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	*Implement basic procedures to make a resistant materials product*	*Implement advanced procedures to make a resistant materials product*	*Implement complex procedures to make a resistant materials product*
TEACHER GUIDANCE	To support students to implement basic procedures to make a resistant materials product, at level 6, teachers could: • Ensure students are aware of a wide range of basic measuring, cutting, shaping, joining and finishing techniques • 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 • Ensure students have an appropriate environment, tools and materials to enable students to work safely with resistant materials to make a product • Provide opportunity for students to explore and discuss techniques and tests in terms of skilfulness and efficiency • Provide opportunity to explore what techniques are most suitable for use with a variety of resistant materials • 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.	To support students to implement advanced procedures to make a resistant materials product, at level 7, teachers could: • Ensure students are aware of a wide range of measuring, cutting, shaping, joining and finishing techniques • 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 • Support students to undertake evaluative tests to demonstrate the final product meets specifications • Provide opportunity for students to explore and discuss advanced procedures in terms of skilfulness and efficiency • Ensure students have an appropriate environment, tools and materials to enable students to work safely with resistant materials to make a product • Provide opportunity to explore what techniques are most suitable for use with a variety of resistant materials • 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.	To support students to implement complex procedures to make a resistant materials product, at level 8, teachers could: • Support students to be aware of a wide range of measuring, cutting, shaping, joining and finishing techniques. • 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. • Provide students with examples of how parts can be interlocked and explore techniques to enable this to occur. • 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. • Support students to undertake evaluative tests to demonstrate the final product meets specifications. • Support students to explore and discuss complex procedures in terms of skilfulness and efficiency. • Ensure students have an appropriate environment, tools and materials to enable students to work safely with resistant materials to make a product. • 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. • 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.
INDICATORS	Students can: • undertake basic procedures to construct a product that meets specifications • apply given techniques and tests in a way that complies with relevant health and safety regulations • show independence and accuracy in the execution of basic techniques and tests • perform basic techniques and tests in a manner that economises time, effort and materials.	Students can: • undertake advanced procedures to construct a product with special features that meets specifications • select and apply scheduled techniques to comply with relevant health and safety regulations • show independence and accuracy in executing the scheduled techniques and tests • undertake techniques and tests in a manner that economises time, effort and materials.	Students can: • undertake complex procedures to construct a product that integrates parts with accuracy and precision, and meets specifications • identify and/or establish key reference points lines and/or planes required for integration of parts • select and apply scheduled techniques to comply with relevant health and safety regulations • show independence and accuracy in executing the scheduled techniques and tests • undertake techniques and tests in a manner that economises time, effort and materials.
AS	**AS91057 Construction and Mechanical Technologies 1.20** *Implement basic procedures using resistant materials to make a specified product*	**AS91344 Construction and Mechanical Technologies 2.20** *Implement advanced procedures using resistant materials to make a specified product with special features*	**AS91620 Construction and Mechanical Technologies 3.20** *Implement complex procedures to integrate parts using resistant materials to make a specified product*
	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	*Implement basic procedures to make a textiles product*	*Implement advanced procedures to make a textiles product*	*Implement complex procedures to make a textiles product*
TEACHER GUIDANCE	To support students to implement basic procedures to make a textiles product, at level 6, teachers could: • Ensure students are aware of a wide range of basic measuring, cutting, shaping, joining and finishing techniques. • 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. • Ensure students have an appropriate environment, tools and materials to enable students to work safely with textile materials to make a product. • provide opportunity for students to explore and discuss techniques and tests in terms of skilfulness and efficiency • Provide opportunity to explore what techniques are most suitable for use with a variety of textile materials • 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.	To support students to implement advanced procedures to make a textiles product, at level 7, teachers could: • Ensure students are aware of a wide range of measuring, cutting, shaping, joining and finishing techniques. • 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. • Provide opportunity for students to explore and discuss advanced procedures in terms of skilfulness and efficiency • Ensure students have an appropriate environment, tools and materials to enable students to work safely with textile materials to make a product. • Provide opportunity to explore what techniques are most suitable for use with a variety of textile materials • 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.	To support students to implement complex procedures to make a textile materials product, at level 8, teachers could: • Support students to be aware of a wide range of measuring, cutting, shaping, joining and finishing techniques. • 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. • Provide students with examples of complex procedures; support them to trial a range of these and discuss them in terms of skilfulness and efficiency. • Support students to undertake evaluative tests to demonstrate the final product meets specifications • Support students to explore and discuss complex procedures in terms of skilfulness and efficiency. • Ensure students have an appropriate environment, tools and materials to enable students to work safely with textile materials to make a product. • 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.
INDICATORS	Students can: • undertake basic procedures to construct a product that meets specifications • apply given techniques and tests in a way that complies with relevant health and safety regulations • show independence and accuracy in the execution of basic techniques and tests • perform basic techniques and tests in a manner that economises time, effort and materials.	Students can: • undertake advanced procedures to construct a product with special features that meets specifications • select and apply scheduled techniques to comply with relevant health and safety regulations. • show independence and accuracy in executing the scheduled techniques and tests • undertake techniques and tests in a manner that economises time, effort and materials.	Students can: • undertake complex procedures to construct a product that meets specifications • use sampling and feedback to inform the selection of techniques when making products. • develop and apply an order of construction to make a product • undertake appropriate tests to demonstrate that a final product meets specifications • undertake techniques, tests and processes in a manner that economises time, effort and materials, and complies with relevant health and safety regulations.
AS	**AS91058 Construction and Mechanical Technologies 1.21** *Implement basic procedures using textile material to make a specified product*	**AS91345 Construction and Mechanical Technologies 2.21** *Implement advanced procedures using textile material to make a specified product with special features*	**AS91621 Construction and Mechanical Technologies 3.21** *Implement complex procedures using textile material to make a specified product*
	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
LO	*Demonstrate understanding of basic techniques used to make resistant materials products*	*Demonstrate understanding of advanced techniques used to make resistant materials products*	
TEACHER GUIDANCE	To support students to develop understandings about the basic techniques used to make resistant material products at level 6, teachers could: • 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. • 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. • Guide students to explore how and why resistant materials and techniques are combined differently for particular situations. • 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.	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: • 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. • Guide students to explore similarities and differences between safe practice in classroom and in industrial environments.	**LEARNING OBJECTIVE COULD PROGRESS TO:** *Implement complex procedures to make a specified product using a Computer Numerical Controlled (CNC) machine* **See next page**
INDICATORS	Students can: • explain how the characteristics of resistant materials influence the selection of safe techniques • discuss why resistant materials require particular techniques for their safe handling and use • discuss why techniques and resistant materials are combined in different ways across two or more situations.	Students can: • discuss how accepted conventions guide constructing in materials in similar contexts • explain the differences between safe practice in classroom and industrial environments • discuss how accepted conventions guide constructing with materials in diverse contexts.	
AS	**AS91059 Construction and Mechanical Technologies 1.22** *Demonstrate understanding of basic concepts used to make products from resistant materials*	**AS91347 Construction and Mechanical Technologies 2.22** *Demonstrate understanding of advanced concepts used to make products*	
	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
LO			*Implement complex procedures to make a specified product using a Computer Numerical Controlled (CNC) machine*
TEACHER GUIDANCE			To support students to implement complex procedures to make a specified product using a Computer Numerical Controlled (CNC) machine at level 8, teachers could: • Support students to be aware of the capability of a CNC machine(s) including its limits • Support students to develop graphic representations of specified products in a computer design setting • Support students to develop an understanding of CNC programming language • Support students to develop skills in calibrating CNC machines to software and manufacturer requirements • Provide students with an opportunity to discuss what is meant by 'complex procedures' in relationship to CNC machines • Support students to undertake evaluative tests to demonstrate that specified products meet specifications • Ensure students have an appropriate environment, to apply relevant health and work regulations when working with CNC machines • 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.
INDICATORS		**LEARNING COULD PROGRESS FROM:** **KNOWLEDGE OF RESISTANT MATERIALS CONSTRUCTION** ***See* previous page**	Students can: • 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 • set up and calibrate a CNC machine to software and manufacturer requirements • operate a CNC machine to make an product in compliance with relevant health and safety regulations • evaluate a CNC machine made product against its graphic representation. • show independence and accuracy in undertaking complex procedures to make specified products using CNC machines • 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.
AS			**ASAS91622 Construction & Mechanical Technologies 3.22** *Implement complex procedures to make a specified product using a Computer Numerical Controlled (CNC) machine*
	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	*Demonstrate understanding of basic techniques used to make textile materials products*	*Demonstrate understanding of advanced techniques used to make textile materials products*	
TEACHER GUIDANCE	To support students to develop understandings about the basic techniques used to make textile material products at level 6, teachers could: • 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. • 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. • Guide students to explore how and why textile materials and techniques are combined differently for particular situations. • 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.	To support students to develop understandings about the advanced techniques used to make textile material products at level 7, teachers could: • 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. • Support students to understand special features and the skills associated with their construction. • Guide students to understand how and why techniques are brought together to achieve special features.	**LEARNING OBJECTIVE COULD PROGRESS TO:** *Implement complex procedures to create an applied design for a specified product* **See next page**
INDICATORS	Students can: • explain how the characteristics of textile materials influence the selection of safe techniques • discuss why textile materials require particular techniques for their safe handling and use • discuss why techniques and textile materials are combined in different ways across two or more situations.	Students can: • identify attributes of special features in textile products • explain construction requirements of special features • explain requirements to obtain a quality finish in special features • discuss why techniques are selected to make special features and how they are influenced by the characteristics of the materials used.	
AS	**AS91060 Construction and Mechanical Technologies 1.23** *Demonstrate understanding of basic concepts used to make products from textile materials*	**AS91348 Construction and Mechanical Technologies 2.23** *Demonstrate understanding of advanced concepts used to make a product with textile materials*	
	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			*Implement complex procedures to create an applied design for a specified product*
TEACHER GUIDANCE		**LEARNING COULD PROGRESS FROM:** **KNOWLEDGE OF TEXTILES CONSTRUCTION** ***S*ee previous page**	To support students to implement complex procedures to create an applied design for a specified product at level 8, teachers could: • Support students to interpret complex designs and determine applied design mediums suited to products • Support students to trial a range of complex techniques to determine the equipment and materials required to create an applied design that enhance products • Support students to apply complex techniques that comply with relevant health and safety regulations. • Support students to develop independence and accuracy in implementing complex procedures to create applied designs for specified products • 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.
INDICATORS			Students can: • interpret a complex design to determine an applied design medium suited to the product • trial to determine the equipment, materials and complex techniques required to create the design • undertake appropriate tests to demonstrate the applied design enhances the product as specified • apply complex techniques that comply with relevant health and safety regulations. • show independence and accuracy in implementing complex procedures to create applied designs for specified products • 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.
AS			**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	*Demonstrate understandings of basic structures*	*Demonstrate understandings of advanced structures*	*Demonstrate understandings of complex structures*
TEACHER GUIDANCE	To support students to understanding basic structures at level 6, teachers could: • Ensure students are aware that frameworks are designed to withstand loads of a greater capacity than they are placed under. • 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). • Provide opportunity for students to understand how 'safety factor' is applied across different framework structure contexts (eg, bridges, cranes, trusses) • 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. • 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.	To support students to understanding advanced structures at level 7, teachers could: • 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). • 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. • 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. • 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.	To support students to understanding complex structures at level 8, teachers could: • 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). • 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. • 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. • 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.
INDICATORS	Students can: • explain what is meant by tension, compression, shear and torsion • explain the safety factors applied to a framework • explain how structural members and pin joints transfer forces in a framework. • discuss how the integrity of a framework is established.	Students can: • describe where pin and moving joints are used on frameworks • describe the effects of loads when fixed joints are used in frameworks • describe the effects of load on pin jointed frameworks using vector diagrams • explain the types of forces which can act on pin jointed structural members when a frameworks is placed under known gravitational loads • explain how structural members combine to resist loads and transfer forces within a pin jointed framework • explain structural member profiles and forms and why they are used in a framework • explain how structural members combine to resist loads and transfer forces within pin jointed framework • explain how safety factors are determined and discuss how they have been applied to ensure the integrity of a framework.	Students can: • use technical language, diagrams and symbols to explain structural members and materials used in a structural system, and how the system withstands known loads • discuss how the selection of structural members and materials enables a structural system to achieve structural integrity in terms of withstanding known loads • evaluate the structural integrity of a structural system. • discuss, with justification, possible ways of increasing the structural integrity of a structural system.
AS	**AS91061 Construction and Mechanical Technologies 1.24** *Demonstrate understanding of basic concepts related to structural frameworks*	**AS91348 Construction and Mechanical Technologies 2.24** *Demonstrate understanding of advanced concepts related to structural frameworks*	**AS91624 Construction and Mechanical Technologies 3.24** *Demonstrate understanding of a structural system*
	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	*Demonstrate understanding of basic concepts related to machines*	*Demonstrate understanding of advanced concepts related to machines*	*Demonstrate understandings of complex concepts related to machines*
TEACHER GUIDANCE	To support students to understanding basic concepts related to machines at level 6, teachers could: • Provide opportunity for students to explain the purpose of levers, inclined planes and screws. • Provide opportunity for students to explain the purpose of a range of mechanical components within a range of machines. • Guide students to explain the advantages and disadvantages of pneumatic and hydraulic systems. • Guide students to understand how a range of machines provide mechanical advantage and motion. • 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.	To support students to understanding advanced concepts related to machines at level 7, teachers could: • 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. • 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. • 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).	To support students to understanding complex concepts related to machines at level 8, teachers could: • Guide students to explain how complex machines work, using technical language, diagrams and symbols as appropriate. • Support students to discuss how components enable complex machines to achieve their function/s. • Support students to discuss the energy efficiency of complex machines and how this impacts on the requirements for the machine's energy system. • Provide opportunity for students to evaluate the energy efficiency of complex machines and determine possible ways of increasing their energy efficiency.
INDICATORS	Students can: • explain the purpose of levers, inclined planes and screws • explain the purpose of a range of mechanical components • explain the advantages and disadvantages of pneumatic and hydraulic systems • explain how a machine provides the mechanical advantage and motion • discuss why particular levers, inclined planes and screws, and mechanical components were selected to ensure the mechanical advantage and motion in machines.	Students can: • describe the efficiencies of machines in relation to their safe application • explain how mechanical components combine to provide the desired mechanical advantage, and relative motion between input and output in a range of machines • 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.	Students can: • explain how complex machines work, using technical language, diagrams and symbols as appropriate • discuss how the components enable complex machines to achieve their function/s • discuss the energy efficiency of complex machines and how this impacts on the requirements for the machine's energy system • evaluate the energy efficiency of complex machines and justify possible ways of increasing their energy efficiency.
AS	**AS91062 Construction & Mechanical Technologies 1.25** *Demonstrate understanding of basic concepts related to machines*	**AS91349 Construction & Mechanical Technologies 2.25** *Demonstrate understanding of advanced concepts related to machines*	**AS91625 Construction & Mechanical Technologies 3.25** *Demonstrate understanding of complex machines*
	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 stills 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	*Make basic adaptations to a pattern to enable a design to fit a person or item*	*Make advanced adaptations to a pattern to change structural and/or style features of a design*	*Draft a pattern to interpret a design for a garment*
TEACHER GUIDANCE	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: • Provide opportunity for students to take key body or item measurements and select a suitable pattern size(s). • Guide students to interpret a selected patterns guide sheet to identify the correct pattern pieces for a selected design. • Guide students to show independence and accuracy when: • making basic adaptations to a pattern to accommodate the key measurements • interpreting pattern symbols and using a patterns guide sheet to correctly place pattern pieces to suit material width and type • developing a construction plan, using appropriate language, symbols and diagrams. • 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.	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: • 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. • Guide students to correctly labell the adapted pattern with grainline, cutting information, pattern piece names, dots and notches. • 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. • Guide students to undertake advance pattern adaptation in a manner that economises time, effort and materials.	To support students to draft a pattern to interpret a design for a garment at level 8, teachers could: • Provide opportunity for students to critique and evaluate how patterns allow for designs to be interpreted. • Support students to work independently and accurately to: • establish and take key measurements, and draft a template (eg, pattern block, working drawings) that uses these measurements • 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 • test and refine the pattern to ensure it provides the special features required by the design • 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 • construct a final toile/or mock up of the adapted pattern to ensure the final pattern correctly interprets the design and its special features. • Guide students to undertake pattern drafting in a manner that economises time, effort and materials.
INDICATORS	Students can: • take key body or item measurements to select pattern size(s) • interpret a selected patterns guide sheet to identify the correct pattern pieces for the selected design • show independence and accuracy when: • making basic adaptations to a pattern to accommodate the key measurements • interpreting pattern symbols and using a patterns guide sheet to correctly place pattern pieces to suit material width and type • developing a construction plan, using appropriate language, symbols and diagrams • 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.	Students can: • 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 • correctly labelling the adapted pattern with grainline, cutting information, pattern piece names, dots and notches • 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 • undertake advance pattern adaptation in a manner that economises time, effort and materials.	Students can • establish and take key measurements, and draft a template that uses these measurements. • use the template to develop a pattern which interprets the design and its special features. • test and refine the pattern to ensure it provides the special features required by the design • develop a pattern guide sheet to ensure correct construction • construct a final toile or mock up of the adapted pattern to ensure the final pattern correctly interprets the design and its special features • draft a pattern with independence and accuracy and in a manner that economises time, effort and materials.
AS	**AS91096 Construction & Mechanical Technologies 1.26** *Make basic adaptations to a pattern to enable a design to fit a person or item*	**AS91350 Construction & Mechanical Technologies 2.26** *Make advanced adaptations to a pattern to change the structure and/or style feature of a design*	**AS91626 Construction & Mechanical Technologies 3.26** *Draft a pattern to interpret a design for a garment*
	Level 1 Construction & Mechanical standards & assessment resources	Level 2 Construction & Mechanical standards & assessment resources	Level 3 Technology achievement standards & assessment resources DRAFT