

<b>Title</b>	<b>Demonstrate knowledge of furnish preparation for paper making</b>		
<b>Level</b>	<b>3</b>	<b>Credits</b>	<b>10</b>

<b>Purpose</b>	People credited with this unit standard are able to: describe the physical properties of fibres in relation to paper properties; explain refiner operation; explain chemical additives in paper making; describe the role of additives used to give water resistance to paper; describe fillers and bonding agents in paper making; and describe the use of additives for colouration.
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<b>Classification</b>	Wood Fibre Manufacturing > Pulp and Paper Technology
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<b>Available grade</b>	Achieved
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## Guidance Information

### 1 Definitions

*Furnish* refers to the fibrous and non-fibrous constituents comprising paper (including waste papers, pulps, dyes, and additives) blended in stock preparation to meet the requirements of various paper grades.

*Worksite documentation* refers to organisation policies and procedures that are documented in memo, electronic, or manual format and available in the workplace, and are consistent with manufacturer's requirements. 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, sustainability, on-site briefings, supervisor's instructions, and procedures to comply with legislative and local body requirements relevant to the pulp and paper industry.

### 2 Range

Paper includes – linerboard, newsprint, tissue, cartonboard.

### 3 Assessment information

Evidence presented for assessment against this unit standard must be consistent with safe working practices and be in accordance with applicable service information, worksite documentation and legislative requirements. This includes the knowledge and use of suitable tools and equipment.

This unit standard does not cover cleaning or screening of furnish. These are contained in Unit 17858, *Describe the manufacturing processes involved in wood pulping and paper making*.

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## Outcomes and performance criteria

### Outcome 1

Describe the physical properties of fibres in relation to paper properties.

#### Performance criteria

- 1.1 Physical properties of paper are described in terms of bulk, surface strength and smoothness, porosity, tensile, tear, burst, stretch, folding endurance, and stiffness.
- 1.2 Optical properties of paper are described in terms of colour, brightness, and opacity.
- 1.3 Chemical components of wood fibres are described.  
  
Range cellulose, hemicellulose, lignin.
- 1.4 Properties of cellulose fibres are described and related to paper making requirements.
- 1.5 Bonding mechanism between cellulose fibres is described in terms of water and cellulose interactions and hydrogen bonding.
- 1.6 Factors which influence paper strength are described in terms of fibre coarseness, fibre type, and refining characteristics.

### Outcome 2

Explain refiner operation.

#### Performance criteria

- 2.1 Purpose of refining is explained in terms of pulp fibre wall separation, fibre shortening, and fines generation.
- 2.2 Effect of refining on pulp properties is explained in terms of drainage rate, water retention, and pulp viscosity.
- 2.3 Effect of refining on paper properties is explained in terms of tensile index, burst index, tear index, opacity, and sheet density.
- 2.4 Parameters used to control the refining process are explained.  
  
Range net specific energy, refining intensity, consistency, plate design.

### Outcome 3

Explain chemical additives in paper making.

**Performance criteria**

3.1 Objectives of chemical addition to paper machine furnishes are explained in relation to machine and paper product performance.

Range bonding, fillers, water resistance, colour.

3.2 The range of chemical additives that are available to achieve the objectives of chemical addition is explained in relation to those objectives and in terms of sequence of addition.

Range may include but is not limited to – alum, size, starch, retention aid, drainage aid, dye, clay, talc, titanium dioxide, wet strength resin.

**Outcome 4**

Describe the role of additives used to give water resistance to paper.

**Performance criteria**

4.1 Process of sizing is described with reference to the hydrophilic nature of cellulose and the porous structure of paper.

4.2 Sizing reactions of papermaker's alum and rosin size, and their links to the drying process are described.

4.3 Terms related to sizing are defined and chemical additions and reactions for each are described.

Range may include but is not limited to – internal sizing, normal sizing, surface sizing, reverse sizing, neutral sizing.

4.4 Sizing process variables are described in terms of their effects.

Range may include but is not limited to – temperature, pH, concentration, refining dilution water quality.

**Outcome 5**

Describe fillers and bonding agents in paper making.

**Performance criteria**

5.1 The range of bonding agents used in papermills is described.

Range may include but is not limited to – retention aid, wet strength, dry strength.

5.2 Functions of fillers used in paper making are described in relation to paper properties.

Range printability, opacity, colour, brightness.

- 5.3 The mechanism for starches, alum, and wet strength agents to be retention aids is described.
- 5.4 Advantages and disadvantages of adding filler to a paper furnish are described in terms of strength, finish, opacity, and surface printability.
- 5.5 Factors affecting filler retention in a paper web are described and optimum conditions for each are specified.

## Outcome 6

Describe the use of additives for colouration.

### Performance criteria

- 6.1 Types of dyes and pigments used in the paper industry are described.
- Range solubility in water, chemical structure.
- 6.2 Use of acid, base, and direct dyes in paper making is described in terms of pH, affinity for cellulose, solubility, and tinctorial strength.

<b>Planned review date</b>	31 December 2028
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### Status information and last date for assessment for superseded versions

Process	Version	Date	Last Date for Assessment
Registration	1	30 November 2000	31 December 2024
Review	2	18 December 2006	31 December 2024
Review	3	24 October 2014	31 December 2025
Review	4	30 November 2023	N/A

<b>Consent and Moderation Requirements (CMR) reference</b>	0173
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This CMR can be accessed at <http://www.nzqa.govt.nz/framework/search/index.do>.

### Comments on this unit standard

Please contact Hanga-Aro-Rau Manufacturing, Engineering and Logistics Workforce Development Council [qualifications@hangaarorau.nz](mailto:qualifications@hangaarorau.nz) if you wish to suggest changes to the content of this unit standard.