration
- Practical exercises
- Written or oral short answer questions

Competency is to be assessed in the workplace or in simulated workplace environment.

CS-E5 Waterproof wet areas

Unit details	
Functional area E	**Surface finishing, tiling and painting**
Unit title	**Waterproof wet areas**
Unit code	**CS-E5**

Description

This unit of competency describes the skills and knowledge required to apply waterproofing membranes to a range of substrates, used in bathrooms, laundries, showers and other internal wet areas.

Elements of competency	Performance criteria	
1. Plan and prepare	1.1	Work instructions are confirmed with supervisor.
	1.2	**Tools and equipment** are selected as required, checked for serviceability and any faults are fixed or reported.
	1.3	Material quantity requirements are calculated in accordance with specifications.
	1.4	**Materials** needed are obtained, checked for compliance and prepared.
2. Determine waterproofing system	1.1	Area of structure to be waterproofed is inspected for defects and soundness.
	1.2	Appropriate waterproofing systems and products are selected and checked for suitability; conformity to specification; and compatibility with surface material, preparation and waterproofing installation technique.
	1.3	Termination detailing is determined.
	1.4	Type of waterproofing material is identified in accordance with job specification and state of structure.
3. Prepare for waterproofing installation	3.1	Wet area and fitment or fixtures are checked for measurements and set out in accordance with drawings and specifications.
	3.2	Substrate is checked for soundness of fit, curing compounds, moisture content and other contaminants, and reported or remedied as required.
	3.3	Flooring installation levels and falls to waste outlets are checked for conformity to specification.
	3.4	Corner flashing is installed in accordance with manufacturer recommendations.
	3.5	Points of connection, termination detailing and over flashings as required are checked to be in place and secure.

	3.6	Rebates for baths and basins are checked for compliance with standards.
4. Prepare **substrate**	4.1	Defects are corrected in accordance with manufacturer specifications, to bring substrate to a smooth and uniform finish.
	4.2	Surface of structure to be waterproofed is prepared to manufacturers' specification, including fixings and belling out around taps.
	4.3	Water stops and hobs are installed in required location in compliance with standards and good building practice.
	4.4	Prepared surface of structure is prime coated to manufacturers' specification, where applicable.
5. Apply waterproofing	5.1	Waterproofing membrane is applied to primed surface of structure to correct thickness and in accordance with manufacturers' job specification.
	5.2	Appropriate bond breakers and fillets are applied as required in accordance with manufacturer specifications.
	5.3	Waterproofing membrane is cured in accordance with manufacturers' specification and workplace requirements.
	5.4	Flood testing of installation is conducted if required.
	5.5	Waterproofing system and materials are protected using methods and materials consistent with manufacturers' specification.
	5.6	Final inspection of site is undertaken in accordance with workplace requirements.
6. Clean-up	6.1	Work area is cleared and materials disposed of, reused or recycled in accordance with legislation, regulations, codes of practice and job specification.
	6.2	Tools and equipment are cleaned, checked, and stored in accordance with manufacturer recommendations and standard work practices.

Evidence guide

To demonstrate competency in this unit the candidate must meet skills and knowledge requirements, plus safety and environmental requirements, as set out in the introduction to these RMCS. The candidate must be able to:

- install and detail a hobless frame shower enclosure and a bath that abuts a masonry connection wall, completing work to specification; and
- waterproof a bathroom incorporating lap up a wall, appropriate penetrations and wastes and hobs.

Critical skills and essential knowledge

The ability to:

- apply common skills and knowledge specified in the introduction to these RMCS.

Knowledge of:

- Assessment of moisture content in substrate materials
- Characteristics and applications of waterproofing materials and adhesives
- Construction systems and waterproofing considerations
- Identify faults in operation of equipment or materials quality
- Internal waterproofing materials, processes and techniques
- Principles and considerations of water exclusion
- Termination and flashing principals

Range statement

Substrates may include:

- Concrete materials
- Blockwork
- Brickwork
- Cement render
- Ferrous and non - ferrous piping
- Fibrous cement sheeting
- Precast concrete
- Polyvinyl chloride (PVC)
- Reinforced-in-situ concrete
- Timber and timber-based products and wet - area plasterboard

Tools and equipment may include:

- Angle grinders
- Broad knives, brooms, brushes, buckets
- Caulking guns, chisels, including cold chisels, cutting blades
- Electric drills and screwdrivers
- Fans, floor scrapers, fusion rollers
- Hammers, heat welders, hot air welders
- Lights
- Measuring tapes and rules, moisture meters
- Nylon rollers
- Pressure rollers
- Scissors, seam probes, solvent applicators spirit levels, straight edges

Materials may include:

- Adhesives
- Drainage cell
- Liquid applied, including acrylic, cementations-based, injection, polyurethane
- Protection board
- Sheet, including:
    - Bentonite composites
    - Butanol
    - Ethylene cop bitumen (ECB)
    - Ethylene propylene diene monomer rubber (EPDM)
    - Polyvinyl chloride (PVC)
- Substrate primer

Competency may be assessed through a combination of:

- Demonstration
- Practical exercises
- Written or oral short answer questions

Competency is to be assessed in the workplace or in simulated workplace environment.

CS-E6 Prepare surfaces for tiling

Unit details	
Functional area E	**Surface finishing, tiling and painting**
Unit title	**Prepare surfaces for tiling**
Unit code	**CS-E6**

Description

This unit of competency describes the skills and knowledge required to repair and prepare different substrates for wall and floor tiling applications. It may include the preparation of materials and substrates for the tiling process.

Elements of competency	Performance criteria
1. Plan and prepare	1.1 Work instructions are confirmed with supervisor.
	1.2 **Tools and equipment** are selected as required, checked for serviceability and any faults are fixed or reported.
	1.3 Material quantity requirements are calculated in accordance with specifications.
	1.4 **Materials** needed are obtained, checked for compliance and prepared.
2. Prepare materials for tiling application	2.1 Floor and wall tiling materials are checked to ensure they are suitable and meet specifications.
	2.2 Material preparation is carried out to satisfy the requirements of the specified application process.
3. Prepare underlay and sheeting **substrate**	3.1 Assistance with **underlay** preparation is provided under supervision.
	3.2 **Substrate surface** is finished to specification, with joints flush and sealed.
4. Prepare render substrate surface	4.1 **Surface-mounted construction** units and attachments are safely detached.
	4.2 **Surfaces** of substrate structure are cleaned to remove all loose material.
	4.3 Materials for splash coat are proportioned and mixed to instructions ready for application to wet surface.
	4.4 Horizontal and vertical surrounds are prepared for tiling process in accordance with **type of tile** and specified finish.
	4.5 Materials for render coat are proportioned and mixed to instructions ready for application.

	4.6	Surface is scratched, rendered, cured and dried in accordance with specifications for tile application.
5. Clean-up	5.1	Work area is cleaned and waste disposed of, reused or recycled in accordance with work specifications.
	5.2	Tools and equipment are cleaned, checked for faults and maintained and stored in accordance with workplace practices.

Evidence guide

To demonstrate competency in this unit the candidate must meet skills and knowledge requirements, plus safety and environmental requirements, as set out in the introduction to these RMCS.

The candidate must be able to use a combination of underlay, render and mechanical and chemical techniques, prepare a:

- Prepare a bathroom work area for wall and floor tiling
- Prepare a concrete bathroom floor and pointed fibre cement sheet wall for tiling
- Prepare a timber bathroom floor and pointed fibre cement sheet wall for tiling

Critical skills and essential knowledge

The ability to:

- apply common skills and knowledge specified in the introduction to these RMCS.

Knowledge of:

- Surface preparation materials and techniques

Range statement

Tools and equipment may include*:*

- Brooms, Brushes, Buckets
- Caulking guns, Cement sheet cutters, Concrete mixers
- Electrical leads
- Hammers, Hose and water sprays
- Ladders, Levelling equipment, Lump hammers
- Measuring tapes and rules, mortar boards
- Nippers
- Pointed grouters, Power drills, power screwdrivers, power grinders, power sanders
- Power grinders and sanders
- Rags, rubber mallets
- Sanding blocks, saws, scrapers, shovels, spacers and wedges
- Spatulas, sponges, squares, squeegees, straight edges, stringlines
- Trowels
- Wet and dry diamond saws, wheelbarrows, wire brushes, wooden floats
- Work platforms

Materials may include:

- Acoustic underlay material, adhesives
- Caulking compound, cement mortar (with and without additives)
- Clouts, cornice adhesive, crack suppression membrane
- Fixings and fasteners
- Patching materials, plasterboard nails, pre-mixed and mixed fillers
- Sand and cement, self-tapping screws, soft sheet nails
- Wall board adhesive

Substrate preparation may include:

- Chemical and mechanical preparation of surfaces
- Rendering to provide a flat surface
- Use of underlay material

Underlay material may be:

- Acoustic
- In sheet or liquid form
- Provide for crack suppression (in membrane form)

Substrate surface materials may include:

- Fibre cement sheets or other lining material or cladding of a similar nature
- Painted surfaces
- Pre-cast cladding
- Solid plaster
- Stone, concrete, timber, waterproof plasterboard, masonry and brick/block
- Terrazzo
- Wall and floor tiles

Surface-mounted construction may include:

- Aluminium framework fixing, attachment of steel brackets or fabricated units
- Brick or block walls or abutments
- Curtain walling fixing
- Fitment units, formwork and false work construction
- Light steel partition walls
- Stair installations
- Timber partition walls

Surfaces may include:

- Blockwork, brickwork
- Ceramic or fibro cement underlay, concrete walls
- Fibre cement sheet
- Rendered surfaces
- Timber
- Other approved waterproof surfaces

Types of tiles may include:

- Ceramic
- Glass
- granite
- Marble
- Porcelain
- Stone
- Terracotta

Competency may be assessed through a combination of:

- Demonstration
- Practical exercises
- Written or oral short answer questions

Competency is to be assessed in the workplace or in simulated workplace environment.

CS-E7 Lay floor tiles

Unit details	
Functional area E	**Surface finishing, tiling and painting**
Unit title	**Lay floor tiles**
Unit code	**CS-E7**

Description

This unit of competency describes the skills and knowledge required to floor tiles, including cutting, fixing and grouting to different substrates using mortar or adhesive.

Elements of competency	Performance criteria
1. Plan and prepare	1.1 Work instructions are confirmed with supervisor.
	1.2 **Tools and equipment** are selected as required, checked for serviceability and any faults are fixed or reported.
	1.3 Material quantity requirements are calculated in accordance with specifications.
	1.4 **Materials** needed are obtained, checked for compliance and prepared.
2. Set out tiling job	2.1 Area to be tiled is prepared to requirements of job specification in accordance with workplace procedures.
	2.2 Tiles are checked for conformity to size, patterns, colours and characteristics in accordance with specifications.
	2.3 Tile work is set out to be symmetrical and balanced, and to produce minimal waste.
	2.4 Waterproof membrane is fitted and laid in wet areas to conform to manufacturer specifications.
3. Cut tiles as required	3.1 **Tiles** are cut without jagged, flaid edges or damage to tile surfaces or finish, in accordance with workplace procedures.
	3.2 Recess hole or curve is cut by hand or machine to shape and size and to specified tolerance.
	3.3 Tile jolly is edged to form a mitre so that biscuit is not exposed at the joint.

4. Lay and fix floor tiles	4.1 Floor is checked for level/falls and square
	4.2 Membranes or underlay are installed in accordance with workplace procedures and manufacturer recommendations.
	4.3 **Substrate** surface is prepared free from contaminants and residues to receive adhesive or screeded mortar, in accordance with specifications.
	4.4 Adhesive is matched with tile and **substrate** material and mixed according to usage, climatic conditions and manufacturer specifications.
	4.5 Cement mortar is prepared to appropriate consistency and floor is slurried and screeded to specifications.
	4.6 Tiles are laid and fixed, maintaining bond with joints that are uniform in size and a finished surface that is flat and smooth or to fulls.
	4.7 Control joints are inserted in accordance with manufacturer specifications.
5. Tile treads, risers, steps and thresholds	5.1 Step rises and goings are determined from formed concrete steps/stairs.
	5.2 Steps are set out for uniform rise and make even cut on both sides of steps.
	5.3 Step riser packing or render support is fixed where applicable and riser tiles are **fixed** to true alignment and uniform set out.
	5.4 Treads infill and thresholds are fixed in line with the top edge of risers within specified tolerances.
6. **Grou**t and seal tiles	6.1 Joints are cleaned and prepared to receive grout according to manufacturer specifications.
	6.2 Grout is mixed and applied in accordance with manufacturer specifications.
	6.3 Tiles are cleaned and polished with dry cloth, removing all dust from surface and joints.
	6.4 Tiles are sealed and protected in accordance with specifications.
7. Clean-up	7.1 Work area is cleaned and waste disposed of, reused or recycled in accordance with work specifications.
	7.2 Tools and equipment are cleaned, checked for faults and maintained and stored in accordance with workplace practices.

Evidence guide

To demonstrate competency in this unit the candidate must meet skills and knowledge requirements, plus safety and environmental requirements, as set out in the introduction to these RMCS. The candidate must be able to, as a minimum:

- tile 4 square metres of a concrete bathroom floor using a sand and cement mortar mix;
- tile 4 square metres of a timber floor, laid on the diagonal with a half tile border, using adhesive;
- tile 4 square metres of a concrete floor with marble tiles, using adhesive; and
- tile a minimum of three steps of 900mm width and 115mm risers and treads, including an expansion joint.

Critical skills and essential knowledge

The ability to:

- apply common skills and knowledge specified in the introduction to these RMCS.

Knowledge of:

- Techniques in fixing tiles to floors and step/stairs, including preparation of substrates
- Tiling materials, including tiles, adhesives, mortar, grouting and substrates, their qualities, characteristics, preparation, techniques, applications, limitations and finishing

Range statement

Tools and equipment may include:

- Brooms, brushes, buckets
- Caulking guns, cement sheet cutters
- Hammers, hose and water sprays
- Ladders levelling equipment lump hammers
- Measuring tapes and rules, mortar boards
- Nippers
- Pointed grouters, power drills, power leads
- Rags, rubber mallets
- Sanding blocks, saws, scrapers, shovels, spacers and wedges, spatulas, sponges, squares squeegees, straight edges, stringlines
- Tile cutters and scribes, trowels
- Wet and dry diamond saws, wheelbarrows wire brushes wooden floats

Tools and equipment may include:

- Concrete mixers
- Masonry drill bits
- Power grinders, power sanders

Materials may include:

- Adhesives
- Caulking compounds, cement mortar (with and without additives)
- Grout
- Sealers
- Tiles

Types of **tiles** may include:

- Ceramic
- Glass
- Granite
- Marble
- Porcelain
- Stone
- Terracotta

Substrates may include:

- Approved waterproof substrates
- Compressed fibre cement (CFC) sheeting, concrete
- Fibre cement underlay
- Rendered concrete
- Timber.

Tiles are **fixed** using:

- Adhesives
- Cement mortar
- Cement mortar with adhesive additive

Grout may be:

- Cementitious
- Epoxy

Competency may be assessed through a combination of:

- Demonstration
- Practical exercises
- Written or oral short answer questions

Competency is to be assessed in the workplace or in simulated workplace environment.

CS-E8 Fix wall tiles

Unit details	
Functional area E	**Residential plumbing**
Unit title	**Fix wall tiles**
Unit code	**CS-E8**

Description

This unit of competency describes the skills and knowledge required to fix wall tiles to differing substrates, using mortar or adhesive.

Elements of competency	**Performance criteria**
1. Plan and prepare	1.1 Work instructions are confirmed with supervisor.
	1.2 **Tools and equipment** are selected as required, checked for serviceability and any faults are fixed or reported.
	1.3 Material quantity requirements are calculated in accordance with specifications.
	1.4 **Materials** needed are obtained, checked for compliance and prepared.
2. Set out tiling job	2.1 Area to be tiled and **substrate** are prepared to requirements of job specification and in accordance with workplace procedures.
	2.2 Tiles are checked for conformity to size, patterns, colours and characteristics in accordance with plans and specifications.
	2.3 Tile work grid patterns are determined and set out to be symmetrical and balanced, and to produce minimal waste in accordance with specifications and standards.
	2.4 Waterproof membrane is fitted and laid in wet areas to conform to manufacturer specifications and regulatory requirements.
3. Cut tiles as required	3.1 **Tiles** are cut without jagged, flaid edges or damage to tile surfaces or finish, in accordance with workplace procedures and manufacturer recommendations.
	3.2 Recess hole or curve is cut by hand or machine to shape and size and to specified tolerance.
	3.3 Tile jolly is edged to form a mitre so that biscuit is not exposed at the joint in accordance with workplace procedures and manufacturer recommendations.
4. Fix wall tiles	4.1 Mortar and/or adhesive is prepared and applied to tile surface in accordance with manufacturer recommendations.
	4.2 Tiles are prepared and fixed, with pad tiles set to level alignment.

		4.3 Horizontal joint is checked for straightness, and tile edges and surface alignment are checked for conformity.
		4.4 Tiles are fixed to alignment maintaining designed pattern to specification.
		4.5 Even margins are shown around openings, frames and fittings to specification.
		4.6 Bottom course is cut and fixed to create a rake or square corner in accordance with drawings and specifications.
		4.7 Splayed, manufactured, formed coves are fixed in accordance with drawings and specifications.
		4.8 Vertical tiles are finished plumb and true to square corners.
		4.9 Joints are maintained straight and uniform in width with due allowance for tolerance of tile sizes.
		4.10 Control joints are built in, in accordance with specifications and manufacturer recommendations.
		4.11 Mitre joints are made, maintaining glazing on mitre without damage to tile surfaces or finish and maintaining uniformity of mitre in accordance with company procedures and manufacturer recommendations.
5.	Tile external corners.	5.1 Setting out for plumb, level and square is checked to be within specified tolerance.
		5.2 External corners are checked to ensure surface intersections are straight.
		5.3 Curved bead angle trim or tiles are fixed so that external return and bead are square and measurements are accurate to junction with tiles and set out, where applicable.
		5.4 Tiles are fixed with minimum voids in tile bed while maintaining fully bedded alignment to specifications.
		5.5 Corner is kept square within specified tolerance and finish to specifications.
6.	Tile internal corners	6.1 Internal corner is checked to ensure surfaces are flat and intersection is straight.
		6.2 Tiles are cut where required and fixed to one wall to maintain alignment in accordance with set out and specifications.
		6.3 Tiles are cut where required and fixed abutting adjacent wall tiles to line, set out and specifications.
		6.4 Joints for abutting tiles are made in accordance with designed margin for grouting or for expansion joint, where applicable, to specifications.

		6.5 Coved tile or trim is installed to coved internal wall or wall and floor junctions.
		6.6 Coved tile or trim is installed so that line is straight and, where applicable, aligned with set out.
		6.7 Tiles are fixed to cove tile or trim and finish to alignment and specifications.
7.	Grout wall tile face	7.1 Joints are cleaned and prepared to receive grout according to manufacturer specifications.
		7.2 Grout is mixed and applied in accordance with workplace and manufacturer specifications and to meet job requirements.
		7.3 Tiles are cleaned and polished with dry cloth to specifications, removing all dust from surface and joints.
8.	Clean-up	8.1 Work area is cleaned and waste disposed of, reused or recycled in accordance with work specifications.
		8.2 Tools and equipment are cleaned, checked for faults and maintained and stored in accordance with workplace practices.

Evidence guide

To demonstrate competency in this unit the candidate must meet skills and knowledge requirements, plus safety and environmental requirements, as set out in the introduction to these RMCS. The candidate must be able to:

- tile the front and return of a standard framed or bricked bath, including a straight hob between the bath and wall, using adhesive or mortar to fix the tiles; tiles are not to be proud of the bath and coving to floor is to allow for control joints as required.

Critical skills and essential knowledge

The ability to:

- apply common skills and knowledge specified in the introduction to these RMCS.

Knowledge of:

- Control joints
- Techniques in fixing tiles to walls and corners, including preparation of substrates
- Tiling materials, including tiles, adhesives, mortar, grouting and substrates, their qualities, characteristics, preparation, techniques, applications, limitations and finishing

Range statement

Tools and equipment may include:

- Brooms, brushes, buckets
- Caulking guns, cement sheet cutters, concrete mixers
- Hammers, hose and water sprays
- Ladders, levelling equipment, lump hammers
- Measuring tapes and rules, mortar boards, masonry drill bits
- Nippers
- Pointed grouters, power drills, power leads
- Rags, rubber mallets
- Sanding blocks, saws, scrapers, shovels, spacers and wedges, spatulas, sponges, squares squeegees, straight edges, stringlines
- Tile cutters and scribes, trowels
- Wet and dry diamond saws, wheelbarrows, wire brushes, wooden floats
- Power grinders, power sanders

Materials may include:

- Adhesives
- Caulking compound
- Cement mortar (with and without additives)
- Grout
- Tiles

Substrate may include:

- Approved waterproof substrates
- Blockwork brickwork
- Concrete
- Fibre cement sheet
- Rendered surfaces
- Timber

Types of **tiles** may include:

- Ceramic
- Glass
- Granite
- Marble
- Porcelain
- Stone
- Terracotta

Competency may be assessed through a combination of:

- Demonstration
- Practical exercises
- Written or oral short answer questions

Competency is to be assessed in the workplace or in simulated workplace environment.

CS-E9 Prepare surfaces for painting

Unit details	
Functional area E	**Surface finishing, tiling and painting**
Unit title	**Prepare surfaces for painting**
Unit code	**CS-E9**

Description

This unit of competency describes the skills and knowledge required to restore, repair and prepare different material surfaces for the application of paint.

Elements of competency	Performance criteria
1. Plan and prepare	1.1 Work instructions are confirmed with supervisor. 1.2 **Tools and equipment** are selected as required, checked for serviceability and any faults are fixed or reported. 1.3 Material quantity requirements are calculated in accordance with specifications. 1.4 Materials needed are obtained, checked for compliance and prepared.
2. Prepare new or uncoated surfaces for painting or clear finish	2.1 Suitability of surface for painting or clear finish application is determined in accordance with manufacturer recommendations. 2.2 Surface preparation method is correctly selected in accordance with the environment, finish and substrate requirements. 2.3 Surface is prepared to manufacturer specifications in compliance with substrate requirements. 2.4 Surface imperfections are stopped, filled and sanded to a smooth finish ready for painting.
3. Prepare previously coated surfaces for painting or clear finish	3.1 Condition and nature of **existing substrate** and surface material are determined and **tested**. 3.2 **Surface preparation** method is correctly selected in accordance with the environment, finish and substrate requirements. 3.3 Surfaces are prepared by removing unwanted coatings and loose debris. 3.4 Surface defects are repaired, filled and sanded to smooth finish ready for painting in accordance with specifications.
4. **Remove wallpaper** and prepare surface for painting	4.1 Type, condition and nature of existing type of wallpaper are determined prior to removal. 4.2 Surface preparation method is correctly selected in accordance with the environment, finish and substrate requirements.

		4.3 **Wallpaper is removed** using the most appropriate method.
		4.4 Surfaces are prepared for paint application by removing loose debris.
		4.5 Surface defects are repaired and imperfections stopped, to smooth finish ready for painting in accordance with specifications.
5.	Clean-up	5.1 Work area is cleared and materials disposed of, reused or recycled in accordance with legislation, regulations, codes of practice and job specification.
		5.2 Tools and equipment are cleaned, checked, and stored in accordance with manufacturer recommendations and standard work practices.

Evidence guide

To demonstrate competency in this unit the candidate must meet skills and knowledge requirements, plus safety and environmental requirements, as set out in the introduction to these RMCS.

The candidate must be able to prepare a minimum of four surfaces for painting to specification:

- A new gyprock surface of a minimum 8 square metres and one new surface of a minimum of 1 square metre or 8 lineal metres
- Remove wallpaper from a room, cubicle or equivalent and prepare the surface for painting
- Three previously coated surfaces with one an external timber surface, one an internal surface and one a metal or masonry surface

Critical skills and essential knowledge

The ability to:

- apply common skills and knowledge specified in the introduction to these RMCS.

Knowledge of:

- Paint application testing procedures
- Prevention and/or rectification procedures for surface coating defects
- Procedures, products and techniques associated with preparation of surfaces and wallpaper removal
- Properties and surface preparation requirements of new substrates
- Required protection for application of clear or stained finishes
- Surface coating technology

Range statement

Tools and equipment may include:

- Drop sheets, duster brushes
- Filling knives and blades
- Hammers, hand sanders, heat removal equipment
- Mechanical sanders
- Nail punches
- Putty knives
- Scrapers
- Water blasters, wire brushes

Existing substrate and surface may be contaminated with:

- Dust
- Films of grease
- Mild chalking, mild efflorescence, mould
- Paint films that are:
  - Blistering
  - Cracking
  - Flaking
  - Peeling
  - Smoke damaged

Tested may include:

- Adhesion test
- Solvent test
- Testing procedures to determine the presence of lead-based paints and asbestos

Surface preparation method may include:

- Chemical stripping
- Grinding
- Sanding, Scraping (mechanical and hand)
- Use of heat guns
- Washing down
- Water blasting

Wallpaper removal methods may include:

- Dry stripping
- Soaking
- Steam stripping

Competency may be assessed through a combination of:

- Demonstration
- Practical exercises
- Written or oral short answer questions

Competency is to be assessed in the workplace or in simulated workplace environment.

CS-E10 Paint by spray, brush and roller

Unit details	
Functional area E	**Surface finishing, tiling and painting**
Unit title	**Paint by spray, brush and roller**
Unit code	**CS-E10**

Description

This unit of competency describes the skills and knowledge required to apply brushed, rolled or sprayed paint coatings to different materials to form a protective and decorative finish.

Elements of competency	Performance criteria	
1. Plan and prepare	1.2	Work instructions are confirmed with supervisor.
	1.3	**Tools and equipment** are selected as required, checked for serviceability and any faults are fixed or reported.
	1.4	Material quantity requirements are calculated in accordance with specifications.
	1.5	**Materials** needed are obtained, checked for compliance and prepared.
2. Prepare work area	2.1	Materials and substrate surfaces are prepared in accordance with manufacturer recommendations.
	2.2	Surfaces not to be painted are protected by drop sheets, masking or removal of objects.
	2.3	Adequate ventilation is provided to maintain a safe environment.
3. Mix paint colour	3.1	Base colour is identified by sample analysis or specification, and correct tint base, paint type and sheen level determined.
	3.2	Colourants suitable for the colour match are selected, mixed with the base, allowed to dry and matched against the sample/specification for accuracy.
	3.3	Materials for specified **paint finish** are mixed in accordance with manufacturer recommendations.
	3.4	Correct amounts of paint material are prepared to specified ratio and drying time in accordance with manufacturer specifications.
4. Apply paint with brush or roller	4.1	Brush and/or roller is selected to suit specified surface profile, size of area, type of paint and finish specified.
	4.2	Sealant, undercoat, intermediate coat and finish coat are applied by brush/roller to achieve the required level of opacity, finish, texture and sheen, in accordance with specifications.

5.	Apply paint by spray	5.1 Appropriate spray equipment, accessories and lines are selected and set up for operation in accordance with the manufacturer's recommendations.
		5.2 Paint is mixed and the viscosity adjusted to allow for spray painting.
		5.3 Paint is applied to achieve correct **finish specifications.**
6.	Finish the application	6.1 Finished paint surface is cured and tested using curing method in accordance with manufacturer recommendations.
		6.2 Doors, windows and furniture removed for painting application are re-installed correctly and without damage to finished surfaces.
7.	Clean-up	7.1 Work area is cleaned and waste disposed of, reused or recycled in accordance with work specifications.
		7.2 Tools and equipment are cleaned, checked for faults and maintained and stored in accordance with workplace practices.

Evidence guide

To demonstrate competency in this unit the candidate must meet skills and knowledge requirements, plus safety and environmental requirements, as set out in the introduction to these RMCS.

The candidate must be able to apply paint to finish specifications to a range of surfaces, including:

- A minimum application of six square metres brushed or rolled
- A timber panel door
- A timber window, including architrave and frame with moving parts
- Four different surface types

Critical skills and essential knowledge

The ability to:

- apply common skills and knowledge specified in the introduction to these RMCS.

Knowledge of:

- Compatibility of preparatory materials and paint systems
- Hazards associated with solvents, chemicals and dust
- Surface coating technology, including specification of paint systems for interior and exterior painting projects to maximise durability, protection and aesthetic considerations
- Testing techniques and support materials
- Theoretical principles relating to adhesion and cohesion of paint
- Theoretical principles relating to pigmentation and colouring agents, drying and curing processes and the role of solvents

Range statement

Tools and equipment may include:

- Brushware, brushware accessories
- Compressor, conventional spray unit
- Diaphragm, drop sheets, duster brushes
- Filling knives and blades filters
- Hand sanders, heat and flame paint removal equipment
- High-volume low-pressure (hvlp) spray application, hose
- Masking equipment, mechanical sanders
- Nail punches
- Paint pots and buckets, paint stirrers
- Piston airless spray unit (electrical, pneumatic and petrol), putty knives
- Regulator, roller frames
- Scrapers, spray equipment, spray guns, spray tips
- Wire brushes

Materials may include:

- Beads
- Adhesives
- Cleaning solvents
- Fillers

Paint finishes may include:

- Alternative and natural paints
- Latex/acrylics
- Low odour, low-volatile-organic compound (VOC) paint
- No-VOC paint, non-toxic paint
- Solvent-based
- Two-pack
- Water repellent for timber, water-based

Finish specifications include:

- Defects
- Thickness
- Colour
- Level of opacity
- Finish
- Texture
- Sheen

Competency may be assessed through a combination of:

- Demonstration
- Practical exercises
- Written or oral short answer questions

Competency is to be assessed in the workplace or in simulated workplace environment.

CS-E11 Apply stains and clear timber finishes

Unit details	
Functional area E	**Surface finishing, tiling and painting**
Unit title	**Apply stains and clear timber finishes**
Unit code	**CS-E11**

Description

This unit of competency describes the skills and knowledge required to apply stains and clear timber finishes to different material surfaces, to form a protective and decorative finish.

Elements of competency	Performance criteria	
1. Plan and prepare	1.1	Work instructions are confirmed with supervisor.
	1.2	**Tools and equipment** are selected as required, checked for serviceability and any faults are fixed or reported.
	1.3	Material quantity requirements are calculated in accordance with specifications.
	1.4	**Materials** needed are obtained, checked for compliance and prepared.
2. Prepare materials and application area	2.1	Adjoining surfaces are protected by masking off or covering.
	2.2	Adequate ventilation is provided to maintain a safe environment.
	2.3	Measures are taken to ensure application area remains free of dust and foreign matter.
	2.4	Existing stained or finished surfaces for application are stripped using appropriate techniques.
3. Stain bare timber surface	3.1	Stain is selected for type of timber in accordance with manufacturer recommendations.
	3.2	Stain is prepared to proportions and consistency in accordance with manufacturer recommendations.
	3.3	**Application method** for the specified surface, area size and type of finish is selected.
	3.4	Stain is applied to bare timber surface to specifications.
	3.5	Wood filler and putty are selected, mixed, colour-matched and applied to timber in accordance with specifications.
4. Apply clear finishes	4.1	Coats of selected clear finish are applied to achieve required level of opacity, finish and sheen in accordance with specifications.

		4.2 Drying time is allowed between coats and clear finish surfaces are cured in accordance with manufacturer recommendations.
5. Clean-up	5.1 Work area is cleaned and waste disposed of, reused or recycled in accordance with work specifications.	
		5.2 Tools and equipment are cleaned, checked for faults and maintained and stored in accordance with workplace practices.

Evidence guide

To demonstrate competency in this unit the candidate must meet skills and knowledge requirements, plus safety and environmental requirements, as set out in the introduction to these RMCS. The candidate must be able to:

- prepare and or strip surfaces; and
- select and apply stains and finishes to timber in accordance with specifications and to suit the timber type, condition and finish required.

Critical skills and essential knowledge

The ability to:

- apply common skills and knowledge specified in the introduction to these RMCS.

Knowledge of:

- Hazards associated with solvents, chemicals and dust
- Surface preparation techniques for clear wood finishing
- Testing techniques and support materials
- Theoretical principles relating to pigmentation and colouring agents, drying and curing processes and the role of solvents
- Types, properties, uses and limitations of clear timber finishes and timber stains
- Types, uses and limitations of commonly used brushes, rollers and other applicators

Range statement

Tools and equipment may include:

- Brushware and accessories, buckets
- Drop sheets, duster brushes
- Filling knives and blades
- Hammers, heat guns
- Nail punches
- Paint pots and buckets, paint stirrers, putty knives
- Roller frames and accessories
- Sanders – hand and mechanical, scrapers, spray equipment

Materials may include:

- Acrylic clear and two pack epoxy clear, shellac, tinting agents and waxes
- Clear finishes for timber, including lacquers and two-pack polyurethane
- Grain fillers (water, spirit or oil)
- Putty
- Single pack clear finish
- Timber stains (water, spirit, oil or slightly pigmented varnish/polyurethane)

Application methods may include:

- Brush
- Paint pad (sponge)
- Rag

- Roller
- Spray

Competency may be assessed through a combination of:

- Demonstration
- Practical exercises
- Written or oral short answer questions

Competency is to be assessed in the workplace or in simulated workplace environment.

Functional area F - Roofing

CS-F1 Work safely on roofs

Unit details	
Functional area F	**Roofing**
Unit title	**Work safely on roofs**
Unit code	**CS-F1**

Description

This unit of competency describes the skills and knowledge required to follow safe working practices when undertaking work on roofing structures.

Elements of competency	Performance criteria	
1. Plan and prepare	1.1	Work instructions are confirmed with supervisor.
	1.2	**Tools and equipment** are selected as required, checked for serviceability and any faults are fixed or reported.
	1.3	Material quantity requirements are calculated in accordance with specifications.
	1.4	Materials needed are obtained, checked for compliance and prepared.
2. Prepare for work	2.1	Suitability of the roof structure to support the **roof safety system** is verified.
	2.2	Fall protection and perimeter protection equipment is inspected for conformance and installed.
3. Perform work on roof	3.1	Access from ground to the roofing work area is checked to ensure it is safe and clear of obstructions and hazards.
	3.2	Roof materials and equipment are safely secured on roof and distributed to eliminate risk of distorting or collapsing the building framework.
	3.3	Roof safety system is checked periodically for optimum performance, and faults are corrected or reported.
4. Clean-up	4.1	Work area is cleaned and waste disposed of, reused or recycled in accordance with work specifications.
	4.2	Tools and equipment are cleaned, checked for faults and maintained and stored in accordance with workplace practices.

Evidence guide

To demonstrate competency in this unit the candidate must meet skills and knowledge requirements, plus safety and environmental requirements, as set out in the introduction to these RMCS. The candidate must be able to:

- erect, maintain and dismantle, for a roof corner area, fall and perimeter protection, incorporating handrails and footwalk or harnesses and harness fixing points for safe access to the roof, stores and equipment locations.

Critical skills and essential knowledge

The ability to:

- apply common skills and knowledge specified in the introduction to these RMCS.

Knowledge of:

- Working safely on roofs

Range statement

Tools and equipment may include:

- Fall protection
- Ladders
- Lifting and load shifting equipment, including:
  - Chain blocks, cranes
  - Elevated work platforms
  - Forklifts
  - Hand trolleys, hoists and jacks
  - Rollers
  - Scaffolds
- Perimeter protection

Roof safety systems may include:

- Footwalks
- Handrails, harness fixing points, harness
- Kickboards
- Scaffolds

Competency may be assessed through a combination of:

- Demonstration
- Practical exercises
- Written or oral short answer questions

Competency is to be assessed in the workplace or in simulated workplace environment.

CS-F2 Install metal roof sheeting and wall cladding

Unit details	
Functional area F	**Roofing**
Unit title	**Install metal roof sheeting and wall cladding**
Unit code	**CS-F2**

Description

This unit of competency describes the skills and knowledge required to install metal roof sheeting and wall cladding, steel battens and plastic building sheets.

Elements of competency	Performance criteria	
1. Plan and prepare	1.1	Work instructions are confirmed with supervisor.
	1.2	**Tools and equipment** are selected as required, checked for serviceability and any faults are fixed or reported.
	1.3	Material quantity requirements are calculated in accordance with specifications.
	1.4	**Materials** needed are obtained, checked for compliance and prepared.
2. Identify insulation requirements	2.1	Level of insulation from rain and other noise, condensation control and heat transfer reduction is determined.
	2.2	Installation method, supports and materials are identified to meet specifications.
	2.3	Quantity and type of insulation materials required are calculated from drawings and specifications.
3. Select sheeting, cladding and non-metallic materials	3.1	Appropriate roof sheeting and wall cladding and manufactured non-metallic roof materials are identified to comply with design specifications.
	3.2	Quantity and type of manufactured roof coverings and/or fittings required are calculated from specifications.
	3.3	Materials, including insulation, are identified, ordered and collected in accordance with workplace procedures.
	3.4	Materials and equipment are obtained and checked for compliance with specifications and for acceptable condition.
4. Install roof sheeting or wall cladding	4.1	Safety mesh and thermal insulation are fixed in accordance with job and manufacturer specification.
	4.2	Sheets are marked and trimmed prior to fixing and cut edges are treated according to manufacturer specifications.

	4.3	Sheets, cladding and non-metallic materials are fixed in compliance with manufacturer specifications.
5. Clean-up	5.1	Work area is cleaned and waste disposed of, reused or recycled in accordance with work specifications.
	5.2	Tools and equipment are cleaned, checked for faults and maintained and stored in accordance with workplace practices.

Evidence guide

To demonstrate competency in this unit the candidate must meet skills and knowledge requirements, plus safety and environmental requirements, as set out in the introduction to these RMCS. The candidate must be able to complete to specification

- Both installations may include insulation, flashings and cappings, using the pierced and concealed fastening methods
- Requirements calculation, selection and install of roof sheeting, wall cladding and insulation for two roof structures, each a minimum of 4 square metres area, one of which incorporates two square metres of non-metallic roof sheeting

Critical skills and essential knowledge
The ability to:

- apply common skills and knowledge specified in the introduction to these RMCS.

Knowledge of:

- Capillary action, thermal expansion and fabrication techniques to prevent leaking installations
- Corrosion prevention treatment requirements of cut sheets
- Electrolysis and problems associated with the use of dissimilar metals
- Processes of selecting and installing roof sheeting and wall cladding
- Relevant safety and fall protection requirements
- Requirements related to installing roof sheeting and wall cladding, including non-metallic materials
- Types of fasteners, fixings and sealants and their application to the installation of roof coverings

Range statement

Tools and equipment may include:

- Elevated work platforms
- Fall protection equipment
- Hand and power tools
- Ladders
- Lifting and load shifting equipment, including:
  - Chain blocks
  - Cranes
  - Forklifts
  - Hand trolleys
  - Hoists and jacks
  - Restricted height scaffolds
  - Rollers
- Measuring equipment

Materials for selecting and installing roof sheeting and wall cladding may include:

- Cappings
- Fixings and fasteners, flashings
- Insulation, including:
  - Fibreglass
  - Laminate
  - Polyethylene
  - Reflective foil
  - Straw
  - Wool
- Insulation supports, including:
  - Plaster board
  - Timber board
  - Wire mesh
- Metal roof covers of concealed or pierce fixed types, moulds
- Plastic building sheets for walls and roofs
- Rain water goods, including:
  - Aluminium
  - Copper
  - Fibreglass
  - Polycarbonate
  - Stainless steel
  - Steel
  - Zincalume
- Rivets and sealants, roof battens
- Self-drilling and tapping screws
- Trims

Competency may be assessed through a combination of:

- Demonstration
- Practical exercises
- Written or oral short answer questions

Competency is to be assessed in the workplace or in simulated workplace environment.

CS-F3 Install curved metal roof

Unit details	
Functional area F	**Roofing**
Unit title	**Install curved metal roof**
Unit code	**CS-F3**

Description

This unit of competency describes the skills and knowledge required to install paraboloid curved metal roof coverings.

Elements of competency	**Performance criteria**
1. Plan and prepare	1.1 Work instructions are confirmed with supervisor.
	1.2 **Tools and equipment** are selected as required, checked for serviceability and any faults are fixed or reported.
	1.3 Material quantity requirements are calculated in accordance with specifications.
	1.4 **Materials** needed are obtained, checked for compliance and prepared.
2. Identify installation requirements	2.1 Quantity and type of manufactured roof covering, and fittings and equipment required, are calculated from drawings and specifications.
	2.2 Proposed sealant, fixing materials, roofing and flashing materials are selected and checked for compatibility.
	2.3 Materials and equipment are obtained and checked for compliance with requirements and for acceptable condition.
3. Install roof coverings	3.1 Safety mesh and thermal insulation are fixed in accordance with job specification and manufacturer requirements.
	3.2 Sheets are marked and trimmed prior to fixing and cut edges are treated according to manufacturer specifications.
	3.3 Roof covering is installed in accordance with manufacturer specifications.
	3.4 Roof covering is performance tested and faults remedied.
4. Clean-up	4.1 Work area is cleaned and waste disposed of, reused or recycled in accordance with work specifications.
	4.2 Tools and equipment are cleaned, checked for faults and maintained and stored in accordance with workplace practices.

Evidence guide

To demonstrate competency in this unit the candidate must meet skills and knowledge requirements, plus safety and environmental requirements, as set out in the introduction to these RMCS. The candidate must be able to complete to specification:

- Calculate the requirements and install the roof covering to a bull nose or curved roof structure, incorporating one internal and one external corner.

Critical skills and essential knowledge
The ability to:

- apply common skills and knowledge specified in the introduction to these RMCS.

Knowledge of:

- Capillary action, thermal expansion and fabrication techniques to prevent leaking installations
- Corrosion prevention treatment requirements of cut sheets
- Electrolysis and problems associated with the use of dissimilar metals
- Processes of fixing covering to curved roof structures
- Relevant safety and fall protection requirements
- Types of fasteners, fixings and sealants and their application to the installation of roof coverings

Range statement

Tools and equipment may include:

- Cranes
- Fall protection equipment
- Hand and power tools
- Ladders, levelling equipment
- Lifting and load shifting equipment, including:
  - Chain blocks
  - Elevated work platforms
  - Forklifts
  - Hand trolleys
  - Hoists
  - Restricted height scaffolds
  - Rollers
  - Measuring equipment

Materials for installing roof coverings to curved roofs may include:

- Blanket and batt types
- Curved metal roof covers of concealed or pierce fixed types
- Metal rain water goods, metal self-drilling and tapping screws
- Plastic building sheets for walls and roofs
- Rivets and sealants
- Thermal insulation of reflective foil laminate

Competency may be assessed through a combination of:

- Demonstration
- Practical exercises
- Written or oral short answer questions

Competency is to be assessed in the workplace or in simulated workplace environment.

CS-F4 Install roof drainage

Unit details	
Functional area F	**Roofing**
Unit title	**Install roof drainage**
Unit code	**CS-F4**

Description

This unit of competency describes the skills and knowledge required to fabricate and install roof drainage and rainwater-collection components.

Elements of competency	Performance criteria
1. Plan and prepare	1.1 Work instructions are confirmed with supervisor.
	1.2 **Tools and equipment** are selected as required, checked for serviceability and any faults are fixed or reported.
	1.3 Material quantity requirements are calculated in accordance with specifications.
	1.4 **Materials** needed are obtained, checked for compliance and prepared.
2. Identify installation requirements	2.1 **Roof drainage components** required for installation are identified from drawings and specifications.
	2.2 Fabrication patterns are drawn based on design and drawing of roof drainage.
	2.3 Quantity, type and sizing of drainage components, rainwater materials and accessories required are calculated from drawings and specifications.
	2.4 Gutter support system to be installed is confirmed to comply with the engineering advice for the building.
	2.5 Materials for fabricating drainage components, as specified in drawings, are marked out.
3. Fabricate roof drainage components	3.1 Method of fabrication, tools and materials requirements are determined based on drawings and job requirements
	3.2 Roof drainage components are fabricated in compliance with drawings and specifications.
4. Set out and install roof drainage components	4.1 Roof drainage components are arranged in order of installation and to comply with and site measurements.
	4.2 Structural supports are installed and roof drainage components are jointed securely and watertight.
	4.3 Flashing and waterproofing is installed, to comply with the plans and the manufacturers' recommendations.

	4.4	The performance of the roof-drainage system is tested to determine satisfactory installation and remedy any faults or leaks.
5. Clean-up	5.1	Work area is cleaned and waste disposed of, reused or recycled in accordance with work specifications.
	5.2	Tools and equipment are cleaned, checked for faults and maintained and stored in accordance with workplace practices.

Evidence guide

To demonstrate competency in this unit the candidate must meet skills and knowledge requirements, plus safety and environmental requirements, as set out in the introduction to these RMCS. The candidate must be able to complete to specification:

- For a roofed area of at least 4 square metres, determine requirements, select, fabricate and install valley gutter, box gutter, eaves gutter and downpipe system, with gutter supports, expansion joints and caps.

Critical skills and essential knowledge
The ability to:

- apply common skills and knowledge specified in the introduction to these RMCS.

Knowledge of:

- Capillary action, thermal expansion and fabrication techniques to prevent leaking installations
- Characteristics of various metals and finishes
- Corrosion prevention treatment requirements of cut sheets
- Electrolysis and problems associated with the use of dissimilar metals
- Joining of materials
- Processes of fabricating, jointing and fixing roof drainage components
- Types of fasteners, fixings and sealants and their application to the fabrication and installation of roof coverings

Range statement

Tools and equipment may include:

- Drawing equipment
- Fall protection equipment
- Hand and power tools
- Ladders
- Lifting and load shifting equipment, including:
  - Chain blocks
  - Cranes
  - Elevated work platforms
  - Forklifts
  - Hand trolleys
  - Hoists and jacks
  - Restricted height scaffolds
  - Rollers
- Measuring equipment.

Materials for fabricating and installing roof drainage components may include:

- Fibreglass
- Laminate
- Metal gutter and structural supports, metal rainwater goods metal roof covers of concealed metal self-drilling and tapping screws or pierce fixed types
- Plastic building sheets for walls and roofs, polyethylene PVC sheet goods roof tiles, rivets and sealants
- Thermal insulation of reflective foil

Roof drainage components may include:

- Box gutters
- Downpipes
- Eaves gutters
- Gutter support system
- Parapet gutters
- Rainwater heads
- Siphonic drainage downpipe systems and materials
- Standing overflows
- Sumps
- Valley gutters

Competency may be assessed through a combination of:

- Demonstration
- Practical exercises
- Written or oral short answer questions

Competency is to be assessed in the workplace or in simulated workplace environment.

CS-F5 Tile Roofs

Unit details	
Functional area F	**Roofing**
Unit title	**Tile Roofs**
Unit code	**CS-F5**

Description

This unit of competency describes the skills and knowledge required to tile roofs, including repairing or replacing concrete and terracotta roof tiles, valley roof sections and flashings on tiled roof structures.

Elements of competency	Performance criteria
1. Plan and prepare	1.1 Work instructions are confirmed with supervisor.
	1.2 **Tools and equipment** are selected as required, checked for serviceability and any faults are fixed or reported.
	1.3 Material quantity requirements are calculated in accordance with specifications.
	1.4 **Materials** needed are obtained, checked for compliance and prepared.
2. Prepare roof face	2.1 Fall arrest system is installed to roof perimeter and roof surface and structure checked for stability and safe access.
	2.2 Tile elevator is assembled and operated in accordance with site conditions and the manufacturers' instructions.
	2.3 Existing roofing material is removed without damage to the roof frame.
	2.4 Areas already tiled are cleaned with high-pressure water cleaners to the new installation's condition.
	2.5 Required materials are obtained and tiles required calculated, minimising quantity by planning efficient cuts at the hip and valley joints.
	2.6 Roof surface is set out and **sarked** to manufacturer recommendations for specified tile.
3. Cut and fix battens	3.1 Battens are measured, cut and fixed using selected fasteners at specified centres.
	3.2 Completed sarking and batten work is checked for correct alignment and fixing.

4. Install tiles	4.1 Tiles are loaded onto roof, supported and evenly distributed.
	4.2 Roof tiles are spread, cut, secured and installed to manufacturer specifications.
	4.3 Flashing and waterproofing is installed to comply with the plans and manufacturers' recommendations.
	4.4 Roof tiles are bedded using correct mortar mix, maintaining alignment.
	4.5 Roof tiles are pointed with mortar to a flush, smooth finish and installed to manufacturer specifications.
5. Clean-up	5.1 Work area is cleaned and waste disposed of, reused or recycled in accordance with work specifications.
	5.3 Tools and equipment are cleaned, checked for faults and maintained and stored in accordance with workplace practices.

Evidence guide

To demonstrate competency in this unit the candidate must meet skills and knowledge requirements, plus safety and environmental requirements, as set out in the introduction to these RMCS. The candidate must be able to, as a minimum, complete the following to specification:

- Tile 45 square metres of a roof frame, incorporating a 1.5m hip, a 1.5m valley, a 1.5m gable and a 1.5m top ridge, including the appropriate sarking, battens, tile cutting, bedding and pointing

Critical skills and essential knowledge

The ability to:

- apply common skills and knowledge specified in the introduction to these RMCS.

Knowledge of:

- Characteristics and applications of roof tiling materials
- Roof construction systems and structures and tiling considerations
- Roof tiling techniques and procedures

Range statement

Tools and equipment may include:

- Air compressors and hoses
- Bedding frames, brooms, buckets
- Calculators, chalk lines, chisels, concrete mixers
- Elevators
- Fall safety devices
- Gutter protectors
- Hammers, hand saws, high pressure water cleaners
- Ladders
- Measuring tapes and rules
- Nail guns
- Pinchers, power drills, power saws
- Shovels, squares, string lines
- Tile cutters, trowels

Materials may include:

- Adhesives
- Concrete and terracotta tiles
- Fastenings and other mechanical fixings
- Flashings
- Mortar
- Sarking materials
- Timber and metal battens

Sarked refers to:

- The application of sarking material. Sarking is a layer of boards or bituminous felt placed beneath tiles or other roofing to provide thermal insulation or to prevent ingress of water

Competency may be assessed through a combination of:

- Demonstration
- Practical exercises
- Written or oral short answer questions

Competency is to be assessed in the workplace or in simulated workplace environment.

CS-F6 Repair or replace roof valleys, valley irons and flashings

Unit details	
Functional area F	**Roofing**
Unit title	**Repair or replace roof valleys, valley irons and flashings**
Unit code	**CS-F6**

Description

This unit of competency describes the skills and knowledge required to repair and replace valley roof sections and flashings to different types and styles of tiled roof structures.

Elements of competency	Performance criteria
1. Plan and prepare	1.1 Work instructions are confirmed with supervisor.
	1.2 **Tools and equipment** are selected as required, checked for serviceability and any faults are fixed or reported.
	1.3 Material quantity requirements are calculated in accordance with specifications.
	1.4 **Materials** needed are obtained, checked for compliance and prepared.
2. Prepare valley section for repair	2.1 Damaged area is identified and located in accordance with plans and specifications.
	2.2 Fall arrest system is installed to roof.
	2.3 Damaged tiles are removed to ensure minimum disturbance to remaining roof tiles.
	2.4 **Pointing** or mortar is removed ensuring no damage to roof tiles.
	2.5 Damaged area is left clean and free of loose waste.
	2.6 Roof structure valleys and flashing installations are checked for soundness and adequacy according manufacturer recommendations.
3. Repair valley sections	3.1 Damaged structural components of valley section of roof are disassembled and repaired or replaced in accordance with specifications.
	3.2 Roof tie down fixings are replaced or installed to roof structure in accordance with specifications.
	3.3 Replacement valley flashings are fabricated and installed in accordance with specifications.
	3.4 Loose mortar is removed from roof tile surface.

	3.5 Replacement and recycled roof tiles are sorted and examined to ensure conformity in matching original roof tiles.
4. Replace roof tiles	4.1 Mortar is mixed to required composition to match original specifications.
	4.2 Roof tiles are laid to maintain conformity to original gauge and alignment, while maintaining bond to specifications.
	4.3 Roof tiles are laid to produce designed features in accordance with original design and specifications.
5. Replace pointing material	5.1 Pointing material is prepared and distributed for use to design specifications.
	5.2 Pointing material is applied to ridge tile joints to specification.
	5.3 Joints are pointed to produce matching finish to existing surrounds, and loose material is removed from roof tile surface.
6. Clean-up	6.1 Work area is cleaned and waste disposed of, reused or recycled in accordance with work specifications.
	6.2 Tools and equipment are cleaned, checked for faults and maintained and stored in accordance with workplace practices.

Evidence guide

To demonstrate competency in this unit the candidate must meet skills and knowledge requirements, plus safety and environmental requirements, as set out in the introduction to these RMCS. The candidate must be able to:

remove and replace 1.5 lineal metres of a tiled roof and damaged roof valley iron, ensuring:

- Correct identification of requirement and completion of repairs and replacement
- Correct selection and use of appropriate processes, tools and equipment
- Completing all work to specification

Critical skills and essential knowledge

The ability to:

- apply common skills and knowledge specified in the introduction to these RMCS.

Knowledge of:

- Characteristics and applications of materials used in repairing tiled roof valleys, valley irons and flashings
- Installation of roof battens, sarking and flashing
- Roof construction systems and structures and tiling considerations
- Techniques and procedures for repairing tiled roof valleys, valley irons

Range statement

Tools and equipment may include:

- Air compressors and hoses
- Bedding frames, brooms, buckets
- Calculators, chalk lines, chisels, concrete mixers
- Elevators
- Fall safety devices
- Gutter protectors
- Hammers, hand saws, high pressure water cleaners
- Ladders
- Measuring tapes and rules
- Nail guns
- Pinchers, power drills, power saws
- Shovels, squares, string lines
- Tile cutters, trowels

Materials may include:

- Adhesives
- Concrete and terracotta tiles
- Fastenings and other mechanical fixings
- Flashings
- Mortar and pointing
- Sarking materials
- Timber and metal battens

Pointing refers to:

- The external part of mortar joints

Competency may be assessed through a combination of:

- Demonstration
- Practical exercises
- Written or oral short answer questions

Competency is to be assessed in the workplace or in simulated workplace environment.

Functional area G – Residential plumbing

CS-G1 Cut and join sheet metal

Unit details	
Functional area G	**Residential plumbing**
Unit title	**Cut and join sheet metal**
Unit code	**CS-G1**

Description

This unit describes the skills and knowledge required to cut, fabricate, join and use sheet metal for plumbing installations.

Elements of competency	Performance criteria
1. Prepare for work	1.1 Work instructions are confirmed with supervisor.
	1.2 **Tools and equipment** are selected as required, checked for serviceability and any faults are fixed or reported.
	1.3 Material quantity requirements are calculated in accordance with specifications.
	1.4 **Materials** needed are obtained, checked for compliance and prepared.
2. Cut and join sheet metal	2.1 Sheet metal is marked out according to plans and specifications.
	2.2 Sheet metal is cut to pattern using appropriate manual or mechanical cutting tools.
	2.3 Laps are measured and shaped for joining using appropriate tools and equipment according to plans and specifications.
	2.4 Surface is prepared and cleaned of contaminants.
	2.5 **Joins** are cleaned and visually inspected to ensure materials are correctly aligned, joined and sealed.
3. Clean up	3.1 Work area is cleaned and waste disposed of, reused or recycled in accordance with work specifications.
	3.2 Tools and equipment are cleaned, checked for faults and maintained and stored in accordance with workplace practices.

Evidence guide

To demonstrate competency in this unit the candidate must meet skills and knowledge requirements, plus safety and environmental requirements, as set out in the introduction to these RMCS. The candidate must be able to, from plans and specifications:

- Cut and join items of sheet metal demonstrating a range of commonly used joining techniques and the use of approved sealants
- Plan the layout, fabricate and assemble to specification a sheet metal product incorporating at least three joining techniques

Critical skills and essential knowledge

The ability to:

- apply common skills and knowledge specified in the introduction to these RMCS.

Knowledge of:

- Appropriateness of different fastening methods for different applications
- Capillary action, thermal expansion and fabrication techniques to prevent leaking
- Characteristics of various metal materials and their compatibility with different joining methods
- Electrolysis and problems associated with the use of dissimilar metals

Range statement

Tools and equipment may include:

- Caulking gun
- Files and rasps
- Guillotines
- Hacksaw
- Hand and power tools
- Measuring equipment
- Soldering equipment
- Tin snips

Materials may include:

- Rivets
- Self-drilling and tapping fasteners, silicon and other sealants
- Sheet metal, including:
    - Colour coated
    - Copper
    - Galvanised
    - Zincalume
    - Aluminium
    - Lead
    - Zinc

Types of **joins** may include:

- Grooved seam
- Knock up
- Lap
- Pittsburgh lock
- Resistance (spot) weld
- Riveted and screwed
- Solder

The following resources must be provided:

- Materials relevant to the proposed activity
- Tools, equipment and facilities appropriate to processes or activity

Competency may be assessed through a combination of:

- Demonstration
- Practical exercises
- Written or oral short answer questions
- Off the job theory and knowledge questions

Competency is to be assessed in the workplace or in simulated workplace environment.

CS-G2 Use oxyacetylene equipment for welding

Unit details	
Functional area G	**Residential plumbing**
Unit title	**Use oxyacetylene equipment for welding**
Unit code	**CS-G2**

Description

This unit of competency describes the skills and knowledge required to safely use oxyacetylene equipment to weld steel.

Elements of competency	Performance criteria
1. Set up	1.1 Work instructions are confirmed with supervisor.
	1.2 **Tools and equipment** are selected as required, checked for serviceability and any faults are fixed or reported.
	1.3 Material quantity requirements are calculated in accordance with specifications.
	1.4 **Materials** needed are obtained, checked for compliance and prepared.
2. Prepare materials and equipment	2.1 Material is cleaned and prepared using appropriate tools and techniques.
	2.2 Welding equipment, welding tips, settings and consumables including cylinders and regulators, are assembled and set up to meet job requirements.
3. Perform welding	3.1. Materials are welded to job requirements using safe welding practices.
	3.2. Appropriate action is taken to report or correct defects, including adjusting settings and welding technique.
	3.3. Welds are cleaned in accordance with workplace requirements.
4. Clean up	4.1 Work area is cleaned and waste disposed of, reused or recycled in accordance with work specifications.
	4.2 Tools and equipment are cleaned, checked for faults and maintained and stored in accordance with workplace practices.

Evidence guide

To demonstrate competency in this unit the candidate must meet skills and knowledge requirements, plus safety and environmental requirements, as set out in the introduction to these RMCS.

The candidate must be able to, from plans and specifications, weld two of the following:

- A flat butt weld up to 6mm mild steel plate, 150mm long
- A vertical butt weld up to 6mm mild steel plate, 150mm long

- A rotated butt weld around up to dn100 mild steel pipe located in a horizontal position and rotated during welding
- Silver braze fabricated non-ferrous pipes, fittings and components

Critical skills and essential knowledge

The ability to:

- apply common skills and knowledge specified in the introduction to these RMCS.

Knowledge of:

- Dangers associated with oxy-acetylene welding in the fabrication and installation of plumbing systems
- Effect of heat on the properties and shape of welded metals
- Operating principles of oxy-acetylene welding equipment
- Welding mild steel plate, non-ferrous materials and pipe by oxy-acetylene welding

Range statement

Tools and equipment may include:

- Clamps
- Hand and power tools
- Jigs
- Measuring equipment
- Oxy-acetylene welding equipment

Materials may include:

- Copper
- Copper alloy
- Low carbon mild steel (plate and pipe)
- Oxy-LPG-acetylene

The following resources must be provided:

- Materials relevant to the proposed activity
- Tools, equipment and facilities appropriate to processes or activity

Competency may be assessed through a combination of:

- Demonstration
- Off the job theory and knowledge questions
- Practical exercises
- Written or oral short answer questions

Competency is to be assessed in the workplace or in simulated workplace environment.

CS-G3 Fusion weld plastic pipe

Unit details	
Functional area	**Residential plumbing**
Unit title	**Fusion weld plastic pipe**
Unit code	**CS-G3**

Description

This unit describes the skills and knowledge required to fusion weld polyethylene (PE), polypropylene (PP) and polybutylene (PB) polymer pipes up to DN300 for water, sanitary and storm water plumbing applications.

Elements of competency	Performance criteria
1. Prepare for work	1.1 Work instructions are confirmed with supervisor.
	1.2 **Tools and equipment** are selected as required, checked for serviceability and any faults are fixed or reported.
	1.3 Material quantity requirements are calculated in accordance with specifications.
	1.4 Materials needed are obtained, checked for compliance and prepared.
2. Weld and pressure test pipes	2.1 Joints are prepared using tools and techniques in accordance with standards and .
	2.2 Test welds are undertaken and verified in accordance with .
	2.3 Fusion welds are carried out in accordance with standards, plans and specifications.
	2.4 Fusion welds are visually inspected for conformance to standards.
	2.5 Pipe joints are pressure tested and inspected in accordance with standards and .
	2.6 Test details and monitored results are checked for accuracy and documented in accordance with requirements and specifications.
3. Clean up	3.1 Work area is cleaned and waste disposed of, reused or recycled in accordance with work specifications.
	3.2 Tools and equipment are cleaned, checked for faults and maintained and stored in accordance with workplace practices.

Evidence guide

To demonstrate competency in this unit the candidate must meet skills and knowledge requirements, plus safety and environmental requirements, as set out in the introduction to these RMCS. The candidate must be able to, from plans and specifications:

- Butt weld up to four joints
- Weld with electro-fusion sockets up to two joints in up to dn300 approved polymer pipes, using appropriate fusion welding processes

Critical skills and essential knowledge

The ability to:

- apply common skills and knowledge specified in the introduction to these RMCS.

Knowledge of:

- Dangers associated with fusion welding of PE
- Effect of heat on the properties of PE pipe
- Fusion welding PE pipes and testing joints in approved polymer pipes up to DN300
- Operating principles of fusion welding equipment

Range statement

Tools and equipment may include:

- Approved polymer welding equipment
- Hand and power tools
- Measuring equipment

The following resources must be provided:

- Materials relevant to the proposed activity
- Tools, equipment and facilities appropriate to processes or activity

Competency may be assessed through a combination of:

- Demonstration
- Practical exercises
- Written or oral short answer questions
- Off the job theory and knowledge questions

Competency is to be assessed in the workplace or in simulated workplace environment.

CS-G4 Install water pipes

Unit details	
Functional area G	**Residential plumbing**
Unit title	**Install water pipes**
Unit code	**CS-G4**

Description

This unit describes the skills and knowledge required to install water pipes.

Elements of competency	**Performance criteria**
1. Prepare for work	1.1 Work instructions are confirmed with supervisor.
	1.2 Tools and equipment are selected as required, checked for serviceability and any faults are fixed or reported.
	1.3 Material quantity requirements are calculated in accordance with specifications.
	1.4 **Materials** needed are obtained, checked for compliance and prepared.
2. Set out and excavate	2.1 Dewatering requirements are determined and applied.
	2.2 Location, alignment direction, level and grade of mains pipe system is determined from job drawings and specifications
	2.3 Works are set out to specification.
	2.4 Plant operators are advised of excavation requirements and levels are monitored.
	2.5 Mains pipe system support mechanism is installed in compliance with specifications and standards.
3. Install mains pipeline	3.1 Pipes are lowered and placed in position according to design specifications of **mains pipe system**.
	3.2 Pipes are joined according to manufacturer specifications using **pipe joining methods**.
	3.3 Pipes are placed and fittings, **valves and flow control devices** are fitted according to drawings, specifications and **installation procedures**.
	3.4 Alignment level and grade are checked continuously for conformance with design plans and specifications.
	3.5 Side support or overlay is positioned beside the pipes.
	3.6 Backfill procedure is monitored to ensure work is completed to specification, where specified.
4. Test mains pipe system	4.1 **Testing** is performed to relevant authorities' requirements as determined by specifications.

	4.2	Mains pipe system test procedures are performed, establishing pressurization, functionality and serviceability.
	4.3	Test results are recorded and reported.
5. Clean up	5.1	Work area is cleaned and waste disposed of, reused or recycled in accordance with work specifications.
	5.2	Tools and equipment are cleaned, checked for faults and maintained and stored in accordance with workplace practices.

Evidence guide

To demonstrate competency in this unit the candidate must meet skills and knowledge requirements, plus safety and environmental requirements, as set out in the introduction to these RMCS.

The candidate must be able to, from plans and specifications and meeting all standards:

- Cut and join items of sheet metal demonstrating a range of commonly used joining techniques and the use of approved sealants
- Plan the layout, fabricate and assemble to specification a sheet metal product incorporating at least three joining techniques

Critical skills and essential knowledge

The ability to:

- apply common skills and knowledge specified in the introduction to these RMCS.

Knowledge of:

- Concrete and concrete fabrication
- Dewatering
- Installation of booster systems
- Installation of thrust blocks
- Interpreting engineering drawings
- Mains pipe systems and installation procedures
- Mains water pressure
- Operational, maintenance and basic diagnostic procedures, including testing procedures
- Processes for calculating pipeline grades and percentages
- Sedimentation and erosion controls
- Valves and flow control devices
- Water reticulation

Range statement

Materials may include:

- Backfill and bedding materials
- Concrete
- Pipes

Mains pipe systems may include:

- In-ground or above ground
- Pressurised mains water pipelines (booster system)

May be constructed from:

- Ductile iron cement lined (DICL)
- Polymer

- Steel and copper
- Other approved materials

Pipe joining methods may include:
- Arc welded and mechanical jointed
- Fusion welded
- Other approved jointing methods
- Rubber ring
- Solvent welded

Valves and flow control devices may include:
- Air release valves
- Energy dissipaters
- Flow control valves
- Non-return valves
- Pressure control valves
- Stop valves

Installation procedures may include:
- Bedding down pipes
- Checking alignment, level and grade
- Positioning pipes
- Selecting size, type and material of pipe

May include:
- Repair work
- Bedding materials, including aggregate and sand
- Support systems, which may include bedding for in-ground trenches; concrete shoulders for above ground pipes

Testing procedures may include:
- Air
- Ovality
- Pressure
- Tolerance
- Visual straightness
- Water

The following resources must be provided:
- Materials relevant to the proposed activity
- Tools, equipment and facilities appropriate to processes or activity

Competency may be assessed through a combination of:
- Demonstration
- Practical exercises
- Written or oral short answer questions
- Off the job theory and knowledge questions

Competency is to be assessed in the workplace or in simulated workplace environment.

CS-G5 Flash plumbing penetrations through roofs and walls

Unit details	
Functional area G	**Residential plumbing**
Unit title	**Flash plumbing penetrations through roofs and walls**
Unit code	**CS-G5**

Description

This unit describes the skills and knowledge required to set out, cut and flash a roof or wall penetration up to 300 millimetres in diameter or 300 millimetres square, through a roof and wall, to accommodate the installation of plumbing ventilation and flue pipes.

Elements of competency	Performance criteria	
1. Prepare for work	1.1	Work instructions are confirmed with supervisor.
	1.2	**Tools and equipment** are selected as required, checked for serviceability and any faults are fixed or reported.
	1.3	Material quantity requirements are calculated in accordance with specifications.
	1.4	**Materials** needed are obtained, checked for compliance and prepared.
2. Identify flashing requirements	2.1	Roof and wall penetrations are identified from drawings and specifications.
	2.2	Penetrations are assessed as required to allow for the location of existing and future services.
3. Flash penetrations	3.1	Fabrication is undertaken according to plans and specifications.
	3.2	Penetration is positioned and cut in compliance with plans, specifications and site measurements.
	3.3	Structural supports are installed and opening prepared in accordance with plans and specifications.
	3.4	Flashing is fitted in accordance with standards, plans, specifications and regulations.
	3.5	Sealant is applied in accord with specifications and manufacturer recommendations
	3.6	Penetration is tested to ensure correct fit and corrected as required.
4. Clean up	4.1	Work area is cleaned and waste disposed of, reused or recycled in accordance with work specifications.

4.2 Tools and equipment are cleaned, checked for faults and maintained and stored in accordance with workplace practices.

Evidence guide

To demonstrate competency in this unit the candidate must meet skills and knowledge requirements, plus safety and environmental requirements, as set out in the introduction to these RMCS.

Critical skills and essential knowledge

The ability to:

- apply common skills and knowledge specified in the introduction to these RMCS.

Knowledge of:

- Capillary action, thermal expansion and fabrication techniques to prevent leaking installations
- Characteristics of various roofing and wall cladding materials and their compatibility with different joining methods
- Corrosion prevention treatment requirements of cut sheets
- Electrolysis and problems associated with the use of dissimilar metals
- Processes of flashing roof and wall penetrations
- Relevant requirements related to the flashing of roof and wall penetrations

Range statement

Tools and equipment may include:

- Chain blocks, cranes
- Elevated work platforms
- Fall protection equipment
- Forklifts
- Hand and power tools
- Hand trolleys, hoists
- Jacks
- Ladders, lifting and load shifting equipment
- Measuring equipment
- Restricted height scaffolds, rollers

Materials used for flashing roof penetrations may include approved materials, such as:

- Fibreglass
- Fixings, which may include:
  - Metal self-drilling and tapping screws
  - Rivets
  - Sealants (silicon and solder)
  - Other approved materials
- Laminate
- Metal roof covers of concealed or pierce fixed types
- Plastic building sheets for walls and roofs
- Polyethylene
- Rainwater goods
- Straw or wool
- Thermal insulation of reflective foil

The following resources must be provided:

- Materials relevant to the proposed activity
- Tools, equipment and facilities appropriate to processes or activity

Competency may be assessed through a combination of:

- Demonstration
- Practical exercises
- Written or oral short answer questions
- Off the job theory and knowledge questions

Competency is to be assessed in the workplace or in simulated workplace environment.

CS-G6 Install water-heating systems

Unit details	
Functional area G	**Residential plumbing**
Unit title	**Install water-heating systems**
Unit code	**CS-G6**

Description

This unit describes the skills and knowledge required to install small-bore hydronic water-heating systems, panel radiators, skirting convectors and unit heaters, using copper tubes, polybutylene pipes, polyethylene pipes or steel tubes connected to a boiler, heat exchanger or other heating source.

Elements of competency	Performance criteria
1. Prepare for work	1.1 Work instructions are confirmed with supervisor.
	1.2 **Tools and equipment** are selected as required, checked for serviceability and any faults are fixed or reported.
	1.3 Material quantity requirements are calculated in accordance with specifications.
	1.4 **Materials** needed are obtained, checked for compliance and prepared.
2. Make connections and test service	2.1 Final connections are made to heated and cold water services ensuring fixtures, jointing methods and appliances comply with standards and are made without damage to surrounding structures.
	2.2 Labels and signage are positioned for non-drinkable water.
	2.3 Water services are hydraulically tested to ensure connections are leak free.
	2.4 Valves, cisterns, taps and other components are checked for correct operation.
3. Commission water services	3.1 Service lines are flushed in accordance with relevant standards and requirements.
	3.2 Water services are commissioned in accordance with regulatory authorities' requirements and manufacturer specifications, emphasizing risk of the **blue water** symptom.
4. Clean up	4.1 Work area is cleaned and waste disposed of, reused or recycled in accordance with work specifications.
	4.3 Tools and equipment are cleaned, checked for faults and maintained and stored in accordance with workplace practices.

Evidence guide

To demonstrate competency in this unit the candidate must meet skills and knowledge requirements, plus safety and environmental requirements, as set out in the introduction to these RMCS.

The candidate must be able to, from plans and specifications, to required standard:

- Plan the layout, and then fit off, connect, test and commission heated, tempered and cold (drinking and non-drinking) water services of a house, including bathroom, kitchen, laundry and outdoor connections.

Critical skills and essential knowledge

The ability to:

- apply common skills and knowledge specified in the introduction to these RMCS.

Knowledge of:

- Characteristics and application of different fittings and fixtures, including fixing and joining techniques and materials
- Implications of cross connections and air gaps
- Isolation processes and procedures
- Non-drinkable water processing, requirements and applications
- Process of fitting off, connecting and commissioning heated and cold water services
- Properties of water, including sources of contamination (blue water), impurities, pressure and flow rates
- Relevant requirements related to fitting off, connecting and commissioning heated and cold water services
- Use of test equipment and procedures

Range statement

Tools and equipment may include:

- Crimping tools
- Flaring tools
- Hand and power tools
- Mechanical and bending tools
- Silver brazing equipment
- Testing equipment

Materials are as approved for heated, tempered and cold water services and may include:

- Fixtures and fittings
- Heaters
- Water services

Blue water is:

- A symptom believed to occur as a result of a less than adequate commissioning process.

Competency may be assessed through a combination of:

- Demonstration
- Practical exercises
- Written or oral short answer questions

Competency is to be assessed in the workplace or in simulated workplace environment.

CS-G7 Fit sanitary fixtures

Unit details	
Functional area G7	**Residential plumbing**
Unit title	**Fit sanitary fixtures**
Unit code	**CS-G7**

Description

This unit of competency describes the skills and knowledge required.

Elements of competency	Performance criteria
1. Identify installation requirements	1.1 Position of **sanitary fixtures** is determined in accordance with plans, specifications and site requirements.
	1.2 Quantity and type of **materials**, including **pipe materials** required, are calculated from design drawings and specifications
	1.3 Materials and equipment are identified and obtained in accordance with workplace procedures.
	1.4 **Tools and equipment** are selected and checked for serviceability.
	1.5 Selected materials and equipment are checked for compliance with relevant standards and acceptable condition.
2. Install and fit off sanitary fixtures	2.1 Set out is checked for compliance with design drawings, manufacturers' instructions and relevant requirements.
	2.2 Fixtures are positioned and installed to comply with plans, specifications and manufacturer requirements.
	2.3 Fixtures, components and pipework are assembled, installed and tested to manufacturer requirements, job specification and relevant standards.
	2.4 Fixtures are installed and connected without damage or distortion to fixture, pipework, surrounding environment or other services.
	2.4 Completed installation is checked for correct functioning and compliance with specifications.
3. Clean up	3.1 Work area is cleaned and waste disposed of, reused or recycled in accordance with work specifications.
	3.2 Tools and equipment are cleaned, checked for faults and maintained and stored in accordance with workplace practices.

Evidence Guide

To demonstrate competency in this unit the candidate must meet skills and knowledge requirements, plus safety and environmental requirements, as set out in the introduction to these RMCS.

The candidate must be able to, from plans and specifications, to required standard, set out, install and fit off the following sanitary fixtures:

- Basin
- Bath
- Dishwashing machine
- Shower base
- Sink
- Wall hung urinal
- Water closet

Critical skills and essential knowledge

The ability to:

- apply common skills and knowledge specified in the introduction to these RMCS.

Knowledge of:

- Calculating material requirements
- Characteristics and the application of different pipe fittings and fixture supports, including fixing and joining techniques
- Installing sanitary plumbing, including connecting discharge pipes to sanitary plumbing and drainage and installing sanitary fixtures
- Levelling and alignment processes
- Process of installing and fitting off sanitary fixtures
- Relevant requirements related to installing and fitting off sanitary fixtures

Range statement

Sanitary fixtures are as authorised and may include:

- Basins, baths
- Clothes washing machines
- Dishwashing machines
- Shower bases, sinks, spa baths
- Troughs
- Wall hung urinals, water closets

Materials to connect sanitary fixtures may include:

- Copper, copper alloy
- High density polyethylene (HDPE)
- Polyvinyl Chloride (PVC)
- Sanitary fixtures, stainless steel pipes
- Other approved materials

Pipe materials may include:

- Copper, copper alloy
- Polymer
- Stainless steel pipes
- Other approved materials

Tools and equipment may include:

- Hand and power tools, heating, cutting and bending equipment
- Ladders, lifting and load shifting equipment, including:
- Chain blocks
- Elevated work platforms
- Forklifts
- Hand trolleys, hoists and jacks
- Restricted height scaffolding, rollers
- Measuring equipment

Competency may be assessed through a combination of:

- Demonstration
- Practical exercises
- Written or oral short answer questions

Competency is to be assessed in the workplace or in simulated workplace environment.

CS-G8 Install Discharge Pipes and Sanitary Stacks

Unit details	
Functional area G	**Residential plumbing**
Unit title	**Install Discharge Pipes and Sanitary Stacks**
Unit code	**CS-G8**

Description

This unit describes the skills and knowledge required to install and fit off sanitary fixtures.

Elements of competency	Performance criteria
1. Prepare for work	1.1 Work instructions are confirmed with supervisor.
	1.2 **Tools and equipment** are selected as required, checked for serviceability and any faults are fixed or reported.
	1.3 Material quantity requirements are calculated in accordance with specifications making allowances for fabrication and assembly.
	1.4 **Materials** needed, including **pipe material**, are obtained, checked for compliance and prepared.
2. Identify installation requirements	2.1 Venting requirements, stack design and branch positions are checked for compliance with requirements of relevant standards,
	2.2 Position of the required discharge pipes and sanitary stacks are determined from plans and specifications so the installation will not interfere with or damage the surrounding structures.
	2.3 Stack design and branch positions are checked for compliance with the specifications.
3. Install and fit off sanitary fixtures	3.1 **Plumbing system** is set out to comply with job plans and relevant standards.
	3.2 Fixtures, components and pipework are assembled, installed and jointed according to job plans and specifications without damage or distortion to fixture, pipework, surrounding environment or other services.
	3.3 Pipe system is tested and adjusted as required.
4. Clean up	4.1 Work area is cleaned and waste disposed of, reused or recycled in accordance with work specifications.
	4.2 Tools and equipment are cleaned, checked for faults and maintained and stored in accordance with workplace practices.

Evidence guide

To demonstrate competency in this unit the candidate must meet skills and knowledge requirements, plus safety and environmental requirements, as set out in the introduction to these RMCS.

The candidate must be able to, from plans and specifications and to required standard:

- Fabricate and install a sanitary stack system of plumbing, to connect future fixtures from two floor levels; fixtures are to include:
  - Fabrication of at least two branches in copper tube (minimum of DN50)
  - WC, bath, basin, shower and floor waste gully at each floor

Critical skills and essential knowledge

The ability to:

- apply common skills and knowledge specified in the introduction to these RMCS.

Knowledge of:

- Calculating material requirements
- Characteristics and the application of different pipe fittings and fixture supports, including fixing and joining techniques
- Installing sanitary plumbing, including connecting discharge pipes to sanitary plumbing and drainage and installing sanitary fixtures
- Levelling and alignment processes
- Process of fabricating, installing and fitting off sanitary stacks
- Process of installing and fitting off sanitary fixtures
- Properties of soil and waste discharges, including temperature and corrosive discharges
- Systems of sanitary plumbing

Range statement

Tools and equipment may include:

- Drop saw
- Hacksaw, hand and power tools
- Heating, cutting and bending equipment
- Jointing knives
- Ladders
- Lifting and load shifting equipment, including:
- Hand and power tools
- Lifting and load shifting equipment, including:
  - Chain blocks
  - Elevated work platforms
  - Forklifts
  - Hand trolleys, hoists and jacks
  - Restricted height scaffolding, rollers
- Measuring equipment
- Threading and bending equipment

Materials to connect sanitary fixtures may include:

- Copper, copper alloy
- Polymer
- Cast iron
- Other approved materials

Pipe materials may include:

- Copper, copper alloy
- Polymer
- Stainless steel pipes
- Other approved materials

Plumbing systems may include:

- Elevated pipework
- Fully vented, fully vented modified
- Revass
- Single stack, single stack modified
- Other approved methods

Competency may be assessed through a combination of:

- Demonstration
- Practical exercises
- Written or oral short answer questions

Competency is to be assessed in the workplace or in simulated workplace environment.

CS-G9 Install Sanitary and Stormwater Drainage Systems

Unit details	
Functional area	**Residential plumbing**
Unit title	**Install Sanitary and Stormwater Drainage Systems**
Unit code	**CS-G9**

Description

This unit describes the skills and knowledge required to install below-ground sanitary drainage systems for sewage and waste discharge from **sanitary fixtures** to and connect to a point of discharge or on-site disposal system.

Elements of competency	Performance criteria
1. Prepare for work	1.1 Work instructions are confirmed with supervisor.
	1.2 **Tools and equipment** are selected as required, checked for serviceability and any faults are fixed or reported.
	1.3 Material quantity requirements are calculated in accordance with specifications.
	1.4 **Materials** needed are obtained, checked for compliance and prepared.
2. Install sanitary drainage system	2.1 Pipework is set out in accordance with drawings and specifications, site requirements or job instructions, with consideration to the location of existing services.
	2.2 Pipework is installed in accordance with specifications without damage to surrounding environment, existing pipework or other services.
	2.3 Pipes are bedded down and checks are made to the alignment, level and grade according to the design specifications.
	2.4 Connections for alterations, additions, relining or repair to existing systems are made in accordance with standards and manufacturer specifications.
	2.5 Installation is checked for compliance with design drawings, specifications, and work requirements.
	2.6 Installation is **tested** to comply with standards and relevant authorities' requirements.

3. Clean up	3.1 Installation is backfilled in accordance with standards and work area is cleared, with materials disposed of or recycled in accordance with work specifications.
	3.2 Tools and equipment are cleaned, checked, maintained and stored in accordance with manufacturer recommendations and workplace procedures.

Evidence guide

To demonstrate competency in this unit the candidate must meet skills and knowledge requirements, plus safety and environmental requirements, as set out in the introduction to these RMCS.

The candidate must be able to, from plans and specifications, complete to specifications:

- Cut in a branch to connect a new water closet and fixture
- Install and test a below ground sanitary drain to connect a bathroom, water closet (WC), kitchen, laundry and soil or waste stack (to a minimum of 30 fixture units), where the drain is to be at least 10 metres long and terminate at ground level

Critical skills and essential knowledge

The ability to:

- apply common skills and knowledge specified in the introduction to these RMCS.

Knowledge of:

- Characteristics and application of different pipe fittings and fixture supports, including fixing and joining techniques
- Excavation processes and procedures
- Hazardous materials
- Levelling and alignment processes
- Materials relevant to sanitary drainage
- Principles of drainage design
- Process of installing and testing sanitary drains
- Sources of information and
- Standards applicable to the installation
- Water and air test systems and procedures

Range statement

Sanitary fixtures may be located in a:

- Bathroom
- Kitchen
- Laundry
- Water Closet (WC)

Tools and equipment may include:

- Bending equipment, butt/socket polymer-welding equipment
- Chain blocks, clamps, compression cutters, crow bar,
- Dropsaws
- Electric facing tool
- Forklifts
- Grinders
- Hacksaws, hammer, hand and power tools, hand excavation tools
- Hand trolleys, heating equipment, hoists and jacks
- Jigs, jointing equipment
- Levelling equipment, lifting and load shifting equipment
- Measuring equipment, mechanical excavation equipment
- Oxyacetylene welding equipment
- Pipe relining equipment
- Rollers
- Saws, shovel
- Trench shoring equipment
- Wheelbarrow

Materials may include:

- Fixtures, which may include all approved residential fixtures as identified in as/nzs3500 national plumbing and drainage set
- Polymer pipes and fittings

Testing may include:

- Air
- Water
- Vacuum testing

The following resources must be provided:

- Materials relevant to the proposed activity
- Tools, equipment and facilities appropriate to processes or activity

Competency may be assessed through a combination of:

- Demonstration
- Practical exercises
- Written or oral short answer questions
- Off the job theory and knowledge questions

Competency is to be assessed in the workplace or in simulated workplace environment.

CS-G10 Install Fire-Sprinkler Systems

Unit details	
Functional area G	**Residential plumbing**
Unit title	**Install Fire-Sprinkler Systems**
Unit code	**CS-G10**

Description

This unit describes the skills and knowledge required to install fire sprinkler systems in buildings up to four storeys in height.

Elements of competency	Performance criteria
1. Identify installation requirements	1.1 Work instructions are confirmed with supervisor.
	1.2 System requirements are identified from plans, specifications and standards.
	1.3 **Tools and equipment** are selected as required, checked for serviceability and any faults are fixed or reported.
	1.4 Material quantity requirements are calculated in accordance with specifications.
	1.5 **Materials** needed are obtained, checked for compliance and prepared.
2. Install and test system components	2.1 system is set out in accordance with plans and specifications.
	2.2 Pipe supports are installed to comply with standards, plans and specifications.
	2.3 Fixings are installed to plans and specifications.
	2.4 Assemblies, devices, alarms, piping and materials are installed in accordance with standards, plans and specifications.
	2.5 Jointing systems are installed in compliance with standards.
	2.6 Installed system is subjected to pressure testing in specifications.
3. Clean up	3.1 Work area is cleaned and waste disposed of, reused or recycled in accordance with work specifications.
	3.2 Tools and equipment are cleaned, checked for faults and maintained and stored in accordance with workplace practices.

Evidence guide

To demonstrate competency in this unit the candidate must meet skills and knowledge requirements, plus safety and environmental requirements, as set out in the introduction to these RMCS.

The candidate must be able to install and test, completing to specifications:

- A domestic and residential fire safety sprinkler system consisting of a water supply, piping, control valves, actuating devices, alarms and sprinkler heads.

Critical skills and essential knowledge

The ability to:

- apply common skills and knowledge specified in the introduction to these RMCS.

Knowledge of:

- Components and materials relevant to installing domestic and residential life safety sprinkler systems
- Function and operation of a range of alarms, actuating devices, sprinkler heads and valves
- Installing and testing a fire sprinkler system, including piping, control valve assemblies, actuating devices, alarms and sprinkler heads
- Pressure test systems and procedures
- Process of installing domestic and residential life safety sprinkler systems
- Relevant requirements related to installing domestic and residential life safety sprinkler systems
- Structural systems, building materials and building services
- Understanding of fire ratings

Range statement

Tools and equipment may include:

- Cutting and threading equipment
- Elevated work platforms
- Hand and power tools
- Ladders
- Silver brazing equipment
- Testing equipment
- Welding equipment

Materials may include:

- Actuating devices
- Control valve assemblies
- Local alarms
- Post-chlorinated PVC (PVC-C), steel or copper pipes or other approved materials
- Sprinkler heads

Competency may be assessed through a combination of:

- Demonstration
- Practical exercises
- Written or oral short answer questions

Competency is to be assessed in the workplace or in simulated workplace environment.

Functional area H – Electrical wiring and cabling

CS-H1 Read Electrical Drawings And Diagrams

Unit details	
Functional area H	**Electrical wiring and cabling**
Unit title	**Read Electrical Drawings And Diagrams**
Unit code	**CS-H1**

Description

This unit describes the skills and knowledge required to use drawings, diagrams, cable schedules, standards, codes and specifications as they apply to the various electro-technology work functions.

Elements of competency	Performance criteria
1. Interpret drawings, diagrams, schedules and manuals	1.1 Drawings, diagrams, schedules and/or manuals are selected to suit the work being undertaken and interpreted, using knowledge of drawing layouts, conventions and symbols.
	1.2 Dimensions are extracted from drawings and diagrams to apply to work task.
	1.3 Manuals are reviewed to locate information relevant to the work to be undertaken.
	1.4 Location of equipment is determined from equipment schedules and location diagrams.
2. Use drawings, diagrams, schedules and manuals to convey information and ideas	2.1 Drawing conventions are used in neat freehand drawings to convey information and ideas to others involved in the work to be undertaken.
	2.2 Drawing conventions are used to neatly correct freehand original job drawing to show final 'as-installed' arrangement.
	2.3 Corrected drawings are forwarded to appropriate person(s) in accordance with established procedures.

Evidence guide

A person who demonstrates competency in this unit must be able to provide evidence of the ability to acquire knowledge using:

- Drawings, diagrams, cable schedules, standards, codes and specifications
- Technical standards, codes and specifications.

Critical skills and essential knowledge

The ability to:

- apply common skills and knowledge specified in the introduction to these RMCS.

Knowledge of:

- Knowledge of drawing layouts, conventions and symbols

Range statement

This unit shall be demonstrated in relation to assembly, installation, fault finding, maintenance or development work functions in any of the following disciplines:

- Appliances
- Business equipment
- Computers
- Data communications
- Electrical
- Electrical machines
- Electronics
- Fire protection
- Instrumentation
- Refrigeration and air conditioning
- Renewable/sustainable energy
- Security technology

The following resources must be provided:

- Materials relevant to the proposed activity
- Tools, equipment and facilities appropriate to processes or activity

Competency may be assessed through a combination of:

- Demonstration
- Off the job theory and knowledge questions
- Practical exercises
- Written or oral short answer questions

Competency is to be assessed in the workplace or in simulated workplace environment.

CS-H2 Lay and install low-voltage wiring and communications cabling

Unit details	
Functional area H	**Electrical wiring and cabling**
Unit title	**Lay and install low-voltage wiring and communications cabling**
Unit code	**CS-H2**

Description

This unit describes the skills and knowledge required to install wiring enclosures, cable support systems, cables and accessories in electrical systems of 36 volts or less.

Elements of competency	Performance criteria
1. Prepare to install extra **low voltage wiring systems**	1.1 Cables and wires are sized to suit calculated load. 1.2 Wiring system components are checked against job requirements. 1.3 Accessories are obtained to comply with task requirements. 1.4 Location for installation of accessories, apparatus and circuits is determined from job requirements. 1.5 **Materials**, tools and equipment needed to complete the work are obtained and checked for correct operation. 1.6 Preparatory work is checked against requirements to ensure no unnecessary damage has occurred.
2. Install and check wiring systems	2.1 Wiring systems are installed to meet requirements, without damaging the surrounding environment or services. 2.2 Accessories are terminated and wires are connected as required to solenoids and controllers. 2.3 Final checks are made to ensure the wiring system is working correctly.

Evidence guide

To demonstrate competency in this unit the candidate must meet skills and knowledge requirements, plus safety and environmental requirements, as set out in the introduction to these RMCS. The candidate must be able to:

- checks that the system meets requirements and works effectively;
- plan and install wiring enclosures, cable support systems, cables and accessories in electrical systems of 36 volts or less;
- read labels and signage to differentiate between extra low voltage and other electrical systems;
- safely work with extra low voltage systems; and
- size cables and wires to suit calculated load.

Critical skills and essential knowledge

The ability to:

- apply common skills and knowledge specified in the introduction to these RMCS.

Knowledge of:

- Follow enterprise safety procedures and safely work with extra low voltage systems

- Isolation and tagging procedures
- Read labels, signage and procedures documentation
- Size cables and wires to suit calculated load
- Testing equipment and procedures

Range statement

Types of **low voltage wiring systems** may include:

- 36 volts or less
- Applications include:
    - Milking equipment systems such as pulsation systems
    - In irrigation systems between controllers and system components such as solenoid valves
    - Domestic garden lighting systems

Materials may include:

- Colour-coded wiring
- Fixings, fasteners, connectors
- Sockets
- Plugs
- Sheathed cables
- Terminating conductors

Competency may be assessed through a combination of:

- Demonstration
- Practical exercises
- Written or oral short answer questions

Competency is to be assessed in the workplace or in simulated workplace environment.

CS-H3 Test Wiring Systems

Unit details	
Functional area H	**Electrical wiring and cabling**
Unit title	**Test wiring systems**
Unit code	**CS-H3**

Description

This unit describes the skills and knowledge required to inspect and test main switchboards, distribution boards and wiring that supplies up to a three-phase load, to verify that an electrical installation is safe and complies with all requirements.

Elements of competency	Performance criteria
1. Prepare to test wiring systems	1.1 All documentation for the installation is reviewed and appropriate personnel informed of the of the testing procedure to ensure that the work is coordinated effectively with others involved on the work site.
	1.2 Required needed tools, equipment and testing devices are obtained and checked for correct operation and safety.
2. Use **measuring equipment** to determine **capitance** and **inductance**	2.1 Recognize electrical hazards.
	2.2 System is visually inspected and safety testing conducted, determining the need to test or measure live where necessary.
	2.3 Checks are made that all circuits/machines/plant are isolated where necessary, and that the wiring is suitable for its environments and is protected from damage or overheating.
	2.4 Confirmation is made that the cable conductor sizes meet the current-carrying capacity requirements, as well as the voltage-drop and fault-loop impedance limitations.
	2.5 Checks are made to ensure the protection methods and devices meet coordination requirements for overload and short-circuit protection.
	2.6 Checks are made to ensure the switchgear and control gear are appropriately rated and meet functional requirements.
	2.7 Confirmation is made that the electrical equipment complies with the safety requirements, that the earthing system components are correctly located and the conductors are correctly sized.
	2.8 Markings on the switchboards are checked for accuracy and clarity and compliance with requirements.
	2.9 **Tests** are conducted to verify that the earthing-conductor resistance is sufficiently low, the insulation resistance is sufficiently high, that all polarities are correct and the circuit connections are correct.

2.10 Tests are conducted to verify the fault-loop impedance is sufficiently low and that the residual-current devices operate as intended.

2.11 Test data is documented for commissioning and sign-off purposes.

Evidence guide

To demonstrate competency in this unit the candidate must meet skills and knowledge requirements, plus safety and environmental requirements, as set out in the introduction to these RMCS.

Critical skills and essential knowledge

The ability to:

- apply common skills and knowledge specified in the introduction to these RMCS.

Knowledge of:

- Apply electrical theories and principles to the testing work
- Understand the electrical characteristics of the materials

Range statement

Capacitance (concept, units, time, constant relationship and hazards)
Inductance (concept, units, time and constant relationship)

Measuring equipment may include:

- Cable tester
- Continuity tester
- Electricity meter
- Frequency counter
- LCR meter
- Multimeters
- Solenoid voltmeter
- Voltametre
- Wattmeter

Capitance is:

- The ability of a system to store an electric charge

Inductance is

- A measure of the amount of electromotive force (voltage) generated for a given rate of change of current. Inductance results from the magnetic field around a current-carrying conductor; the electric current through the conductor creates a magnetic flux.

Tests may include:

- Component isolation
- Continuity tests
- Resistance tests
- Sectional testing
- Split-half tests
- Visual inspection

Competency may be assessed through a combination of:

- Demonstration

- Practical exercises
- Written or oral short answer questions

Competency is to be assessed in the workplace or in simulated workplace environment.

CS-H4 Attach cords and plugs to electrical equipment

Unit details	
Functional area H	**Electrical wiring and cabling**
Unit title	**Attach cords and plugs to electrical equipment**
Unit code	**CS-H4**

Description

This unit describes the skills and knowledge required to attach flexible cords/cables and plugs to electrical equipment connected to a supply up to 1,000 Volt Alternative Current (v a.c.). Or 1,500 Volt Direct Current (v d.c.)

Elements of competency	Performance criteria
1. Plan and prepare	1.1 **Materials, tools, equipment** and **testing devices** to complete the work are obtained and checked against job requirements and for correct operation and safety.
	1.2 **Flexible cord/cables** are prepared without damage to insulation and conductors.
	1.3 Safety policies and procedures are followed throughout the work.
2. Attach flexible cords/cables and plugs and test for safety	2.1 Single insulated metal-framed equipment is earthed in accordance with requirements.
	2.2 The integrity of double insulated equipment is maintained.
	2.3 Conductors are connected to terminals to ensure required polarity.
	2.4 Appropriate **tests** of the cords/cables and plugs connected to the electrical equipment are conducted to ensure that they will operate safely.
3. Locate and repair faults in attached flexible cords and plugs	3.1 Electrical equipment and attached flexible cords and plugs are isolated in accordance with established procedures.
	3.2 Visual checks of the attached flexible cords and plugs are carried out to detect any obvious damage or fault.
	3.3 Faults in attached flexible cords and plugs are identified and repaired in accordance with established procedures.
	3.4 Required documentation is completed in accordance with work procedures.

Evidence guide

To demonstrate competency in this unit the candidate must meet skills and knowledge requirements, plus safety and environmental requirements, as set out in the introduction to these RMCS. The candidate must be able to:

- deal with unplanned events by drawing on essential knowledge and skills to provide appropriate solutions;
- demonstrate each performance criteria at least twice;
- implement workplace safety procedures and practices; and
- plan, prepare, test, replace and repair when attaching flexible cords/cables and plugs up to 1,000 v a.c. To 1,500 v d.c.

Critical skills and essential knowledge

The ability to:

- apply common skills and knowledge specified in the introduction to these RMCS.

Knowledge of:

- AC and DC power supplies
- Assessing and testing equipment
- Cable support and protection devices, accessories; typical applications and installation techniques
- Relevant mathematical concepts and application of formulae
- Structural components of cables and their purpose
- Technical fault finding
- Understanding of power cable and conductor terminations

Range statement

Materials, tools, equipment may include:

- Adjustable wrench
- Cable cutters
- Long nose pliers
- magnetic nut driver, masking tape
- Pencil
- Screwdrivers, sealant, side cutters
- Wire strippers

Testing devices may include:

- Cable tester
- Continuity tester
- Electricity meter
- Frequency counter
- LCR meter
- Multimeters
- Solenoid voltmeter

Flexible cables/cords connect appliances to power supply by plugs and may include:

- 2kw fan heaters
- Certain hair dryers
- Electric drills
- Food mixers
- Irons
- Kettles
- Refrigerators
- Table lamps
- Vacuum cleaners

Types of flex cables/cords may include:

- 85°c rubber high temperature cords (e.g. for immersion heaters, storage heaters)
- Light duty 85°c PVC cords (e.g. for pendant light fittings)
- Light duty PVC (e.g. for fridges, televisions, sewing machines, food mixers, domestic hair dryers, table lamps, plate warmers. All appliances not too hot to handle)
- Ordinary PVG (e.g. for washing machines, tumble dryers, vacuum cleaners, lawnmowers, toasters)
- Parallel twin (e.g. for clocks)
- Rubber textile braid or ordinary duty PVC (e.g. for room heaters)
- Rubber with oil resistant sheath (e.g. for frypans - hot appliances)
- Rubber/textile braided (e.g. for irons)

- Volt meter
- Wattmeter

Tests may include:

- Component isolation
- Continuity tests
- Resistance tests
- Sectional testing
- Split-half tests
- Visual inspection

The following resources must be provided:

- Materials relevant to the proposed activity and reflective of current industry practices
- Tools, equipment and facilities appropriate to processes or activity

Competency may be assessed through a combination of:

- Demonstration
- Off the job theory and knowledge questions
- Practical exercises
- Written or oral short answer questions

Competency is to be assessed in the workplace or in simulated workplace environment.

CS-H5 Disconnect and reconnect low-voltage electrical equipment

Unit details	
Functional area H	**Electrical wiring and cabling**
Unit title	**Disconnect and reconnect low-voltage electrical equipment**
Unit code	**CS-H5**

Description

This unit describes the skills and knowledge required to disconnect and reconnect electrical wiring systems, including general low voltage lighting, power circuits, control/indication and alarm circuits.

Elements of competency	**Performance criteria**
1. Plan and prepare	1.1 Work requirements are confirmed with appropriate parties or by site inspection.
	1.2 Relevant plans, drawings and texts are selected and interpreted.
	1.3 Tools, **materials** and **testing devices** needed to carry out the work are obtained and checked for correct operation.
2. Disconnect electrical equipment	2.1 Electrical equipment isolation points are determined in accordance with site requirements.
	2.2 **Wiring enclosures/support** systems are assembled/positioned and installed in accordance with the work plan and inspected for serviceability.
	2.3 Electrical equipment is isolated and confirmed as de-energised.
	2.4 Visual checks of electrical equipment and **wiring** are carried out to detect any abnormal or obvious damage or faults.
	2.5 The conductor connection sequence is recorded and labelled in accordance with workplace procedures.
	2.6 Electrical equipment is disconnected from fixed wiring without damage to other components.
	2.7 Disconnected conductors/cables are terminated to ensure they are safe and that they present no potential hazard.
3. Prepare to reconnect electrical equipment	3.1 The point of **isolation** of the circuit where the electrical equipment is to be connected is identified.
	3.2 Original and/or replacement electrical equipment is tested to ensure it is safe to connect to the electrical supply and use.
	3.3 Measures are taken to ensure that the circuit to which the electrical equipment is to be connected remains isolated and de-energized.
	3.4 The resistance between the protective earthing conductor and the neutral conductor is tested to determine whether it is sufficiently low, (i.e. not greater than 2 Ohms).
	3.5 The insulation resistance of active conductors is tested to confirm that it is greater than 1 megohm.

		3.6 Continuity between exposed conductive parts of the equipment and the main earth or metal switchboard enclosure is confirmed.
4.	Test the reconnected electrical equipment for safe operation	4.1 Electrical equipment is disconnected from the fixed wiring without any damage to components. 4.2 Electrical equipment is connected checked to confirm compliance with requirements and safe operation. 4.3 Work reports and report faults are completed in accordance with workplace procedures.

Evidence guide

To demonstrate competency in this unit the candidate must meet skills and knowledge requirements, plus safety and environmental requirements, as set out in the introduction to these RMCS. The candidate must be able to:

- deal with unplanned events by drawing on essential knowledge and skills;
- determine the electrical characteristics of equipment;
- identify and isolate circuit (including testing for safe isolation);
- identify faults at point of disconnection and/or reconnection ;
- identify point of installation ;
- prepare to disconnect electrical equipment;
- safely disconnect and reconnect fixed wired electrical equipment connected to a low voltage supply ;
- select tools, equipment, and testing devices;
- test the reconnected electrical equipment for safe operation including polarity and earth continuity; and
- undertake visual checks of the electrical equipment and associated wiring to detect and reporting any damage or fault.

Critical skills and essential knowledge

The ability to:

- apply common skills and knowledge specified in the introduction to these RMCS.

Knowledge of:

- Basic electrical principles
- Disconnect/reconnect procedures
- Electrical safe working practices
- General principles of fault finding
- Power cable and conductor terminations
- Produce status reports using established procedures

Range statement

Materials may refer to:

- Masonry anchors, bolts, nuts, washers, screws, rivets, saddles, clips, brackets, solvents, adhesives, insulation tapes, heat shrink, sleeving, spiral binding, cable ties, solder, lubricants, greases, sealants, lugs, connectors, terminal blocks, cable markers and identification labels

Testing devices can refer to:

- Insulation resistance/continuity tester and multimeters

Work site environment may be affected by nearby plant or process, e.g. heat, noise, dust, oil, water and chemical

Wiring enclosures/support systems may refer to:

- conduit such as rigid/flexible steel; and
- light/heavy duty PVC, flexible PVC and their associated fittings; duct or trunk such as concrete, metal, PVC and their associated fittings; cable tray/rack such as standard/heavy duty galvanised steel ladder, perforated cable tray and their associated fittings.

Wiring may include:

- Busway, single/multi-core copper, aluminium thermoplastic or elastomer sheathed, flat or circular cables, flexible cords, steel wire armoured, mims, data/communications cable and their associated cable glands and plugs

Isolations can refer to:

- Electrical/mechanical or other associated processes

The following resources must be provided:

- Materials relevant to the proposed activity
- Tools, equipment and facilities appropriate to processes or activity

Competency may be assessed through a combination of:

- Demonstration
- Practical exercises
- Written or oral short answer questions
- Off the job theory and knowledge questions

Competency is to be assessed in the workplace or in simulated workplace environment and in relation to disconnecting and reconnecting at least one of the following types of electrical equipment, connected to supplies up to 1,000v a.c. or 1,500v d.c:

- Appliances (o)
- Composite equipment incorporating one or more current-using devices and/or controls (examples a self-contained refrigeration unit, machine tools)
- Control devices
- Electrical water heaters
- Motors
- Pre-assembled types 1 and 2 cold cathode neon signs

Competency may be assessed through a combination of:

- Demonstration
- Practical exercises
- Written or oral short answer questions

Competency is to be assessed in the workplace or in simulated workplace environment.

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Regional Model Competency Standards: Construction

The need to improve the quality and effectiveness of skills training system remains a major challenge for many countries in the Asia-Pacific region.

National competency standards play an important and increasing role in the skills development and recognition in the Asia-Pacific region, as they do in many other parts of the world. They are a guide to the range of skills and knowledge required for a whole industry. Competency standards can be flexibly combined into jobs and occupations. They are the common basis for training programmes, skills assessment and certification in many countries. The ILO has developed, in consultation with employers, governments and workers, the Regional Model Competency Standard (RMCS) in identify priority areas and in a simplified format. The RMCS will benefit those countries that are in the process of developing standards or reviewing existing national standards in light of similar standards available in the region.

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