

Table of Contents

BCCTC3001B	Install tunnelling construction services.....	1159
BCCTC3002B	Line tunnel.....	1167
BCCTC3003B	Excavate tunnel by machine	1175
BCCTC3004B	Muck out tunnel earthworks	1183
BCCTC3005B	Construct portals	1191

BCCTC3001B**Unit Descriptor****Install tunnelling construction services**

This unit specifies the competency required to install tunnelling construction services for the provision of essential services to effect a safe and healthy working environment during tunnel construction. It includes the minimum criteria for competency assessment.

This unit includes air ventilation, water supply, road/rail access and drainage for the extraction of excess water.

Employability Skills

The required outcomes described in this Unit of Competency contain applicable facets of employability skills. The Employability Skills Qualification Summary for the qualification in which this Unit of Competency is packaged will assist in identifying employability skill requirements.

Element

Elements define the essential outcomes of a unit of competency.

Performance Criteria

Performance criteria specify the level of performance required to demonstrate achievement of the element.

1 Plan and prepare

- 1.1 Work instructions, including plans, specifications, quality requirements and operational details are obtained, confirmed and applied to the allotted task
- 1.2 Safety requirements are obtained from the site safety plan and organisational policies and procedures, confirmed and applied to the allotted task
- 1.3 Signage requirements are identified and obtained from the project traffic management plan and implemented
- 1.4 Plant, tools and equipment selected to carry out tasks are consistent with the requirements of the job, checked for serviceability and any faults are rectified or reported
- 1.5 Environmental protection requirements are identified from the project environmental management plan, confirmed and applied to the allotted task

2 Install ducting for air and ventilation

- 2.1 Pipeline for compressed air is installed to design location and connected to compressor to specifications and manufacturers' recommendations
- 2.2 Pipeline for air supply is installed to location and specifications
- 2.3 Ventilation ducting is installed to location and specifications

- | | | | |
|---|---|-----|--|
| 3 | Install pipelines for construction services | 3.1 | Pipelines for drainage are installed to specifications and connected to pumping system to manufacturers' recommendations |
| | | 3.2 | Pipelines for water supply are installed to locations and specifications and relevant water authority requirements |
| 4 | Install road/rail access | 4.1 | Material is laid, spread and compacted to specification to provide surface for vehicular access where specified |
| | | 4.2 | Rail track construction is identified from tunnel drawings and specifications |
| | | 4.3 | Rail track is laid and installed to specification |
| | | 4.4 | Warning and directional signage is installed to designed locations and specifications |
| 5 | Maintain services | 5.1 | Service ducting and pipelines are maintained to operational condition |
| | | 5.2 | Access facilities are maintained to safe working operational requirements |
| | | 5.3 | Rail track is inspected and maintained |
| 6 | Clean up | 6.1 | Work area is cleared and materials disposed of or recycled in accordance with project environmental management plan |
| | | 6.2 | Plant, tools and equipment are cleaned, checked, maintained and stored in accordance with manufacturers' recommendations and standard work practices |

Range Statement

The Range Statement provides advice to interpret the scope and context of this unit of competency allowing for differences between enterprises and workplaces. It relates to the unit as a whole and facilitates holistic assessment. The following variables relate to this particular unit:

Unit scope

- Services are to include but not be limited to air supply, ventilation and dust extraction, water, drainage, compressed air and the transportation system
- Traffic control signage may include but not be limited to site safety signage, temporary signage, barricades and traffic signage
- Planning and preparation is to include but not be limited to worksite inspection, equipment defect identification, assessment of conditions and hazards and determination of work requirements
- Traffic conditions may include but not be limited to congested urban environments, low traffic rural areas, off-road un-trafficked areas, buildings, parking sites and pedestrian areas

Safety (OH&S)

- OH&S requirements are to be in accordance with State or Territory legislation and regulations, organisational safety policies and procedures, and project safety plan. This may include protective clothing and equipment, use of tools and equipment, workplace environment and safety, handling of materials, use of fire fighting equipment, use of first aid equipment, hazard control and hazardous materials and substances
- Personal protective equipment is to include that prescribed under legislation, regulation and workplace policies and practices
- Safe operating procedures are to include but not be limited to recognising and preventing hazards associated with underground and overhead services, other machines, personnel, restricted access barriers, traffic control, working in proximity to others, worksite visitors and the public
- Safe parking practices are to include but not be limited to ensuring access ways are clear, equipment/machinery is away from overhangs and refuelling sites, safe distance from excavations, and secured from unauthorised access or movement

Safety (OH&S) (continued)	<ul style="list-style-type: none">• Hazards and risks may include but not be limited to uneven/unstable terrain, trees, fires, overhead and underground services, bridges, buildings, excavations, traffic, embankments, cuttings, structures and hazardous materials• Emergency procedures related to this unit are to include but may not be limited to emergency shutdown and stopping, organisational first aid requirements and evacuation
Environmental Requirements	<ul style="list-style-type: none">• Environmental requirements are to include but are not limited to organisational/project environmental management plan, waste management, water quality protection, noise, vibration, dust and clean-up management
Quality Requirements	<ul style="list-style-type: none">• Quality requirements may include but not be limited to dimensions, tolerances, standards of work and material standards as detailed in the project drawings, specifications and project documentation to meet client satisfaction
Statutory/Regulatory Authorities	<ul style="list-style-type: none">• State/Regulatory Authorities may Federal, State and Local Authorities
Tools and equipment	<ul style="list-style-type: none">• Tools and equipment are to include but not limited to hydraulic pipe jacks, shovels, compressors and may include generators
Materials	<ul style="list-style-type: none">• Materials are to include but not limited to reinforced concrete pipes, air ventilation, ducting, strip drainage and drainage conduit
Communications	<ul style="list-style-type: none">• Communications are to include but not limited to verbal instructions and fault reporting and may include two way radio, hand signals, mobile phone, site specific instructions, written instructions or instructions related to job/task

Information

- Information sources may include but not be limited to verbal or written and graphical instructions, signage, work schedules/plans/specifications, work bulletins, charts and hand drawings, memos, material safety data sheets (MSDS) and diagrams or sketches
- Safe work procedures or equivalent related to the installation of tunnelling construction services
- Regulatory/legislative requirements pertaining to the installation of tunnelling construction services
- Manufacturers' specifications and instructions
- Organisation work specifications and requirements.
- Instructions issued by authorised organisational or external personnel
- Relevant Australian Standards

Evidence Guide

The Evidence Guide identifies the critical aspects, knowledge and skills to be demonstrated to confirm competency for this unit. This is an integral part of the assessment of competency and should be read in conjunction with the Performance Criteria, the Range Statement, and the Assessment Guidelines of the Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

- Location, interpretation and application of relevant information, standards and specifications
- Compliance with site safety plan, OH&S regulations and State/Territory legislation applicable to workplace operations
- Compliance with organisational policies and procedures including quality requirements
- Installation of a minimum of 20 metres of ventilation, 20 metres of drainage and 20 metres of road/rail access for one project, to job specification
- Safe and effective operational use of tools, plant and equipment
- Communication and working effectively and safely with others

- Relationship to other units**
- Pre-requisite units are:

BCCCM1001C Follow OH&S policies and procedures

Competency in this unit may be assessed in conjunction with other functional units which together form part of the holistic work role
- Specific knowledge required to achieve the performance criteria**
- A knowledge of
 - Site and equipment safety requirements
 - Tunnel construction
 - Tunnel construction services
 - Construction principles
 - Processes for interpreting engineering drawings
 - Equipment types, characteristics, technical capabilities and limitations
 - Operational, maintenance and basic diagnostic procedures
 - Site isolation and traffic control responsibilities and authorities
 - Materials Safety Data Sheets and materials handling methods
 - Project quality requirements
 - Civil construction terminology
 - JSA's/Safe work method statement
- The context of assessment**
- The application of competency is to be assessed in the workplace or realistically simulated workplace
 - Assessment is to occur under standard and authorised work practices, safety requirements and environmental constraints
 - Assessment of essential underpinning knowledge, other than confirmatory questions, will usually be conducted in an off-site context
 - Assessment is to comply with relevant regulatory or Australian Standards requirements

Methods of assessment

- Assessment must satisfy the endorsed assessment guidelines of the Building and Construction industry's Civil Construction Training Package
- Assessment methods must confirm consistency and accuracy of performance together with application of underpinning knowledge
- Assessment must be by direct observation of tasks, with questioning on underpinning knowledge
- Assessment methods must confirm the ability to access and correctly interpret and apply the essential underpinning knowledge
- Assessment may be applied under project related conditions (real or simulated) and require evidence of process
- Assessment must confirm a reasonable inference that competency is able not only to be satisfied under the particular circumstance, but is able to be transferred to other circumstances
- Assessment may be in conjunction with assessment of other units of competency, including those listed above

Specific resource requirements for this unit

- The following resources should be made available:
 - workplace location or simulated workplace
 - materials relevant to the installation of tunnel construction services
 - hand and power tools, plant and equipment appropriate to the installation of tunnel construction services
 - specifications and work instructions

... End ...

BCCTC3002B**Line tunnel****Unit Descriptor**

This unit specifies the competency required to prepare and line a tunnel for stabilisation of the tunnel roof and walls. It includes the minimum criteria for competency assessment.

This unit includes drilling and installing anchors, fixing reinforced mesh, installing drainage, shotcreting and concreting.

Employability Skills

The required outcomes described in this Unit of Competency contain applicable facets of employability skills. The Employability Skills Qualification Summary for the qualification in which this Unit of Competency is packaged will assist in identifying employability skill requirements.

Element

Elements define the essential outcomes of a unit of competency.

Performance Criteria

Performance criteria specify the level of performance required to demonstrate achievement of the element.

1 Plan and prepare

- 1.1 Work instructions, including plans, specifications, quality requirements and operational details are obtained, confirmed and applied to the allotted task
- 1.2 Safety requirements are obtained from the site safety plan and organisational policies and procedures, confirmed and applied to the allotted task
- 1.3 Signage requirements are identified and obtained from the project traffic management plan and implemented
- 1.4 Plant, tools and equipment selected to carry out tasks are consistent with the requirements of the job, checked for serviceability and any faults are rectified or reported
- 1.5 Environmental protection requirements are identified from the project environmental management plan, confirmed and applied to the allotted task

2 Prepare tunnel face for concrete/shotcrete

- 2.1 Rock anchors and/or bolts are installed to designed locations in accordance with structural drawings and specifications/directions
- 2.2 Reinforcing mesh is prepared in accordance with tunnel shape, designed lining and specifications, where specified
- 2.3 Reinforcing mesh is located in place and secured in accordance to specifications

- | | | |
|---|--|--|
| 2 | Prepare tunnel face for concrete/shotcrete (continued) | 2.4 Dowels are fixed to wall face to provide depth gauge thickness of shotcrete in accordance to engineer's specifications/directions |
| | | 2.5 Drainage is installed to the tunnel roof and walls where specified |
| 3 | Line/shotcrete tunnel face | 3.1 Pump, pipelines and spray equipment are set up and checked for serviceability and operation |
| | | 3.2 Mix is controlled in accordance to specification and job requirements |
| | | 3.3 Pump is operated in accordance with manufacturers' recommendations |
| | | 3.4 Formwork is prepared and set to specifications |
| | | 3.5 Support is provided to shotcreter in monitoring supply and assistance with elevated platform and allied equipment |
| | | 3.6 Shotcrete is applied in a consistent application in accordance to specifications |
| 4 | Clean up | 4.1 Work area is cleared and materials disposed of or recycled in accordance with project environmental management plan |
| | | 4.2 Plant, tools and equipment are cleaned, checked, maintained and stored in accordance with manufacturers' recommendations and standard work practices |

Range Statement

The Range Statement provides advice to interpret the scope and context of this unit of competency allowing for differences between enterprises and workplaces. It relates to the unit as a whole and facilitates holistic assessment. The following variables relate to this particular unit:

Unit Scope

- Tunnel lining is to include but not be limited to shotcreting, rock bolting, reinforced mesh and may include formwork, pre-cast concrete lining and concrete lining
- Lining of tunnels is to include but not be limited to applied shotcrete finishes and may include poured reinforced concrete and installation of pre-cast sections
- Concrete application is to include but not be limited to a concrete lining machine and may include slip or telescopic formwork, strip and re-assemble formwork, and fold and re-assemble formwork
- Traffic control signage may include but not be limited to site safety signage, temporary signage, barricades, and traffic conditions signage
- Planning and preparation is to include but not be limited to worksite inspection, equipment defect identification, assessment of conditions and hazards and determination of work requirements
- Traffic conditions may include but not be limited to congested urban environments, low traffic rural areas, off-road un-trafficked areas, buildings, parking sites and pedestrian areas

Safety (OH&S)

- OH&S requirements are to be in accordance with State or Territory legislation and regulations and may include protective clothing and equipment, use of tools and equipment, workplace environment and safety, handling of materials, use of fire fighting equipment, use of first aid equipment, hazard control and hazardous materials and substances
- Personal protective equipment is to include that prescribed under legislation, regulation and workplace policies and practices
- Safe operating procedures are to include but not be limited to recognising and preventing hazards associated with underground and overhead services, other machines, personnel, restricted access barriers, traffic control, working in proximity to others, worksite visitors and the public

**Safety (OH&S)
(continued)**

- Safe parking practices are to include but not be limited to ensuring access ways are clear, equipment/machinery is away from overhangs and refuelling sites, safe distance from excavations, and secured from unauthorised access or movement
- Hazards and risks may include but not be limited to uneven/unstable terrain, trees, fires, overhead and underground services, bridges, buildings, excavations, traffic, embankments, cuttings, structures and hazardous materials
- Emergency procedures related to this unit are to include but may not be limited to emergency shutdown and stopping, organisational first aid requirements and evacuation

**Environmental
Requirements**

- Environmental requirements are to include but are not limited to organisational/project environmental management plan, waste management, water quality protection, noise, vibration, dust and clean-up management

Quality Requirements

- Quality requirements may include but not be limited to dimensions, tolerances, standards of work and material standards as detailed in the project drawings, specifications and project documentation to meet client satisfaction

**Statutory/Regulatory
Authorities**

- State/Regulatory Authorities may Federal, State and Local Authorities

Tools and equipment

- Tools and equipment are to include but not limited to shotcreting machines, drill rigs, spanners and shotcrete pumps, concrete pumps, slick lines and formwork

Materials

- Materials are to include but not limited to dowels, rock bolts, drainage materials (strip drains, PVC pipe) and reinforced mesh

Communications

- Communications are to include but not limited to verbal instructions and fault reporting and may include two way radio, hand signals, mobile phone, site specific instructions, written instructions or instructions related to job/task

Information

- Information sources may include but not be limited to verbal or written and graphical instructions, signage, work schedules/plans/specifications, work bulletins, charts and hand drawings, memos, material safety data sheets (MSDS) and diagrams or sketches
- Safe work procedures or equivalent related to the tunnel lining
- Regulatory/legislative requirements pertaining to the tunnel lining
- Manufacturer's specifications and instructions
- Organisation work specifications and requirements.
- Instructions issued by authorised organisational or external personnel
- Relevant Australian Standards

Evidence Guide

The Evidence Guide identifies the critical aspects, knowledge and skills to be demonstrated to confirm competency for this unit. This is an integral part of the assessment of competency and should be read in conjunction with the Performance Criteria, the Range Statement, and the Assessment Guidelines of the Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

- Location, interpretation and application of relevant information, standards and specifications
- Compliance with site safety plan, OH&S regulations and State/Territory legislation applicable to workplace operations
- Compliance with organisational policies and procedures including quality requirements
- Completion of drilling and installation of rock bolts, application of reinforcing mesh and shotcreting/concreting of a minimum of a five lineal metre section of tunnel
- Safe and effective operational use of tools, plant and equipment
- Communication and working effectively and safely with others

Relationship to other units	<ul style="list-style-type: none"> • Pre-requisite units are: BCCCM1001C Follow OH&S policies and procedures Competency in this unit may be assessed in conjunction with other functional units which together form part of the holistic work role
Specific knowledge required to achieve the performance criteria	<ul style="list-style-type: none"> • A knowledge of <ul style="list-style-type: none"> - Site and equipment safety requirements - Tunnel construction - Tunnel lining - Construction principles - Materials used in tunnel lining - Scaffolding and work platform installation - Processes for interpreting engineering drawings - Equipment types, characteristics, technical capabilities and limitations - Operational, maintenance and basic diagnostic procedures - Site isolation and traffic control responsibilities and authorities - Materials Safety Data Sheets and materials handling methods - Project quality requirements - Civil construction terminology - JSA's/Safe work method statement
The context of assessment	<ul style="list-style-type: none"> • The application of competency is to be assessed in the workplace or realistically simulated workplace • Assessment is to occur under standard and authorised work practices, safety requirements and environmental constraints • Assessment of essential underpinning knowledge, other than confirmatory questions, will usually be conducted in an off-site context • Assessment is to comply with relevant regulatory or Australian Standards requirements
Methods of assessment	<ul style="list-style-type: none"> • Assessment must satisfy the endorsed assessment guidelines of the Building and Construction industry's Civil Construction Training Package • Assessment methods must confirm consistency and

accuracy of performance together with application of underpinning knowledge

- Assessment must be by direct observation of tasks, with questioning on underpinning knowledge
- Assessment methods must confirm the ability to access and correctly interpret and apply the essential underpinning knowledge
- Assessment may be applied under project related conditions (real or simulated) and require evidence of process
- Assessment must confirm a reasonable inference that competency is able not only to be satisfied under the particular circumstance, but is able to be transferred to other circumstances
- Assessment may be in conjunction with assessment of other units of competency, including those listed above
- The following resources should be made available:
 - workplace location or simulated workplace
 - materials relevant to the installation of tunnel lining
 - hand and power tools, plant and equipment appropriate to the installation of tunnel lining
 - specifications and work instructions

... End ...

Specific resource requirements for this unit

BCCTC3003B

Unit Descriptor

Excavate tunnel by machine

This unit specifies the competency required to prepare and excavate a tunnel by machine for services such as rail, road, communications, water, sewerage, power and gas. It includes the minimum criteria for competency assessment.

This unit includes using road header machines, tunnel boring machines and shields.

Employability Skills

The required outcomes described in this Unit of Competency contain applicable facets of employability skills. The Employability Skills Qualification Summary for the qualification in which this Unit of Competency is packaged will assist in identifying employability skill requirements.

Element

Elements define the essential outcomes of a unit of competency.

Performance Criteria

Performance criteria specify the level of performance required to demonstrate achievement of the element.

1 Plan and prepare

- 1.1 Work instructions, including plans, specifications, quality requirements and operational details are obtained, confirmed and applied to the allotted task
- 1.2 Safety requirements are obtained from the site safety plan and organisational policies and procedures, confirmed and applied to the allotted task
- 1.3 Signage requirements are identified and obtained from the project traffic management plan and implemented
- 1.4 Ground conditions are identified from engineers' survey analysis and assessed
- 1.5 Plant, tools and equipment selected to carry out tasks are consistent with the requirements of the job, checked for serviceability and any faults are rectified or reported
- 1.6 Environmental protection requirements are identified from the project environmental management plan, confirmed and applied to the allotted task

- | | | | |
|---|------------------------------|-----|--|
| 2 | Set up for machine operation | 2.1 | Production schedules are devised and followed consistent with job requirements |
| | | 2.2 | Machine and equipment are set up and located in accordance to planned operating procedure |
| | | 2.3 | Machine and attachments are adjusted for terrain, rock and ground conditions where specified |
| | | 2.4 | Controls are used to produce smooth efficient operation of machine as per manufacturers' manual |
| | | 2.5 | Operator maintenance and servicing of machine and equipment is carried out to regular schedule during excavation process |

-
- | | | |
|---|--|--|
| 3 | Excavate tunnel and control dust and water | <ul style="list-style-type: none">3.1 Tunnel is excavated to shape required by specification and/or according to laser/line levels and measurements3.2 Dust suppression methods are incorporated with machine cutting operation to control dust as per OH&S requirements3.3 Dust extraction systems are operated and maintained to maximum efficiency during excavation3.4 Excess water is removed by operating pumping or drainage system to maintain minimal surface water levels |
| 4 | Control mucking | <ul style="list-style-type: none">4.1 Conveyor/mucking system is set up and aligned to spoil system4.2 Mucking attachments are operated safely to manufacturers' recommendations4.3 Dust extraction system is maintained in operation along conveyor or mucking system4.4 Spoil is removed in accordance with planned operating procedures4.5 Trucks are directed safely to and from the mucking area |
| 5 | Clean up | <ul style="list-style-type: none">5.1 Work area is cleared and materials disposed of or recycled in accordance with project environmental management plan5.2 Plant, tools and equipment are cleaned, checked, maintained and stored in accordance with manufacturers' recommendations and standard work practices |

Range Statement

The Range Statement provides advice to interpret the scope and context of this unit of competency allowing for differences between enterprises and workplaces. It relates to the unit as a whole and facilitates holistic assessment. The following variables relate to this particular unit:

Unit scope

- Ground structure is to include but not be limited to rock, clay and may include sand
- Tunnel services may include but not be limited to rail, road, communication, water and power
- Excavations may incorporate but not be limited to shields, earth pressure bearing shields and pipe jacking
- Traffic control signage may include but not be limited to site safety signage, temporary signage, barricades, and traffic conditions signage
- Planning and preparation is to include but not be limited to worksite inspection, equipment defect identification, assessment of conditions and hazards and determination of work requirements
- Traffic conditions may include but not be limited to congested urban environments, low traffic rural areas, off-road un-trafficked areas, buildings, parking sites and pedestrian areas

Safety (OH&S)

- OH&S requirements are to be in accordance with State or Territory legislation and regulations and may include protective clothing and equipment, use of tools and equipment, workplace environment and safety, handling of materials, use of fire fighting equipment, use of first aid equipment, hazard control and hazardous materials and substances
- Personal protective equipment is to include that prescribed under legislation, regulation and workplace policies and practices
- Safe operating procedures are to include but not be limited to recognising and preventing hazards associated with underground and overhead services, other machines, personnel, restricted access barriers, traffic control, working in proximity to others, worksite visitors and the public

Safety (OH&S) (continued)	<ul style="list-style-type: none">• Safe parking practices are to include but not be limited to ensuring access ways are clear, equipment/machinery is away from overhangs and refuelling sites, safe distance from excavations, and secured from unauthorised access or movement• Hazards and risks may include but not be limited to uneven/unstable terrain, trees, fires, overhead and underground services, bridges, buildings, excavations, traffic, embankments, cuttings, structures and hazardous materials• Emergency procedures related to this unit are to include but may not be limited to emergency shutdown and stopping, organisational first aid requirements and evacuation
Environmental Requirements	<ul style="list-style-type: none">• Environmental requirements are to include but are not limited to organisational/project environmental management plan, waste management, water quality protection, noise, vibration, dust and clean-up management
Quality Requirements	<ul style="list-style-type: none">• Quality requirements may include but not be limited to dimensions, tolerances, standards of work and material standards as detailed in the project drawings, specifications and project documentation to meet client satisfaction
Statutory/Regulatory Authorities	<ul style="list-style-type: none">• State/Regulatory Authorities may Federal, State and Local Authorities
Tools and equipment	<ul style="list-style-type: none">• Tools and equipment are to include but not limited to road header machines, tunnel boring machines (TBM), shields and pipe jacking equipment
Communications	<ul style="list-style-type: none">• Communications are to include but not limited to verbal instructions and fault reporting and may include two way radio, hand signals, mobile phone, site specific instructions, written instructions or instructions related to job/task

Information

- Information sources may include but not be limited to verbal or written and graphical instructions, signage, work schedules/plans/specifications, work bulletins, charts and hand drawings, memos, material safety data sheets (MSDS) and diagrams or sketches
- Safe work procedures or equivalent related to the excavating tunnel by machine
- Regulatory/legislative requirements pertaining to the excavating tunnel by machine
- Manufacturers' specifications and instructions
- Organisation work specifications and requirements.
- Instructions issued by authorised organisational or external personnel
- Relevant Australian Standards

Evidence Guide

The Evidence Guide identifies the critical aspects, knowledge and skills to be demonstrated to confirm competency for this unit. This is an integral part of the assessment of competency and should be read in conjunction with the Performance Criteria, the Range Statement, and the Assessment Guidelines of the Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

- Location, interpretation and application of relevant information, standards and specifications
- Compliance with site safety plan, OH&S regulations and State/Territory legislation applicable to workplace operations
- Compliance with organisational policies and procedures including quality requirements
- Completion of cutting and excavation to line and level for a tunnel a minimum of between three and five metres diameter to a distance of ten metres for rock and clay, following job specifications
- Safe and effective operational use of tools, plant and equipment
- Communication and working effectively and safely with others

Relationship to other units	<ul style="list-style-type: none"> • Pre-requisite units are: BCCCM1001C Follow OH&S policies and procedures Competency in this unit may be assessed in conjunction with other functional units which together form part of the holistic work role
Specific knowledge required to achieve the performance criteria	<ul style="list-style-type: none"> • A knowledge of <ul style="list-style-type: none"> - Site and equipment safety requirements - Tunnel construction - Tunnel excavation - Construction principles - Soil and rock type characteristics - Processes for interpreting engineering drawings - Equipment types, characteristics, technical capabilities and limitations - Operational, maintenance and basic diagnostic procedures - Site isolation and traffic control responsibilities and authorities - Materials Safety Data Sheets and materials handling methods - Project quality requirements - Civil construction terminology - JSA's/Safe work method statement
The context of assessment	<ul style="list-style-type: none"> • The application of competency is to be assessed in the workplace or realistically simulated workplace • Assessment is to occur under standard and authorised work practices, safety requirements and environmental constraints • Assessment of essential underpinning knowledge, other than confirmatory questions, will usually be conducted in an off-site context • Assessment is to comply with relevant regulatory or Australian Standards requirements
Methods of assessment	<ul style="list-style-type: none"> • Assessment must satisfy the endorsed assessment guidelines of the Building and Construction industry's Civil Construction Training Package • Assessment methods must confirm consistency and accuracy of performance together with application of

underpinning knowledge

- Assessment must be by direct observation of tasks, with questioning on underpinning knowledge
- Assessment methods must confirm the ability to access and correctly interpret and apply the essential underpinning knowledge
- Assessment may be applied under project related conditions (real or simulated) and require evidence of process
- Assessment must confirm a reasonable inference that competency is able not only to be satisfied under the particular circumstance, but is able to be transferred to other circumstances
- Assessment may be in conjunction with assessment of other units of competency, including those listed above

Specific resource requirements for this unit

- The following resources should be made available:
 - workplace location or simulated workplace
 - materials relevant to tunnel excavation
 - hand and power tools, plant and equipment appropriate to tunnel excavation
 - specifications and work instructions

... End ...

BCCTC3004B

Unit Descriptor

Muck out tunnel earthworks

This unit specifies the competency required to safely and effectively muck out tunnels for the removal of excess excavated material as a result of the tunnel being excavated by drill and blast, tunnel boring machine or road header. It includes the minimum criteria for competency assessment.

This unit includes the operation of mucking out by machine or by hand loading.

Employability Skills

The required outcomes described in this Unit of Competency contain applicable facets of employability skills. The Employability Skills Qualification Summary for the qualification in which this Unit of Competency is packaged will assist in identifying employability skill requirements.

Element

Elements define the essential outcomes of a unit of competency.

Performance Criteria

Performance criteria specify the level of performance required to demonstrate achievement of the element.

1 Plan and prepare

- 1.1 Work instructions, including plans, specifications, quality requirements and operational details are obtained, confirmed and applied to the allotted task
- 1.2 Safety requirements are obtained from the site safety plan and organisational policies and procedures, confirmed and applied to the allotted task
- 1.3 Signage requirements are identified and obtained from the project traffic management plan and implemented
- 1.4 Plant, tools and equipment selected to carry out tasks are consistent with the requirements of the job, checked for serviceability and any faults are rectified or reported
- 1.5 Environmental protection requirements are identified from the project environmental management plan, confirmed and applied to the allotted task

2 Bar/scale down loose material

- 2.1 Plant and equipment is identified and positioned in accordance with job requirements
- 2.2 Loose material is barred/scaled down safely and in accordance to job requirements

3 Remove spoil by hand

- 3.1 Excavated muck is removed and transported to spoil heap

- | | | | |
|---|-----------------------|-----|---|
| 4 | Load spoil by machine | 4.1 | Spoil haulage lines, rail, and conveyor system are installed to engineer's and/or manufacturers' specifications |
| | | 4.2 | Mucking machines are operated according to manufacturers' specifications |
| | | 4.3 | Conveyors are inspected regularly and maintained to manufacturers' specification |

- | | | |
|---|--------------|--|
| 5 | Remove spoil | 5.1 Hauling engine is operated smoothly and to manufacturers' specifications |
| | | 5.2 Continuous conveyor system is operated to manufacturers' specifications |
| | | 5.3 Dust controls are maintained throughout mucking process |
| 6 | Clean up | 6.1 Work area is cleared and materials disposed of or recycled in accordance with project environmental management plan |
| | | 6.2 Plant, tools and equipment are cleaned, checked, maintained and stored in accordance with manufacturers' recommendations and standard work practices |

Range Statement

The Range Statement provides advice to interpret the scope and context of this unit of competency allowing for differences between enterprises and workplaces. It relates to the unit as a whole and facilitates holistic assessment. The following variables relate to this particular unit:

Unit scope

- Spoil haulage systems may include but not be limited to rail, road or conveyor
- Tunnel preparation is to include but not be limited to mucking by either TBM, road header or by the drill and blast method
- Tunnel muck removal is to include but not be limited to mucking out by machine, mucking out by hand, noise control and dust control
- Soil conditions are to include but not be limited to rock and clay
- Traffic control signage may include but not be limited to site safety signage, temporary signage, barricades, and traffic conditions signage
- Planning and preparation is to include but not be limited to worksite inspection, equipment defect identification, assessment of conditions and hazards and determination of work requirements
- Traffic conditions may include but not be limited to congested urban environments, low traffic rural areas, off-road un-trafficked areas, buildings, parking sites and pedestrian areas

Safety (OH&S)

- OH&S requirements are to be in accordance with State or Territory legislation and regulations, organisational safety policies and procedures, and project safety plan. This may include protective clothing and equipment, use of tools and equipment, workplace environment and safety, handling of materials, use of fire fighting equipment, use of first aid equipment, hazard control and hazardous materials and substances
- Personal protective equipment is to include that prescribed under legislation, regulation and workplace policies and practices
- Safe operating procedures are to include but not be limited to recognising and preventing hazards associated with underground and overhead services, other machines, personnel, restricted access barriers, traffic control, working in proximity to others, worksite visitors and the public
- Safe parking practices are to include but not be limited to ensuring access ways are clear, equipment/machinery is away from overhangs and refuelling sites, safe distance from excavations, and secured from unauthorised access or movement
- Hazards and risks may include but not be limited to uneven/unstable terrain, trees, fires, overhead and underground services, bridges, buildings, excavations, traffic, embankments, cuttings, structures and hazardous materials
- Emergency procedures related to this unit are to include but may not be limited to emergency shutdown and stopping, organisational first aid requirements and evacuation

Environmental Requirements

- Environmental requirements are to include but are not limited to organisational/project environmental management plan, waste management, water quality protection, noise, vibration, dust and clean-up management

Quality Requirements

- Quality requirements may include but not be limited to dimensions, tolerances, standards of work and material standards as detailed in the project drawings, specifications and project documentation to meet client satisfaction

Statutory/Regulatory Authorities

- State/Regulatory Authorities may Federal, State and Local Authorities

-
- | | |
|----------------------------|---|
| Tools and equipment | <ul style="list-style-type: none">• Tools and equipment are to include but not limited to shovels, wheelbarrows, muckers/boggers and may include skid steer loaders, front end loaders and face shovels |
| Communications | <ul style="list-style-type: none">• Communications are to include but not limited to verbal instructions and fault reporting and may include two way radio, hand signals, mobile phone, site specific instructions, written instructions or instructions related to job/task |
| Information | <ul style="list-style-type: none">• Information sources may include but not be limited to verbal or written and graphical instructions, signage, work schedules/plans/specifications, work bulletins, charts and hand drawings, memos, material safety data sheets (MSDS) and diagrams or sketches• Safe work procedures or equivalent related to the mucking out of tunnel earthworks• Regulatory/legislative requirements pertaining to the mucking out of tunnel earthworks• Manufacturers' specifications and instructions• Organisation work specifications and requirements.• Instructions issued by authorised organisational or external personnel• Relevant Australian Standards |

Evidence Guide

The Evidence Guide identifies the critical aspects, knowledge and skills to be demonstrated to confirm competency for this unit. This is an integral part of the assessment of competency and should be read in conjunction with the Performance Criteria, the Range Statement, and the Assessment Guidelines of the Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

- Location, interpretation and application of relevant information, standards and specifications
- Compliance with site safety plan, OH&S regulations and State/Territory legislation applicable to workplace operations
- Compliance with organisational policies and procedures including quality requirements
- Completion of mucking out tunnel earthworks to the required job specification including a minimum of ten cubic metres by machine
- Safe and effective operational use of tools, plant and equipment
- Communication and working effectively and safely with others

Relationship to other units

- Pre-requisite units are:
BCCCM1001C Follow OH&S policies and procedures

Competency in this unit may be assessed in conjunction with other functional units which together form part of the holistic work role

Specific knowledge required to achieve the performance criteria

- A knowledge of
 - Site and equipment safety requirements
 - Tunnel construction
 - Tunnel mucking out
 - Construction principles
 - Soil and rock type characteristics
 - Scaffolding and work platform installation
 - Processes for interpreting engineering drawings
 - Equipment types, characteristics, technical capabilities and limitations
 - Operational, maintenance and basic diagnostic procedures
 - Site isolation and traffic control responsibilities and authorities
 - Materials Safety Data Sheets and materials handling methods
 - Project quality requirements
 - Civil construction terminology
 - JSA's/Safe work method statement

The context of assessment

- The application of competency is to be assessed in the workplace or realistically simulated workplace
- Assessment is to occur under standard and authorised work practices, safety requirements and environmental constraints
- Assessment of essential underpinning knowledge, other than confirmatory questions, will usually be conducted in an off-site context
- Assessment is to comply with relevant regulatory or Australian Standards requirements

Methods of assessment

- Assessment must satisfy the endorsed assessment guidelines of the Building and Construction industry's Civil Construction Training Package
- Assessment methods must confirm consistency and accuracy of performance together with application of underpinning knowledge
- Assessment must be by direct observation of tasks, with questioning on underpinning.
- Assessment methods must confirm the ability to access and correctly interpret and apply the essential underpinning knowledge
- Assessment may be applied under project related conditions (real or simulated) and require evidence of process
- Assessment must confirm a reasonable inference that competency is able not only to be satisfied under the particular circumstance, but is able to be transferred to other circumstances
- Assessment may be in conjunction with assessment of other units of competency, including those listed above

Specific resource requirements for this unit

- The following resources should be made available:
 - workplace location or simulated workplace
 - materials relevant to mucking out tunnels
 - hand and power tools, plant and equipment appropriate to mucking out tunnels
 - specifications and work instructions

... End ...

BCCTC3005B**Unit Descriptor****Construct portals**

This unit specifies the competency required to construct portals on civil works projects. It includes the minimum criteria for competency assessment.

The unit covers planning and preparation for work, the excavation and forming of the portal shape, the installation of support for the portal and the post-operation clean up.

Employability Skills

The required outcomes described in this Unit of Competency contain applicable facets of employability skills. The Employability Skills Qualification Summary for the qualification in which this Unit of Competency is packaged will assist in identifying employability skill requirements.

Element

Elements define the essential outcomes of a unit of competency.

Performance Criteria

Performance criteria specify the level of performance required to demonstrate achievement of the element.

1 Plan and prepare

- 1.1 Work instructions, including plans, specifications, quality requirements and operational details are obtained, confirmed and applied to the allotted task
- 1.2 Safety requirements are obtained from the site safety plan and organisational policies and procedures, confirmed and applied to the allotted task
- 1.3 Traffic management plan requirements are implemented and monitored throughout the work
- 1.4 Plant, tools and equipment selected to carry out tasks are consistent with the requirements of the job, checked for serviceability and any faults are rectified or reported
- 1.5 Preliminary ground work requirements to support portal surrounds are identified prior to excavating
- 1.6 Environmental protection requirements are identified from the project environmental management plan, confirmed and applied to the allotted task

- | | | | |
|---|-----------------------|-----|---|
| 2 | Excavate portal shape | 2.1 | Location, alignment and direction of portals are determined from details contained in job drawings and specifications |
| | | 2.2 | Method of construction for portal is determined from design plans and specifications |
| | | 2.3 | Material for the construction process for the selected portals is prepared according to design plans and specifications |
| | | 2.4 | Excavation is completed to plan |
| | | 2.5 | Dust and noise suppression are controlled in accordance with EPA and OH&S regulations |

3	Support excavation and form portal surrounds	3.1	Sheeting and/or first set is installed to specifications
		3.2	Battering is excavated and trimmed to design and drainage specifications
4	Install ground support	4.1	Ground support is identified from project drawings and specifications
		4.2	Base is constructed to detail drawings and specifications
		4.3	Ground support is installed to specifications and shotcreted/concreted
		4.4	Drainage and seepage provisions are placed to specifications
5	Clean up	5.1	Work area is cleared and materials disposed of or recycled in accordance with project environmental management plan
		5.2	Plant, tools and equipment are cleaned, checked, maintained and stored in accordance with manufacturers' recommendations and standard work practices

Range Statement

The Range Statement provides advice to interpret the scope and context of this unit of competency allowing for differences between enterprises and workplaces. It relates to the unit as a whole and facilitates holistic assessment. The following variables relate to this particular unit:

Unit scope

- Ground support prior to excavating may include but not be limited to rock anchors, rock bolts, soil nails, spalling bars, cable anchors, canopy tubes or steel sets
- Ground support to finish portal surrounds may include shotcrete, masonry, stone or concrete blockwork, reinforced concrete, precast concrete panels and ground cover
- Operator maintenance is to include cleaning, authorised servicing, recording and reporting of faults. It may also include the conduct of authorised minor replacements and the provision of assistance to maintenance personnel during maintenance and repair activities

Safety (OH&S)

- OH&S requirements are to be in accordance with State or Territory legislation and regulations, organisational safety policies and procedures, and project safety plan. This may include protective clothing and equipment, use of tools and equipment, workplace environment and safety, handling of materials, use of fire fighting equipment, use of first aid equipment, hazard control and hazardous materials and substances
- Personal protective equipment is to include that prescribed under legislation, regulation and workplace policies and practices
- Safe operating procedures are to include but not be limited to recognising and preventing hazards associated with underground and overhead services, other machines, personnel, restricted access barriers, traffic control, working at heights, working in proximity to others, worksite visitors and the public
- Hazards and risks may include but not be limited to uneven/unstable terrain, trees, fires, overhead and underground services, bridges, buildings, excavations, traffic, embankments, cuttings, structures and hazardous materials
- Emergency procedures related to this unit are to include but may not be limited to emergency shutdown and stopping, organisational first aid requirements and evacuation

Environmental Requirements

- Environmental requirements are to include but are not limited to organisational/project environmental management plan, waste management, water quality protection, noise, vibration, dust and clean-up management

Quality Requirements

- Quality requirements may include but not be limited to dimensions, tolerances, standards of work and material standards as detailed in the project drawings, specifications and project documentation to meet client satisfaction

Statutory/Regulatory Authorities	<ul style="list-style-type: none">• State/Regulatory Authorities may Federal, State and Local Authorities
Tools and equipment	<ul style="list-style-type: none">• Tools and equipment are to include hand tools, excavation tools and installation and drilling equipment relevant to the selected ground support system(s)
Communications	<ul style="list-style-type: none">• Communications are to include but not be limited to verbal instructions and fault reporting and may include two way radio, hand signals, mobile phone, site specific instructions, written instructions or instructions related to job/task• On site meeting processes may include notification/scheduling (time, place, purpose), task discussions and local coordination of procedural and operational issues
Information	<ul style="list-style-type: none">• Information sources may include but not be limited to verbal or written and graphical instructions, signage, work schedules/plans/specifications, work bulletins, charts and hand drawings, memos, material safety data sheets (MSDS) and diagrams or sketches• Safe work procedures related to the construction of portals• Regulatory/legislative requirements pertaining to the construction of portals• Manufacturers' specifications and instructions• Organisation work specifications and requirements.• Instructions issued by authorised organisational or external personnel• Relevant Australian Standards

Evidence Guide

The Evidence Guide identifies the critical aspects, knowledge and skills to be demonstrated to confirm competency for this unit. This is an integral part of the assessment of competency and should be read in conjunction with the Performance Criteria, the Range Statement, and the Assessment Guidelines of the Training Package.

Critical aspects of evidence required to demonstrate competency in this unit

- Location, interpretation and application of relevant information, standards and specifications
- Compliance with site safety plan, OH&S regulations and State/Territory legislation applicable to workplace operations
- Compliance with organisational policies and procedures including quality requirements
- The construction of a portal using an excavation ground support system
- The application of emergency procedures
- The conduct of authorised operator maintenance
- Communication and working effectively and safely with others

Relationship to other units

- Pre-requisite units are:
BCCCM1001C Follow OH&S policies and procedures

Competency in this unit may be assessed in conjunction with other functional units which together form part of the holistic work role

Specific knowledge required to achieve the performance criteria

- A knowledge of
 - The types and purposes of portals
 - Basic principles of soil technology for civil works
 - The principles of ground support
 - The types, functions, characteristics and limitations of excavation ground support systems
 - The types, functions, characteristics and limitations of finishing ground support systems
 - Ground support systems installation techniques
 - Types, characteristics, uses and limitations of drilling equipment
 - Site and equipment safety requirements
 - Processes for interpreting engineering drawings and sketches
 - Operational, maintenance and basic diagnostic procedures
 - Site isolation and traffic control responsibilities and authorities
 - Materials Safety Data Sheets and materials handling methods
 - Project quality requirements
 - Civil construction terminology
 - Portal installation methods
 - JSA's/Safe work method statement

The context of assessment

- The application of competency is to be assessed in the workplace or realistically simulated construction site
- Assessment is to occur under standard and authorised work practices, safety requirements and environmental constraints
- Assessment of essential underpinning knowledge, other than confirmatory questions, will usually be conducted in an off-site context
- Assessment is to comply with relevant regulatory or Australian Standards requirements

Methods of assessment

- Assessment must satisfy the endorsed assessment guidelines of the Building and Construction industry's Civil Construction Training Package
- Assessment methods must confirm consistency and accuracy of performance together with application of

underpinning knowledge

- Assessment must be by direct observation of tasks, with questioning on underpinning knowledge
- Assessment methods must confirm the ability to access and correctly interpret and apply the essential underpinning knowledge
- Assessment may be applied under project related conditions (real or simulated) and require evidence of process
- Assessment must confirm a reasonable inference that competency is able not only to be satisfied under the particular circumstance, but is able to be transferred to other circumstances
- Assessment may be in conjunction with assessment of other units of competency, including those listed above
- The following resources should be made available:
 - workplace location or simulated workplace
 - realistic portal tasks covering the mandatory task requirements
 - ground support systems and installation equipment including drilling equipment
 - maintenance materials appropriate to the equipment
 - specifications and work instructions

... End ...

**Specific resource
requirements for this unit**