

# Demolition theory and application

Code DEMSAFO5B

Workplace Health and Safety Queensland (WHSQ) requires the prescribed activity of demolition work in Queensland to be supervised by a competent person. One element recognised by WHSQ as contributing toward competency as a supervisor involves achieving a qualification covering knowledge of the *Australian Standard 2601-2001 The demolition of structures* (AS 2601). Learning and assessment is conducted in the Vocational Education and Training (VET) sector in which units of competency set out the knowledge and skills needed to demonstrate competent performance in this activity.

© State of Queensland (Department of Employment and Industrial Relations) 2008

The State of Queensland acting through the Department of Employment and Industrial Relations (DEIR) Workplace Health and Safety Queensland (WHSQ) holds copyright of this material.

## DEMFAF05B

### Demolition Theory and Application

#### Descriptor:

This unit specifies the knowledge required of the AS 2601 necessary for the purposes of licensing the prescribed activity of demolition within the state of Queensland and for the development of the associated work method statements.

#### Employability Skills

The following Employability skills are addressed within this unit of competency:

Communication, teamwork, problem solving, initiative and enterprise, planning and organising, self management, learning, and technology.

#### Application of the Unit

This unit supports the attainment of skills and knowledge required for demolition workers tasked with the responsibility of supervising demolition work or preparing work method statements in accordance with Queensland workplace health and safety legislation.

#### Elements and Performance Criteria:

Element of Competency	Performance Criteria
Element 1. Apply the standards of AS 2601 to demolition activities.	1.1 <b>Health and safety requirements</b> for the general public and site personnel are specified in accordance with AS2601
	1.2 General <b>health and safety precautions</b> for ensuring the health and safety of the general public and site personnel are specified in accordance with AS 2601
Element 2. Analyse the methods of demolition to identify hazards.	2.1 AS 2601 requirements for undertaking a <b>site investigation</b> and <b>structural investigation</b> are specified
	2.2 <b>Methods of demolition</b> are specified and <b>precautions for methods of demolition</b> associated with those methods are specified.
	2.3 <b>Demolition procedures</b> relating to a specific method of demolition is determined.
Element 3. Apply risk management practices for building structures and members.	3.1 Hazards posed by various <b>methods of demolition</b> and <b>demolition procedures</b> are identified
	3.2 Precautions are applied to manage the hazards identified as a result of the selected <b>methods of demolition</b> and <b>demolition procedures</b> .
Element 4. Develop the demolition work plan relating to the specific demolition activity.	4.1 Specific <b>methods of demolition, demolition procedures</b> and <b>precautions for methods of demolition</b> in accordance with AS 2601 are applied to a demolition activity.
	4.2 A demolition work plan is produced which is compliant with AS 2601 in relation to a specific demolition activity.

#### Underpinning Skills and Knowledge

**Underpinning skills and knowledge includes**

A knowledge of

- Australian Standard AS 2601
- *Workplace Health and Safety Act 1995*
- *Workplace Health and Safety Regulation 1997*
- Safe work method statements
- Demolition work plans
  - Site investigations
  - Hazard identification
  - Work procedures
  - Work methods
  - Work restrictions / conditions
  - Time charts
  - Approvals

**Underpinning skills and knowledge includes:**

- Language & communications skills that:-
  - Communicates proposed ideas and strategies
  - Clarifies details & schedules
- Literacy skills
  - Use a range of communication styles e.g. forms, diagrams, charts, formulae
  - Document investigations
  - Write procedures
  - Write demolition work plan
- Research skills
  - Access information
  - Explore options & concepts
  - Identify critical and influential factors

**Underpinning skills and knowledge includes:**

- Analytical Skills
  - Interpret plans & specifications
  - Deduce potential outcomes
- Cognitive skills
  - Generate relevant ideas/solutions
  - Review and evaluate ideas
  - Determine range of solutions

**- Communicates proposed ideas and strategies**

- Communicating ideas and information to relevant personnel in order to confirm process and procedures
- Listens and responds to questions of others

**- Collecting, analysing and organising information**

- Establishes specific work based objectives
- Analyses information and documentation to determine activities and processes

**- Planning & organising activities**

- Co-ordinates the demolition process
- Ensures work activity is according to procedures
- Establishes and maintains work priorities according to plan

**- Working with others and in teams**

- Defines the purpose and objectives for the work activity for others.
- Accounts for the different skills of workers
- Provides supervision of work activity to ensure work is carried according to legal and procedural requirements

**- Uses mathematical ideas & techniques**

- Extracts data from site plans
- Checks mathematical calculations of others
- Applies a variety of formulae to calculate weight and volume.

**- Solving Problems**

- Able to determine the major factors affecting processes and outcomes to demolition activities
- Anticipates potential problems by understanding the conditions, which they can arise.
- Is able to judge the effectiveness of solutions/ideas

**- Uses Technology**

- Enters and retrieves data
- Conducts and reviews literature search

**Range Statement**

This range statement adds definition to the unit by elaborating criteria or significant aspects of the performance requirements of the unit. The range statement establishes indicative meanings or applications of these requirements in different contexts and conditions. The specific aspects, which require elaboration, are indicated by the use of *italics* in the performance criteria.

<p>General <b><i>health and safety requirements</i></b> include but are not limited to:</p> <p>General <b><i>health and safety precautions</i></b> include but are not limited to:</p>	<ul style="list-style-type: none"> <li>• Health &amp; safety of the general public <ul style="list-style-type: none"> <li>○ General</li> <li>○ Lighting</li> <li>○ Falling materials</li> <li>○ Fencing hoarding &amp; warning notices</li> <li>○ Scaffolding</li> <li>○ Overhead protection</li> </ul> </li> <li>• Health and safety of site personnel <ul style="list-style-type: none"> <li>○ Safety of work areas</li> <li>○ PPE &amp; devices</li> <li>○ Working in confined spaces</li> <li>○ Cutting &amp; welding processes</li> <li>○ Fire protection systems</li> <li>○ First Aid</li> <li>○ Amenities</li> <li>○ Electrical safety</li> </ul> </li> <li>• Hazardous substances including: <ul style="list-style-type: none"> <li>○ Asbestos and other materials and conditions audit</li> <li>○ Hazardous substances management plan</li> </ul> </li> <li>• Protection <ul style="list-style-type: none"> <li>○ Protection of adjoining buildings <ul style="list-style-type: none"> <li>▪ Access and egress</li> </ul> </li> </ul> </li> </ul>
--	--

	<ul style="list-style-type: none"> <li>▪ Damage and structural integrity</li> <li>▪ Vibration and concussion</li> <li>▪ Weatherproofing</li> <li>▪ Protective screen/scaffolding</li> <li>○ Protection of immediate environment <ul style="list-style-type: none"> <li>▪ Burning</li> <li>▪ Dust</li> <li>▪ Noise</li> <li>▪ Protection of public roads</li> <li>▪ Protection of services</li> </ul> </li> <li>○ Protection of external site <ul style="list-style-type: none"> <li>▪ Retained buildings or portions</li> <li>▪ Protection of flora</li> <li>▪ vermin</li> </ul> </li> <li>○ Plant &amp; equipment <ul style="list-style-type: none"> <li>▪ General</li> <li>▪ Cranes</li> <li>▪ Gas and flammable liquid containers</li> </ul> </li> </ul>
<p>Planning and Execution General Requirements: <b>Site investigations</b> include but are not limited to:</p> <p>Planning and Execution General Requirements: <b>Structural investigations</b> include but are not limited to:</p>	<ul style="list-style-type: none"> <li>• Investigation of the structure <ul style="list-style-type: none"> <li>○ Legal matters <ul style="list-style-type: none"> <li>▪ Statutory, regulatory or other legal impediments /restrictions to observe</li> <li>▪ Empowerment to demolish/remove</li> <li>▪ Identification of hazardous substances</li> <li>▪ Permission for adjoining neighbouring properties for the purposes of site protection</li> <li>▪ Acquisition of relevant plans and drawings</li> <li>▪ Contract documents</li> </ul> </li> <li>○ Structural issues/reports <ul style="list-style-type: none"> <li>▪ Principal materials of construction</li> <li>▪ Location and nature of hazardous or potentially hazardous materials</li> <li>▪ Structural stability <ul style="list-style-type: none"> <li>❖ Vertical loads</li> <li>❖ Horizontal loads</li> </ul> </li> <li>▪ Services <ul style="list-style-type: none"> <li>❖ Location and extent of supply mains or reticulation</li> <li>❖ Water</li> <li>❖ Gas</li> <li>❖ Electricity</li> </ul> </li> <li>▪ Condition of the structure and fittings</li> <li>▪ Confined spaces</li> </ul> </li> </ul> </li> <li>• Investigation of the site <ul style="list-style-type: none"> <li>▪ Location of other services including entry / exit</li> <li>▪ Sewage</li> <li>▪ Drainage</li> <li>▪ Heating, ventilation &amp; air conditioning</li> <li>▪ Emergency services <ul style="list-style-type: none"> <li>❖ Fire</li> <li>❖ Medical</li> <li>❖ Police</li> </ul> </li> <li>▪ Site plans <ul style="list-style-type: none"> <li>❖ Basements/cellars other u/g storage</li> </ul> </li> </ul> </li> </ul>

	<ul style="list-style-type: none"> <li>❖ Retaining structures</li> <li>❖ U/g storage tanks</li> <li>❖ Site ingress /egress</li> <li>❖ Personnel</li> <li>❖ Vehicles</li> <li>❖ Neighbouring buildings and structures</li> <li>❖ Security/ hoarding/barricades/overhead protection/fencing</li> <li>• Work plan <ul style="list-style-type: none"> <li>▪ In accordance with AS 2601</li> <li>▪ Site location, height of structure, building description and demolition zone identified</li> <li>▪ Methods of demolition and equipment to be used including level by level plan for moving mechanical equipment including size and weight of each item</li> <li>▪ Level by level procedures for stripping, breaking up and removal of materials including hazardous substances</li> <li>▪ Demolition sequence including time charts</li> <li>▪ Traffic and environmental management plans</li> <li>▪ Occupational health and safety system</li> <li>▪ Structural engineers report/s for safe suspension of loads</li> <li>▪ Restrictions / requirements by statutory authorities</li> </ul> </li> <li>○ Execution procedures <ul style="list-style-type: none"> <li>▪ Permits/approvals</li> <li>▪ Security of site</li> <li>▪ Permanent and emergency exits</li> <li>▪ Amenities</li> <li>▪ Site personnel communication</li> <li>▪ Disaster response/plans</li> </ul> </li> <li>○ Daily checklists - pre days work <ul style="list-style-type: none"> <li>▪ Site safety</li> <li>▪ Equipment checks</li> <li>▪ Temporary bracing</li> <li>▪ Fire and safety services</li> <li>▪ Hazardous materials</li> <li>▪ Communications</li> </ul> </li> <li>○ Daily checks – end of days work <ul style="list-style-type: none"> <li>▪ Stabilised partially completed work</li> <li>▪ Removable materials removed</li> <li>▪ Fires and embers extinguished</li> <li>▪ Emergency access clear and well marked</li> <li>▪ Public thoroughfares clear.</li> </ul> </li> <li>• Explosives</li> <li>• Training</li> <li>• Working in accordance with the work plan</li> </ul>
<p><b>Methods of Demolition</b> include but are not limited to:</p> <p><b>Precautions for methods of</b></p>	<ul style="list-style-type: none"> <li>• General precautions <ul style="list-style-type: none"> <li>○ Supervision</li> <li>○ Stability of the structure</li> <li>○ Loading on the floors</li> </ul> </li> </ul>

<p><b>demolition</b> include but are not limited to:</p>	<ul style="list-style-type: none"> <li>○ Loading against walls</li> <li>○ Protection of openings</li> <li>○ Glass</li> <li>○ Weather</li> <li>○ Site access</li> <li>○ Access within the structure</li> <li>○ Live and disconnected services</li> <li>○ Use of lifts during demolition</li> <li>● Damaged or ruinous buildings</li> <li>● Removal of hazardous substances <ul style="list-style-type: none"> <li>○ Removal of asbestos</li> <li>○ Removal of other materials</li> </ul> </li> <li>● Sequential methods <ul style="list-style-type: none"> <li>○ Sequence of demolition</li> <li>○ Removal of demolished materials</li> <li>○ Cutting and lowering of large members</li> </ul> </li> <li>● Manual demolition</li> <li>● Mechanical demolition <ul style="list-style-type: none"> <li>○ Crane</li> <li>○ By load shifting equipment</li> <li>○ On suspended floors</li> </ul> </li> <li>● Induced collapse methods <ul style="list-style-type: none"> <li>○ Pulling with ropes and chains</li> <li>○ Direct pushing / pulling</li> <li>○ Collapse induced by explosives</li> </ul> </li> </ul>
<p><b>Demolition procedures</b> for demolition include but are not limited to:</p>	<ul style="list-style-type: none"> <li>● Prestressed concrete structures <ul style="list-style-type: none"> <li>○ Prestressed concrete</li> <li>○ Methods of concrete stressing: pre-tensioning, post-tensioning and bonded and unbonded tendons</li> <li>○ Identifying prestressed members</li> <li>○ Prestressed hazards</li> </ul> </li> <li>● Demolition techniques <ul style="list-style-type: none"> <li>○ Pre-tensioned and grouted post-tensioned members</li> <li>○ Ungouted post-tensioned members</li> </ul> </li> <li>● Columns and walls <ul style="list-style-type: none"> <li>○ Steel columns</li> <li>○ Concrete columns</li> <li>○ Masonry walls</li> <li>○ Concrete walls</li> </ul> </li> <li>● Roof &amp; floor systems <ul style="list-style-type: none"> <li>○ Domed, vaulted or arched</li> <li>○ Flat roofs</li> </ul> </li> <li>● Steel framed flooring <ul style="list-style-type: none"> <li>○ Composite steel and concrete floors</li> </ul> </li> <li>● Concrete framed flooring <ul style="list-style-type: none"> <li>○ Slabs supported only by beams or walls</li> <li>○ Slab panels supported by beams and columns</li> <li>○ Slabs without beams, supported by columns</li> <li>○ Ribbed slabs</li> </ul> </li> <li>● Beams in beam and slab construction <ul style="list-style-type: none"> <li>○ Single span beams</li> <li>○ Multiple span beams</li> <li>○ Beams framing other columns</li> </ul> </li> <li>● Lifts</li> </ul>

	<ul style="list-style-type: none"> <li>• Basements and other below ground structures</li> <li>• Storage tanks</li> <li>• Chimneys <ul style="list-style-type: none"> <li>○ Masonry</li> <li>○ Steel</li> <li>○ Concrete</li> </ul> </li> <li>• Reinforced precast panel walls</li> <li>• Reinforced concrete tilt up panels</li> </ul>
--	--

## Evidence Guide

### Critical Aspects of Evidence

The evidence guide provides advice on assessment and must be read in conjunction with the Performance Criteria, Required Skills and Knowledge, the Range Statement and the Assessment Guidelines for this Training Course.

### Overview of Assessment

To demonstrate competency in the unit, candidates must be able to show evidence that they can apply the AS 2601. This requires the candidate to be able to demonstrate competency in an examination and oral presentation as well as satisfactorily present and develop a demolition document required under Queensland's workplace health and safety legislation that relates to the demolition of structures.

### Evidence Requirements

Critical aspects of evidence:

- Location, interpretation and application of relevant information standards and specifications
- Compliance with Australian Standard 2601 in respect to Demolition activities
- Communicating and working effectively with others
- Presenting an verbal presentation of approximately 10-15 minutes duration discussing the demolition methods, procedures and precautions utilised within a demolition work plan and how it demonstrates compliance with AS 2601
- Responding to questions asked by the trainer/ assessor in regards to the application of AS 2601 contained in the demolition work plan
- Completing and submitting a demolition work plan that conforms to AS 2601 guidelines covering a specific demolition scenario
- Completing a theoretical examination which demonstrates competency.

### Methods of assessment

- Assessment methods must confirm consistency and accuracy of performance together with application of underpinning knowledge
- Assessment methods must confirm the ability to access and correctly interpret and apply the essential underpinning knowledge
- Assessments are to be applied under project related conditions and require evidence of process
- Assessment must confirm a reasonable inference that competency can be satisfied under a particular circumstance and can also be transferred to other circumstances
- Assessment methods should reflect workplace demands, such as literacy, and the needs of particular groups, such as:
  - a. people with disabilities
  - b. people from culturally and linguistically diverse backgrounds
  - c. Aboriginal and Torres Strait Islander people
  - d. women

- e. young people
- f. older people
- g. people in rural and remote locations.

The following assessment methods are required:

Verbal presentation of 10-15 minutes duration

Verbal questioning to assess knowledge and understanding

Written examination comprising both multiple choice and short answer questions

Completion of a workplace document produced as part of routine work activities.

Examples of documents found during routine demolition work may include:

- Safe Work Method Statements for demolition
- Construction Safety Plan
- Demolition Safety Plans

### **Context of assessment**

Evidence for assessment must be gathered over time in a range of contexts to ensure the person can achieve the unit outcome and apply the competency in different situations or environments:

- The application of competency is to be assessed from examinations and 'real work' documents
- Assessment of essential underpinning knowledge, may not be conducted in an off site context
- Assessment is to comply with the relevant regulatory requirements.

### **Resource implications for assessment**

Candidate has access to:

- Relevant Act, Regulations, Codes of Practice, Australian Standards for demolition
- Libraries
- Regulatory Authorities
- Word processing facilities.

### **Access & Equity**

An individual's access to the assessment process should not be adversely affected by restrictions placed on the location or context of assessment beyond the requirements specified in this Training Package.

Reasonable adjustments can be made to ensure equity in assessment for people with disabilities. Adjustments include any changes to the assessment process or context that meet the individual needs of the person with a disability, but do not change competency outcomes. Such adjustments are considered 'reasonable' if they do not impose an unjustifiable hardship on a training provider or employer. When assessing people with disabilities, assessors are encouraged to apply good practice assessment methods with sensitivity and flexibility.