

Modification history

Release	Comments
Release 1	This version released with FWP Forest and Wood Products Training Package Version [4.0].

FWPXXX0000	Design timber building systems for compliance, off-site manufacture and on-site installation
Application	<p>This unit of competency describes the skills and knowledge required to design panelised and/or modular prefabricated timber building systems to meet structural and safety compliance, off-site manufacture and on-site installation. The main job functions are to facilitate collaborative design and achieve detailed and integrated design solutions for prefabricated timber building systems.</p> <p>The unit applies to individuals who work as designers in a building design team. These include architects, design engineers, draftspersons, structural engineers, building services engineers, architectural technicians, 3D visualisers, Building Information Modelling (BIM) technicians or computer-aided design (CAD) modellers. They demonstrate deep knowledge in a specific technical area and analyse, design and communicate solutions to sometimes complex problems.</p> <p>No occupational licensing, legislative or certification requirements apply to this unit at the time of publication.</p>
Prerequisite Unit	Nil
Unit Sector	[Sector] ([SEC])

Elements	Performance Criteria
<i>Elements describe the essential outcomes.</i>	<i>Performance criteria describe the performance needed to demonstrate achievement of the element.</i>
1. Interact with supply chain stakeholders to achieve integrated design	<p>1.1 Communicate with the developer during the design process to ensure that prefabricated timber building system is fully fit for purpose and meets client functional requirements</p> <p>1.2 Conduct collaborative analysis with the fabricator, builder, component suppliers and regulators to achieve a design configuration that allows for lean processes during all stages of timber building system life cycle, meets regulations and does not complicate other design considerations</p> <p>1.3 Ensure that the design accounts for fabrication capabilities</p> <p>1.4 Implement a continuous improvement process during the life of the building system being designed to report, record and resolve issues</p>
2. Determine design solutions and specifications for structural compliance	<p>2.1 Determine the National Construction Code (NCC) Performance Requirements for structural robustness, which the timber building system and its components need to satisfy</p> <p>2.2 Determine and apply appropriate structural design actions to ensure that the timber building system meets the minimum NCC structural requirements and performs without risks when used as intended through its design life</p> <p>2.3 Use experimental and observational data for the strength of materials, structural components, connections or assemblies to determine design values and provide a required level of assurance and verifiability for the actual robustness and reliability of the physical building system</p> <p>2.4 Verify the design for structural compliance and document the process in line with the NCC, standards and codes to facilitate design certification and approvals</p> <p>2.5 Determine durability requirements for the materials of timber building system and ensure that they are specified in design documentation for prefabricators so that the system will be suitable for the nominated design life with planned maintenance</p>

Elements	Performance Criteria
<i>Elements describe the essential outcomes.</i>	<i>Performance criteria describe the performance needed to demonstrate achievement of the element.</i>
3. Determine design solutions and specifications for safety compliance	<p>3.1 Conduct risk assessments early in the design process to determine hazards to health and safety during all stages of timber building system life cycle in line with the workplace health and safety laws, regulations and the NCC</p> <p>3.2 Determine and apply health and safety design control measures in line with standards, codes and technical guides to eliminate or minimise health and safety risks during all stages of timber building system life cycle</p> <p>3.3 Verify design documentation and ensure that health and safety provisions are specified for all stages of timber building system life cycle in line with standards, codes and technical guides</p> <p>3.4 Verify design documentation and ensure that detailed maintenance provisions are specified for all components of the timber building system being designed in order to retain the system in a state in which it can fulfil its intended functions</p>
4. Determine design solutions and specifications for services	<p>4.1 Determine the NCC Performance Requirements for fire resistance and acoustic and thermal properties, which the timber building system and its components need to satisfy</p> <p>4.2 Verify design documentation and ensure that intended materials, separations, insulations, fire warnings and fire-fighting management systems are specified for the required fire, acoustic, thermal and waterproofing performance in line with standards, codes and technical guides</p> <p>4.4 Use design control actions to mitigate any possible effects of transportation, handling, on-site installation or maintenance on the integrity of intended connections, insulations or materials</p> <p>4.3 Determine early in the design phase where points of entry are required in the timber building system, components and materials for services installation</p> <p>4.5 Verify design documentation and ensure that installation and connections provisions are specified for each service in line with standards, codes and technical guides</p> <p>4.6 Verify the design and ensure that all tolerances for the timber building system and its components are specified in line with standards to facilitate off-site manufacture and on-site installation</p> <p>4.7 Verify and ensure that testing, approval and compliance certification for installation of services, partitions and floor elements are performed to the appropriate standards for thermal, acoustic and fire performance and in line with local requirements prior to on-site installation</p>
5. Determine design solutions and specifications for transportation and on-site installation	<p>5.1 Determine maximum dimensions and weight for the building system being designed to meet restrictions provided by transportation vehicles, lifting plants, road configuration around the construction site and local regulations</p> <p>5.2 Ensure that lifting requirements are specified for all stages of timber building system life cycle in the design documentation and they are in line with the NCC to facilitate and maintain timber building system integrity and adequate performance</p> <p>5.3 Determine the effects of cargo restraints and exposure to acceleration forces on the strength (structural attributes) of timber building structure during transportation and use design control actions to allow for the forces applied</p> <p>5.4 Verify the design and ensure that necessary restraint conditions during transportation and residual risks to the timber building systems resulting from transportation are specified</p> <p>5.5 Ensure that the sequence for the installation of timber building systems and components is specified in design documentation</p>

Foundation Skills	
<i>This section describes those language, literacy, numeracy and employment skills that are essential for performance in this unit of competency but are not explicit in the performance criteria.</i>	
Skill	Description
[Skill]	<ul style="list-style-type: none"> • [Style to be applied is SI Bullet List 1 • Use sentence case (i.e. commence with upper case) for each bullet point but do not put a full stop at the end • See <i>Guidelines</i> for the skills to be described, the order in which to list them and hints on writing descriptions
[Skill]	<ul style="list-style-type: none"> • SI Bullet List 1 • SI Bullet List 1
[Style to be applied in left column is SI Text[<ul style="list-style-type: none"> • SI Bullet List 1 • SI Bullet List 1]

Unit Mapping Information			
Code and title current version	Code and title previous version	Comments	Equivalence status
FWPXXX0000 Design timber building systems for compliance, off-site manufacture and on-site installation	Not applicable	New unit	Not applicable

Links	Companion Volumes, including Implementation Guides, are available at VETNet: https://vetnet.education.gov.au/Pages/TrainingDocs.aspx?q=0d96fe23-5747-4c01-9d6f-3509ff8d3d47
--------------	---

TITLE	Assessment requirements for FWPXXX0000 Design timber building systems for compliance, off-site manufacture and on-site installation
Performance Evidence	
<p>An individual demonstrating competency must satisfy all of the elements and performance criteria in this unit.</p> <p>There must be evidence that the individual has assessed complete sets of timber building design documentations for two construction projects relating to different classes of buildings that allow the use of timber construction systems as defined in the NCC. In doing the above, the individual has:</p> <ul style="list-style-type: none"> • determined and confirmed whether the design is fit for purpose and meet capabilities within supply chain regarding prefabrication, storage, transportation and on-site installation • determined the compliance requirements of physical timber building system for: <ul style="list-style-type: none"> • structural robustness • durability • fire resistance and acoustic and thermal properties • health and safety hazards during all stages of life cycle • transportation • assessed whether the design provides adequate solutions to meet all compliance requirements, determining design actions in line with standards to fill the design gaps • verified design considerations regarding services installation and mitigation of possible effects during transportation, handling, on-site installation or maintenance • verified the level of provisions in design documentation to demonstrate or specify: <ul style="list-style-type: none"> • structural compliance • health and safety information for each stage of timber building system life cycle • timber building system and components maintenance during timber building system design life • materials, separations, insulations, fire warnings, fire-fighting management system for required fire, acoustic, thermal and waterproofing performance • installation and connections requirements for each service • tolerances for the timber building system and its components • lifting requirements for each stage of timber building system life cycle • restraint conditions during transportation • installation sequence for the timber building systems and components. 	
Knowledge Evidence	
<p>An individual must be able to demonstrate the knowledge required to perform the tasks outlined in the elements and performance criteria of this unit. This includes knowledge of:</p> <ul style="list-style-type: none"> • BIM software for communication and coordination among various stakeholders and disciplines during all stages of timber building system life cycle • principles of Design for Manufacture and Assembly (DfMA), lean processes for off-site manufacture, storage, transportation and on-site installation, and Failure Mode and Effects Analysis (FMEA) • different types of prefabricated timber building systems made of structural timber, cross-laminated timber (CLT), laminated veneer lumber (LVL), Glulam, I-Joists or floor trusses as well as services, windows, glazing or plasterboard • prefabrication technologies for timber building systems readily available at the place of off-site manufacture • the NCC Performance Requirements regarding structural robustness of different prefabricated timber building systems as classified via their function • standards relevant to the structural design of timber buildings and systems • technical design guides for prefabricated timber building systems • Structural design considerations regarding prefabricated timber building systems and design actions as outlined in technical design guides • testing-based design approaches as outlined in relevant standards • the NCC assessments, calculations and evidence requirements regarding robustness and reliability of prefabricated timber building systems for controlling the risk of structural failure and safety 	

Knowledge Evidence

- verification methods for structural robustness of prefabricated timber building systems and traceability of risks as outlined in the NCC and technical design guides
- 'Hold Points' and verification requirements during the design stage of prefabricated building systems
- environmental and specific conditions that might affect durability of the timber building system; specific hazards with respect to the service life of timber systems/constructions, particularly insect and fungal attack, weathering, moisture exposure and fire; high risk areas within the building structure such as bathroom and external walls; solutions to minimise the effects upon the performance of the timber system during the design life as outlined by standards and guides in regards to preservative treatment, moisture content, insulation and cladding
- the NCC Performance Requirements regarding structural safety and fire safety of prefabricated timber building systems as classified via their function
- workplace health and safety legislation and codes requiring implementation of safe design principles
- health and safety design provisions as required by the Safe Design of Structures – Code of Practice and the NCC
- safety risks arising from off-site manufacture, storage, transportation, on-site installation, use and maintenance of a prefabricated timber building system
- health and safety design provisions as required by the Safe Design of Structures – Code of Practice, the NCC and standards
- health and safety design specifications as required by standards, codes and technical guides for any person who carries out activities in relation to a prefabricated timber building system
- the NCC Performance Requirements regarding fire resistance, thermal performance and acoustic performance for prefabricated timber building systems as classified via their function
- fire, acoustic, thermal resistance and waterproofing testing of prefabricated timber building systems for complying with standards
- factors influencing fire protection, sound propagation and thermal resistance in prefabricated timber structures and industry-accepted design solutions
- structural deflection of fire-rated elements
- use of fire separations and cavity barriers in prefabricated timber building systems
- the NCC fire engineering measures in relation to the use of timber building systems
- standards related to installation of hydraulic, electrical, mechanical, fire protection and acoustic systems and design considerations
- effects of transport, handling and on-site installation processes on intended connections, different insulations (fire, weatherproofing, vibrational and acoustical, thermal) or material and prefabricated timber building system integrity as outlined in the NCC
- services design considerations regarding prefabricated timber building systems and design actions as outlined in technical design guides
- design procedure for joint/connections involving timber structures as per national and international standards
- connections design specifications required by standards, codes and technical guides for any person who carries out services and installation works in relation to a prefabricated timber building system
- acceptable tolerances for material quality, off-site manufacture and on-site installation as outlined in standards
- design tolerances and specifications required by standards, codes and technical guides for any person who carries out off-site manufacture and on-site installation works in relation to a prefabricated timber building system
- tolerances and design considerations regarding prefabricated timber building systems and design actions as outlined by technical design guides
- documentary evidence of any thermal, acoustic and fire compliance for prefabricated timber building systems
- transport and handling modes being employed in relation to prefabricated timber building systems
- loading characteristics and types of road trucks being employed in relation to prefabricated timber building systems
- restrictions on transportation imposed by local regulations
- transport legislation requiring application of safe design principles
- loading characteristics and types of cranes or lifting plants, including lifting and stacking techniques used at each stage of the prefabricated timber building systems' life cycle
- factors influencing lifting stability of a prefabricated timber building system
- timber material characteristics and behaviour/fatigue to temporary lifting loads

Knowledge Evidence
<ul style="list-style-type: none"> • lifting design specifications required by standards, codes and technical guides for any person who carries out lifting activities in relation to a prefabricated timber building system • acceleration coefficients for different modes of transport and various securing directions as outlined in international and national codes of practice • load restraint methods and requirements as outlined in Load Restraint Guide from the National Transport Commission and Code of Practice for Packing of Cargo Transport Units (CTU Code) • friction factors and effects on strength resistance and structural response of the prefabricated timber building systems • the importance of sequencing or planning the order of the system installation sequence.

Assessment Conditions
<p>Assessment of skills must take place under the following conditions:</p> <ul style="list-style-type: none"> • resources, equipment and materials: <ul style="list-style-type: none"> • documentation for two timber building designs • computer with internet access and software currently in use in building design practices to view and print 3D models, finite element models, 2-D CAD drawings and design documentation • access to relevant codes, standards and government regulations • access to current publications on measurement, design, building construction and manufacturers product literature timber building design <p>Assessors of this unit must satisfy the requirements for assessors in applicable vocational education and training legislation, frameworks and/or standards.</p>

Links	
	<p>Companion Volumes, including Implementation Guides, are available at VETNet: https://vetnet.education.gov.au/Pages/TrainingDocs.aspx?q=0d96fe23-5747-4c01-9d6f-3509ff8d3d47</p>