

## INDICATORS OF PROGRESSION FOR THE LEARNING OBJECTIVES FOR THE TECHNOLOGY SPECIALIST KNOWLEDGE AND SKILLS STRANDS

The technology learning area has been revised to strengthen the positioning of digital technologies in *The New Zealand Curriculum*.

See [Technology in the NZC](#).

The digital technologies achievement objectives and indicators of progression have been replaced with learning progressions in the two technological areas: computational thinking for digital technologies and designing and developing digital outcomes.

See [Computational thinking: Progress outcomes and exemplars](#) and [Designing and developing digital outcomes: Progress outcomes and exemplars](#).

You can still access the digital technologies indicators of progression in this PDF: [Digital technologies: Learning objectives, indicators of progression, and teacher guidance \(December 2012\)](#).

## INDICATORS OF PROGRESSION FOR THE LEARNING OBJECTIVES FOR THE TECHNOLOGY SPECIALIST KNOWLEDGE AND SKILLS STRANDS

The *Indicators of Progression* (Indicators) provide support for teachers to interpret the Learning Objectives (LOs) for each specialist knowledge and skill technology component. They:

- provide an overview statement that explains the focus of the Learning Objectives and an overview statement about student progression from curriculum levels 6-8;
- restate the Learning Objectives for each level;
- provide guidance to teachers on what they could do to support student learning at curriculum levels 6-8;
- provide indicators of what students should know or be able to do at curriculum levels 6-8; and
- indicate the achievement standard(s) that align to the Learning Objective at curriculum levels 6-8.

The *Teacher Guidance* highlights the importance of the teacher's role in supporting student learning. It also acknowledges how the nature of teaching needs to change to ensure students are able to take more responsibility for their learning as they progress from curriculum levels 6-8 of the NZC. This has been emphasised by using the following terms to denote this shift in responsibilities from teacher to student.

- **Provide** is used when the teacher takes full responsibility for introducing and explicitly teaching new knowledge/skill or practices.
- **Guide** is used when the teacher assumes students will have some level of understanding/competency to draw from but continues to take the majority of the responsibility for developing these understandings further.
- **Support** is used when the balance shifts towards the student taking more responsibility for their learning, drawing from their past learning to consolidate and extend their understandings. In this case the teacher plays a more supportive role through questioning and challenging students to support them in their learning.

The *Teacher Guidance* also uses the term **ensure** to denote when the teacher plays a monitoring role to check that conditions critical for learning are present. For example, in 'planning for practice' and 'outcome development and evaluation' the teacher must ensure an appropriate brief is available to guide student work.

The *Indicators* describe specific understandings and capabilities that students should be able demonstrate consistently if they are to be considered to have met the related learning objective. The indicators for each level should be viewed 'collectively' as indicating the LO at that level.

*NOTE: At this stage of developing indicators for the Learning Objectives, teacher guidance is based on the 'best' guidance available as to how to support learning at curriculum levels 6-8. It is envisaged that this guidance will be refined later using classroom informed evidence.*

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# DESIGN IN TECHNOLOGY: KNOWLEDGE OF DESIGN

Knowledge of design focuses on understanding the way informed, creative and critical development of new ideas is achieved and how these are realised into feasible outcomes.

Initially students learn basic concepts relating to 'What is design?' and how or why something may be described as a 'good' or 'bad' design. Students progress to advanced concepts relating to sustainable design and innovation as currently understood, and to complex concepts relating to future focused themes, principles of good design, and making judgements of a design's quality in the context of its use.

	LEVEL 6	LEVEL 7	LEVEL 8
LO	<i>Demonstrate understanding of basic concepts in design</i>	<i>Demonstrate understanding of advanced concepts in design</i>	<i>Demonstrate understanding of complex concepts in design</i>
TEACHER GUIDANCE	<p>To support students to develop understandings about the basic concepts in design at level 6, teachers could:</p> <ul style="list-style-type: none"> <li>• Guide students to recognise that 'design' can be understood both as a verb and a noun.</li> <li>• Provide opportunity for students to explore/debate different definitions of 'design' in order to understand what design is.</li> <li>• Provide opportunity for students to explore how designing pulls together subjective and objective considerations to take human ideas into 'made' outcomes. Subjective considerations are those linked to aesthetics (where aesthetics is understood as it relates to all human senses/sensibilities). Objective considerations are those that can be established in a quantifiable sense.</li> <li>• Provide opportunity for students to explore differing opinions about the value of particular designs and how these arise due to differences in how subjective and objective considerations are prioritised.</li> <li>• Guide students to understand that designs can be evaluated as 'good' or 'bad' in terms of how they bring together form, function, cost and contextual understandings.</li> </ul>	<p>To support students to develop understandings about the advanced concepts in design at level 7, teachers could:</p> <ul style="list-style-type: none"> <li>• Provide opportunity for students to understand what 'designing for lifecycle' means and what additional considerations are required when designing for lifecycle (eg, those related to accessing materials/ongoing maintenance and disposal).</li> <li>• Provide opportunity for students to explore implications of additional considerations on how any design can be judged as 'good' or 'bad'.</li> <li>• Provide opportunity for students to debate the nature of innovative designing.</li> <li>• Guide students to determine the types of things that can inspire innovative ideas through analysing historical and contemporary innovations to identify inspirational drivers, for example previous designs (within a similar and dissimilar range of outcomes), art, nature, literature, attitudes, needs/desires/constraints/ opportunities.</li> <li>• Guide students to determine aspects that support innovative designing, for example, acceptance of risk taking, collaboration, freedom to explore diverse design ideas, appropriate resourcing, opportunity for free and frank debate, application of 'feasibility filters' – timing and 'depth'.</li> </ul>	<p>To support students to develop understandings about the complex concepts in design at level 8, teachers could:</p> <ul style="list-style-type: none"> <li>• Provide opportunity for students to explore innovative designing for sustainable futures.</li> <li>• Guide students to examine a range of models of design as recognised by design professionals and organisations.</li> <li>• Provide opportunity for students to develop a contemporary understanding of the 'principles of good design'.</li> <li>• Provide students with an opportunity to debate possible and probable future scenarios, the reliability of projections based on uncertainty, and the role of design principles in responding to uncertainty and the mitigation of risk.</li> <li>• Provide opportunity for students to apply the principles of good design to make informed judgements about the quality of a design.</li> <li>• Provide opportunity for students to debate how the principles of good design may have impacted on the design decision-making undertaken during the development of a variety of technological outcomes.</li> </ul>
INDICATORS	<p>Students can:</p> <ul style="list-style-type: none"> <li>• explain the elements that underpin design within a specified context</li> <li>• explain considerations used to determine the quality of a design within a specified context</li> <li>• discuss the quality of a design in relation to design elements and considerations of the specific context in which the design is situated.</li> </ul>	<p>Students can:</p> <ul style="list-style-type: none"> <li>• explain the relationship between lifecycle design, innovation and sustainability</li> <li>• explain how lifecycle analysis is undertaken and how this determines the focus for design intervention</li> <li>• discuss the competing priorities and compromises made as a result of lifecycle analysis when developing a sustainable technology.</li> </ul>	<p>Students can:</p> <ul style="list-style-type: none"> <li>• evaluate the quality of the design of a technological outcome using contemporary design judgement criteria</li> <li>• discuss the impact of contemporary judgement criteria on design decision making</li> <li>• justify the evaluation of a technological outcome's design.</li> </ul>
AS	<p><b>AS91053 Generic Technology 1.10</b> <i>Demonstrate understanding of design elements</i></p>	<p><b>AS91363 Generic Technology 2.10</b> <i>Demonstrate understanding of sustainability in design</i></p>	<p><b>AS91617 Generic Technology 3.10</b> <i>Undertake a critique of a technological outcome's design</i></p>
	Level 1 Generic Technology standards & assessment resources	Level 2 Generic Technology standards & assessment resources	Level 3 Technology achievement standards & assessment resources DRAFT

## DESIGN IN TECHNOLOGY: HUMAN FACTORS IN DESIGN

Human factors in design refers to ergonomic and aesthetic factors that influence the design of products, systems and environments. These factors are supported by the use of anthropometric, psychological and sensory data gathering and analysis techniques. Understanding spatial relationships between people, objects and their environments is important when considering human factors in design.

Initially students learn about human factors that need to be considered when designing a product, system or environment. This should progress to students learning about the relationship between anthropometric data, user preference and ergonomic fit in a product, system or environment; as well as how customisation is undertaken to address personal preference and obtain ergonomic fit.

	LEVEL 6	LEVEL 7	LEVEL 8
LO	<i>Demonstrate understanding of basic concepts and techniques related to human factors in design</i>	<i>Demonstrate understanding of advanced concepts and techniques related to human factors in design</i>	
TEACHER GUIDANCE	<p>To support students to develop understandings about the basic concepts related to human factors in design, at level 6 teachers could:</p> <ul style="list-style-type: none"> <li>• Guide students to understand human factors that need to be considered when designing products, systems and environments</li> <li>• Guide students to understand what the terms personal preference, style, and fashion refer to, how they differ from each other and can impact on the design of products, systems and environments</li> <li>• Guide students to explore why ergonomics and aesthetics needed to be considered in the design of a range of products, systems and/or environments</li> <li>• Provide opportunities for students to explore data gathering, including: anthropometrics, psychological and sensory data, and analysis techniques that were used inform the design of products, systems and environments. Discuss why they were used and their suitability.</li> </ul>	<p>To support students to develop understandings about advanced concepts related to human factors in design, at level 7 teachers could:</p> <ul style="list-style-type: none"> <li>• Provide opportunities for students to explore the role of statistics and probability in establishing guiding ratios and ergonomic aids</li> <li>• Guide students to consider ethical and economic parameters as human factors</li> <li>• Support students to explore how socio-cultural considerations impact on personal preference, style and fashion.</li> <li>• Support students to understand how customisation techniques are used to address user preferences. These include: using dressmakers mannequins, patterns, and ergonomics; using data from anthropometric, psychological and sensory data, focus groups and test subjects; using investigation and stimuli to establish personal preferences; and using functional modelling and prototypes</li> <li>• Support students to understand the relationships between anthropometric data, user preference and ergonomic fit across a range of products, systems and environments</li> <li>• Support students to identify the customisation undertaken to address personal preference and obtain ergonomic fit across a range of products, systems and environments.</li> </ul>	
INDICATORS	<p>Students can:</p> <ul style="list-style-type: none"> <li>• describe the human factors that need to be considered when designing products, systems and environments</li> <li>• explain how personal preference, group preferences, style and trends may impact on the design of products, systems and/or environments</li> <li>• explain how data gathering and analysis techniques may be used in the design of products, systems and environments</li> <li>• discuss why human factors identified for the design of a product, system and/or environment need to be considered</li> <li>• discuss the suitability of data gathering and analysis techniques that may be used in the design of a product, system and/or environment.</li> </ul>	<p>Students can:</p> <ul style="list-style-type: none"> <li>• explain how statistics and probability are used to establish guiding ratios for anthropometric data and ergonomic aids</li> <li>• explain how anthropometric data, user preference and ergonomic fit in a product, system or environment</li> <li>• discuss the relationship between anthropometric data, user preference and ergonomic fit in a product, system or environment</li> <li>• discuss customisation undertaken to address user preference and obtain ergonomic fit in a product, system or environment.</li> </ul>	
AS	<b>AS91054 Generic Technology 1.11</b> <i>Demonstrate understanding of basic human factors in design</i>	<b>AS91363 Generic Technology 2.11</b> <i>Demonstrate understanding of advanced concepts related to human factors in design</i>	<b>AS91617 Generic Technology 3.10</b> <i>Undertake a critique of a technological outcome's design</i>
	<a href="#">Level 1 Generic Technology standards &amp; assessment resources</a>	<a href="#">Level 2 Generic Technology standards &amp; assessment resources</a>	<a href="#">Level 3 Technology achievement standards &amp; assessment resources DRAFT</a>

### LEARNING OBJECTIVE PROGRESSES TO:

*Demonstrate understanding of complex concepts in design*

See previous page

## MANUFACTURING: KNOWLEDGE OF MANUFACTURING

Knowledge of manufacturing focuses on the underpinning concepts of manufacturing. This covers the systems and processes used in the production of goods.

Initially students learn about different manufacturing systems and various categories of manufacturing techniques. Students progress to complex understandings that also include broader concepts such as the use and availability of resources and political, social, economic and environmental factors.

	LEVEL 6	LEVEL 7	LEVEL 8
LO	<i>Demonstrate understanding of basic manufacturing concepts and techniques</i>	<i>Demonstrate understanding of advanced manufacturing concepts and techniques</i>	
TEACHER GUIDANCE	<p>To support students to develop understandings about basic manufacturing concepts and techniques at level 6, teachers could:</p> <ul style="list-style-type: none"> <li>• Provide a range of case studies to demonstrate different types of manufacturing systems.</li> <li>• Support students with their application of techniques used in manufacturing.</li> <li>• Support students to produce flow diagrams to communicate manufacturing processes.</li> <li>• Ensure students understand the need for differing manufacturing systems to meet specific requirements (eg, one off, batch and continuous production).</li> </ul>	<p>To support students to develop understandings about advanced manufacturing concepts and techniques at level 7, teachers could:</p> <ul style="list-style-type: none"> <li>• Support students with their understanding of how quality management techniques impact on manufacturing products.</li> <li>• Present advanced technologies to students such as CNC, PLC or SCADA systems.</li> <li>• Ensure students understand key drivers on manufacturing such as customer, social, environmental and safety imperatives. Level 3 Technology: Draft achievement standards and assessment resources</li> </ul>	<p><b>LEARNING OBJECTIVE PROGRESSES TO:</b></p> <p><i>Develop understanding of, and implement, a 'green' manufacturing process</i></p> <p><b>See next page</b></p>
INDICATORS	<p>Students can:</p> <ul style="list-style-type: none"> <li>• explain how safety issues were addressed in a manufacturing process</li> <li>• identify the impacts of new technologies and/or techniques on the suitability of different types of manufacturing systems and increased possibilities for quality control</li> <li>• discuss how and why quality management techniques have been important in changing manufacturing practices.</li> </ul>	<p>Students can:</p> <ul style="list-style-type: none"> <li>• communicate manufacturing processes by using process flow and system diagrams</li> <li>• explain why particular types of manufacturing systems are used in specified contexts</li> <li>• discuss the application of a range of techniques to meet production requirements</li> <li>• discuss how yield prediction and its determination, and quality control mechanisms, may be affected by social and environmental change.</li> </ul>	
AS	<p><b>AS91055 Generic Technology 1.12</b></p> <p><i>Demonstrate understanding of basic concepts used in manufacturing</i></p>	<p><b>AS91365 Generic Technology 2.12</b></p> <p><i>Demonstrate understanding of advanced concepts used in manufacturing</i></p>	
	<a href="#">Level 1 Generic Technology standards &amp; assessment resources</a>	<a href="#">Level 2 Generic Technology standards &amp; assessment resources</a>	<a href="#">Level 3 Technology achievement standards &amp; assessment resources DRAFT</a>

# MANUFACTURING: IMPLEMENT A MULTI-UNIT MANUFACTURING PROCESS

Implement a multi-unit manufacturing process focuses on the application of underpinning concepts and techniques in the multi-unit manufacturing of goods.

Initially students will use a defined technological outcome suitable for manufacture that has established manufacturing specifications. They will determine and implement the manufacturing system by considering the type of outcome, the resources and the techniques to be used. Students progress towards the incorporation of quality management and quality control procedures in the development and implementation of a 'green' manufacturing process.

	LEVEL 6	LEVEL 7	LEVEL 8
LO	<i>Implement a multi-unit manufacturing process</i>	<i>Develop and implement an effective manufacturing process</i>	<i>Develop understanding of, and implement, a 'green' manufacturing process</i>
TEACHER GUIDANCE	<p>To support students to implement a multi-unit manufacturing process at level 6, teachers could:</p> <ul style="list-style-type: none"> <li>• Provide opportunity for students to consider a range of manufacturing processes to explore relationships between the type of outcome and the resources and techniques selected.</li> <li>• Provide students with a defined technological outcome suitable for manufacture that has established manufacturing specifications.</li> <li>• Support students with their application of techniques used in their selected multi-unit manufacturing processes.</li> </ul>	<p>To support students to develop and implement an effective manufacturing process at level 7, teachers could:</p> <ul style="list-style-type: none"> <li>• Provide opportunity for students to analyse a range of technological outcome to determine suitability for manufacture and discuss design changes as required.</li> <li>• Support students in establishing specifications, including tolerances, required of the outcome that is to be manufactured.</li> <li>• Support students to select a manufacturing process and quality control procedures that enable units to meet the established specifications and tolerances</li> <li>• Support students to organise and use resources and carry out techniques in keeping with relevant codes of practice.</li> </ul>	<p>To support students to develop and implement a 'green' manufacturing process at level 8, teachers could:</p> <ul style="list-style-type: none"> <li>• Provide opportunity for discussion of how 'green' considerations are having an increasing influence on technological outcomes and their manufacture.</li> <li>• Support students to develop their understanding of 'green' manufacturing processes.</li> <li>• Discuss contemporary judgement criteria, based on the principles of good design, and how these may impact on the development and implementation of 'green' manufacturing processes.</li> <li>• Provide examples of optimisation in terms of energy and resources that exemplify 'green' manufacturing processes.</li> <li>• Support students to analyse a technological outcome to determine its suitability for 'green' manufacture and to make design changes as required.</li> <li>• Support students to modify the techniques and use of resources and the quality control procedures established to tailor the 'green' manufacturing process to the constraints and/or opportunities of the manufacturing location.</li> <li>• Support students to evaluate the success of their manufacturing process in meeting 'green' considerations.</li> </ul>
INDICATORS	<p>Students can:</p> <ul style="list-style-type: none"> <li>• Identify a manufacturing process suitable for multi-unit manufacture of the technological outcome</li> <li>• implement the manufacturing process by using selected resources and carrying out techniques in keeping with accepted practices, including safety and legal requirements</li> <li>• use feedback from quality control to review and modify the manufacturing process, leading to an improvement in the proportion of units meeting the specifications.</li> </ul>	<p>Students can:</p> <ul style="list-style-type: none"> <li>• analyse a range of technological outcomes to determine suitability for manufacture</li> <li>• establish specifications, including tolerances, required of the outcome that is to be manufactured</li> <li>• select a manufacturing process and quality control procedures that enable units to meet the established specifications and tolerances</li> <li>• organise and use selected resources and carry out techniques independently and accurately in keeping with relevant codes of practice</li> <li>• implement the manufacturing process using feedback from quality control to ensure the majority of the units meet the established specifications and tolerances.</li> </ul>	<p>Students can:</p> <ul style="list-style-type: none"> <li>• analyse a technological outcome to determine its suitability for 'green' manufacture</li> <li>• make design changes as required for the technological outcome guided by contemporary judgement criteria</li> <li>• establish specifications, including tolerances, required of the outcome that is to be manufactured</li> <li>• discuss how and why quality management procedures have been important in changing manufacturing practices to better support 'green' considerations</li> <li>• monitor quality control procedures that allow for ongoing monitoring to enhance the review and refinement of the manufacturing process to better suit the nature of the outcome and enhance its success in meeting 'green' considerations</li> <li>• justify the level of success the manufacturing process has attained in meeting 'green' considerations.</li> </ul>
AS	<p><b>AS91056 Generic Technology 1.13</b>  <i>Implement a multi-unit manufacturing process</i></p>	<p><b>AS91366 Generic Technology 2.13</b>  <i>Undertake development and implementation of an effective manufacturing process</i></p>	<p><b>AS91618 Generic Technology 3.13</b>  <i>Undertake development and implementation of a 'green' manufacturing process</i></p>
	Level 1 Generic Technology standards & assessment resources	Level 2 Generic Technology standards & assessment resources	Level 3 Technology achievement standards & assessment resources DRAFT

## TECHNICAL AREAS: KNOWLEDGE OF TECHNICAL AREAS

Knowledge of technical areas focuses on understanding the way such areas are applied in different technological fields.

Students draw from their learning in technology generally, and particularly the Nature of Technology and Technological Knowledge components and specialist knowledge and skills, to be able to explain how technical ideas have underpinned past, contemporary and possible future developments in diverse fields of technology.

		LEVEL 6	LEVEL 7	LEVEL 8				
LO	TEACHER GUIDANCE	<p><i>Demonstrate understanding of the application of technical areas to specific fields</i></p> <p>To support students to understand the application of technical areas to specific fields, at level 8, teachers could:</p> <ul style="list-style-type: none"><li>• Support students to be aware of a wide range of fields in which applications of technical areas are of key importance. Examples of fields include: medicine, sports, military, communications, entertainment, urban planning, food production.</li><li>• Provide students with examples of technical areas and support them to explore the technical ideas that have led to the development of these areas and their changes over time. Examples of technical areas include: nano-technology, laser technologies, virtual modelling, robotics, Artificial Intelligence.</li><li>• Provide students with the opportunity to discuss how and why technical areas have been applied in different fields (or in the same field) at different times, geographical locations and socio-cultural contexts in the past.</li><li>• Provide students with the opportunity to explore and discuss potential developments in technical areas and debate how these could be applied in fields in the future.</li></ul> <p>Students can:</p> <ul style="list-style-type: none"><li>• explain the technical ideas that have led to the development of technical areas and how these ideas, and the area, have changed over time.</li><li>• discuss current limitations and opportunities of technical areas in relation to specific fields</li><li>• debate the feasibility of future developments as related to changes to the technical area and/or to changes to the field in which it is applied.</li></ul>						
INDICATORS								
AS								
					<p><b>AS91619 Generic Technology 3.14</b></p> <p><i>Demonstrate understanding of the application of a technical area to a specific field</i></p>			
					<p>Level 3 Technology achievement standards &amp; assessment resources DRAFT</p>			

## CONSTRUCTION AND MECHANICAL TECHNOLOGIES: CONSTRUCT A RESISTANT MATERIALS PRODUCT

Construct a resistant material's product requires students to implement procedures and tests to make specified products using resistant materials.

Initially students learn to perform a sequence of techniques and tests to make resistant materials products that meet specifications. Students should progress to performing complex procedures, which incorporates interlocking parts to make a high quality resistant materials product that meets specifications.

	LEVEL 6	LEVEL 7	LEVEL 8
LO	<i>Implement basic procedures to make a resistant materials product</i>	<i>Implement advanced procedures to make a resistant materials product</i>	<i>Implement complex procedures to make a resistant materials product</i>
TEACHER GUIDANCE	<p>To support students to implement basic procedures to make a resistant materials product, at level 6, teachers could:</p> <ul style="list-style-type: none"> <li>• Ensure students are aware of a wide range of basic measuring, cutting, shaping, joining and finishing techniques</li> <li>• Ensure students are able to interpret job sequences from step-by-step instructions and understand the tests required to check progress when constructing products that will ultimately meet specifications</li> <li>• Ensure students have an appropriate environment, tools and materials to enable students to work safely with resistant materials to make a product</li> <li>• Provide opportunity for students to explore and discuss techniques and tests in terms of skilfulness and efficiency</li> <li>• Provide opportunity to explore what techniques are most suitable for use with a variety of resistant materials</li> <li>• Provide students with the opportunity to practice a range of basic techniques on different resistant materials and carry out appropriate checks to increase accuracy and finish. This may be through completing a range of individual products and/or joint class projects/activities.</li> </ul>	<p>To support students to implement advanced procedures to make a resistant materials product, at level 7, teachers could:</p> <ul style="list-style-type: none"> <li>• Ensure students are aware of a wide range of measuring, cutting, shaping, joining and finishing techniques</li> <li>• Provide students with the opportunity to discuss what is meant by advanced procedures. That is procedures that require the student to make informed selection and scheduling of techniques and testing to make the product</li> <li>• Support students to undertake evaluative tests to demonstrate the final product meets specifications</li> <li>• Provide opportunity for students to explore and discuss advanced procedures in terms of skilfulness and efficiency</li> <li>• Ensure students have an appropriate environment, tools and materials to enable students to work safely with resistant materials to make a product</li> <li>• Provide opportunity to explore what techniques are most suitable for use with a variety of resistant materials</li> <li>• Provide students with the opportunity to schedule and practice a range of techniques and tests to develop quality products. This may be through completing a range of individual products and/or joint class projects/activities.</li> </ul>	<p>To support students to implement complex procedures to make a resistant materials product, at level 8, teachers could:</p> <ul style="list-style-type: none"> <li>• Support students to be aware of a wide range of measuring, cutting, shaping, joining and finishing techniques.</li> <li>• Provide students with examples of assembly reference points, lines and/or planes and support them to identify or establish their own reference points, lines and/or planes.</li> <li>• Provide students with examples of how parts can be interlocked and explore techniques to enable this to occur.</li> <li>• Provide students with the opportunity to discuss what is meant by 'complex procedures' – these are procedures that require the student to make informed selection and scheduling of techniques and testing to make a product that incorporates two or more assembled parts which require accuracy and precision.</li> <li>• Support students to undertake evaluative tests to demonstrate the final product meets specifications.</li> <li>• Support students to explore and discuss complex procedures in terms of skilfulness and efficiency.</li> <li>• Ensure students have an appropriate environment, tools and materials to enable students to work safely with resistant materials to make a product.</li> <li>• Support students to explore techniques that are most suitable for use with a variety of resistant materials and allow parts to be effectively assembled with accuracy and precision.</li> <li>• Support students to schedule and practice a range of techniques and tests to develop quality products. This may be through completing a range of individual products and/or projects/activities.</li> </ul>
INDICATORS	<p>Students can:</p> <ul style="list-style-type: none"> <li>• undertake basic procedures to construct a product that meets specifications</li> <li>• apply given techniques and tests in a way that complies with relevant health and safety regulations</li> <li>• show independence and accuracy in the execution of basic techniques and tests</li> <li>• perform basic techniques and tests in a manner that economises time, effort and materials.</li> </ul>	<p>Students can:</p> <ul style="list-style-type: none"> <li>• undertake advanced procedures to construct a product with special features that meets specifications</li> <li>• select and apply scheduled techniques to comply with relevant health and safety regulations</li> <li>• show independence and accuracy in executing the scheduled techniques and tests</li> <li>• undertake techniques and tests in a manner that economises time, effort and materials.</li> </ul>	<p>Students can:</p> <ul style="list-style-type: none"> <li>• undertake complex procedures to construct a product that integrates parts with accuracy and precision, and meets specifications</li> <li>• identify and/or establish key reference points lines and/or planes required for integration of parts</li> <li>• select and apply scheduled techniques to comply with relevant health and safety regulations</li> <li>• show independence and accuracy in executing the scheduled techniques and tests</li> <li>• undertake techniques and tests in a manner that economises time, effort and materials.</li> </ul>
AS	<p><b>AS91057 Construction and Mechanical Technologies 1.20</b>  <i>Implement basic procedures using resistant materials to make a specified product</i></p>	<p><b>AS91344 Construction and Mechanical Technologies 2.20</b>  <i>Implement advanced procedures using resistant materials to make a specified product with special features</i></p>	<p><b>AS91620 Construction and Mechanical Technologies 3.20</b>  <i>Implement complex procedures to integrate parts using resistant materials to make a specified product</i></p>
	Level 1 Construction & Mechanical standards & assessment resources	Level 2 Construction & Mechanical standards & assessment resources	Level 3 Technology achievement standards & assessment resources DRAFT



## CONSTRUCTION AND MECHANICAL TECHNOLOGIES: CONSTRUCT A TEXTILES PRODUCT

Construct a textile material's product requires students to implement techniques and procedures and tests to make specified products using textile materials

Textile materials refer to a group of materials that are commonly grouped together because they show certain common characteristics. These materials include but are not limited to natural and synthetic fibres, yarns, knits and woven fabrics. Constructing using textile materials require particular techniques and procedures to be undertaken to enable materials to be skilfully and safely measured, cut, shaped, joined and finished to make quality products. Advanced and complex techniques are required to craft special features of a high standard in a product and rely on the consistent application to achieve a desired effect. Special features, structural, style and/or decorative, include such things as set in sleeve, fly front, tailored collars and cuffs, welt pocket, embroidering, shirring. Complex procedures include but are not limited to: joining materials with different properties, for example jacket shell and lining; changing the characteristics of the materials for example interfacing, interlining, boning, applied design; managing special fabrics, for example fine knits, sheers, satins; or designs cut on the bias.

Initially students learn to perform basic procedures by implementing a given sequence of techniques and tests to make a quality textile product that meets specifications. Students should progress to performing complex procedures that require them to select and perform at least two techniques involving different types of materials.

	LEVEL 6	LEVEL 7	LEVEL 8
LO	<i>Implement basic procedures to make a textiles product</i>	<i>Implement advanced procedures to make a textiles product</i>	<i>Implement complex procedures to make a textiles product</i>
TEACHER GUIDANCE	<p>To support students to implement basic procedures to make a textiles product, at level 6, teachers could:</p> <ul style="list-style-type: none"> <li>Ensure students are aware of a wide range of basic measuring, cutting, shaping, joining and finishing techniques.</li> <li>Ensure students are able to interpret job sequences from step-by-step instructions and understand the tests required to check progress when constructing products that will ultimately meet specifications.</li> <li>Ensure students have an appropriate environment, tools and materials to enable students to work safely with textile materials to make a product.</li> <li>provide opportunity for students to explore and discuss techniques and tests in terms of skilfulness and efficiency</li> <li>Provide opportunity to explore what techniques are most suitable for use with a variety of textile materials</li> <li>Provide students with the opportunity to practice a range of basic techniques on different textile materials and carry out appropriate checks to increase accuracy and finish. This may be through completing a range of individual products and/or joint class projects.</li> </ul>	<p>To support students to implement advanced procedures to make a textiles product, at level 7, teachers could:</p> <ul style="list-style-type: none"> <li>Ensure students are aware of a wide range of measuring, cutting, shaping, joining and finishing techniques.</li> <li>Provide students with the opportunity to discuss what is meant by advanced procedures. That is procedures that require the student to make informed selection and scheduling of techniques and testing to make the product and undertaking evaluative tests to demonstrate the final product meets specifications.</li> <li>Provide opportunity for students to explore and discuss advanced procedures in terms of skilfulness and efficiency</li> <li>Ensure students have an appropriate environment, tools and materials to enable students to work safely with textile materials to make a product.</li> <li>Provide opportunity to explore what techniques are most suitable for use with a variety of textile materials</li> <li>Provide students with the opportunity to schedule and practice a range of techniques and tests to develop quality products. This may be through completing a range of individual products and/or joint class projects.</li> </ul>	<p>To support students to implement complex procedures to make a textile materials product, at level 8, teachers could:</p> <ul style="list-style-type: none"> <li>Support students to be aware of a wide range of measuring, cutting, shaping, joining and finishing techniques.</li> <li>Provide students with the opportunity to discuss what is meant by complex procedures, i.e. procedures that require the student to make informed selection and scheduling of at least two techniques and testing to make a product that incorporates two or more materials.</li> <li>Provide students with examples of complex procedures; support them to trial a range of these and discuss them in terms of skilfulness and efficiency.</li> <li>Support students to undertake evaluative tests to demonstrate the final product meets specifications</li> <li>Support students to explore and discuss complex procedures in terms of skilfulness and efficiency.</li> <li>Ensure students have an appropriate environment, tools and materials to enable students to work safely with textile materials to make a product.</li> <li>Support students to schedule and practice a range of techniques and tests to develop quality products. This may be through completing a range of individual products and/or projects/activities.</li> </ul>
INDICATORS	<p>Students can:</p> <ul style="list-style-type: none"> <li>undertake basic procedures to construct a product that meets specifications</li> <li>apply given techniques and tests in a way that complies with relevant health and safety regulations</li> <li>show independence and accuracy in the execution of basic techniques and tests</li> <li>perform basic techniques and tests in a manner that economises time, effort and materials.</li> </ul>	<p>Students can:</p> <ul style="list-style-type: none"> <li>undertake advanced procedures to construct a product with special features that meets specifications</li> <li>select and apply scheduled techniques to comply with relevant health and safety regulations.</li> <li>show independence and accuracy in executing the scheduled techniques and tests</li> <li>undertake techniques and tests in a manner that economises time, effort and materials.</li> </ul>	<p>Students can:</p> <ul style="list-style-type: none"> <li>undertake complex procedures to construct a product that meets specifications</li> <li>use sampling and feedback to inform the selection of techniques when making products.</li> <li>develop and apply an order of construction to make a product</li> <li>undertake appropriate tests to demonstrate that a final product meets specifications</li> <li>undertake techniques, tests and processes in a manner that economises time, effort and materials, and complies with relevant health and safety regulations.</li> </ul>
AS	<p><b>AS91058 Construction and Mechanical Technologies 1.21</b>  <i>Implement basic procedures using textile material to make a specified product</i></p>	<p><b>AS91345 Construction and Mechanical Technologies 2.21</b>  <i>Implement advanced procedures using textile material to make a specified product with special features</i></p>	<p><b>AS91621 Construction and Mechanical Technologies 3.21</b>  <i>Implement complex procedures using textile material to make a specified product</i></p>
	Level 1 Construction & Mechanical standards & assessment resources	Level 2 Construction & Mechanical standards & assessment resources	Level 3 Technology achievement standards & assessment resources DRAFT

## CONSTRUCTION AND MECHANICAL TECHNOLOGIES: KNOWLEDGE OF RESISTANT MATERIALS CONSTRUCTION

Resistant Materials refer to a group of materials that are grouped together because they show certain common characteristics. These characteristics include: tensile strength, compressive resistance, hardness, malleability, ductility, elasticity, grain. Such materials are broadly categorised as wood, metal, ceramics, plastics, glass and their composites. Particular resistant materials exhibit characteristics to a greater or lesser extent. Resistant materials are often sub categorised. For example hardwood and softwood; thermosetting and thermoplastics, alloys and pure metals.

Resistant materials require particular basic techniques to be used to enable materials to be measured, cut, shaped, joined and finished when making products. Advanced and complex techniques are required to craft special features of a high standard in a product and rely on the consistent application of accepted conventions to achieve a desired effect. Special features can be structural and/or aesthetic and include such things as: inlays, special fit (eg, interference, push fit), matching turned components, internal screw cutting on a lathe, compound machining, glass fusing.

Knowledge within this component includes understanding how resistant materials are characterised, and understanding techniques used to work them. Understanding of techniques would include: how it is done in a safe and effective manner, the impact of the technique on materials involved, and when the technique would be suitable to use.

Initially students learn about resistant materials per se, the basic techniques commonly used to work them, and the relationship between these. Students progress to learning about advanced techniques and conventions required for highly crafted special features and the complex concepts and processes involved in resistant materials evaluation and development.

LEVEL 6		LEVEL 7	LEVEL 8
<b>LO</b>	<i>Demonstrate understanding of basic techniques used to make resistant materials products</i>	<i>Demonstrate understanding of advanced techniques used to make resistant materials products</i>	<p><b>LEARNING OBJECTIVE COULD PROGRESS TO:</b>  <i>Implement complex procedures to make a specified product using a Computer Numerical Controlled (CNC) machine</i>  <b>See next page</b></p>
<b>TEACHER GUIDANCE</b>	<p>To support students to develop understandings about the basic techniques used to make resistant material products at level 6, teachers could:</p> <ul style="list-style-type: none"> <li>• Provide opportunity for students to categorise a range of materials and identify those that display characteristics associated with the broad categories: resistant materials and textiles. Include materials that exist at the boundaries of the category such as vinyl and leather.</li> <li>• Provide opportunity for students to explore a range of products made from resistant materials in order to discuss the materials used, their characteristics and the techniques that would be appropriate to work them safely.</li> <li>• Guide students to explore how and why resistant materials and techniques are combined differently for particular situations.</li> <li>• Provide students with the opportunity to understand how basic techniques are undertaken in safe and effective manner, and the impact of these techniques on different materials. Examples of basic techniques include: marking and layout; sawing, filing machining, folding, sanding, planning; gluing, welding, soldering, fastening, jointing; painting, staining, bluing, polishing, machine finishing.</li> </ul>	<p>To support students to develop understandings about the advanced techniques used to make products from resistant or any other material type at level 7, teachers could:</p> <ul style="list-style-type: none"> <li>• Provide opportunity for students to explore accepted conventions used when constructing products using resistant or any other material type, and discuss how these conventions guide construction in similar and diverse contexts. Examples of accepted conventions include: drape, flush, parallel, perpendicular, offset, symmetry, array, tolerance, ease, press fit, clearances, taper, level, plumb.</li> <li>• Guide students to explore similarities and differences between safe practice in classroom and in industrial environments.</li> </ul>	
<b>INDICATORS</b>	<p>Students can:</p> <ul style="list-style-type: none"> <li>• explain how the characteristics of resistant materials influence the selection of safe techniques</li> <li>• discuss why resistant materials require particular techniques for their safe handling and use</li> <li>• discuss why techniques and resistant materials are combined in different ways across two or more situations.</li> </ul>	<p>Students can:</p> <ul style="list-style-type: none"> <li>• discuss how accepted conventions guide constructing in materials in similar contexts</li> <li>• explain the differences between safe practice in classroom and industrial environments</li> <li>• discuss how accepted conventions guide constructing with materials in diverse contexts.</li> </ul>	
<b>AS</b>	<p><b>AS91059 Construction and Mechanical Technologies 1.22</b>  <i>Demonstrate understanding of basic concepts used to make products from resistant materials</i></p>	<p><b>AS91347 Construction and Mechanical Technologies 2.22</b>  <i>Demonstrate understanding of advanced concepts used to make products</i></p>	
Level 1 Construction & Mechanical standards		Level 2 Construction & Mechanical standards	Level 3 Technology achievement standards & assessment resources DRAFT

## CONSTRUCTION AND MECHANICAL TECHNOLOGIES: CONSTRUCT A SPECIFIED PRODUCT USING CNC MACHINES

Construct a specified product requires students to implement procedures and tests to make specified products using Computer Numerical Controlled (CNC) machines.

Initially students learn to perform a sequence of techniques and tests to make specified products using CNC machines that meet specifications. Students should progress to performing complex procedures, which incorporate the use of CNC machines to make specified products that meets specifications.

		LEVEL 6	LEVEL 7	LEVEL 8
TEACHER GUIDANCE	LO	<p><b>LEARNING COULD PROGRESS FROM:</b>  <b>KNOWLEDGE OF RESISTANT MATERIALS CONSTRUCTION</b>  <i>See previous page</i></p>		<p><i>Implement complex procedures to make a specified product using a Computer Numerical Controlled (CNC) machine</i></p>
				<p>To support students to implement complex procedures to make a specified product using a Computer Numerical Controlled (CNC) machine at level 8, teachers could:</p> <ul style="list-style-type: none"> <li>• Support students to be aware of the capability of a CNC machine(s) including its limits</li> <li>• Support students to develop graphic representations of specified products in a computer design setting</li> <li>• Support students to develop an understanding of CNC programming language</li> <li>• Support students to develop skills in calibrating CNC machines to software and manufacturer requirements</li> <li>• Provide students with an opportunity to discuss what is meant by 'complex procedures' in relationship to CNC machines</li> <li>• Support students to undertake evaluative tests to demonstrate that specified products meet specifications</li> <li>• Ensure students have an appropriate environment, to apply relevant health and work regulations when working with CNC machines</li> <li>• Support students to schedule and practice a range of complex procedures when making specified products. This may be through completing a range of individual products and/or projects/activities.</li> </ul>
INDICATORS				<p>Students can:</p> <ul style="list-style-type: none"> <li>• integrate the limits of a CNC machine into a graphic representation of the desired product in a computer design setting that demonstrates an understanding of CNC programming language</li> <li>• set up and calibrate a CNC machine to software and manufacturer requirements</li> <li>• operate a CNC machine to make an product in compliance with relevant health and safety regulations</li> <li>• evaluate a CNC machine made product against its graphic representation.</li> <li>• show independence and accuracy in undertaking complex procedures to make specified products using CNC machines</li> <li>• undertake complex procedures in a manner that economises time, effort, tooling and materials when implementing complex procedures to make a specified product using CNC machines.</li> </ul>
	AS			<p><b>ASAS91622 Construction &amp; Mechanical Technologies 3.22</b>  <i>Implement complex procedures to make a specified product using a Computer Numerical Controlled (CNC) machine</i></p>
		Level 1 Construction & Mechanical standards	Level 2 Construction & Mechanical standards	Level 3 Technology achievement standards & assessment resources DRAFT

## CONSTRUCTION AND MECHANICAL TECHNOLOGIES: KNOWLEDGE OF TEXTILES CONSTRUCTION

Textile Materials refer to a group of materials that are grouped together because they show certain common characteristics. These materials include but are not limited to: natural and synthetic fibres, yarns, knits and woven fabrics.

Textile materials require particular basic techniques to be used to enable these materials to be measured, cut, shaped, joined and finished when making products. Advanced and complex techniques are required to craft special features of a high standard in a product and rely on the consistent application of accepted conventions to achieve a desired effect. Special features can be structural and/or aesthetic, and include: style features such as set in sleeves, fly front, tailored collars and cuffs, welt pockets; decorative features such as pin tucks, embroidery, shirring; and structural features such as 3D felting, combining different fibres in felting and different materials (eg, nuno felting).

Initially students learn about textile materials per se, the basic techniques commonly used to work them, and the relationship between these. Students progress to learning about advanced techniques required to craft special features and the complex concepts and processes involved in textile material evaluation and development.

LEVEL 6		LEVEL 7	LEVEL 8
LO	<i>Demonstrate understanding of basic techniques used to make textile materials products</i>	<i>Demonstrate understanding of advanced techniques used to make textile materials products</i>	<b>LEARNING OBJECTIVE COULD PROGRESS TO:</b> <i>Implement complex procedures to create an applied design for a specified product</i> <b>See next page</b>
	<p>To support students to develop understandings about the basic techniques used to make textile material products at level 6, teachers could:</p> <ul style="list-style-type: none"> <li>• Provide opportunity for students to categorise a range of materials and identify those that display characteristics associated with the broad categories: resistant materials and textiles. Include materials that exist at the boundaries of the category, such as vinyl and leather.</li> <li>• Provide opportunity for students to explore a range of products made from textile materials in order to discuss the materials used, their characteristics (eg, Strength, thickness, stretch, drape) and the techniques that would be appropriate to work them safely.</li> <li>• Guide students to explore how and why textile materials and techniques are combined differently for particular situations.</li> <li>• Provide students with the opportunity to understand how basic techniques are undertaken in safe and effective manner, and the impact of these techniques on different materials. Examples of basic techniques include: measuring and marking out; sizing, shaping and forming; joining and assembling; finishing and detailing.</li> </ul>	<p>To support students to develop understandings about the advanced techniques used to make textile material products at level 7, teachers could:</p> <ul style="list-style-type: none"> <li>• Provide opportunity for students to explore accepted conventions used when constructing products using textile materials, and discuss how these conventions guide constructing in materials in similar and diverse contexts. Examples of accepted conventions include: drape, parallel, perpendicular, offset, symmetry, array, tolerance, ease, clearances, taper, level.</li> <li>• Support students to understand special features and the skills associated with their construction.</li> <li>• Guide students to understand how and why techniques are brought together to achieve special features.</li> </ul>	
INDICATORS	<p>Students can:</p> <ul style="list-style-type: none"> <li>• explain how the characteristics of textile materials influence the selection of safe techniques</li> <li>• discuss why textile materials require particular techniques for their safe handling and use</li> <li>• discuss why techniques and textile materials are combined in different ways across two or more situations.</li> </ul>	<p>Students can:</p> <ul style="list-style-type: none"> <li>• identify attributes of special features in textile products</li> <li>• explain construction requirements of special features</li> <li>• explain requirements to obtain a quality finish in special features</li> <li>• discuss why techniques are selected to make special features and how they are influenced by the characteristics of the materials used.</li> </ul>	
	<p><b>AS91060 Construction and Mechanical Technologies 1.23</b>  <i>Demonstrate understanding of basic concepts used to make products from textile materials</i></p>	<p><b>AS91348 Construction and Mechanical Technologies 2.23</b>  <i>Demonstrate understanding of advanced concepts used to make a product with textile materials</i></p>	
AS	Level 1 Construction & Mechanical standards	Level 2 Construction & Mechanical standards	Level 3 Technology achievement standards & assessment resources DRAFT

# CONSTRUCTION AND MECHANICAL TECHNOLOGIES: CREATE AN APPLIED DESIGN

Implement procedures to create an applied design for a specified product requires students to learn how applied designs and complex procedures can be used to create specified products.

		LEVEL 6	LEVEL 7	LEVEL 8	
LO	TEACHER GUIDANCE	<div>LEARNING COULD PROGRESS FROM: KNOWLEDGE OF TEXTILES CONSTRUCTION See previous page</div>			Implement complex procedures to create an applied design for a specified product
					To support students to implement complex procedures to create an applied design for a specified product at level 8, teachers could: <ul style="list-style-type: none"><li>Support students to interpret complex designs and determine applied design mediums suited to products</li><li>Support students to trial a range of complex techniques to determine the equipment and materials required to create an applied design that enhance products</li><li>Support students to apply complex techniques that comply with relevant health and safety regulations.</li><li>Support students to develop independence and accuracy in implementing complex procedures to create applied designs for specified products</li><li>Support students to implement complex procedures in a manner that economises time, effort and materials when implementing complex procedures to create an applied design for a specified product. This may be through completing a range of individual products and/or projects/activities.</li></ul>
INDICATORS	AS				Students can: <ul style="list-style-type: none"><li>interpret a complex design to determine an applied design medium suited to the product</li><li>trial to determine the equipment, materials and complex techniques required to create the design</li><li>undertake appropriate tests to demonstrate the applied design enhances the product as specified</li><li>apply complex techniques that comply with relevant health and safety regulations.</li><li>show independence and accuracy in implementing complex procedures to create applied designs for specified products</li><li>undertake complex procedures in a manner that economises time, effort, tooling and materials when implementing complex procedures to create an applied design for a specified product.</li></ul>
					AAS91623 Construction and Mechanical Technologies 3.23 Implement complex procedures to create an applied design for a specified product
		Level 1 Construction & Mechanical standards	Level 2 Construction & Mechanical standards	Level 3 Technology achievement standards & assessment resources DRAFT	

## CONSTRUCTION AND MECHANICAL TECHNOLOGIES: KNOWLEDGE OF STRUCTURES

A structure refers to framework that is used to support a load(s). A framework is comprised of structural members that are assembled using pin or fixed joints. The integrity of a framework is reliant on the strength, weight, material and profile of its structural members; the combination and means of joining structural members; and the safety factors applied to the structure.

Knowledge within this component includes understanding of how pin jointed structural members transfer forces when a framework is subjected to gravitational loads; how safety factors are applied to ensure a frameworks integrity; and calculating using vector diagrams the magnitude, direction and type of force acting on pin jointed structural members in a framework.

Initially students learn what is meant by tension, compression, shear and torsion; how safety factors are applied in the design of frameworks; how structural members and pin joints transfer forces in a framework; and how the integrity of a framework is established. This should progress to students learning how to: use technical language, diagrams and symbols to explain structural members and materials used in structural systems such as buildings, bridges, cranes; explain the way structural members and materials enable a structural system achieve structural integrity through withstanding known loads; and evaluate the structural integrity of a structural system; and determine ways of increasing the structural integrity of a structural system.

	LEVEL 6	LEVEL 7	LEVEL 8
LO	<i>Demonstrate understandings of basic structures</i>	<i>Demonstrate understandings of advanced structures</i>	<i>Demonstrate understandings of complex structures</i>
TEACHER GUIDANCE	<p>To support students to understanding basic structures at level 6, teachers could:</p> <ul style="list-style-type: none"> <li>Ensure students are aware that frameworks are designed to withstand loads of a greater capacity than they are placed under.</li> <li>Provide opportunity for students to understand the causes and effects of internal forces within frameworks. That is, the relationship between tension, compression, bending, shear and torsion in structural framework members, and how material selection (i.e. composition, profile) is used to address this (eg, round pipe rather than solid round is used when members subjected to a compressive force).</li> <li>Provide opportunity for students to understand how 'safety factor' is applied across different framework structure contexts (eg, bridges, cranes, trusses)</li> <li>Provide opportunity for students to understand the structural members that form a framework (eg, Posts, beams, struts, ties) and how they are joined (eg, fixed, pin joint, moving) across different framework structure contexts.</li> <li>Provide opportunity for students to understand how pin jointed structural members in a framework transfer forces due to gravity load to ensure the frameworks integrity is maintained.</li> </ul>	<p>To support students to understanding advanced structures at level 7, teachers could:</p> <ul style="list-style-type: none"> <li>Provide opportunity for students to understand how, where and why pin and moving joints are used in frameworks across different framework structure contexts (eg, bridges, cranes, trusses).</li> <li>Provide opportunity for students to explain, using vector diagrams, the magnitude, direction and type of force acting on pin jointed structural members when a framework is subjected to known gravitational loads.</li> <li>Provide opportunity for students to explain how structural members combine to resist loads and transfer forces within a pin jointed framework to ensure the frameworks is maintained in equilibrium.</li> <li>Provide opportunity for students to understand how 'safety factor' is applied across different framework structure contexts (eg, bridges, cranes, trusses) to ensure a frameworks integrity is maintained.</li> </ul>	<p>To support students to understanding complex structures at level 8, teachers could:</p> <ul style="list-style-type: none"> <li>Provide opportunity for students to understand how dynamic loads (such as those resulting from changes in temperature, wind and earth movement, end use) impact on the design of structural systems (such as buildings, bridges, cranes, vehicles, appliances).</li> <li>Provide opportunity for students to use technical language, diagrams and symbols to explain structural members and materials used in structural systems, and how these systems withstand known loads.</li> <li>Provide opportunity for students to understand how the selection of structural members and materials enables structural systems to achieve integrity in terms of withstanding known loads across a range of differing structural systems.</li> <li>Provide opportunity for students to evaluate structural systems and discuss, with justifications, possible ways of increasing the structural integrity of structural systems across a range of differing structural systems.</li> </ul>
INDICATORS	<p>Students can:</p> <ul style="list-style-type: none"> <li>explain what is meant by tension, compression, shear and torsion</li> <li>explain the safety factors applied to a framework</li> <li>explain how structural members and pin joints transfer forces in a framework.</li> <li>discuss how the integrity of a framework is established.</li> </ul>	<p>Students can:</p> <ul style="list-style-type: none"> <li>describe where pin and moving joints are used on frameworks</li> <li>describe the effects of loads when fixed joints are used in frameworks</li> <li>describe the effects of load on pin jointed frameworks using vector diagrams</li> <li>explain the types of forces which can act on pin jointed structural members when a frameworks is placed under known gravitational loads</li> <li>explain how structural members combine to resist loads and transfer forces within a pin jointed framework</li> <li>explain structural member profiles and forms and why they are used in a framework</li> <li>explain how structural members combine to resist loads and transfer forces within pin jointed framework</li> <li>explain how safety factors are determined and discuss how they have been applied to ensure the integrity of a framework.</li> </ul>	<p>Students can:</p> <ul style="list-style-type: none"> <li>use technical language, diagrams and symbols to explain structural members and materials used in a structural system, and how the system withstands known loads</li> <li>discuss how the selection of structural members and materials enables a structural system to achieve structural integrity in terms of withstanding known loads</li> <li>evaluate the structural integrity of a structural system.</li> <li>discuss, with justification, possible ways of increasing the structural integrity of a structural system.</li> </ul>
AS	<b>AS91061 Construction and Mechanical Technologies 1.24</b> <i>Demonstrate understanding of basic concepts related to structural frameworks</i>	<b>AS91348 Construction and Mechanical Technologies 2.24</b> <i>Demonstrate understanding of advanced concepts related to structural frameworks</i>	<b>AS91624 Construction and Mechanical Technologies 3.24</b> <i>Demonstrate understanding of a structural system</i>
	Level 1 Construction & Mechanical standards & assessment resources	Level 2 Construction & Mechanical standards & assessment resources	Level 3 Technology achievement standards & assessment DRAFT

## CONSTRUCTION AND MECHANICAL TECHNOLOGIES: KNOWLEDGE OF MACHINES

Machines consist of fixed and moving parts that modify mechanical energy and transmit it in a more useful form. A simple machine; such as a lever, a pulley, or an inclined plane; alters the magnitude or direction, or both, of an applied force. Complex machines have internal energy systems; such as electric motors, steam engines, turbines, combustion engines, solar energy systems, nuclear systems; that combine with levers, inclined planes and/or screws to enable the machine to perform their intended function/s.

Initially students learn about simple machines such as levers, inclined planes and screws and how when combined with mechanical components they are able to achieve a mechanical advantage and motion. This should progress to students learning how to explain the functionality of complex machines using technical language, diagrams and symbols; and being able to evaluate such machines in terms of their energy efficiency in order to suggest ways of improving this.

	LEVEL 6	LEVEL 7	LEVEL 8
LO	<i>Demonstrate understanding of basic concepts related to machines</i>	<i>Demonstrate understanding of advanced concepts related to machines</i>	<i>Demonstrate understandings of complex concepts related to machines</i>
TEACHER GUIDANCE	<p>To support students to understanding basic concepts related to machines at level 6, teachers could:</p> <ul style="list-style-type: none"> <li>• Provide opportunity for students to explain the purpose of levers, inclined planes and screws.</li> <li>• Provide opportunity for students to explain the purpose of a range of mechanical components within a range of machines.</li> <li>• Guide students to explain the advantages and disadvantages of pneumatic and hydraulic systems.</li> <li>• Guide students to understand how a range of machines provide mechanical advantage and motion.</li> <li>• Guide students to discuss why particular levers, inclined planes and screws, and mechanical components were selected to ensure mechanical advantage and motion in across a range of machines.</li> </ul>	<p>To support students to understanding advanced concepts related to machines at level 7, teachers could:</p> <ul style="list-style-type: none"> <li>• Provide opportunity for students to explore efficiencies of machines (eg, block and tackle, chain block, pneumatic or hydraulic jack, and turntable) and explain their safe use.</li> <li>• These machines should include two or more mechanical components (eg, cams and followers; pivots and linkages; gears; belt or chains and sprockets; shafts and bearings) Guide students to explain how mechanical components combine to provide the desired mechanical advantage, and relative motion between input and output in a range of machines.</li> <li>• Guide students to discuss for a range of machines how mechanical advantage was obtained by combining mechanical components, the relative motion between input and output for the machines, and efficiency(s) obtained. Note: a machines efficiency is determined by the ratio of the energy delivered (or work done) by a machine to the energy needed (or work required) to operate it (i.e. output energy/input energy).</li> </ul>	<p>To support students to understanding complex concepts related to machines at level 8, teachers could:</p> <ul style="list-style-type: none"> <li>• Guide students to explain how complex machines work, using technical language, diagrams and symbols as appropriate.</li> <li>• Support students to discuss how components enable complex machines to achieve their function/s.</li> <li>• Support students to discuss the energy efficiency of complex machines and how this impacts on the requirements for the machine's energy system.</li> <li>• Provide opportunity for students to evaluate the energy efficiency of complex machines and determine possible ways of increasing their energy efficiency.</li> </ul>
INDICATORS	<p>Students can:</p> <ul style="list-style-type: none"> <li>• explain the purpose of levers, inclined planes and screws</li> <li>• explain the purpose of a range of mechanical components</li> <li>• explain the advantages and disadvantages of pneumatic and hydraulic systems</li> <li>• explain how a machine provides the mechanical advantage and motion</li> <li>• discuss why particular levers, inclined planes and screws, and mechanical components were selected to ensure the mechanical advantage and motion in machines.</li> </ul>	<p>Students can:</p> <ul style="list-style-type: none"> <li>• describe the efficiencies of machines in relation to their safe application</li> <li>• explain how mechanical components combine to provide the desired mechanical advantage, and relative motion between input and output in a range of machines</li> <li>• discuss why mechanical components were combined to provide the mechanical advantage, relative motion between input and output, and efficiency desired in a range of machines.</li> </ul>	<p>Students can:</p> <ul style="list-style-type: none"> <li>• explain how complex machines work, using technical language, diagrams and symbols as appropriate</li> <li>• discuss how the components enable complex machines to achieve their function/s</li> <li>• discuss the energy efficiency of complex machines and how this impacts on the requirements for the machine's energy system</li> <li>• evaluate the energy efficiency of complex machines and justify possible ways of increasing their energy efficiency.</li> </ul>
AS	<p><b>AS91062 Construction &amp; Mechanical Technologies 1.25</b> <i>Demonstrate understanding of basic concepts related to machines</i></p>	<p><b>AS91349 Construction &amp; Mechanical Technologies 2.25</b> <i>Demonstrate understanding of advanced concepts related to machines</i></p>	<p><b>AS91625 Construction &amp; Mechanical Technologies 3.25</b> <i>Demonstrate understanding of complex machines</i></p>
	Level 1 Construction & Mechanical standards & assessment resources	Level 2 Construction & Mechanical standards & assessment resources	Level 3 Technology achievement standards & assessment resources DRAFT



## CONSTRUCTION AND MECHANICAL TECHNOLOGIES: PATTERN MAKING

Pattern making includes skills in pattern adaptation and pattern drafting. Pattern drafting requires a pattern block or working drawing to be established by using key measurements and using these to develop a pattern which interprets a garments or items design including its special features. Patterns are tested using toiles and mock-ups to ensure that pattern pieces correctly interpret a design and its special features.

Initially students learn how to select and adapt existing patterns to enable a garment to correctly fit for the body or an item to meet desired size and fit specifications. This should progress to students learning how to draft patterns and test these using toiles and mock-ups to ensure the final pattern correctly interprets a design and its special features. Students also learn how to develop a pattern guide sheet that incorporates appropriate language, symbols and/or diagrams to: communicate pattern layout, and the step by step instructions required to construct a garment or item.

	LEVEL 6	LEVEL 7	LEVEL 8
LO	<i>Make basic adaptations to a pattern to enable a design to fit a person or item</i>	<i>Make advanced adaptations to a pattern to change structural and/or style features of a design</i>	<i>Draft a pattern to interpret a design for a garment</i>
TEACHER GUIDANCE	<p>To support students to make basic adaptations to a pattern to enable a design to fit a person or item at level 6, teachers could:</p> <ul style="list-style-type: none"> <li>• Provide opportunity for students to take key body or item measurements and select a suitable pattern size(s).</li> <li>• Guide students to interpret a selected patterns guide sheet to identify the correct pattern pieces for a selected design.</li> <li>• Guide students to show independence and accuracy when: <ul style="list-style-type: none"> <li>• making basic adaptations to a pattern to accommodate the key measurements</li> </ul> </li> <li>• interpreting pattern symbols and using a patterns guide sheet to correctly place pattern pieces to suit material width and type</li> <li>• developing a construction plan, using appropriate language, symbols and diagrams.</li> <li>• Provide opportunity for students to construct a toile or mock up using an adapted pattern and test to ensure that it interprets the design, providing the correct fit for the body or item in a manner that economises time, effort and materials.</li> </ul>	<p>To support students to make advanced adaptations to a pattern to change structural and/or style features of a design at level 7, teachers could:</p> <ul style="list-style-type: none"> <li>• Provide opportunity for students to undertake advanced adaptations to a pattern which has three or more pieces, by making changes to pieces to enable structural and/or style design features to be achieved. Such features requiring advanced pattern adaptation may include: manipulated darts, sleeves; added pleats, gores, yokes, button wraps, facings and collars; deep buttoning, waterproof openings, and changing the types of fastenings.</li> <li>• Guide students to correctly labell the adapted pattern with grainline, cutting information, pattern piece names, dots and notches.</li> <li>• Guide students to demonstrate independence and accuracy when constructing a toile/or mock-up; testing and refining the pattern where necessary, to ensure the final pattern correctly interprets the design and provides the correct fit for the body or item.</li> <li>• Guide students to undertake advance pattern adaptation in a manner that economises time, effort and materials.</li> </ul>	<p>To support students to draft a pattern to interpret a design for a garment at level 8, teachers could:</p> <ul style="list-style-type: none"> <li>• Provide opportunity for students to critique and evaluate how patterns allow for designs to be interpreted.</li> <li>• Support students to work independently and accurately to: <ul style="list-style-type: none"> <li>• establish and take key measurements, and draft a template (eg, pattern block, working drawings) that uses these measurements</li> <li>• use their templates to develop a pattern which interprets the design and its special features, where the special features need to be realised through the creation of a pattern rather than the manipulation of the fabric</li> <li>• test and refine the pattern to ensure it provides the special features required by the design</li> <li>• develop a pattern guide sheet, using appropriate language, symbols and/or diagrams, to communicate pattern layout and the step by step instructions required to construct a garment or item</li> <li>• construct a final toile/or mock up of the adapted pattern to ensure the final pattern correctly interprets the design and its special features.</li> </ul> </li> <li>• Guide students to undertake pattern drafting in a manner that economises time, effort and materials.</li> </ul>
INDICATORS	<p>Students can:</p> <ul style="list-style-type: none"> <li>• take key body or item measurements to select pattern size(s)</li> <li>• interpret a selected patterns guide sheet to identify the correct pattern pieces for the selected design</li> <li>• show independence and accuracy when: <ul style="list-style-type: none"> <li>• making basic adaptations to a pattern to accommodate the key measurements</li> </ul> </li> <li>• interpreting pattern symbols and using a patterns guide sheet to correctly place pattern pieces to suit material width and type</li> <li>• developing a construction plan, using appropriate language, symbols and diagrams</li> <li>• construct a toile or mock up using the adapted pattern and test to ensure that it interprets the design, providing the correct fit for the body or item in a manner that economises time, effort and materials.</li> </ul>	<p>Students can:</p> <ul style="list-style-type: none"> <li>• undertake advanced adaptations to a pattern that has three or more pieces, by making changes to pieces to enable structural and/or style design features to be achieved</li> <li>• correctly labelling the adapted pattern with grainline, cutting information, pattern piece names, dots and notches</li> <li>• demonstrate independence and accuracy when constructing a toile/or mock-up; testing and refining the pattern where necessary, to ensure the final pattern correctly interprets the design and provides the correct fit for the body or item</li> <li>• undertake advance pattern adaptation in a manner that economises time, effort and materials.</li> </ul>	<p>Students can</p> <ul style="list-style-type: none"> <li>• establish and take key measurements, and draft a template that uses these measurements.</li> <li>• use the template to develop a pattern which interprets the design and its special features.</li> <li>• test and refine the pattern to ensure it provides the special features required by the design</li> <li>• develop a pattern guide sheet to ensure correct construction</li> <li>• construct a final toile or mock up of the adapted pattern to ensure the final pattern correctly interprets the design and its special features</li> <li>• draft a pattern with independence and accuracy and in a manner that economises time, effort and materials.</li> </ul>
AS	<b>AS91096 Construction &amp; Mechanical Technologies 1.26</b> <i>Make basic adaptations to a pattern to enable a design to fit a person or item</i>	<b>AS91350 Construction &amp; Mechanical Technologies 2.26</b> <i>Make advanced adaptations to a pattern to change the structure and/or style feature of a design</i>	<b>AS91626 Construction &amp; Mechanical Technologies 3.26</b> <i>Draft a pattern to interpret a design for a garment</i>
	Level 1 Construction & Mechanical standards & assessment resources	Level 2 Construction & Mechanical standards & assessment resources	Level 3 Technology achievement standards & assessment resources DRAFT



## DESIGN AND VISUAL COMMUNICATION: VISUAL COMMUNICATION

Visual communication refers to the effective communication and presentation of design ideas using modelling and graphic design techniques Initially students learn to communicate and present their design ideas and information by applying 2D and 3D visual communication techniques such as sketching, rendering, mock-ups, digital drawing and modelling, annotations, instrumental, templates, collage, overlays, Students progress to effectively and clearly applying complex and high quality visual techniques and knowledge that communicate a story to an audience - the intent of their design ideas.

	LEVEL 6	LEVEL 7	LEVEL 8
LO	<i>Demonstrate understanding of and skills in fundamental visual communication techniques</i>	<i>Demonstrate understanding of and skills in advanced visual communication techniques to visually communicate and present detailed visual information</i>	<i>Demonstrate understanding of and skills in complex visual communication techniques to visually communicate and promote the intent and details of design ideas</i>
TEACHER GUIDANCE	<p>To support students to demonstrate understanding of, and skills in, fundamental visual communication techniques at level 6, teachers could:</p> <ul style="list-style-type: none"> <li>Support students to develop competency in 2D and 3D drawing techniques (eg, oblique, isometric, and planometric, which includes freehand sketching and instrumental drawing)</li> <li>Support students to develop competency in 2D sketching and instrumental drawing techniques (eg, multi-view orthographic drawings showing in-depth information such as hidden detail, surface development, and geometric construction)</li> <li>Support students to develop competence in applying drawing techniques: quick rendering, crating, line hierarchy</li> <li>Support students to develop skills in rendering to communicate visual information of materials, how light falls on an object, how shadows are created</li> <li>Support students to develop competency in using drawing instruments (including computer programmes) to create instrumental 2D and 3D drawings incorporating conventions such as line weights, dimensioning, scale, reference lines, and geometric construction</li> <li>Guide students to understand how the use of media, modes (such as 3D mock-ups, digital modelling, photography) and drawing equipment are 'key' for communicating and presenting visual information.</li> <li>Support students to develop an understanding about compositional principles of layout, visual impact and typography (as shown in different designers work) and how these can be applied to visually communicate designs.</li> </ul>	<p>To support students to demonstrate understanding of, and skills in, advanced visual communication techniques to visually communicate and present detailed visual information at level 7, teachers could:</p> <ul style="list-style-type: none"> <li>Support students to develop an appreciation of aesthetic and functional qualities in a design, and techniques for effectively visually communicating these qualities.</li> <li>Support students to develop visual communication techniques such as sketching, rendering, modelling, and using digital media.</li> <li>Support students to develop advanced 2D freehand and instrumental drawing techniques (eg, auxiliary views, sectional views, exploded, and assembly), to communicate design features.</li> <li>Support students to understand how multiple drawings communicate details of shape and form.</li> <li>Support students to develop advanced 3D freehand and instrumental drawing techniques (such as one- and two-point perspective projection and isometric projection).</li> <li>Support students to understand how media, drawing equipment and layout are 'key' for effectively presenting visual information</li> <li>Support students to develop skills in using modes and media to highlight design ideas.</li> <li>Support students to develop skills associated with applying compositional principles such as proximity, alignment, hierarchy, positive and negative space when presenting design ideas.</li> </ul>	<p>To support students to demonstrate understanding of, and skills in, complex visual communication techniques to communicate and promote the intent and details of design ideas at Level 8, teachers could:</p> <ul style="list-style-type: none"> <li>Support students to understand how to select and use visual communication techniques to best communicate the qualities and intent of design ideas.</li> <li>Support students to understand the integration of different drawings/models for the effective communication of complex visual Information.</li> <li>Support students to develop visual communication strategies (such as abstraction, re-combination, exaggeration, transformations and deconstruction) for re-generating design ideas.</li> <li>Support students to understand the selection and use of presentation techniques and formats.</li> <li>Support students to understand the qualities of an exhibition space or setting and the needs of the viewer to best present a design outcome.</li> <li>Support students to develop using advanced media techniques and digital technologies.</li> <li>Support students to understand how a set of working drawings communicate production details of design ideas.</li> <li>Support students to develop a cohesive set of drawings and/or models.</li> </ul>
INDICATORS	<p>Students can:</p> <ul style="list-style-type: none"> <li>create 2D and 3D freehand sketches that show in-depth design features in proportion relative to the context of the design brief to convey the intent of the design ideas.</li> <li>produce accurate instrumental 2D drawings that show in-depth information about technical features of a design</li> <li>produce accurate paraline drawings that show in-depth information about design features</li> <li>skilfully apply rendering techniques to convincingly communicate shape and surface qualities, enhancing the realistic representation of design qualities to an audience</li> <li>use rendering techniques to communicate the form of design ideas.</li> <li>skilfully plan, select and apply presentation skills that are of a high quality showing accurate layout skills, and visual impact to tell a story.</li> </ul>	<p>Students can:</p> <ul style="list-style-type: none"> <li>communicate their design ideas using techniques that explore both identifiable aesthetic and functional details of a design; apply techniques such as sketching, modelling, rendering, collage, overlays and digital media</li> <li>produce a set of instrumental or computer-related 2D working drawings showing technical details that indicate shape and form – these working drawings show the important design features of the item being communicated, such as parts and how they assemble, sizes or details of hidden parts (sections)</li> <li>use appropriate engineering and architectural conventions correctly</li> <li>produce perspective instrumental projection drawings (parallel and/or angular) that communicate design features and the associated details. (such as spatial drawings: window framing, door handles, and engineering: webs, holes, fasteners</li> <li>apply instrumental projection conventions: picture plane, station point, eye level lines, ground level lines, vanishing points, height lines</li> <li>select a view point that enables the design features of an item to be shown.</li> <li>select graphic modes and media, and apply compositional principles (eg, proximity, alignment, hierarchy, positive and negative space) that best present the design features of an item being communicated</li> <li>appropriately present visual information that includes consideration of the design context (eg, spatial design, product, landscape) and presentation context (eg, location, audience).</li> </ul>	<p>Students can:</p> <p>apply visual communication strategies that aid divergent design thinking to enable the creative and analytical interrogation and re-generation of design ideas</p> <p>produce a visual presentation that demonstrates the understanding of compositional principles, modes and media, and the relationship between the presentation and its context (eg, location, viewer, content)</p> <p>use specialist spatial design visual communication techniques and approaches (such as architectural drawing and rendering, models, fly-through animation) to express spatial design ideas</p> <p>use specialist product design visual communication techniques and approaches (such as industrial design drawing and rendering, models, moving-part animation) to express product design ideas</p> <p>produce a set of related 2D &amp; 3D working drawings and/or models that show details of components and information related to construction and assembly</p>
AS	<p><b>AS91063 Design and Visual Communication 1.30</b> <i>Produce freehand sketches to communicate own design ideas</i></p> <p><b>AS91064 Design and Visual Communication 1.31</b> <i>Produce instrumental, multi-view orthographic drawings that communicate technical features of design ideas</i></p> <p><b>AS91065 Design and Visual Communication 1.32</b> <i>Produce instrumental paraline drawings to communicate design ideas</i></p> <p><b>AS91066 Design and Visual Communication 1.33</b> <i>Use rendering techniques to communicate the form of design ideas</i></p> <p><b>AS91069 Design and Visual Communication 1.36</b> <i>Promote an organised body of work to an audience using visual communication techniques</i></p>	<p><b>AS91337 Design and Visual Communication 2.30</b> <i>Use visual communication techniques to generate design ideas</i></p> <p><b>AS91338 Design and Visual Communication 2.31</b> <i>Produce working drawings to communicate technical details of a design</i></p> <p><b>AS91339 Design and Visual Communication 2.32</b> <i>Produce instrumental perspective projection drawings to communicate design ideas</i></p> <p><b>AS91343 Design and Visual Communication 2.36</b> <i>Use visual communication techniques to compose a presentation of a design</i></p>	<p><b>AS91627 Design and Visual Communication 3.30</b> <i>Initiate design ideas through exploration</i></p> <p><b>AS91628 Design and Visual Communication 3.31</b> <i>Develop a visual presentation that exhibits a design outcome to an audience</i></p> <p><b>AS91631 Design and Visual Communication 3.34</b> <i>Produce working drawings to communicate production details for a complex design</i></p>
	Level 1 DVC Technologies standards & assessment resources	Level 2 DVC standards & assessment resources	Level 3 Technology achievement standards & assessment DRAFT

## DESIGN AND VISUAL COMMUNICATION: GRAPHICS PRACTICE

Graphics practice refers to the creative application of drawing and design knowledge and techniques to develop conceptual outcomes that address a brief, or a technological outcome of a graphical nature. The brief used may be provided to the students or developed by the students as part of their practice. Quality outcomes resulting from graphics practice rely on the selection of appropriate and well-executed drawing techniques, and presentation methods that allow conceptual designs to be communicated effectively. Initially students learn to apply drawing and design knowledge and techniques to visually communicate design ideas when developing conceptual outcomes to address a brief, through generating, testing, and evaluating design ideas. This should progress to students learning to undertake critical analysis of a conceptual outcome against the brief to ensure justify its potential fitness for purpose.

	LEVEL 6	LEVEL 7	LEVEL 8
LO	<i>Demonstrate ability to explore and develop design ideas by applying visual communication and design knowledge and techniques in response to a brief</i>	<i>Demonstrate ability to explore and develop design ideas by applying specialist visual communication and design knowledge and techniques in response to a brief</i>	<i>Demonstrate ability to explore, develop and extend design ideas by integrating specialist visual communication and design knowledge and techniques in response to a brief</i>
TEACHER GUIDANCE	<p>To support students to explore and develop design ideas by applying visual communication and design knowledge and techniques in response to a brief, at level 6, teachers could:</p> <ul style="list-style-type: none"> <li>• Provide opportunity for students to develop design knowledge and a range of drawing techniques that can be used to respond to a brief.</li> <li>• Provide opportunity for students to explore, generate, and refine design ideas informed by principles of aesthetics and function</li> <li>• Provide opportunity for students to develop design ideas to a conceptual design informed by research and testing.</li> <li>• Provide opportunity for students to incorporate design judgements when developing design ideas and undertaking ongoing evaluation during the development of a conceptual design.</li> <li>• Provide opportunity for students to present conceptual designs to an audience that visually communicate the details of design ideas in response to the design brief.</li> </ul>	<p>To support students to explore and develop design ideas by applying specialist visual communication and design knowledge and techniques in response to a brief, at level 7, teachers could:</p> <ul style="list-style-type: none"> <li>• Provide opportunity for students to generate, develop and communicate design ideas informed by appropriate research (eg. relevant testing, existing design examples, identified design characteristics of a design movement or era).</li> <li>• Provide opportunity for students to use presentation techniques that draw on compositional principles (eg. proximity, alignment, hierarchy, use of positive and negative space), graphic modes (eg. digital, photography, animation, conventional sketching and drawing methods) and media (eg. pastels, collage, card and digital media, marker pens) to present design ideas and conceptual outcomes.</li> <li>• Provide opportunity for students to review and refine design ideas that incorporate specialist spatial design knowledge (eg. materials, processes; sustainability; environmental considerations such as climate, aspect, light) and graphic techniques (eg. architectural drawings, renderings, modelling) for inside and outside spaces in response to a brief.</li> <li>• Provide opportunity for students to review and refine design ideas that incorporate specialist product design knowledge (eg. materials, processes; sustainability; joining, fitting, fasteners, ergonomics, anthropometric data) and graphic techniques (eg. component drawings, sectioning, animation, renderings, modelling) in response to a brief.</li> <li>• Provide opportunity for students to incorporate design judgements in the development and ongoing evaluation of design ideas into a conceptual outcome.</li> <li>• Provide opportunity for students to explore a range of communication techniques to determine suitability for presenting design outcomes to different audiences. This should include opportunity to understand and use a variety of compositional principles, graphical modes, and media.</li> </ul>	<p>To support students to explore, develop and extend design ideas by integrating specialist visual communication and design knowledge and techniques in response to a brief, at level 8, teachers could:</p> <ul style="list-style-type: none"> <li>• Provide opportunity for students to experiment and explore ideas through providing abstract or esoteric starting points and ongoing contexts.</li> <li>• Provide opportunity for students to generate, develop and communicate design ideas informed by research beyond the design situation (eg. not obviously connected to the design situation) and using relevant testing including modelling (2D and 3D physical and virtual mock-ups and models, animations, prototypes) and graphic techniques.</li> <li>• Provide opportunity for students to use presentation techniques that draw on compositional principles (eg. proximity, alignment, hierarchy, use of positive and negative space), graphic modes (eg. digital, photography, animation, conventional sketching and drawing methods) and media (eg. pastels, collage, card and digital media, marker pens) to present design ideas and conceptual outcomes</li> <li>• Provide opportunity for students to review and refine the aesthetic and functional qualities of a spatial design that incorporates specialist spatial design knowledge and tools (eg. ergonomics, mock-ups, market research, virtual modelling) and graphic techniques for inside and outside spaces, in response to a brief.</li> <li>• Provide opportunity for students to review and refine the aesthetic and functional qualities of a product design, incorporating specialist product design knowledge, and tools (eg. ergonomics, mock-ups, market research, virtual modelling) and graphic techniques, in response to a brief.</li> <li>• Guide students to respond and reflect upon design judgements in the development and ongoing critiquing of design ideas into a conceptual outcome.</li> <li>• Provide opportunity for students to match presentation format and construction procedures through consideration and selection of presentation techniques, viewer needs and the nature of the design outcomes being presented, and communicate design outcomes to an audience in response to the design brief.</li> <li>• Provide opportunity for students to evaluate conceptual outcomes against the brief, informed by wider conditions and factors related to the context, and justify how the outcome addresses identified opportunities and constraints.</li> </ul>
INDICATORS	<p>Students can:</p> <ul style="list-style-type: none"> <li>• explore and refine design ideas by considering possible alternatives;</li> <li>• integrate principles of aesthetics and function, and design judgements, in a coherent and connected way to develop design ideas;</li> <li>• convincingly communicate design ideas visually in accordance with the context specified in the design brief.</li> </ul>	<p>Students can:</p> <ul style="list-style-type: none"> <li>• explore and refine design ideas that draw on spatial design knowledge;</li> <li>• explore and refine design ideas that draw on product design knowledge;</li> <li>• make design judgements on the positive and/or negative aspects of aesthetic and functional features of the design in response to the brief;</li> <li>• review and refine well-considered design ideas that incorporate specialist spatial design knowledge progressing towards an outcome;</li> <li>• review and refine well-considered design ideas that incorporate specialist product design knowledge progressing towards an outcome;</li> <li>• use presentation techniques, and the application of compositional principles, modes and media, to effectively present visual information.</li> </ul>	<p>Students can:</p> <ul style="list-style-type: none"> <li>• explore diverse contexts beyond and within design situations to identify opportunities for potential design solutions</li> <li>• use modelling and graphic techniques to explore and refine design ideas as potential solutions for situations</li> <li>• communicate a variety of design ideas as potential solutions for the situation.</li> <li>• explore the possibilities of a range of potential design solutions within a design situation and the interrelationships that exist between them.</li> <li>• produce visual presentations that skilfully use compositional principles, modes, media, and presentation techniques to communicate a design outcome to the viewer.</li> <li>• explore design contexts to identify opportunities and constraints for refining a product and/or spatial design</li> <li>• clarify design ideas through an iterative refinement process that draws on specialist product and/or spatial design knowledge</li> <li>• communicate product and/or spatial designs that are justified against identified opportunities and constraints.</li> </ul>
AS	<p><b>AS91068 Design and Visual Communication 1.35</b> <i>Undertake development of design ideas through graphics practice</i></p>	<p><b>AS91341 Design and Visual Communication 2.34</b> <i>Develop a spatial design through graphics practice</i> <b>AS91342 Design and Visual Communication 2.35</b> <i>Develop a product design through graphics practice</i> <b>AS91343 Design and Visual Communication 2.36</b> <i>Use visual communication techniques to compose a presentation of a design</i></p>	<p><b>AS91627 Design &amp; Visual Communication 3.30</b> <i>Initiate design ideas through exploration;</i> <b>AS91628 Design &amp; Visual Communication 3.31</b> <i>Develop a visual presentation that exhibits a design outcome to an audience;</i> <b>AS91629 Design &amp; Visual Communication 3.32</b> <i>Resolve a spatial design through graphics practice;</i> <b>AS91630 Design &amp; Visual Communication 3.33</b> <i>Resolve a product design through graphics practice</i></p>
	Level 1 DVC Technologies standards & assessment	Level 2 DVC standards & assessment resources	Level 3 Technology achievement standards & assessment DRAFT

## DESIGN AND VISUAL COMMUNICATION: KNOWLEDGE OF DESIGN PRACTICE

Design practice focuses on developing conceptual designs in response to a brief. Knowledge of design practice includes understanding that designers identify the qualities and potential of design ideas in terms of the broad principles of design (aesthetics and function) and sustainability, and that they are influenced by societal, environmental, historical and technological factors.

Initially students learn about how design practice combines and prioritises different design elements and thought processes to initiate and develop ideas in a response to a brief, and how design and design thinking is a tool which is used to create new solutions to meet the needs of our society. Students progress to complex to learning about how design is a unique human activity of inquiry and action that fosters innovation and creativity by using design and design thinking as a tool to create new innovative solutions that meet the needs of our society and the global community, for the future.

	LEVEL 6	LEVEL 7	LEVEL 8
LO	<i>Demonstrate understanding of design principles and processes, and the work of influential designers</i>	<i>Demonstrate understanding of design movements or eras</i>	<i>Demonstrate understanding of approaches to design practice and the nature of designerly thinking</i>
TEACHER GUIDANCE	<p>To support students to develop understandings about design principles, approaches and the work of influential designers at level 6, teachers could:</p> <ul style="list-style-type: none"> <li>Develop understandings of two principles of design (aesthetics and function) and of their derived elements; such as shape, form, rhythm, balance, proportion, colour, contrast, durability, stability, flexibility/rigidity.</li> <li>Investigate key designers to develop an understanding of their design work and its continued impact.</li> <li>Promote opportunities for students to investigate the design practice of different designers to initiate and develop their own ideas.</li> <li>Promote students to ask questions of a given brief and explore the constraints in creative ways and to look for new directions.</li> </ul>	<p>To support students to develop understandings about design movements and eras at level 7, teachers could:</p> <ul style="list-style-type: none"> <li>Provide opportunity for students to understand how design elements are characterised in different design movements and eras.</li> <li>Ensure that students understand that the application (including their prioritisation) of design principles and elements is particularly susceptible to changes in fashion, taste, historical changes, technological advancements.</li> <li>Ensure that students understand that the development of designs does not occur in a vacuum that there are recognisable links and influences.</li> <li>Help students develop awareness of the visual motifs and concepts that identify a style, movement or era.</li> <li>Promote students to be design thinkers by putting people first and to imagine solutions that are inherently desirable and meet explicit needs.</li> </ul>	<p>To support students to develop understandings of approaches to design practice and the nature of designerly thinking, at level 7, teachers could:</p> <ul style="list-style-type: none"> <li>Promote students to be creative thinkers by continual questioning and critiquing of the 'status quo' to expand design thinking and possibilities.</li> <li>Promote a variety of experiences for the purposes of initiating ideas</li> <li>Support students to develop an advanced knowledge of specialist spatial design, including the specific design tools used, specific technical knowledge and specific visual communication techniques and approaches.</li> <li>Support students to develop an advanced knowledge of specialist product design, including the specific design tools used, specific technical knowledge and specific visual communication techniques and approaches.</li> </ul>
INDICATORS	<p>Students can:</p> <ul style="list-style-type: none"> <li>select and research an influential designer</li> <li>identify and explain the aesthetic and functional characteristics of their chosen influential designer</li> <li>integrate aesthetic and functional characteristics of chosen influential designer when developing their own design ideas.</li> </ul>	<p>Students can:</p> <ul style="list-style-type: none"> <li>investigate a design era or design movement and explain the aesthetic and functional characteristics of the design movement or era</li> <li>describe social factors such as cultural, historical, societal and technological, that influenced the design movement or era</li> <li>interpret and embed into their own designs characteristics identified in the chosen design era and movement</li> <li>show understanding that design does not develop in a vacuum, but is affected by the circumstances of the society in which it exists and serves (eg, Bauhaus is a response to the need for industrial growth after the First World War), and that the social, economic and political environment has a significant impact on establishing and evolving a designs movement.</li> </ul>	<p>Students can:</p> <ul style="list-style-type: none"> <li>critique design ideas in relation to their given context and in comparison with other alternatives</li> <li>describe interaction of design elements and how design judgments reconcile the various considerations</li> <li>show understanding of specialist knowledge related to the various fields of spatial design</li> <li>show understanding of specialist knowledge related to the various fields of product design</li> </ul>
AS	<p><b>AS91067 Design and Visual Communication 1.34</b> <i>Use the work of an influential designer to inform design ideas</i></p>	<p><b>AS91340 Design and Visual Communication 2.33</b> <i>Use the characteristics of a design movement or era to inform own design ideas</i></p>	<p><b>AS91627 Design and Visual Communication 3.30</b> <i>Initiate design ideas through exploration</i></p> <p><b>AS91629 Design and Visual Communication 3.32</b> <i>Resolve a spatial design through graphics practice</i></p> <p><b>AS91630 Design and Visual Communication 3.33</b> <i>Resolve a product design through graphics practice</i></p> <p><b>AS91631 Design and Visual Communication 3.34</b> <i>Produce working drawings to communicate production details for a complex design</i></p>
	Level 1 DVC Technologies standards & assessment resources	Level 2 DVC standards & assessment resources	Level 3 Technology achievement standards & assessment DRAFT

## PROCESSING TECHNOLOGIES: IMPLEMENT A PROCESS

Implement a process focuses on undertaking appropriate procedures to process a specified product. Products may include but are not limited to: fermented or non-fermented foods and beverages; biologically active products; household chemicals; toiletries; cosmetics; paper; resin or fibreglass products.

Initially students learn to follow appropriate processing operations and undertake testing to make a product that meets specifications. Students progress to complex processing operations that require analysis, modification, testing and calculation of relevant factors.

	LEVEL 6	LEVEL 7	LEVEL 8
LO	<i>Implement basic procedures to make a processed product</i>	<i>Implement advanced procedures to make a processed product</i>	<i>Implement complex procedures to make a processed product</i>
TEACHER GUIDANCE	<p>To support students to implement basic procedures to make a processed product at level 6, teachers could:</p> <ul style="list-style-type: none"> <li>• Provide opportunity for students to undertake basic processing operations.</li> <li>• Develop step by step guides to inform student practice.</li> <li>• Enable students to undertake basic testing such as pH, temperature, size to determine appropriateness of a product.</li> <li>• Ensure students apply relevant health and safety practices.</li> </ul>	<p>To support students to implement advanced procedures to make a processed product at level 7, teachers could:</p> <ul style="list-style-type: none"> <li>• Support students with their undertaking of advanced processing operations.</li> <li>• Guide students with advanced testing techniques such as: viscosity; moisture content; and degree of fermentation.</li> <li>• Ensure students comply with health and safety documentation such as HACCP and HSNO (see AS/NZ3343.3:200s)</li> </ul>	<p>To support students to implement complex procedures to make a processed product, at level 8, teachers could:</p> <ul style="list-style-type: none"> <li>• Support students in determining the techniques that have been involved in specific processing of materials.</li> <li>• Discuss the difference between process control in the classroom and in industry for a specified product.</li> <li>• Demonstrate complex processing operations such as: distilling; cryogenic freezing; and batch transfer</li> <li>• Support students in the implementation of complex processing operations.</li> <li>• Provide or negotiate with students the selection of a specified product.</li> <li>• Support students in the development of safety plans, risk management plans and quality assurance plans.</li> </ul>
INDICATORS	<p>Students can:</p> <ul style="list-style-type: none"> <li>• Implement basic processing operations.</li> <li>• Conduct basic tests to determine if a product has met required specifications.</li> <li>• Follow relevant health and safety practices</li> </ul>	<p>Students can:</p> <ul style="list-style-type: none"> <li>• Work independently in the execution of advanced procedures.</li> <li>• Undertake advanced testing techniques to determine if a product meets established specifications.</li> <li>• Comply with relevant health and safety documentation.</li> </ul>	<p>Students can:</p> <ul style="list-style-type: none"> <li>• Analyse and justify the procedures used to process a specified product.</li> <li>• Explain how processing operations can be controlled by test feedback.</li> <li>• Evaluate the appropriateness of safety, risk management and quality assurance plans</li> <li>• Make informed decisions based on knowledge of techniques, operations and testing feedback.</li> <li>• Modify processing operations based on feedback from testing.</li> <li>• Calculate yield and relevant financial costs.</li> <li>• Develop suitable safety, risk management and assurance plans.</li> </ul>
AS	<p><b>AS91082 Processing Technologies 1.60</b>  <i>Implement basic procedures to process a specified product</i></p>	<p><b>AS91351 Processing Technologies 2.60</b>  <i>Implement advanced procedures to process a specified product</i></p>	<p><b>AS91643 Processing Technologies 3.60</b>  <i>Implement complex procedures to process a specified product</i></p>
	<a href="#">Level 1 Digital Technologies standards &amp; assessment resources</a>	<a href="#">Level 2 Digital Technologies standards &amp; assessment resources</a>	<a href="#">Level 3 Technology achievement standards &amp; assessment resources DRAFT</a>

## PROCESSING TECHNOLOGIES: KNOWLEDGE OF PROCESSING

Knowledge of processing focuses on the underpinning concepts associated with processing.

Initially students learn about the operations and practices inherent to processing. Students progress to complex understandings that enable them to explain, evaluate and justify a broad range of operations and practices related to processing.

	LEVEL 6	LEVEL 7	LEVEL 8
LO	<i>Demonstrate understanding of basic techniques involved in processing materials</i>	<i>Demonstrate understanding of advanced techniques involved in processing materials</i>	<b>LEARNING OBJECTIVE PROGRESSES TO:</b> <i>Implement complex procedures to make a processed product</i> <b>See previous page</b>
TEACHER GUIDANCE	To support students to develop understandings about basic techniques involved in processing materials at level 6, teachers could: <ul style="list-style-type: none"> <li>• Provide a range of case studies to demonstrate different processing systems and sequences.</li> <li>• Support students with their understanding of techniques and skills in a processing operation.</li> <li>• Demonstrate safe practices in processing.</li> <li>• Model a range of processing operations such as: measuring; safe disposal of biologically active material; culturing by plating; and controlling of enzymes.</li> </ul>	To support students to develop understandings about advanced techniques involved in processing materials at level 7, teachers could: <ul style="list-style-type: none"> <li>• Support students with their understanding of how advanced techniques are implemented in processing materials.</li> <li>• Present a range of advanced processing operations such as: cell counting; emulsifying; and centrifuging.</li> <li>• Ensure students understand the difference between health and safety in the classroom and industry.</li> </ul>	
INDICATORS	Students can: <ul style="list-style-type: none"> <li>• Explain the relationship between processing operations, tests, and expected outcomes.</li> <li>• Discuss processing operations and tests and their suitability for different materials and/or purposes.</li> <li>• Communicate the need for safe processing practices.</li> </ul>	Students can: <ul style="list-style-type: none"> <li>• Identify advanced techniques used in processing materials.</li> <li>• Describe how processing operations and tests can be combined in a processing sequence.</li> <li>• Explain why specific tests are used in processing operations.</li> </ul>	
AS	<b>AS91083 Processing Technologies 1.61</b> <i>Demonstrate understanding of basic concepts used in processing</i>	<b>AS91352 Processing Technologies 2.61</b> <i>Demonstrate understanding of advanced concepts used in processing</i>	<b>AS91643 Processing Technologies 3.60</b> <i>Implement complex procedures to process a specified product</i>
	Level 1 Digital Technologies standards & assessment resources	Level 2 Digital Technologies standards & assessment resources	Level 3 Technology achievement standards & assessment resources DRAFT



## PROCESSING TECHNOLOGIES: KNOWLEDGE OF PRODUCT PRESERVATION, PACKAGING AND STORAGE

Product preservation, packaging and storage focuses on the ways in which products can be treated during and after their development in order to maintain their integrity over time by inhibiting internal degradation and/or protecting them from external damage. Initially students learn basic concepts relating to why certain types of products require the use of preservation techniques, and which techniques are suitable for use in domestic settings where the product planned to be used in the near future and storage will be within known environmental conditions. They also will learn how packaging and storage procedures work together to further protect products in local environments. Students progress to learning more advanced concepts relating to ensuring products maintain integrity over an extended time and the variable environmental conditions of a national market, and the increasingly sophisticated techniques used in industrial settings, and then to understanding the technical and sociocultural implications and complexities involved in the preservation, packaging and storage of products suitable for international distribution.

	LEVEL 6	LEVEL 7	LEVEL 8
LO	<i>Demonstrate understanding of basic concepts and techniques used in the preservation, packaging and storage of products</i>	<i>Demonstrate understanding of advanced concepts and techniques used in the preservation, packaging and storage of products</i>	<i>Demonstrate understanding of complex concepts and techniques used in the preservation, packaging and storage of products</i>
TEACHER GUIDANCE	<p>To support students to develop understandings about basic concepts and techniques used in the preservation, packaging and storage of products, at level 6, teachers could:</p> <ul style="list-style-type: none"> <li>• Provide opportunity for students to explore why we need to preserve certain products to maintain their integrity over time.</li> <li>• Provide opportunity for students to explore different forms of packaging and storage instructions and relate this to the specific nature of the product and the techniques used in its preservation.</li> <li>• Ensure students are aware of the requirements for labelling of preserved products to ensure end-users can make informed choices.</li> <li>• Ensure students are familiar with a wide range of basic preservation techniques (eg, freezing, heating, air drying, chemical additives – use of vinegar/sugar), and packaging (eg, bottling, vacuum packing, solid wall containers, padded protective wrapping, labelling for identification) and storage procedures (eg, freezer, refrigerator, cool/dark cupboard) commonly used in domestic situations.</li> <li>• Guide students to understand how the techniques and procedures used in preserving/packaging and storage of a range of products allows them to maintain their integrity over time and in a known environment (eg, in the home, at school).</li> <li>• Provide students with multiple opportunities to select and test different basic techniques and procedures to enhance product integrity. This would include understanding the properties and implications of the materials used in the product and what is required of the product in terms of withstanding changes over short periods of time and in known environments.</li> </ul>	<p>To support students to develop understandings about advanced concepts and techniques used in the preservation, packaging and storage of products, at level 7, teachers could:</p> <ul style="list-style-type: none"> <li>• Provide opportunity for students to explore a range of different types of products to understand the changes needed in the preservation/packaging/storage decision-making to ensure products are able to withstand changing environments over extended times (eg, preservation during transportation, storage in warehouses, packaging for safe handling etc.)</li> <li>• Guide students to develop understanding of how preserving/packaging and storage work together to ensure products maintain integrity over extended times and variable physical environments.</li> <li>• Provide students opportunity to explore and debate the implications of, and for, the distribution of products to national markets on the preservation, packaging and storage of products.</li> <li>• Provide opportunities for students to become familiar with a wide range of advanced preservation techniques (eg, spray drying of liquids, ultra violet reaction inhibition, liquid immersion freezing and chilling, chemical additives), and packaging (eg, canning, retortable pouches, gas flush packages, permeable packaging films, sealing mechanisms, portion control, labelling for point of difference – eco, heart ticks etc) and storage procedures (eg, controlled atmosphere) commonly used in industrial situations.</li> <li>• Provide students with opportunities to explore advanced techniques being used currently in a range of industries. This would include understanding the properties and implications of the materials used in the product and what is required of the product in terms of ensuring particular shelf-life and withstanding variable environmental conditions.</li> </ul>	<p>To support students to develop understandings about complex concepts and techniques used in the preservation, packaging and storage of products, at level 8, teachers could:</p> <ul style="list-style-type: none"> <li>• Provide opportunity for students to debate how the preservation, packaging and storage of products have been influenced by changes in global distribution chains. This includes ways products can be made suitable for a range of consumers who may live in different political and social environments to where the product originated.</li> <li>• Guide students to develop understanding of how preserving/packaging and storage work together to ensure products maintain integrity and acceptability over extended times and variable physical, social and political environments.</li> <li>• Provide opportunity for students to explore a range of products to understand how the preservation/packaging and/or storage has changed cultures/society (needs, desires, the way life is experienced) in the past and present and to debate how they may change cultures/society in the probable future.</li> <li>• Provide opportunities for students to become familiar with a wide range of complex preservation techniques (eg, freeze drying, UHT sterilisation, cryogenic freezing, irradiation, high pressure sterilisation), and packaging (eg, aseptic filling, modified atmosphere packs, crush protection, dosage control, brand value packaging), and storage procedures (eg, accelerated storage life trials, modified atmosphere packs commonly used for products destined for international markets).</li> <li>• Provide students with opportunities to explore the implications and complexities involved in developing and distributing 'risk' products for international markets. This would include understanding the properties and implications of the materials used in the product and what is required of the product in terms of complex distribution chains. That is withstanding significant changes of time and environmental conditions including changing social, cultural and ethical dimensions.</li> </ul>
INDICATORS	<p>Students can:</p> <ul style="list-style-type: none"> <li>• explain the links between types of decay and preservation techniques</li> <li>• explain why a particular preservation and packaging technique was chosen for a specific product to be stored in a local environment</li> <li>• discuss how to control the storage environment to limit decay of different types of products during storage</li> <li>• discuss why legal labelling is required in a local environment</li> <li>• compare and contrast preservation and packaging techniques for a product to be stored in a local environment.</li> </ul>	<p>Students can:</p> <ul style="list-style-type: none"> <li>• explain the links between combinations of decay mechanisms in preservation and packaging techniques</li> <li>• compare and contrast preservation and packaging techniques for a product in a national environment.</li> <li>• discuss why labelling is legally required and how labelling for marketing is used in a national environment.</li> </ul>	<p>Students can:</p> <ul style="list-style-type: none"> <li>• explain how environmental factors interact to influence product quality</li> <li>• compare and contrast preservation and packaging techniques for a product in an international environment</li> <li>• compare and contrast legal, marketing and cultural requirements for labelling in two countries.</li> </ul>
AS	<p><b>AS91084 Processing Technologies 1.62</b>  <i>Demonstrate understanding of basic concepts used in preservation and packaging techniques for product storage</i></p>	<p><b>AS91353 Processing Technologies 2.62</b>  <i>Demonstrate understanding of advanced concepts used in preservation and packaging techniques for product storage</i></p>	<p><b>AS91644 Processing Technologies 3.62</b>  <i>Demonstrate understanding of combined preservation mechanisms used to maintain product integrity</i></p>
	Level 1 Processing Technologies standards & assessment resources	Level 2 Processing Technologies standards & assessment resources	Level 3 Technology achievement standards & assessment resources DRAFT