



**Australian Government**

**Department of Education, Employment and Workplace Relations**

# **CPCBC6014A Apply structural principles to the construction of large, high rise and complex buildings**

**Release: 1**

## **CPCBC6014A Apply structural principles to the construction of large, high rise and complex buildings**

### **Modification History**

Not Applicable

### **Unit Descriptor**

#### **Unit descriptor**

This unit of competency specifies the outcomes required to apply structural principles to the building of large, high rise and complex buildings.

The design and construction of large buildings requires the input of a range of skilled professionals, including architects and engineers. The building and construction professional plays a significant role within this project team and requires the ability to communicate effectively with building design professionals and develop sound and safe practices in relation to structural procedures on site.

### **Application of the Unit**

#### **Application of the unit**

This unit of competency supports builders, project managers and related construction industry professionals responsible for ensuring the structural integrity of materials and building and construction work so that site safety and quality control measures are maintained during residential and commercial projects.

### **Licensing/Regulatory Information**

Not Applicable

## **Pre-Requisites**

**Prerequisite units** Nil

## **Employability Skills Information**

**Employability skills** This unit contains employability skills.

## **Elements and Performance Criteria Pre-Content**

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Elements describe the essential outcomes of a unit of competency.

Performance criteria describe the performance needed to demonstrate achievement of the element. Where bold italicised text is used, further information is detailed in the required skills and knowledge section and the range statement. Assessment of performance is to be consistent with the evidence guide.

## Elements and Performance Criteria

ELEMENT	PERFORMANCE CRITERIA
1. Apply structural principles to the planning of the erection or demolition of a structure.	<p>1.1. Main <i>structural principles</i> that apply to the erection of large, high rise and complex structures are identified.</p> <p>1.2. Performance characteristics of the structural elements, including <i>materials</i> identified in the building plan, are identified, analysed and applied to the planning of the construction work.</p> <p>1.3. Demolition of existing structures is undertaken in accordance with legislative and planning requirements and safe work practices.</p>
2. Coordinate and manage the site assessment and job set-up.	<p>2.1. Processes are put in place to analyse stability of soils and capacity of the site to support the construction loads.</p> <p>2.2. Requirements for retaining walls are identified in conjunction with related industry professionals and applied to the planning process.</p> <p>2.3. Structural function and requirements for <i>temporary structural elements</i> are analysed and applied to the planning process.</p>
3. Coordinate and manage construction of footing systems.	<p>3.1. Coordination of the set-out of the building is undertaken in accordance with documented building plans, following the full assessment of the site.</p> <p>3.2. Structural performance of the footings specified in the building plan is assessed for compliance with relevant codes and accepted industry construction principles.</p> <p>3.3. Footings, as specified in the building plan, are laid and checked for compliance with standards and accepted industry construction principles.</p> <p>3.4. Damp coursing and the provision of termite barriers and other relevant techniques are planned, implemented and checked in accordance with codes, standards and industry practice.</p>
4. Coordinate and manage structural elements of the construction process.	<p>4.1. Technical construction principles and performance characteristics of construction materials are identified and analysed in the planning of project.</p> <p>4.2. Processes for construction of all structural elements are identified, implemented and checked for compliance with manufacturer specifications and relevant Australian standards and codes.</p> <p>4.3. Building plans and relevant standards and codes are identified and implemented to ensure appropriate allowances have been made for plumbing, electrical</p>

**ELEMENT**

**PERFORMANCE CRITERIA**

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conduits and other services to be installed.

## ELEMENT

## PERFORMANCE CRITERIA

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| 5. Analyse and plan for structural integrity of buildings. | 5.1. Relevant industry professionals are consulted to provide advice regarding the structural integrity of proposed building.<br>5.2. <b>Structural requirements and loads</b> of the building design are assessed.<br>5.3. Analysis is conducted of the effects of force and movements on structural elements.<br>5.4. Analysis of properties and behaviours of structural materials is conducted.<br>5.5. Analysis of section properties of structural elements is conducted using standard industry formulas and performance comparisons.<br>5.6. <b>Performance characteristics of columns</b> are evaluated using standard industry techniques.<br>5.7. Methods used for stress distribution in connections between structural elements are assessed.<br>5.8. Impact of <b>various loads</b> on the building structure is assessed.<br>5.9. Design impact of high performance structural elements is considered. |
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## Required Skills and Knowledge

### REQUIRED SKILLS AND KNOWLEDGE

This section describes the skills and knowledge required for this unit.

#### Required skills

Required skills for this unit are:

- application of design concepts and principles
- application of measurements and calculations
- communication skills to:
  - consult with industry professionals
  - enable clear and direct communication, using questioning to identify and confirm requirements, share information, listen and understand
  - read and interpret:
    - codes and standards
    - legislative and planning requirements
    - plans, specifications and drawings
    - other relevant documentation

## **REQUIRED SKILLS AND KNOWLEDGE**

- use and interpret non-verbal communication
- use language and concepts appropriate to cultural differences
- interpret documentation from a wide range of sources
- numeracy skills to apply measurements and calculations.

### **Required knowledge**

Required knowledge for this unit is:

- applications of structural principles in buildings
- Building Code of Australia (BCA) and Australian standards
- design principles and behaviour of structural members undergoing stress, strain, compression, bending or combined actions
- interpretation and analysis of work drawings and specifications
- nature of materials and effect of performance.

## Evidence Guide

### EVIDENCE GUIDE

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The evidence guide provides advice on assessment and must be read in conjunction with the performance criteria, required skills and knowledge, range statement and the Assessment Guidelines for the Training Package.

#### Overview of assessment

This unit of competency could be assessed by the application of structural design principles and communication of the selection, positioning and sizing of all structural members that form fixed or temporary building structures.

This unit of competency can be assessed in the workplace or a close simulation of the workplace environment, provided that simulated or project-based assessment techniques fully replicate construction workplace conditions, materials, activities, responsibilities and procedures.

#### Critical aspects for assessment and evidence required to demonstrate competency in this unit

A person who demonstrates competency in this unit must be able to provide evidence of the ability to:

- coordinate professional input to evaluate structural integrity of large and complex buildings
- clearly analyse structural impact of design decisions
- comply with OHS and organisational quality procedures and processes
- apply and interpret relevant documentation and codes
- apply design principles relating to performance
- identify typical faults and problems and the action required to rectify such faults.

#### Context of and specific resources for assessment

This competency is to be assessed using standard and authorised work practices, safety requirements and environmental constraints.

Assessment of essential underpinning knowledge will usually be conducted in an off-site context.

Assessment is to comply with relevant regulatory or Australian standards' requirements.

Resource implications for assessment include:

- documentation, including design brief drawings, specifications, codes, design concepts, construction schedules and other



## EVIDENCE GUIDE

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necessary supporting documents

- research resources, including timber product information and samples
- access to relevant legislation, regulations and codes of practice, including the BCA
- relevant computer software package and suitable hardware.

Reasonable adjustments for people with disabilities must be made to assessment processes where required. This could include access to modified equipment and other physical resources, and the provision of appropriate assessment support.

### Method of assessment

Assessment methods must:

- satisfy the endorsed Assessment Guidelines of the Construction, Plumbing and Services Training Package
- include direct observation of tasks in real or simulated work conditions, with questioning to confirm the ability to consistently identify and correctly interpret the essential underpinning knowledge required for practical application
- reinforce the integration of employability skills with workplace tasks and job roles
- confirm that competency is verified and able to be transferred to other circumstances and environments.

Validity and sufficiency of evidence requires that:

- competency will need to be demonstrated over a period of time reflecting the scope of the role and the practical requirements of the workplace
- where the assessment is part of a structured learning experience the evidence collected must relate to a number of performances assessed at different points in time and separated by further learning and practice, with a decision on competency only taken at the point when the assessor has complete confidence in the person's demonstrated ability and applied knowledge
- all assessment that is part of a structured

## EVIDENCE GUIDE

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learning experience must include a combination of direct, indirect and supplementary evidence.

Assessment processes and techniques should as far as is practical take into account the language, literacy and numeracy capacity of the candidate in relation to the competency being assessed.

Supplementary evidence of competency may be obtained from relevant authenticated documentation from third parties, such as existing supervisors, team leaders or specialist training staff.

## Range Statement

### RANGE STATEMENT

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The range statement relates to the unit of competency as a whole. It allows for different work environments and situations that may affect performance. Bold italicised wording, if used in the performance criteria, is detailed below. Essential operating conditions that may be present with training and assessment (depending on the work situation, needs of the candidate, accessibility of the item, and local industry and regional contexts) may also be included.

***Structural principles*** relate to factors, including:

- dead and live load calculations and characteristics
- impact of wind, snow, ground water, earthquake, liquid pressure, rainwater and earth pressure actions
- impact of time-dependent effects, including creep and shrinkage
- impact of thermal effects
- structural resistance of materials
- fire resistance of materials
- structural resistance of forms of construction.

***Materials*** include:

- masonry
- concrete, including reinforced and pre-stressed concrete
- steel, including cold-formed steel
- composite steel and concrete
- aluminium.

## RANGE STATEMENT

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***Temporary structural elements*** include:

- bracing
- close sheeting
- formwork props
- pressure resistant formwork
- scaffolding sole plates
- shields
- shoring collar sets
- soldier sets
- ties.

***Structural requirements and loads*** relate to building:

- aesthetics
- economy
- equilibrium
- functionality
- stability
- strength.

***Properties and behaviours of structural materials*** include consideration of:

- effect of force on materials in tension, compression, stress, strain and elasticity
- structural properties of common materials.

Analysis of ***performance characteristics of columns*** requires consideration of:

- bending behaviour and performance of loaded support beams
- eccentric and axial load effect
- load spanning elements for bending moments, shear forces, deflection and torsion
- effect of connections
- effect of slab behaviour in relation to spans and stress distribution
- effect of slenderness ratio.

***Various loads*** include:

- dead load
- earthquake load
- live load
- wind load.

***High performance structural elements*** include:

- castellated beams
- connections
- fire resistance
- laminated beams
- pre-stressed beams
- slabs
- trusses
- use of steel to reinforce concrete
- waffle slabs.

## **Unit Sector(s)**

**Unit sector** Construction

## **Co-requisite units**

**Co-requisite units** Nil

## **Functional area**

**Functional area**