Title	**Demonstrate knowledge of technology and processes for laminated veneer lumber and plywood manufacture**		
Level	**3**	**Credits**	**10**

Purpose	People credited with this unit standard are able to demonstrate knowledge of: chemical concepts used in laminated veneer lumber (LVL) and plywood manufacture; resin types and their properties that relate to LVL and plywood manufacture; the lay-up of veneer for LVL and plywood manufacture; the principles of hydraulics used in pressing LVL and plywood; pressing operations for LVL and plywood panel manufacture; adhesive reactions during LVL and plywood panel manufacture; and sanding and quality control testing for LVL and plywood panel manufacture.

Classification	Solid Wood Manufacturing > Laminated Veneer Lumber and Plywood Manufacturing

Available grade	Achieved

Guidance Information

1 Legislation
Health and Safety at Work Act 2015.
Resource Management Act 1991.

2 Definitions
Accepted industry practice refers to approved codes of practice and standardised procedures accepted by the wider wood manufacturing industry as examples of best practice.
Workplace procedures refer to documented policies and procedures set by the organisation carrying out the work, and to documented or other directions provided to staff, and applicable to the tasks being carried out. They may include but are not limited to – standard operating procedures, site specific procedures, site safety procedures, equipment operating procedures, quality assurance procedures, product quality specifications, references, approved codes of practice, housekeeping standards, environmental considerations, on-site briefings, supervisor's instructions, and procedures to comply with legislative and local body requirements relevant to the wood manufacture sector.

3 Assessment information
All activities and evidence must be in accordance with workplace procedures and accepted industry practice.

Outcomes and performance criteria

Outcome 1

Demonstrate knowledge of chemical concepts used in LVL and plywood manufacture.

Performance criteria

1.1 The properties of ionic, covalent, and metallic solids are explained.

1.2 Physical and chemical change is identified and the distinction between them is explained.

1.3 The terms acid, alkali (base), neutralisation and the pH scale and their uses in LVL and plywood manufacture are explained.

1.4 The differences between inorganic and organic compounds used in LVL and plywood manufacture are explained.

Outcome 2

Demonstrate knowledge of the resin types and their properties that relate to LVL and plywood manufacture.

Performance criteria

2.1 Potential hazards associated with resins are explained.

Range storage, handling, spillage.

2.2 Factors that impact on the bonding of wood with resins are explained.

2.3 Thermoset and thermoplastic resins are defined and their use in LVL and plywood manufacture is explained.

2.4 The use of melamine in making resins is explained and the stages that are necessary in the use of melamine resins are outlined.

2.5 Factors that impact on the use of phenol formaldehyde resin in LVL and plywood manufacture are explained.

2.6 The characteristics and use of urea formaldehyde, phenol formaldehyde, and melamine urea resins in LVL and plywood manufacture are compared.

2.7 The preparation and quality checks required for resins are explained.

2.8 Terms associated with resin use in LVL and plywood manufacture are defined.

Range terms may include but are not limited to – viscosity, solids content, rate of cure, storage life, working life, polymerisation, surface tension, specific gravity, usage, spread, tack point, tack loss point, residual tack, dry-out point, catalyst;
evidence for 10 terms is required.

2.9 Advantages and disadvantages of resin application systems are explained.

Range systems include but is not limited to – hard rolls, air curtain, spray, extrusion.

Outcome 3

Demonstrate knowledge of the lay-up of veneer for LVL and plywood manufacture.

Performance criteria

3.1 Methods to control resin spread are explained.

3.2 Techniques to determine resin spread are explained and corrective actions for out-of-specification resin spread results are identified.

3.3 Process checks to be carried out at the lay-up of a continuous LVL line are explained.

3.4 Problems that may occur during lay-up of continuous LVL and result in panel downgrade or rejection are explained.

Range evidence of four problems is required.

3.5 Health and safety issues relating to monitoring of a continuous LVL line are identified and techniques to overcome these are described.

Outcome 4

Demonstrate knowledge of the principles of hydraulics used in pressing LVL and plywood.

Performance criteria

4.1 The principles of hydraulic circuits in terms of pressurising and control of fluid to produce force and linear motion are explained.

4.2 The principles of Pascal’s Law as they relate to hydraulics in pressing of LVL and plywood panels are explained.

4.3 Contaminants to be avoided in hydraulics and their method of control are explained.

Range water, grit, oil, air.

4.4 Energy transfer in a hydraulic system in terms of mechanical to hydraulic energy transfers and force multiplier effects are explained.

4.5 Hydraulic circuit diagrams are interpreted by identification of components and their symbols.

Range components – hydraulic fluid lines, motors, relief valves, control valves, hydraulic cylinder.

4.6 Factors influencing the performance of hydraulic systems are explained.

Range pipe diameter, length, restrictions, valves, and fittings.

4.7 The purpose of components in a hydraulic system is explained.

Range may include but is not limited to – reservoir, piping and hoses, filters, gauges, valves, pumps, accumulators, actuators, cylinder ram, motor, component control systems, valves, controllers, servos, solenoids.

4.8 Operator checks for signs of deterioration are explained.

4.9 Hydraulic system safety and environmental requirements are explained.

Outcome 5

Demonstrate knowledge of pressing operations for LVL and plywood panel manufacture.

Performance criteria

5.1 The objectives of pre-pressing are described.

5.2 Factors that impact on tack and transfer are identified.

5.3 Pressing variables that must be controlled to cure adhesives and for good bonding are explained.

Range evidence of four variables is required.

5.4 The impacts of press platen temperature on panel quality are explained.

5.5 The impacts of the hot press pressure cycle on panel quality are explained.

5.6 The monitoring required for microwave units that provide early rapid heating is explained.

Outcome 6

Demonstrate knowledge of adhesive reactions during LVL and plywood panel manufacture.

Performance criteria

6.1 Factors that impact on the gluing process and bond quality in LVL and plywood manufacture are explained.

6.2 Working (pot) life of a glue is defined.

6.3 Factors that impact on lay-up and open assembly are explained.

6.4 Factors that impact on successful glue joints are explained.

6.5 Variables to be controlled during the jointing process to obtain reliable bonding with any formaldehyde adhesive are identified.

Range evidence of ten variables is required.

6.6 The determination of joint strength, and types of joint failure, are explained.

6.7 Wood characteristics that impact on bond quality are explained.

Outcome 7

Demonstrate knowledge of sanding and quality control testing for LVL and plywood panel manufacture.

Performance criteria

7.1 Reasons for sanding LVL and plywood panels are explained.

7.2 Panel defects that relate to sanding are identified and remedial actions for each defect are explained.

Range evidence of seven defects is required.

7.3 Quality checks carried out during panel manufacture are identified and the purpose of each check is explained.

7.4 Specific product characteristics attributed to LVL and plywood are described and related to physical properties of the panel.

7.5 Final product tests undertaken on panels are identified and their methodology is explained.

Planned review date	31 December 2024

Status information and last date for assessment for superseded versions

Process	Version	Date	Last Date for Assessment
Registration	1	29 March 2005	31 December 2012
Rollover and Revision	2	23 February 2007	31 December 2013
Review	3	19 April 2012	N/A
Review	4	22 October 2020	N/A

Consent and Moderation Requirements (CMR) reference	0013

This CMR can be accessed at http://www.nzqa.govt.nz/framework/search/index.do.

Comments on this unit standard

Please contact Competenz qualifications@competenz.org.nz if you wish to suggest changes to the content of this unit standard.