Study Area Specification

Manufacturing

2006 (updated 2011)

Queensland Government

Queensland Studies Authority
Partnership and innovation

Manufacturing Study Area Specification 2006 (updated 2011)

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Rationale

We live in a society characterised by dynamic technological change, and schools seek to prepare students for an active role within this society. This study area specification (SAS) develops life skills that directly apply to a technical or industrial field and that help students adjust to the changing demands of society.

The *Manufacturing Study Area Specification* is relevant to all students who seek to develop:

- an understanding of industrial technology and its application to industry
- preparation for vocational employment
- a capacity to cope with and contribute to life in a technological society
- a sense of personal worth and self-esteem
- problem-solving abilities.

Manufacturing offers a flexible structure that allows programs to be modified in response to local, economic, social or technological changes and to use available resources, equipment and teacher expertise efficiently.

Subject matter from which learning experiences may be offered is drawn from a range of technologies, including:

- aeroskills
- automotive
- building and construction
- engineering (manufacturing)
- furnishing
- industrial graphics
- plastics.

Manufacturing helps students to develop an understanding of the Australian manufacturing industry. The SAS is a broad framework, and gives schools a wide choice of content offerings. Schools may draw on their own local industries and environment. It enables students to pursue elective studies in an industry of interest, and also allows a wider focus for students not yet committed to a specific area of study.

In general, all students should be able to use their creativity and derive satisfaction from working with materials, tools and machines while they gain the skills they need to prepare themselves for future employment as well as recreation and leisure.

The *Manufacturing Study Area Specification* has been developed for a broad range of students in Years 11 and 12. It allows for three approaches:

Approach A: Vocational education and training (VET) certificates

Schools may choose a certificate I qualification in General Construction, Engineering or Furnishing, or a certificate II qualification in Manufacturing Technology.

Approach B: Vocational learning

Schools may devise a course over four semesters, based on units that promote vocational education as well as general knowledge and skills needed for employment in the manufacturing industries. For some schools, meeting the human and physical resource requirements attached to

vocational units of competency presents difficulties. Approach B has been developed to meet the needs of these schools.

Students will receive a level of achievement on their Senior Certificate.

Approach C: Strand allowing for a VET outcome

Students complete a certificate I qualification in Furnishing over two semesters and a course based on units selected from those outlined in Approach B in the remaining two semesters.

Key competencies[1]

Manufacturing provides opportunities for the development of the key competencies in contexts that arise naturally from the objectives and learning experiences of the subject.

In the course of their studies, students will gather, analyse and organise information in various forms. Individually and in groups, students will plan and organise activities, managing both time and resources. They will have opportunities to make informed decisions and propose, implement and evaluate solutions to tasks and projects. Students will be involved in communicating ideas, information, opinions and conclusions, in a variety of formats and for a range of target audiences. As part of their learning and classroom experiences, students will also have opportunities to employ mathematical ideas and procedures associated with industrial technologies. Through undertaking a study in Manufacturing, students should develop important, transferable skills for using the industrial technologies defined by the selected strands.

While the course has a vocational orientation, it also provides opportunities for students to develop important skills that they will need in other life roles, and serves as a support subject for study in other disciplines.

[1] KC1: collecting, analysing and organising information; KC2: communicating ideas and information; KC3: planning and organising activities; KC4: working with others and in teams; KC5: using mathematical ideas and techniques; KC6: solving problems; KC7: using technology

Approach A: VET certificates

1. VET certificates — Manufacturing Study Area Specification

This approach offers certificates from nationally endorsed training packages. There are a number of qualifications at the Certificate I level and one qualification at Certificate II level.

Table 1: Certificates available in this approach

Training package	Certificate
CPC08 Construction, Plumbing and Services Integrated Framework	CPC10111 Certificate I in Construction (Note that CPC10108 Certificate I in Construction has been superseded and no new students can be enrolled from 2012)
LMF02 Furnishing Training Package	LMF10108 Certificate I in Furnishing
MEM05 Metal and Engineering Training Package	MEM10105 Certificate I in Engineering
MSA07 Manufacturing Training Package	MSA10107 Certificate I in Manufacturing (Pathways) MSA20208 Certificate II in Manufacturing Technology

The Queensland Studies Authority (QSA) can provide support for these certificates by providing:

- advice in accordance Australian Quality Training Framework (AQTF) standards and guidelines
- advice on the relevant units of competency within these two certificates
- access to the units of competency via a link to the Training.gov.au (TGA) website <www.training.gov.au>
- advice on competency-based assessment
- sample training and assessment strategies
- access to resources
- information on registration requirements.

This support may be accessed on the QSA website, <www.qsa.qld.edu.au>, under Years 10-12 > VET — Vocational education and training.

To offer either of these certificates, schools must either:

- register with the QSA and meet particular human and physical resource requirements for each qualification. Relevant information is on the QSA website, <www.qsa.qld.edu.au>, under Years 10-12 > VET — Vocational education and training

  or

- work with a registered training organisation (RTO) that has this qualification in its scope of registration. This provider could be another school, a TAFE institute, or a private provider.

Schools may deliver the certificate over four semesters. Schools may design their own program from the training package.

2. Certificates offered in this approach

2.1 CPC10111 Certificate I in Construction

CPC10111 Certificate I in Construction is based on units of competency selected from pathways described in the Construction, Plumbing and Services Integrated Framework Training Package (CPC08). This qualification replaced CPC10108 and there should be no new enrolments in CPC10108 from 2012.

To achieve the qualification, students must achieve competence in units that meet the qualification packaging rules.

Training packages are amended periodically to reflect the latest industry practices. For information on certificate structure for this approach, download the latest version by going to the Training.gov.au (TGA) website <www.training.gov.au> and locating information about the training package.

2.2 LMF10108 Certificate I in Furnishing

LMF10108 Certificate I in Furnishing is based on units of competency selected from pathways described in the Furnishing Training Package (LMF02).

To achieve the qualification, students must achieve competence in units that meet the qualification packaging rules.

Training packages are amended periodically to reflect the latest industry practices. For information on certificate structure for this approach, download the latest version by going to the Training.gov.au (TGA) website <www.training.gov.au> and locating information about the training package.

2.3 MEM10105 Certificate I in Engineering

MEM10105 Certificate I in Engineering is based on units of competency selected from pathways described in the Metal and Engineering training package (MEM05).

To achieve the qualification, students must achieve competence in units that meet the qualification packaging rules.

Training packages are amended periodically to reflect the latest industry practices. For information on certificate structure for this approach, download the latest version by going to the Training.gov.au (TGA) website <www.training.gov.au> and locating information about the training package.

2.4 MSA10107 Certificate I in Manufacturing (Pathways)

MSA10107 Certificate I in Manufacturing (Pathways) is based on units of competency selected from the MSA07 Manufacturing Training Package.

To achieve the qualification, students must achieve competence in units that meet the qualification packaging rules.

Training packages are amended periodically to reflect the latest industry practices. For information on certificate structure for this approach, download the latest version by going to the Training.gov.au (TGA) website <www.training.gov.au> and locating information about the training package.

2.5 MSA20208 Certificate II in Manufacturing Technology

MSA20208 Certificate II in Manufacturing Technology is based on units of competency selected from the MSA07 Manufacturing Training Package.

To achieve the qualification, students must achieve competence in units that meet the qualification packaging rules.

Training packages are amended periodically to reflect the latest industry practices. For information on certificate structure for this approach, download the latest version by going to the Training.gov.au (TGA) website <www.training.gov.au> and locating information about the training package.

3. Work placement

VET programs, whether delivered in an institutional setting (e.g. a school), should include quality work placement because work placement:

- is necessary for industry recognition of training
- provides opportunities for school students to become confident and capable in applying off-the-job knowledge and skills to workplace standards according to the relevant training package in actual workplace settings
- provides opportunities for school students to acquire generic workplace competencies (employability or generic skills) that are highly valued by employers; these skills are not necessarily acquired in institutional settings.

Therefore, it is strongly recommended that students undertaking these certificates be given the opportunity for work placement. Ten days (or the equivalent) is recommended for Certificate I. This could include part-time, paid or unpaid work.

4. Higher qualifications

Students who complete the Certificate I qualification should be given the opportunity to commence a VET qualification at a higher level through either a TAFE institute or a private provider.

Schools should form partnerships to meet the diverse vocational needs of young people:

- to identify suitable programs for the senior phase of learning
- by working with other RTOs to deliver content and conduct assessment
- by working with business/community groups to establish work placement, employment opportunities and support for professional development.

Approach B: Vocational learning

1. Aims

Manufacturing aims to meet the needs of students in the senior phase of learning. In particular, a course derived from this study area specification aims to:

- provide students with a general knowledge and appreciation of materials, equipment, processes and procedures that can be built upon to keep pace with changing technologies
- help students think critically about their material environment with particular emphasis on innovation and problem solving
- equip students with broadly based practical skills that can be further developed, directed or transferred to other technical situations thus enhancing their capacities to adjust to technological change
- develop students' technical vocabulary to a level which will help them understand information and communicate in the workplace
- help students appreciate the importance of good communication and cooperation with team members in a work situation
- foster personal development, self reliance and a sense of personal worth and esteem within the framework of social responsibility
- promote the development of safety awareness and safe working practices
- create an environment which fosters continued successful learning
- develop an appreciation of the role of industrial technology in society
- promote the need for and a commitment to quality control of products and organisation of work
- develop attitudes appropriate to students' future participation in society and their understanding of career pathways for the world of work
- develop skills in the application of technology by using information and applying mathematical computation.

2. Objectives

The general objectives of this SAS are grouped into the following categories:

- Knowledge & understanding
- Applied processes
- Practical skills
- Attitudes & values.

The first three categories of objectives, *Knowledge & understanding, Applied processes* and *Practical skills* are reflected in the three assessment criteria. At the completion of the course, all objectives must be covered. Attitudes & values objectives need not be directly reflected in assessment tasks or in the assessment criteria.

2.1 Knowledge & understanding

At the completion of the course, in familiar situations, students should be able to demonstrate knowledge and understanding of:

- safe work practices
- content related to the key elements and key ideas
- processes and procedures
- technical information, drawings and specifications
- a range of materials, tools and equipment
- fundamental measurement, estimation and calculation techniques
- terminology relevant to the chosen industry context.

2.2 Applied processes

At the completion of the course, in both familiar and unfamiliar situations, students should be able to:

- apply safe work practices
- follow a procedure or plan
- follow instructions, industry guidelines, policies and procedures
- select and apply industry processes and procedures
- use and interpret technical information, drawings and specifications
- apply fundamental measurement, estimation and calculation techniques relevant to the chosen industry context
- develop procedures, sequences and specifications
- organise materials and resources
- propose solutions
- justify decisions and choices in completing a task or project to industry standard.

2.3 Practical skills

At the completion of the course students should be able to:

- apply relevant housekeeping and safety requirements
- use manufacturing procedures
- demonstrate skill in the use of hand and power tools

- operate a range of plant and equipment
- maintain a range of tools, technologies and equipment
- complete tasks within agreed timeframes
- communicate verbal and graphical information using industry-specific terminology
- use measuring techniques when making products or undertaking repairs to specification.

2.4 Attitudes & values

These objectives are concerned with attitudes, values and feelings that the subject aims to foster. At the completion of the course, students should:

- appreciate the need for competent and safe work practices
- develop an awareness of environmental issues relating to industry
- develop an awareness of the value and importance of technology and its influence on society
- appreciate the contribution that the manufacturing industries have made to society
- appreciate the variety, scope and use of materials, tools and equipment, and of industrial processes
- develop an appreciation of quality processes and products and the aesthetic qualities of products
- appreciate the need for industry standards and quality assurance
- value the importance of working cooperatively with colleagues and in teams
- commit to a responsible and productive work ethic.

3. Course organisation

3.1 Time allocation

This course has been designed to cater for a minimum of 55 hours per semester of timetabled school time, including assessment.

3.2 Course

A course in Manufacturing comprises:

- a mandatory study area core, integrated throughout the course
- a specified number of units of study, as prescribed by the particular strand/s chosen.

The subject has been designed as a project-based or activity-based course that emphasises using current industry practice and safe technological processes to solve problems or complete tasks in a workshop or simulated workplace environment. Projects and practical activities set the context within which the key elements of the course are delivered and provide the means for the consolidation and application of skills and knowledge. They should be authentic or credible simulations of real manufacturing projects, and should be student-centred to promote confident and self-motivated learners. The course should be flexible in order to accommodate new and emerging technologies in the manufacturing industries and the wide range of interests and abilities of the students who take the course.

The subject can provide a number of educational outcomes to suit local conditions, defined in part by the human and physical resource constraints of the school and local community, projected employment demands and requirements, further education, the development of lifelong learning and employability skills, and the diversity of abilities, learning styles and interests of the students.

Industry partnership

Each school is encouraged to form a partnership with local industry so that students are exposed to employment opportunities and the latest technologies.

3.3 Strands

The following strands are available within Manufacturing:

- Aeroskills Studies
- Automotive Studies
- Building & Construction Studies
- Engineering Studies
- Furnishing Studies
- Industrial Graphics
- Plastics Studies
- Industrial Technology Studies.

3.3.1 Strand format

Each strand has the following sections:

Structure

This section outlines the requirements for the particular strand.

Key elements

The key elements are mandatory and are aligned to the competencies contained in the relevant industry training package.

Key ideas

Key ideas and suggested content are provided for each key element. The key ideas are mandatory. The suggested content provides guidance for teachers about possible subject matter.

Units of study

Each strand lists a number of units of study. These units outline the focus of study, the knowledge and skills to be acquired, related key elements involved, and include some suggested activities and ideas for projects and activities. These units of study provide a focus for developing the study area core in context and for applying the knowledge and skills.

3.4 Study area core

The study area core is mandatory and aims to introduce students to workshop practice and to achieve a basic understanding of the skills and attitudes that underpin employment in an industrial sector. It consists of the core principles of manufacturing, safety and technological processes. **An integrated approach over the two-year period should be adopted**. It encompasses a problem-solving approach to project development and provides a basis for acquiring the underpinning skills, understandings and concepts of the subject that will support further student learning.

The study area core is designed to equip students with a basic understanding of the following skills and practices:

- *occupational health and safety*, which must be incorporated into the general delivery of projects; specific aspects are elaborated upon within each strand
- *communication skills* — the ability to communicate using the language of the workplace and the ability to adapt the form of communication to the expected audience; this includes knowledge and understanding of technical vocabulary, safety rules, safety regulations, identification of materials, hand tools, equipment, machines, available resources and methods of construction of practical projects
- *mathematical skills* — the ability to perform fundamental measurements and use techniques of estimation and approximation for practical workshop purposes
- *manipulative skills* — the ability to apply technology and combine physical and sensory skills to operate hand and power tools and other equipment
- *organisational skills* — the ability to prioritise and monitor one's own performance and available resources
- *collaborative skills* — the capacity to interact with other people and work effectively as a member of a team
- *problem-solving skills* — the ability to clarify desired outcomes, maintain focus and respond to faults and difficulties as they arise.

3.4.1 Details of the study area core

Basic legal requirements covering occupational health and safety in the workplace:

- general aims and objectives of occupational health and safety
- employer and employee responsibilities, rights and obligations
- workplace hazards and the appropriate action to control the hazards
- personal safety in a workshop.

Communicating ideas and information using the language of the workplace:

- use and understand words and terms commonly used in the workplace
- use a standard dictionary and thesaurus
- read and interpret written instructions such as safety rules and safety regulations
- read and interpret general workshop communications such as instructions, job cards, timesheets, technical drawings and sketches.

Fundamental measurements, estimations and calculations for practical workshop purposes:

- calculate areas, ratios, percentages and perimeters using whole numbers, fractions and decimals
- identify types of units and their application to length, mass, volume, temperature, density, time, energy, area, pressure and rates of consumption, as applicable to the chosen strands.

Applying technological processes to a project:

- interpreting drawings
- selecting materials
- manufacturing processes
- manipulating hand and power tools, and fixed equipment
- establishing and maintaining focus in completing a defined activity
- identifying sequential stages in simple and complex processes.

Interacting with others and working effectively as a member of a team:

- work with others to achieve agreed objectives
- participate in group discussion.

Problem-solving strategies:

- clarify desired outcome, maintain focus and respond to faults and difficulties as they arise
- suggest solutions to given problems
- evaluate suggested strategies and validate the solution.

4. Strands

4.1 Aeroskills Studies

4.1.1 Structure

This strand covers basic skills in the aircraft maintenance/construction industry.

A course in Aeroskills Studies comprises:

- the mandatory study area core unit of work, integrated throughout the course
- studies developed from the **five** units identified.

Industry partnership

Schools should form a partnership with local industry so that students are exposed to employment opportunities and the latest in aircraft maintenance/construction technology.

4.1.2 Key elements

- Introduction to the aircraft maintenance/construction industry
- Safety in the aircraft industry workplace
- Basic aerodynamics, aeroplane aerodynamics and flight controls
- Selection and application of hand and power tools
- Maintenance practices
- Basic aircraft hardware
- Basic aeroplane structures and aircraft materials
- Propulsion systems
- Propeller fundamentals
- Basic electricals and electronics

Introduction to the aircraft maintenance/construction industry	
Description: This element provides a general overview of the vocations in the aeroskills industry, and the skills related to those vocations.	
Key ideas	**Suggested content**
Identification	• common fields/streams – fixed wing aircraft – rotary wing aircraft – general aviation – commercial aviation • common trades/vocations/careers – aircraft maintenance engineer (AME) — mechanical – aircraft maintenance engineer (AME) — structures – aircraft maintenance engineer (AME) — avionics – licensed aircraft maintenance engineer (LAME) — mechanical – licensed aircraft maintenance engineer (LAME) — avionics – aeronautical engineer • careers – pathways – linking skills to employment options

Safety in the aircraft industry workplace	
Description: This element equips students with the knowledge and skills to identify aircraft industry workplace hazards, manage risk and appreciate safe working practices.	
Key ideas	**Suggested content**
Identification — hazards	• rotating equipment • electrical/electronic • environmental • chemical • pneumatic • hydraulic • fire, e.g. involving fuel, solvent, electricity • physical, e.g. involving manual handling
Application	• administrative controls* • tool selection • processes and procedures • storage • risk management* • energy sources • fire control • environment – dust – fumes – waste – noise – movement – barriers • personal protective equipment • manual handling techniques • duty of care for self and others
* See Appendix 1: Safety for further explanation	

Basic aerodynamics, aeroplane aerodynamics and flight controls	
Description: This element provides a general overview of the aerodynamics related to aircraft and the flight controls used to operate aircraft.	
Key ideas	**Suggested content**
Identification	• basic aerodynamics – physics of the atmosphere – aerodynamics – theory of flight – flight stability and dynamics • aeroplane aerodynamics • flight controls
Application	• flight-control operation • yoke, cockpit quadrants • connection methods • linear to rotary movement • cables, pulleys and fairleads • torque tube • fly by wire
Maintenance	• pre-flight checks – rigging inspection
Housekeeping	• storage, e.g. storing volatiles, refrigerated composites • clean-up • transportation, e.g. transporting sheet metals • environmental management
Safety	• administrative controls, e.g. CASA regulations • processes and procedures • risk management • energy sources • environment – dust – fumes – waste – noise – movement – barriers • personal protective equipment • duty of care for self and others

Selection and application of hand and power tools	
Description: This element equips students with the knowledge and skills to safely manipulate common hand tools and hand-held power tools.	
Key ideas	**Suggested content**
Identification	• measuring/marking-out tools and equipment, e.g. rules, tape measures, graduated devices (micrometers, verniers), squares, bevels, calipers • holding devices, e.g. bench vices, machine vices, magnetic clamps • hand cutting tools, e.g. hacksaws, files, cold chisels, punches • striking tools, e.g. hammers, mallets • power tools for hand-held operations, e.g. drills, nibblers, shears • pneumatic tools
Application	• measuring/marking-out tools and equipment • holding devices • hand cutting tools • striking tools • power tools for hand-held operations • pneumatic tools
Maintenance	• sharpening • disposable blade/cutter replacement • guards and attachments • servicing
Housekeeping	• storage • clean-up • transportation • environmental management
Safety	• administrative controls • tool selection • processes and procedures • storage • risk management • environment – dust – fumes – waste – noise – movement – barriers • personal protective equipment • duty of care to self and others

Maintenance practices	
Description: This element equips students with the knowledge and skills to safely plan and organise work activities.	
Key ideas	**Suggested content**
Identification	• safety precautions – aircraft – workshop • basic maintenance practices – workshop practices – tools – engineering drawings, diagrams and standards – fits and clearances
Application	• tool control – tagging system – security • foreign object damage (FOD) awareness • practical identification and use of tooling
Maintenance	• protection and calibration of precision measuring instruments • inspection of workplace • continued maintenance of workplace
Housekeeping	• storage • clean-up • transportation • environmental management, e.g. waste disposal, recycling
Safety	• equipment selection • processes and procedures • storage • attachments/guards • risk management • energy sources • environment – dust – fumes – waste – noise – movement – barriers • personal protective equipment • duty of care to self and others

Basic aircraft hardware	
Description: This element equips students with the knowledge and skills to select and use basic aircraft hardware.	
Key ideas	**Suggested content**
Identification	• screw threads • bolts, studs and screws • locking devices • bearings • control cables
Application	• practical identification • appropriate installation
Maintenance	• thread cleaning • taps and dies • bearing lubrication • control-cable inspection
Housekeeping	• storage • clean-up • transportation • environmental management, e.g. waste disposal, recycling
Safety	• administrative controls • processes and procedures • risk management • energy sources • environment – dust – fumes – waste – noise – movement – barriers • personal protective equipment • duty of care to self and others

Basic aeroplane structures and aircraft materials	
Description: This element equips students with the knowledge and skills to understand the key elements of aeroplane structures and aircraft materials.	
Key ideas	**Suggested content**
Identification	• aeroplane structures – general concepts – fuselage – wings – stabilisers – flight control surfaces – nacelles and pylons • aircraft materials – ferrous and non-ferrous – composite and non-metallic – wooden – fabric covering
Application	• inspection • component construction • assembly of components • ground tests • flight tests
Maintenance	• parts inspection • damage identification • corrosion/degradation prevention • metal fatigue
Housekeeping	• storage, e.g. storing volatiles, refrigerated composites • clean-up • transportation, e.g. transporting sheet metals • environmental management
Safety	• administrative controls, e.g. CASA regulations • processes and procedures • risk management • energy sources • environment – dust – fumes – waste – noise – movement – barriers • personal protective equipment • duty of care to self and others

Propulsion systems	
Description: This element equips students with the knowledge and skills to understand the basic operation of aircraft propulsion systems.	
Key ideas	**Suggested content**
Identification	• piston engines • gas turbine • turbo prop • towed • catapult • future developments
Application	• disassembly • inspection • construction • ground tests • flight tests
Maintenance	• lubrication • systems – ignition – cooling – fuel – controls
Housekeeping	• storage • clean-up • transportation • environmental management
Safety	• tool selection • processes and procedures • storage • attachments, guards, tooling, e.g. fitting of same • risk management • energy sources • environment – dust – fumes – waste – noise – movement – barriers • duty of care to self and others

Basic electricals and electronics	
Description: This element equips students with the knowledge and understanding of basic electricals and electronics related to aircraft.	
Key ideas	**Suggested content**
Identification	• electrical/electronic devices • test equipment • hand tools
Application	• disassembly inspections • construction • fault finding • repairs • tests
Maintenance	• parts inspection • damage identification • measuring voltages, currents and resistance • reading electrical circuits
Housekeeping	• storage • clean-up • transportation • environmental management, e.g. waste disposal, recycling
Safety	• processes and procedures • risk management • resuscitation • environment – dust – fumes – waste – electrical power • personal protective equipment • duty of care to self and others

4.1.3 Units of study

A course in Aeroskills Studies is to be based on the **five** units listed below. These units are mandatory; however the content of each unit is at the discretion of the school. It is expected that all key elements will be covered by the end of the course.

For this strand, "aeroskills" could refer to static aircraft scale models or kits; operational aircraft scale models or kits, including gliders, rubber-band-powered and motorised units; control-line and radio-controlled scale models or kits.

A. Industry orientation

This unit allows for the development of knowledge and skills implicit in the aircraft maintenance/construction industry. The unit may be based upon the practice and performance of routine tasks and skills.

Related key elements:

- Introduction to the aircraft maintenance/construction industry
- Safety in the aircraft industry workplace

Suggested activities:

- job-search activity on the web
- safety induction course
- workplace visits
- workshop safety report
- observe safe use of hand and power tools
- simple paper-plane flight tests

B. Assembly

This unit allows for the development of knowledge, understanding and skills required to complete a range of assembly tasks. By the end of the unit, students should be able to prepare for assembly, interpret and follow procedures and instructions, and safely use tools and equipment.

Related key elements:

- Safety in the aircraft industry workplace
- Basic aerodynamics, aeroplane aerodynamics and flight controls
- Selection and application of hand and power tools
- Maintenance practices
- Basic aircraft hardware
- Basic aeroplane structures and aircraft materials

Suggested activities:

- assembling static aircraft models or operational model aircraft kits, e.g. gliders and powered models (rubber band, catapult, motorised)

C. Removal and installation

This unit allows for the development of knowledge, understanding and skills required to complete a range of removal and installation tasks. By the end of the unit, students should be able to remove and install aircraft model or kit components using appropriate procedures, tools and equipment.

Related key elements:

- Safety in the aircraft industry workplace
- Basic aerodynamics, aeroplane aerodynamics and flight controls
- Basic aircraft hardware
- Selection and application of hand and power tools
- Maintenance practices
- Basic aeroplane structures and aircraft materials
- Propulsion systems
- Propeller fundamentals
- Basic electricals and electronics

Suggested activities:

- removing and installing model engines, fuel tanks, flight control units

D. Testing and inspection

This unit allows for the development of knowledge, understanding and skills required to complete a range of testing and inspection tasks. By the end of the unit, students should be able to test and inspect aircraft model or kit components and functions to determine their effectiveness.

Related key elements:

- Safety in the aircraft industry workplace
- Basic aerodynamics, aeroplane aerodynamics and flight controls
- Maintenance practices
- Selection and application of hand and power tools
- Basic aeroplane structures and aircraft materials
- Propulsion systems
- Propeller fundamentals
- Basic electricals and electronics

Suggested activities:

- testing spars
- thrust evaluation of engines
- testing and inspecting flight control surfaces

E. Troubleshooting and rectification

This unit allows for the development of knowledge, understanding and skills required to troubleshoot and rectify problems in aircraft models or kits. By the end of the unit, students should be able to identify possible or existing problems with aircraft models or kits and then apply solutions to the problems.

Related key elements:

- Safety in the aircraft industry workplace
- Basic aerodynamics, aeroplane aerodynamics and flight controls
- Maintenance practices
- Basic aeroplane structures and aircraft materials
- Propulsion systems
- Propeller fundamentals
- Basic electricals and electronics.

Suggested activities

- identify and rectify problems associated with model aircraft or kits, e.g. engine performance, fuel supply, electrical polarity of starter motors

4.2 Automotive Studies

4.2.1 Structure

This strand covers basic skills in the automotive industry.

A course in Automotive Studies comprises:

- the mandatory study area core, integrated throughout the course
- studies developed from **four of the five** units identified.

Industry partnership

Schools should form a partnership with local industry so that students are exposed to employment opportunities and the latest in automotive technology.

4.2.2 Key elements

- Introduction to the automotive industry
- Safety in the automotive workplace
- Drawing and information interpretation
- Selection and application of hand and power tools
- Selection and application of machinery/equipment
- Pre-repair preparation
- Remove and replace mechanical components
- Vehicle systems

Introduction to the automotive industry	
Description: This element provides a general overview of vocations in the automotive industry, and the skills related to those vocations.	
Key ideas	**Suggested content**
Identification	• common fields/streams – production – mechanical – fabrication – electrical/electronic – technical – professional • common trades/vocations – common names – job descriptions • careers – pathways – linking skills to employment options

Safety in the automotive workplace	
Description: This element equips students with the knowledge and skills to correctly identify automotive workplace hazards, manage risk and appreciate safe working practices.	
Key ideas	**Suggested content**
Identification — hazards	• rotating equipment • electrical/electronics • environmental • chemical • pneumatic • fire, e.g. involving fuel, solvent, electricity • physical, e.g. involving manual handling
Application	• administrative controls* • tool selection • processes and procedures • storage • risk management* • energy sources • fire control • environment – dust – fumes – waste – noise – movement – barriers • personal protective equipment • manual handling techniques • duty of care to self and others
* See Appendix 1: Safety for further explanation	

Drawing and information interpretation	
Description: This element equips students with the knowledge and skills to interpret various forms of written and graphical information used in the automotive industry.	
Key ideas	**Suggested content**
Identification	• technical presentations (orthogonal, pictorial) – assembly – sub-assembly – detail assembly – detail – schematic • technical information, e.g. manufacturers' specifications and manuals
Interpretation	• graphical content • dimensions • symbols/annotation • scale • technical information
Application	• assembly/disassembly to specification • diagnosis, testing and service to manufacturers' specifications

Selection and application of hand and power tools	
Description: This element equips students with the knowledge and skills to safely manipulate common hand and power tools.	
Key ideas	**Suggested content**
Identification	• measuring/marking-out tools, e.g. verniers, callipers, feeler gauges • holding devices, e.g. bench vices, G-clamps • hand tools, e.g. sockets, hacksaws, spanners • diagnostic equipment • power/air tools, e.g. electric drills, air duster guns, impact wrenches, air ratchets • workshop equipment, e.g. floor jacks, safety stands, hoists and lifting equipment
Application	• measuring/marking-out tools • holding devices • hand tools • diagnostic equipment • power/air tools • workshop equipment
Maintenance	• guards and attachments • connections, e.g. pneumatic • servicing, e.g. adjustment, lubrication
Housekeeping	• storage • clean-up • transportation • environment
Safety	• administrative controls • tool selection • processes and procedures • storage • risk management • environment – dust – fumes – waste – noise – movement – barriers • personal protective equipment • duty of care to self and others

Selection and application of machinery/equipment	
Description: This element equips students with the knowledge and skills to safely operate common machinery and equipment used in the automotive industry.	
Key ideas	**Suggested content**
Identification	• purpose, capabilities and limitations of specific machinery • parts of the machine (structure) • guards and attachments • tooling • switching devices
Application	• basic operations • guards and attachments • tooling • switching devices
Maintenance	• structural parts • tooling • guards and attachments • servicing, e.g. adjustments, lubrication
Housekeeping	• storage • clean-up • transportation • environment
Safety	• administrative controls • machine selection • processes and procedures • storage, e.g. storing attachments • risk management • energy sources • environment – dust – fumes – waste – noise – movement – barriers • personal protective equipment • duty of care to self and others

Pre-repair preparation	
Description: This element equips students with the knowledge and skills required to clean components by mechanical or chemical means in preparation for storage or repair.	
Key ideas	**Suggested content**
Identification	• cleaning agents • processes and procedures, e.g. chemical, manual, air, pressure
Application — cleaning	• purposes, e.g. to facilitate inspection, assessment, replacement and repair • processes and procedures
Housekeeping	• storage • clean-up • transportation • environmental management, e.g. waste disposal, recycling
Safety	• administrative controls • tool selection • processes and procedures • storage • risk management • energy sources • fire control • environment – dust – fumes – waste – noise – movement – barriers • personal protective equipment • manual handling techniques • duty of care to self and others

Remove and replace mechanical components	
Description: This element equips students with the knowledge and skills to remove and replace mechanical components/units/assemblies for the purpose of service or repair.	
Key ideas	**Suggested content**
Identification	• tools • equipment • components – mechanical – electrical
Application	• process and procedures – mechanical – electrical
Housekeeping	• storage • clean-up • transportation • environmental management, e.g. waste disposal, recycling
Safety	• administrative controls • machine selection • processes and procedures • storage, e.g. storing attachments • risk management • energy sources • environment – dust – fumes – waste – noise – movement – barriers • personal protective equipment • duty of care to self and others

Vehicle systems	
Description: This element equips students with the knowledge and skills to identify and test systems and subsystems used in the automotive industry.	
Key ideas	**Suggested content**
Identification	• components • systems and subsystems
Interpretation	• role of components in systems • interrelationships
Application	• processes and procedures – assembly/disassembly – testing, diagnosing and reporting
Safety	• administrative controls • tool selection • processes and procedures • storage • risk management • environment – dust – fumes – waste – noise – movement – barriers • personal protective equipment • duty of care to self and others

4.2.3 Units of study

A course in Automotive Studies is to be based on **four of the five** units listed below. The "Industry orientation" unit is mandatory. The content of other units, and their integration, is at the discretion of the school. It is expected that all key elements will be covered by the end of the course.

It is not intended that the units of study be taught discretely. It is preferable that schools integrate these units across the course.

For this strand, "automotive" could refer to small motors, bicycles, light/heavy vehicles, marine or outdoor power equipment.

A. Industry orientation

This unit allows for the development of knowledge and skills implicit in the automotive industry. Delivery of this unit may be based upon the practice and performance of routine tasks and skills.

Related key elements:

- introduction to the automotive industry
- safety in the automotive workplace

Suggested activities:

- job-search activity on the web
- safety induction course
- workplace visits
- workshop safety report
- observe safe use of tools and equipment
- work placement

B. Servicing

This unit allows for the development of knowledge, understanding and skills required to complete a range of servicing tasks. By the end of the unit, students should be able to plan and prepare procedures to service a range of automotive equipment.

Related key elements:

- safety in the automotive workplace
- drawing and information interpretation
- selection and application of hand and power tools
- selection and application of machinery/equipment
- pre-repair preparation
- remove and replace mechanical components

Suggested activities:

- removing, servicing, replacing and testing automotive components to manufacturers' specifications, e.g. removing and replacing throttle cables; undertaking logbook service of a motor; servicing a braking system; testing a cooling system or battery

C. Maintenance and repair

This unit allows for the development of knowledge, understanding and skills required to complete a range of maintenance and repair tasks. By the end of the unit, students should be able to diagnose and repair a range of automotive equipment.

Related key elements:

- Safety in the automotive workplace
- Drawing and information interpretation
- Selection and application of hand and power tools
- Selection and application of machinery/equipment
- Pre-repair preparation
- Remove and replace mechanical components

Suggested activities:

- troubleshooting, diagnosing, repairing and testing components, e.g. fuel or water pumps, starter motors, bicycle derailleurs

D. Detailing

This unit allows for the development of knowledge, understanding and skills required to integrate materials and products to present a well-finished product.

Related key elements:

- Safety in the automotive workplace
- Drawing and information interpretation
- Selection and application of hand and power tools
- Pre-repair preparation

Suggested activities:

- surface preparation and application of finishes, e.g. boat hulls, car duco, fabrics, motor exteriors

E. Systems

This unit allows for the development of knowledge, understanding and skills required to analyse, operate and maintain vehicle systems.

Related key elements:

- Introduction to the automotive industry
- Safety in the automotive workplace
- Drawing and information interpretation
- Selection and application of hand and power tools
- Selection and application of machinery/equipment
- Pre-repair preparation
- Remove and replace mechanical components
- Vehicle systems

Suggested activities:

- inspecting, analysing, diagnosing, repairing and testing systems, e.g. braking, steering, suspension, and electrical systems

4.3 Building & Construction Studies

4.3.1 Structure

This strand covers basic skills in the building and construction industry.

A course in Building & Construction Studies comprises:

- the mandatory study area core unit of work, integrated throughout the course
- studies developed from the **four** units identified.

Industry partnership

Schools should form a partnership with local industry so that students are exposed to employment opportunities and the latest in building and construction technology.

4.3.2 Key elements

- Introduction to the building and construction industry
- Safety in the construction workplace
- Drawing, interpretation and site set-out
- Selection and application of hand and power tools
- Selection of materials and construction applications
- Fabrication and assembly of construction-based projects

Introduction to the building and construction industry	
Description: This element provides a general overview of vocations in the building and construction industry, and the skills related to those vocations.	
Key ideas	**Suggested content**
Identification	• common fields/streams – production – mechanical – fabrication – electrical/electronic – technical – professional • common trades/vocations – common names – job descriptions • careers – pathways – linking skills to employment options

Safety in the construction workplace	
Description: This element equips students with the knowledge and skills to correctly identify construction workplace hazards, manage risk and appreciate safe working practices.	
Key ideas	**Suggested content**
Identification — hazards	• rotating equipment • electrical • environmental • chemical • pneumatic • fire, e.g. involving fuel, solvent, electricity • physical, e.g. involving manual handling
Application	• administrative controls* • tool selection • processes and procedures • storage • risk management* • energy sources • fire control • environment – dust – fumes – waste – noise – movement – barriers • personal protective equipment • duty of care to self and others
* See Appendix 1: Safety for further explanation	

Drawing interpretation and site set-out	
Description: This element equips students with the knowledge and skills to interpret working drawings and set out a construction project.	
Key ideas	**Suggested content**
Identification	• technical presentations, e.g. orthogonal projections, pictorial drawings (including exploded views), concept sketches, floor plans, detail drawings and specifications • set-out tools and materials • levelling tools and equipment • management and planning of site • set out, e.g. profiles • level, plumb and square
Interpretation	• graphical content • dimensions • symbols/annotation • scale
Application	• marking out • determining levels • establishing profiles • set-out procedures • project production to specifications

Selection and application of hand and power tools	
Description: This element equips students with the knowledge and skills to safely manipulate common hand and power tools to produce a variety of timber projects.	
Key ideas	**Suggested content**
Identification	• measuring/marking-out tools, e.g. rules, tape measures, squares, bevels • holding devices, e.g. bench vices, G-clamps, sash clamps • hand tools, e.g. chisels, saws, planes • power tools • pneumatic tools • striking tools, e.g. hammers, mallets • levelling tools
Application	• measuring/marking-out tools • tape measures, squares, bevels, calliper • holding devices • hand tools • power tools • pneumatic tools • levelling devices
Maintenance	• sharpening/maintaining equipment • maintaining sharpening equipment • storage • transportation
Housekeeping	• storage • clean-up • transportation • environmental management
Safety	• tool selection • processes and procedures • storage • risk management • environment – dust – fumes – waste – noise – movement – barriers • personal protective equipment • duty of care to self and others

Selection of materials and construction applications	
Description: This element equips students with the knowledge and skills to select materials and plan appropriate construction applications in preparation for a project.	
Key ideas	**Suggested content**
Identification	• materials – properties – applications – variables – tooling • supplier characteristics • ordering methods
Applications	• commercial and/or domestic applications – dressing/sizing – material optimisation – tooling selection – joinery processes – framing – tie downs – boxing and formwork – fixtures and fittings – bricklaying and paving – painting and decorating – plastering and tiling – concreting

Fabrication and assembly of construction-based projects	
Description: This element equips students with the knowledge and skills to construct, fabricate and assemble construction projects.	
Key ideas	**Suggested content**
Identification	• safe site organisation • cutting and preparation methods • pre-fabrication techniques • on-site placement, e.g. building materials, waste • timber/metal framing practices • formwork placement • roofing • tools – cutting – striking – pneumatic – power – concreting – finishing • safe work practices
Application	• sequencing • pre-fabrication • production systems • clamping and holding devices • using adhesives and sealants • steel fixing — reinforcement • product development • fixtures and fittings • tie downs
Housekeeping	• storage • clean-up • transportation • environmental management
Safety	• administrative controls • tool selection • processes and procedures • risk management • energy sources • environment – dust – fumes – waste – noise – movement – barriers • personal protective equipment • duty of care to self and others

4.3.3 Units of study

A course in Building & Construction Studies is to be based on the **four** units listed below. These units are mandatory; however, the content and integration of each unit is at the discretion of the school. It is expected that all key elements will be covered by the end of the course.

For this strand, "construction" could refer to domestic/civil construction, renovations or repairs.

A. Industry orientation

This unit allows for the development of knowledge and skills implicit in the building and construction industry. Delivery of this unit may be based upon the practice and performance of routine tasks and skills.

Related key elements:

- Introduction to the building and construction industry
- Safety in the building and construction workplace

Suggested activities:

- job-search activity on the web
- safety induction course (i.e. 30215 Qld)
- workplace visits
- worksite safety report
- observe safe use of tools and equipment
- work placement

B. Outdoor construction

This unit allows for the development of knowledge, understanding and skills required to complete a range of outdoor construction tasks. By the end of the unit, students should be able to plan, prepare and manufacture basic outdoor constructions.

Related key elements:

- Safety in the construction workplace
- Selection and application of hand and power tools
- Drawing, interpretation and site set-out
- Selection of materials and construction applications
- Fabrication and assembly of construction-based projects

Suggested activities:

- setting out
- levelling
- formwork
- slabs and footings
- framing
- roofing
- cladding
- brick/block laying

C. Indoor construction

This unit allows for the development of knowledge, understanding and skills required to complete a range of indoor construction tasks. By the end of the unit, students should be able to plan, prepare and manufacture basic indoor constructions.

Related key elements:

- Safety in the construction workplace
- Selection and application of hand and power tools
- Drawing, interpretation and site set-out
- Selection of materials and construction applications
- Fabrication and assembly of construction-based projects

Suggested activities:

- setting out
- framing and joinery, e.g. involving windows, doors, architraves, skirting, cornices
- fit out
- skill-building projects, e.g. carry-all, tool box, saw stool

D. Finishing

This unit allows for the development of knowledge, understanding and skills required to integrate materials, fixtures and fittings to present a well-finished construction project.

Related key elements:

- Safety in the construction workplace
- Selection and application of hand and power tools
- Selection of materials and construction applications

Suggested activities:

- concrete finishing
- painting and decorating
- plastering
- rendering
- tiling

4.4 Engineering Studies

4.4.1 Structure

This strand covers basic skills in the engineering industry.

A course in Engineering Studies comprises:

- the mandatory study area core unit of work, integrated throughout the course
- studies developed from the **five** units of study identified.

Industry partnership

Schools should form a partnership with local industry so that students are exposed to employment opportunities and the latest in engineering technology.

4.4.2 Key elements

- Introduction to the engineering industry
- Safety in the engineering workplace
- Drawing interpretation and setting out
- Selection and application of hand and power tools
- Selection and application of static machinery
- Selection and application of welding/cutting processes
- Materials selection and application
- Surface preparation and finishing

Introduction to the engineering industry	
Description: This element provides a general overview of vocations in the engineering industry and the skills related to those vocations.	
Key ideas	**Suggested content**
Identification	• common fields/streams – production – mechanical – fabrication – electrical/electronic – technical – professional • common trades/vocations – common names – job descriptions • careers – pathways – linking skills to employment options

Safety in the engineering workplace	
Description: This element equips students with the knowledge and skills to correctly identify engineering workplace hazards, manage risk and appreciate safe working practices.	
Key ideas	**Suggested content**
Identification – hazards	• rotating equipment • electrical • environmental • chemical • pneumatic • fire, e.g. hazards involving fuel, solvent, electricity • physical, e.g. involving manual handling
Application	• administrative controls* • tool selection • processes and procedures • storage • risk management* • energy sources • fire control • environment – dust – fumes – waste – noise – movement – barriers • personal protective equipment • manual handling techniques • duty of care to self and others
* See Appendix 1: Safety for further explanation	

Drawing interpretation and setting out	
Description: This element equips students with the knowledge and skills to interpret and apply various forms of graphical presentations used in the engineering industry.	
Key ideas	**Suggested content**
Identification	• technical presentations (orthogonal, pictorial) – assembly – sub-assembly – detail assembly – detail • concept sketches • development • full-size set-outs
Interpretation	• graphical content • dimensions • symbols/annotations, e.g. surface finishes, weld types • scale and proportion
Application of data	• marking out • set out production (as required) • job/component production to specification

Selection and application of hand and power tools	
Description: This element equips students with the knowledge and skills to safely manipulate common hand tools and hand-held power tools.	
Key ideas	**Suggested content**
Identification	• measuring/marking-out tools and equipment, e.g. rules, tape measures, graduated devices (micrometers, verniers), squares, bevels, callipers • holding devices, e.g. bench vices, machine vices, magnetic clamps • hand cutting tools, e.g. hacksaws, files, cold chisels, punches • striking tools, e.g. hammers, mallets • power tools for hand held operations, e.g. drills, nibblers, shears • pneumatic tools
Application	• measuring/marking-out tools and equipment • holding devices • hand cutting tools • striking tools • power tools for hand held operations • pneumatic tools
Maintenance	• sharpening • disposable blade/cutter replacement • guards and attachments • servicing, e.g. adjustments, lubrication
Housekeeping	• storage • clean-up • transportation • environmental management
Safety	• administrative controls • tool selection • energy sources • processes and procedures • storage • risk management • environment – dust – fumes – waste – noise – movement – barriers • personal protective equipment • duty of care to self and others

Selection and application of static machinery	
Description: This element equips students with the knowledge and skills to operate static machinery for basic operations used in engineering.	
Key ideas	**Suggested content**
Identification	• purpose, capabilities and limitations of specific machinery, e.g. lathes, milling machines, pedestal drills, grinders, guillotines, panbrakes • structural parts of the machine • guards and attachments • tooling • switching devices
Application	• basic operations • speed/feed selection • guards and attachments • tooling • switching devices
Maintenance	• structural parts • guards and attachments • tooling, e.g. sharpening • servicing, e.g. adjustments, lubrication
Housekeeping	• storage, e.g. guards and attachments • clean-up • transportation • environmental management
Safety	• administrative controls • machine selection • processes and procedures • storage, e.g. attachments • guards, attachments and tooling, e.g. fitting • risk management • environment – dust – fumes – waste – noise – movement – barriers • personal protective equipment • duty of care to self and others

Selection and application of welding/cutting processes	
Description: This element equips students with the knowledge and skills to perform basic welding and cutting processes used in engineering.	
Key ideas	**Suggested content**
Identification	• purpose, capabilities and limitations of specific equipment – manual metal arc welding (MMAW) – gas metal arc welding (GMAW) – http://www.acronymfinder.com/Oxy_Acetylene-Welding-%28OAW%29.htmloxy-acetylene (OAW) • techniques – brazing – soldering • parts of the equipment • energy sources • attachments, consumables • personal protective equipment • guards/sight screens
Application	• processes and procedures, e.g. amperage selection, gas flow, operating pressures, shutdown procedures, brazing/soldering techniques • attachments • guards/sight screens • energy controls
Maintenance	• structural parts • guards and attachments • servicing, e.g. adjustments, connections
Housekeeping	• storage, e.g. storing attachments, consumables • clean-up • transportation • environmental management
Safety	• administrative controls • processes and procedures • guards and attachments • risk management • energy sources • environment – dust – fumes – waste – noise – movement – barriers • personal protective equipment • duty of care to self and others

Materials selection and application	
Description: This element equips students with the knowledge and skills to select and process materials for various applications in the manufacturing industry.	
Key ideas	**Suggested content**
Identification	• classification – ferrous – non-ferrous – non-metal • properties, e.g. physical, mechanical • products, e.g. sheets, plates, flat bars, angle bars, hollow sections
Application	• selection – materials – products • processes and procedures – founding – forging – casting – extruding – welding – hard and soft soldering
Housekeeping	• storage • clean-up • transportation • environmental management
Safety	• equipment selection • processes and procedures • guards and attachments • risk management • energy sources • environment – dust – fumes – waste – noise – movement – barriers • personal protective equipment • duty of care to self and others

Surface preparation and finishing	
Description: This element equips students with the knowledge and skills required to prepare surfaces and apply finishes.	
Key ideas	**Suggested content**
Identification	• purpose, capabilities and limitations of equipment, e.g. spray-painting equipment • consumables, e.g. paints, thinners, volatiles • job requirements – surface preparation – surface finishing • processes and procedures, e.g. machine preparation, hand preparation, spray application, brush application
Application	• equipment • consumables • processes and procedures
Maintenance	• plant and equipment – servicing, e.g. cleaning, adjustments, lubrication – attachments and fittings, e.g. connectors, nozzles
Housekeeping	• storage, e.g. storing solvents, paints, chemicals • stock control • clean-up • transportation • environmental management
Safety	• administrative controls, e.g. Material Safety Data Sheets (MSDS) • equipment selection • processes and procedures • guards and attachments • risk management • energy sources • environment – dust – fumes – waste – noise – movement – barriers • personal protective equipment • duty of care to self and others

4.4.3 Units of study

A course in Engineering Studies is to be based on the **five** units listed below. These units are mandatory; however, the content and integration of each unit is at the discretion of the school. It is expected that all key elements will be fully covered by the end of the course.

For this strand, "engineering" could refer to light or heavy fabrication, mechanical production, hand production, electrical/electronic, restoration or repair.

"Materials" refers to, but is not limited to, metal products.

A. Industry orientation

This unit allows for the development of knowledge and skills implicit in the engineering industry. Delivery of this unit should be based upon industry standards and possible career pathways.

Related key elements:

- Introduction to the engineering industry
- Safety in the engineering workplace

Suggested activities:

- job-search activity on the web
- safety induction course
- workplace visits
- workshop safety report
- safe use of tools and equipment
- work placement

B. Cutting and joining materials

This unit allows for the development of knowledge, understanding and skills required to complete a range of cutting and joining tasks. By the end of the unit, students should be able to apply various methods to cut and join a range of materials.

Related key elements:

- safety in the engineering workplace
- drawing interpretation and setting out
- selection and application of hand and power tools
- selection and application of welding/cutting processes
- materials selection and application

Suggested activities:

- production processes involving drilling, cutting, shaping, welding/soldering
- exercises involving interpretation of instructions, drawings or technical data
- component production for a product, e.g. sand anchor and G clamp, human-powered vehicle, solar-powered vehicle

C. Machining materials

This unit allows for the development of knowledge, understanding and skills required to complete a range of machining tasks. By the end of the unit, students should be able to perform basic operations using a range of metal machines (hand-held or static) and a variety of materials.

Related key elements:

- Safety in the engineering workplace
- Drawing interpretation and setting out
- Selection and application of hand and power tools
- Selection and application of static machinery
- Materials selection and application.

Suggested activities:

- production processes involving drilling, grinding, milling, turning
- exercises involving interpretation of instructions, drawings or technical data
- component production for a product, e.g. G clamp, meat mallet, machine vice, human-powered vehicle, solar-powered vehicle, model steam engine

D. Fabrication

This unit allows for the development of knowledge, understanding and skills required to complete a range of light and heavy fabrication tasks. By the end of the unit, students should be able to apply a range of fabrication techniques using various materials.

Related key elements:

- Safety in the engineering workplace
- Drawing interpretation and setting out
- Selection and application of static machinery
- Materials selection and application
- Surface preparation and finishing

Suggested activities:

- applying fabrication techniques (cutting, bending, shaping, and finishing) to be used as part of a production process; fabrication techniques may be applied to produce articles or components used in, for example, auto parts washers, floor creepers, wheelbarrows, compost tumblers, toolboxes, barbecues, sand anchors, boat hulls

E. Production

This unit allows for the development of knowledge, understanding and skills required to manufacture an engineered product. By the end of the unit, students should be able to integrate the techniques of cutting and joining, machining, and fabrication to produce an article to specification.

Related key elements: All

Suggested activities:

- assembling fabricated, mechanical or electrical/electronic components into a finished product; for example, a machine vice, folding shovel, dragsters/racer, model steam engine, electronic kit building, robotic arm, wind mill, circuit board manufacture, trailer wiring, security system, remote control motor/vehicle, human-powered vehicle, solar-powered vehicle

4.5 Furnishing Studies

This strand covers basic skills in the furnishing industry.

4.5.1 Structure

A course in Furnishing Studies comprises:

- the mandatory study area core unit of work, integrated throughout the course
- studies developed from the **four** units identified.

Industry partnership

Schools should form a partnership with local industry so that students are exposed to employment opportunities and the latest in furnishing technology.

4.5.2 Key elements

- Introduction to the furnishing industry
- Safety in the furnishing workplace
- Drawing interpretation and setting out
- Selection and application of hand and power tools
- Selection and application of static machinery
- Materials selection, construction and assembly of a product
- Surface preparation and finishing

Introduction to the furnishing industry	
Description: This element provides a general overview of vocations in the furnishing industry and the skills related to those vocations.	
Key ideas	**Suggested content**
Identification	• common fields/streams – production – mechanical – fabrication – electrical/electronic – technical – professional • common trades/vocations – common names – job descriptions • careers – pathways – linking skills to employment options

Safety in the furnishing workplace	
Description: This element equips students with the knowledge and skills to correctly identify furnishing workplace hazards, manage risk and appreciate safe working practices.	
Key ideas	**Suggested content**
Identification — hazards	• rotating equipment • electrical • chemical • pneumatic • fire, e.g. involving fuel, solvent, electricity • physical, e.g. involving manual handling
Application	• administrative controls* • tool selection • processes and procedures • storage • risk management* • energy sources • fire control • environment – dust – fumes – waste – noise – movement – barriers • personal protective equipment • manual handling techniques • duty of care to self and others
* See Appendix 1: Safety for further explanation	

Drawing interpretation and setting out	
Description: This element equips students with the knowledge and skills to interpret various forms of graphical presentations used in the furnishing industry.	
Key ideas	**Suggested content**
Identification	• technical presentations, e.g. orthogonal projections, pictorial drawings (including exploded views) • concept sketches • full-sized set-outs
Interpretation	• graphical content • dimensions • symbols/annotations • scale
Application	• marking out • set out production (as required) • job/component production to specification

Selection and application of hand and power tools	
Description: This element equips students with the knowledge and skills to safely manipulate common hand and power tools used in furnishing.	
Key ideas	**Suggested content**
Identification	• measuring/marking-out tools, e.g. rules, tape measures, squares, bevels, callipers • holding devices, e.g. bench vices, G-clamps, holdfasts, sash clamps • hand cutting tools, e.g. chisels, saws, planes • striking tools, e.g. hammers, mallets • power tools, e.g. drills, jigsaws, routers • pneumatic tools
Application	• measuring/marking-out tools • holding devices • hand cutting tools • striking tools • power tools • pneumatic tools
Maintenance	• sharpening • disposal of blades/cutter replacement • tools and equipment • guards and attachments • servicing, e.g. adjustment, lubrication
Housekeeping	• storage • clean-up • transportation • environmental management
Safety	• administrative controls • tool selection • processes and procedures • risk management • energy sources • environment – dust fumes – waste – movement – barriers • personal protective equipment • duty of care to self and others

Selection and application of static machinery	
Description: This element equips students with the knowledge and skills to safely manipulate common static machinery used in furnishing.	
Key ideas	**Suggested content**
Identification	• purpose, capabilities and limitations of specific machinery • structural parts of the machine • guards and attachments • tooling • switching devices
Application	• basic operations • guards and attachments • tooling • switching devices
Maintenance	• structural parts • guards and attachments • tooling • servicing, e.g. adjustments, lubrication
Housekeeping	• storage • clean-up • transportation • environmental management
Safety	• administrative controls • machine selection • processes and procedures • risk management • energy sources • environment – dust – fumes – waste – noise – movement – barriers • personal protective equipment • duty of care to self and others

Materials selection, construction and assembly of a product	
Description: This element equips students with knowledge and skills to select materials and processes to construct and assemble a product.	
Key ideas	**Suggested content**
Identification	• materials – properties – applications – variables – tooling • processes and procedures, e.g. framing, carcase, joining systems
Application	• construction – dressing/sizing – material optimisation – tooling selection – joinery processes, e.g. carcase and framing – fixtures and fittings • assembly – flat panels – production systems – clamping/holding – adhesives – fixtures and fittings
Housekeeping	• storage • clean-up • transportation • environmental management
Safety	• administrative controls • equipment selection • processes and procedures • risk management • energy sources • environment – dust – fumes – waste – noise – movement – barriers • personal protective equipment • duty of care to self and others

Surface preparation and finishing	
Description: This element equips students with the knowledge and skills required to prepare surfaces and apply finishes.	
Key ideas	**Suggested content**
Identification	• purpose, capabilities and limitations of equipment • consumables • job requirements – surface preparation – surface finishing • processes and procedures, e.g. machine preparation, manual preparation, spray application, brush application
Application	• equipment • consumables • processes and procedures
Maintenance	• plant and equipment – servicing, e.g. cleaning, adjustments, lubrication of attachments and fittings, e.g. connectors, nozzles
Housekeeping	• storage, e.g. storing solvents, paints, chemicals • stock control • clean-up • transportation • environmental management
Safety	• administrative controls, e.g. Material Safety Data Sheets (MSDS) • equipment selection • processes and procedures • guards and attachments • risk management • energy sources • environment – waste – fumes – noise – movement – barriers • personal protective equipment • duty of care to self and others

4.5.3 Units of study

A course in Furnishing is to be based on the four units listed below. These units are mandatory; however, the content and integration of each unit is at the discretion of the school. It is expected that all key elements will be fully covered by the end of the course.

For this strand, "furnishing" could refer to renovations and repairs, shop fitting, boat building, cabinet making, picture framing and wood machining.

A. Industry orientation

This unit allows for the development of knowledge and skills in the furnishing industry. Delivery of this unit should be based upon industry standards and possible career pathways.

Related key elements:

- Introduction to the furnishing industry
- Safety in the furnishing workplace

Suggested activities:

- job-search activity on the web
- safety induction course (i.e. 30125 Qld)
- workplace visits
- workshop safety report
- safe use of tools and equipment
- work placement

B. Framing construction

This unit allows for the development of knowledge, understanding and skills required to complete a range of framing construction tasks. By the end of the unit, students should be able to plan, prepare and manufacture basic framing constructions.

Related key elements:

- Safety in the furnishing workplace
- Drawing interpretation and setting out
- Selection and application of hand and power tools
- Selection and application of static machinery
- Materials preparation, construction and assembly of a product

Suggested activities:

- constructing a stool, chair, table, picture frame, hallstand, framed and panelled door, desk, or rack

C. Carcase construction

This unit allows for the development of knowledge, understanding and skills required to complete a range of carcase finishing tasks. By the end of the unit, students should be able to plan, prepare and manufacture basic carcase constructions.

Related key elements:

- Safety in the furnishing workplace
- Drawing interpretation and setting out
- Selection and application of hand and power tools
- Selection and application of static machinery
- Materials preparation, construction and assembly of a product

Suggested activities:

- constructing a bedside cabinet, vanity cabinet, stereo cabinet, wine cabinet, display cabinet, bookshelf

D. Finishing

This unit allows for the development of knowledge, understanding and skills required to integrate materials, fixtures and fittings to present a well-finished furnishing project.

Related key elements:

- Safety in the furnishing workplace
- Drawing interpretation and setting out
- Selection and application of hand and power tools
- Selection and application of static machinery
- Materials preparation, construction and assembly of a product
- Surface preparation and finishing

Suggested activities:

- sanding by hand, with a power tool and a static machine
- applying stain, water- and solvent-based lacquers
- using pneumatic tools associated with furniture finishing
- observing safety procedures associated with furniture finishing

4.6 Industrial Graphics Studies

4.6.1 Structure

This strand covers the field of industrial graphics.

A course in Industrial Graphics Studies comprises:

- the mandatory study area core unit of work, integrated throughout the course
- studies developed from the **five** units identified.

Industry partnership

Schools should form a partnership with local industries so that students are exposed to employment opportunities and the latest in industrial graphics technology.

4.6.2 Key elements

- Introduction to the design and drafting industry
- Basic design concepts
- Drawing interpretation and production — manual drafting/freehand sketching
- Identification and interpretation — drafting standards and conventions
- 2D drawing production using computer-aided design and drafting systems
- 3D drawing production using computer-aided design and drafting systems

Optional:

- Computer-aided manufacturing (CAM)

Introduction to the design and drafting industry	
Description: This element provides a general overview of vocations available in the design and drafting sector.	
Key ideas	**Suggested content**
• Identification	• common fields/streams – computer-aided design and drafting (CADD) operators – draftsmen, e.g. production, mechanical, fabrication, electrical/electronic – industrial designers – architects • common trades/vocations – common names – job descriptions • careers – pathways – linking skills to employment options

Basic design concepts	
Description: This element equips students with the knowledge and understanding of design processes used in the manufacturing industry.	
Key ideas	**Suggested content**
Identification	• inputs – primary/secondary functions – design options – design constraints, e.g. cost, materials, resources – written instructions, e.g. specifications, standards
Application	• concept creation – analysing inputs – hypotheses – synthesising data • evaluation • presentation techniques – oral – written – graphic, e.g. sketches, CADD presentations – multimedia

Drawing interpretation and production — manual drafting/ freehand sketching	
Description: This element equips students with the knowledge and skills to interpret and draw various forms of graphical presentations using manual drafting formats.	
Key ideas	**Suggested content**
Identification	• formats – 2D viewing systems – 3D viewing systems • methods and techniques – manual drafting – freehand sketching – rendering – shading – dimensions – symbols/annotations – scale and proportion
Interpretation	• graphical content • dimensions • symbols/annotations • scale and proportion
Application	• manual drafting production • freehand sketch production, e.g. 2D/3D presentations, flow charts, bubble sketches • annotations

Identification and interpretation — drafting standards and conventions	
Description: This element equips students with the knowledge and skills to identify and interpret drafting standards and conventions used in technical presentations.	
Key ideas	**Suggested content**
Identification	• appropriate standards, e.g. architectural, engineering, electrical • conventions • formats – 2D viewing system – 3D viewing systems • methods and techniques – sketching – rendering – shading – dimensions – symbols/annotations – scale and proportion
Interpretation	• graphical content • dimensions • symbols/annotations • scale and proportion

2D drawing production using computer-aided design and drafting systems	
Description: This element equips students with the skills to prepare a 2D environment and produce or modify 2D drawings.	
Key ideas	**Suggested content**
Identification	• computer-aided design and drafting (CADD) environment – toolbars and menu – viewing tools – file types – coordinate system – applying standards – model space – paper space – macros • properties/defaults, e.g. scale, layers, colours, line types, dimension styles • support elements, e.g. blocks, attributes, hatching patterns
Application	• preparation of CADD environment • properties/defaults • support elements • templates and prototypes
Production	• 2D viewing systems – orthogonal projections – pictorial (2D) – development – geometrical constructions – diagrams and charts • appropriate standards • modification of existing objects • tables/lists • symbols/annotations • dimensions • preparation of 2D drawings from pictorial drawings/models • drawing outputs, e.g. plots, file exports

3D drawing production using computer-aided design and drafting systems	
Description: This element equips students with the skills to prepare a 3D computer-aided design and drafting (CADD) environment and produce or modify 3D drawings.	
Key ideas	**Suggested content**
Identification	• CADD environment – toolbars and menus – viewing tools – file types – coordinate system – applying standards – model space – paper space – macros • properties/defaults, e.g. scale, layers, colours, line types, dimension styles • support elements, e.g. blocks, attributes, hatching patterns • 3D modelling features, e.g. extrusion, animation
Application	• preparing the CADD environment • properties/defaults • support elements • 3D modelling features • templates and prototypes
Production	• 3D viewing systems — pictorial representations • presentation – assembly – animation – rendering – shadows • standards • modification of existing objects • generation of 2D drawings from 3D models • drawing outputs, e.g. plots, file exports

Optional: Computer-aided manufacturing (CAM)	
Description: This element equips students with the knowledge and skills to produce real-world outputs from a virtual 3D model.	
Key ideas	**Suggested content**
Identification	• machine features, e.g. axes of operation, cutting method • CADD/CAM environment • properties/defaults, e.g. machine parameters, stock parameters • processes and procedures, e.g. sequencing, simulations, modifications
Application	• machine features • preparation of CADD/CAM interface • properties/defaults • processes and procedures
Production	• machine operation systems • standards • templates and prototypes • modification of existing objects • manufacture of products • outputs, e.g. interface, export
Maintenance	• sharpening • disposable blades/cutter replacement • tools and equipment • guards and attachments • servicing, e.g. adjustment, lubrication
Housekeeping	• storage • clean-up • transportation • environmental management
Safety	• administrative controls • equipment selection • processes and procedures • risk management • energy sources • environment – dust – fumes – waste – noise – movement – barriers • personal protective equipment • duty of care to self and others

4.6.3 Units of study

A course in Industrial Graphics Studies is based on the five units listed below. These units are mandatory; however, the content and integration of each unit is at the discretion of the school. It is expected that all key elements will be fully covered by the end of the course.

For this strand, "industrial graphics" could refer to freehand sketching/manual drafting and CADD techniques.

A. Industry orientation

This unit allows for the development of knowledge and skills implicit in the design and drafting industry. Delivery of this unit should be based upon industry standards and possible career pathways and include an introduction to the design elements of the course.

Related key elements:

- introduction to the design and drafting industry
- basic design concepts (introductory only) Suggested activities:
- job-search activity on the web
- workplace visits
- work placement
- observing the use of graphical communication techniques, design concept development, computer
- hardware and software applications

Students intending to visit industrial worksites should undertake a safety induction course.

B. Graphics for the building and construction industry

This unit allows for the development of knowledge, understanding and skills required to complete a range of drafting production tasks related to the building and construction industry.

Related key elements:

- drawing interpretation and production — manual drafting/freehand sketching
- identification and interpretation — drafting standards and conventions
- 2D drawing production using computer-aided design and drafting systems
- 3D drawing production using computer-aided design and drafting systems

Suggested activities:

- producing 2D and 3D drawings related to the building and construction industry, e.g. roof structures, wall framing, footings, schematic diagrams (electrical), and plans of domestic and industrial dwellings

C. Graphics for the furnishing industry

This unit allows for the development of knowledge, understanding and skills required to complete a range of drafting production tasks related to the furnishing industry.

Related key elements:

- drawing interpretation and production — manual drafting/freehand sketching
- identification and interpretation — drafting standards and conventions
- 2D drawing production using computer-aided design and drafting systems
- 3D drawing production using computer-aided design and drafting systems

Optional:

- Computer-aided manufacturing (CAM) Suggested activities:
- producing 2D and 3D drawings related to the furnishing industry, e.g. kitchens, bathrooms, individual furniture items, storage systems

D. Graphics for general manufacturing industries

This unit allows for the development of knowledge, understanding and skills required to complete a range of drafting tasks related to general manufacturing industries such as the aerospace, automotive, engineering, marine, mining and plastics industries.

Related key elements:

- drawing interpretation and production — manual drafting/freehand sketching
- identification and interpretation — drafting standards and conventions
- 2D drawing production using computer-aided design and drafting systems
- 3D drawing production using computer-aided design and drafting systems

Optional:

- Computer-aided manufacturing (CAM) Suggested activities:
- producing 2D and 3D drawings — related to the general manufacturing industries, such as the aerospace, automotive, engineering, marine, mining and plastics industries — e.g. aircraft wing sections, water pumps, machinery parts, components/assemblies, hydraulic and electric schematics, robotics, boat-hull sections, drag-line components, plastic extrusions, canopies for human-powered vehicles

E. Industrial design

This unit allows for the development of knowledge, understanding and skills required to complete a range of design and drafting tasks related to the development of products.

Related key elements:

- Basic design concepts
- Drawing interpretation and production — manual drafting/freehand sketching
- 2D drawing production using computer-aided design and drafting systems
- 3D drawing production using computer-aided design and drafting systems Optional:
- Computer-aided manufacturing (CAM) Suggested activities:
- conceptualising and presenting 2D and 3D designs and drawings related to product development, e.g. concept sketches, working drawings, presentational drawings

4.7 Plastics Studies

4.7.1 Structure

This strand covers basic skills in the plastics industry.

A course in Plastics Studies comprises:

- the mandatory study area core unit of work, integrated throughout the course
- studies developed from the **four** units identified.

Industry partnership

Schools should form a partnership with local industry so that students are exposed to employment opportunities and the latest in plastics production technologies.

4.7.2 Key elements

- Introduction to the plastics industry
- Safety in the plastics workplace
- Drawing and information interpretation
- Materials selection and processing
- Selection and application of hand and power tools
- Selection and application of machinery/equipment

Introduction to the plastics industry	
Description: This element provides a general overview of vocations in the plastics industry, and the skills related to those vocations.	
Key ideas	**Suggested content**
Identification	• common fields/streams – production, e.g. extrusion, injection – fabrication, e.g. welding, forming – technical – chemical – administration • common trades/vocations – common names – job descriptions • careers – pathways – linking skills to employment options

Safety in the plastics workplace	
Description: This element equips students with the knowledge and skills to correctly identify plastics workplace hazards, manage risk and appreciate safe working practices.	
Key ideas	**Suggested content**
Identification — hazards	• involving equipment, e.g. rotating or heating equipment • electrical • environmental • chemical • pneumatic • physical, e.g. involving manual handling • fire, e.g. involving fuel, solvent, electricity
Application	• administrative controls* • tool selection • processes and procedures • storage • risk management* • energy sources • fire control • environment – dust – fumes – waste – noise – movement – barriers • personal protective equipment • manual handling techniques • duty of care to self and others
* See Appendix 1: Safety for further explanation	

Drawing and information interpretation	
Description: This element equips students with the knowledge and skills to interpret various forms of written and graphical information used in the plastics industry.	
Key ideas	**Suggested content**
Identification	• technical presentations (orthogonal, pictorial) – assembly – sub assembly – detail assembly – detail – schematic • technical information, e.g. manufacturers' specifications and manuals
Interpretation	• graphical content • dimensions • symbols/annotation • scale and proportion • technical information
Application	• marking out • set out production (as required) • job/component production to specification • assembly and disassembly of equipment to specification • diagnosing, testing and servicing equipment to manufacturers' specifications

Materials selection and processing	
Description: This element equips students with the knowledge and skills to select and process materials for various applications in the plastics industry.	
Key ideas	**Suggested content**
Identification	• classification of materials – thermoplastics (forming) – thermosetting plastics (hardening) • materials – properties, e.g. tensile strength, distortion – applications, e.g. marine and automotive applications – variables, e.g. shelf life, working time, cure time • tooling, e.g. forming, moulding, casting • processes and procedures – fabricating – moulding – extruding – injecting – casting – blow forming – vacuum forming – lay-up
Application	• selection – materials – products – tooling – equipment – consumables • production processes – fabricating – moulding – extruding – injecting – casting – blow forming – vacuum forming – lay-up
Housekeeping	• storage, e.g. storing solvents, chemicals • stock control • clean-up • transportation • environmental management
Safety	• administrative controls • equipment selection • processes and procedures • storage • risk management • energy sources • environment – dust – fumes – waste disposal – noise – movement – barriers • personal protective equipment • safe handling of chemicals • duty of care to self and others

Selection and application of hand and power tools	
Description: This element equips students with the knowledge and skills to safely manipulate common hand and power tools used in the plastics industry.	
Key ideas	**Suggested content**
Identification	• measuring/marking-out tools, e.g. verniers, callipers, feeler gauges • holding devices, e.g. bench vices, G-clamps • hand tools, e.g. saws, mallets, files, rollers, brushes • power tools, e.g. jigsaws, routers, grinders, drills • pneumatic tools, e.g. buff, drills, grinders
Application	• measuring/marking-out tools • holding devices • hand tools • power tools • pneumatic tools
Maintenance	• sharpening • disposal of blades/cutter replacement • tools and equipment • guards and attachments • servicing, e.g. adjustment, lubrication
Housekeeping	• storage • clean-up • transportation • environmental management
Safety	• administrative controls • tool selection • energy sources • processes and procedures • storage • risk management • environment – dust – fumes – waste – noise – movement – barriers • personal protective equipment • duty of care to self and others

Selection and application of machinery/equipment	
Description: This element equips students with the knowledge and skills to safely operate common machinery and equipment used in the plastics industry.	
Key ideas	**Suggested content**
Identification	• purpose, capabilities and limitations of specific machinery • structural parts of the machine • guards and attachments • tooling, e.g. dies, moulds, jigs • switching devices
Application	• basic operations • guards and attachments • tooling • switching devices
Maintenance	• structural parts • guards and attachments • tooling • servicing, e.g. adjustments, lubrication
Housekeeping	• storage • clean-up • transportation • environmental management
Safety	• administrative controls • machinery/equipment selection • processes and procedures • storage, e.g. storing attachments • guards, attachments, tooling, e.g. fitting attachments etc. • risk management • energy sources • environment – dust – fumes – waste – noise – movement – barriers • personal protective equipment • duty of care to self and others

4.7.3 Units of study

A course in Plastics Studies is to be based on the four units listed below. These units are mandatory; however, the content and integration of each unit is at the discretion of the school. It is expected that all key elements will be covered by the end of the course.

For this strand, "plastics" could refer to thermoplastics moulding, casting and embedding, repairing, boat building, automotive panels and plumbing.

A. Industry orientation

This unit allows for the development of knowledge, understanding and skills related to the plastics industry. Delivery of this unit may be based upon the practice and performance of routine tasks and skills.

Related key elements:

- Introduction to the plastics industry
- Safety in the plastics workplace

Suggested activities:

- job-search activity on the web
- workplace visits
- work placement
- workshop safety audit
- identifying safe work practices and safe work scenarios

B. Thermoplastic fabrication

This unit allows for the development of knowledge, understanding and skills required to apply a range of fabrication techniques. By the end of the unit, students should be able to plan and implement procedures to fabricate basic plastics products.

Related key elements:

- Safety in the plastics workplace
- Drawing and information interpretation
- Materials selection and processing
- Selection and application of hand and power tools
- Selection and application of machinery/equipment

Suggested activities:

- manufacturing products by measuring, cutting, bending, shaping, bonding and welding
- manufacturing simple moulds, jigs and formers

C. Thermoplastic moulding

This unit allows for the development of knowledge, understanding and skills required to use a range of thermoplastic moulding techniques. By the end of the unit, students should be able to prepare and implement moulding procedures to make basic plastics products.

Related key elements:

- Safety in the plastics workplace
- Drawing and information interpretation
- Materials selection and processing
- Selection and application of machinery/equipment

Suggested activities:

- manufacturing simple articles or components using the basic techniques of injection moulding, blow forming and vacuum forming

D. Thermosetting plastics

This unit allows for the development of knowledge, understanding and skills required to create a range of simple moulded products using thermosetting plastics. By the end of the unit students should be able to manufacture and repair simple products.

Related key elements:

- Safety in the plastics workplace
- Drawing and information interpretation
- Materials selection and processing
- Selection and application of hand and power tools
- Selection and application of machinery/equipment

Suggested activities:

- casting and embedding projects
- fibre-reinforced plastics (FRP) projects using moulds
- manufacturing simple plugs and moulds
- repairing damaged products (e.g. car panels, boats, surfboards) using thermosetting plastics

4.8 Industrial Technology Studies

4.8.1 Structure

This strand offers students the opportunity to develop work, life and/or leisure skills integrating the study area core of manufacturing, safety and technological processes within the selected units of study.

The flexibility of this course is intended to allow students to gain some knowledge and skills in a number of different industry areas, rather than focus on one area.

A course in Industrial Technology Studies comprises:

- the mandatory study area core, integrated throughout the course
- a minimum of **four** and a maximum of **six** units of study drawn from at least two of the seven industry-specific strands.

Industry partnership

Schools should form partnerships with local industries so that students are exposed to employment opportunities and the latest in relevant manufacturing technologies.

4.8.2 Key elements

The key elements covered in the course will be those related to units of study that schools select from the seven industry-specific strands.

Note: within these strands, each unit of study lists the related key elements that could be aligned with that particular unit.

The key ideas and suggested content will be those related to the key elements chosen. These are detailed under each key element within each strand.

4.8.3 Units of study

Schools will choose a minimum of **four** and a maximum of **six** units of study drawn from any of the seven industry-specific strands to develop a course in Industrial Technology Studies.

Courses which focus only on industry orientation units of study are not considered appropriate, because they do not allow students to develop a suitable range of processes or skills.

The content of each unit is at the discretion of the school and will be based on the suggested content for each key element chosen.

Activities may be drawn from those suggested within each unit, or may be developed by the school.

4.8.4 Contexts

In the delivery of this strand, the units of study could be covered within industrial, domestic and/or recreational contexts.

Industrial

This area would aim to develop practical knowledge and skills that might apply in an industrial environment. Activities in industrial situations include manufacture, maintenance and repair.

The industrial environment encompasses many sectors that provide employment opportunities, for example, construction, engineering, transport, mining and agriculture.

Domestic

This area would aim to develop practical knowledge and skills that will allow students to enhance their personal living standards. The ability to perform routine maintenance and development tasks in the home is both economical and desirable.

Ultimately, success in such activities will provide students with a sense of pride and self-worth, with the potential to transfer learned skills to other areas.

Recreational

This area would aim to develop practical knowledge and skills that might be used in a recreational context. There is a need for broad-based and integrated skills that enhance safe enjoyment and use of leisure time and the potential development of interests.

5. Learning experiences

5.1 Setting the learning environment

Manufacturing is an applied study, and practical activities in a workshop environment constitute an essential component of student learning. Teachers should plan learning experiences that are interesting, challenging and sufficiently varied to cover the objectives of the course. Teachers should prepare the student for life in a technological society and foster an ability to transfer acquired facts and skills to solve technological problems in a variety of situations.

Occupational health and safety is an integral part of all workshop activities and should be taught and modelled by the teacher in a way that helps students transfer their knowledge to future employment, recreation and leisure activities, and the home.

A course developed from this SAS should be delivered through a hands-on approach in which students are actively involved in project work.

Many learning experiences may be planned to help students acquire knowledge about industrial technology and its impact on society, and to develop their inquiry and practical skills. These include learning by:

- researching available resources
- following teacher demonstration
- undertaking practical exercises
- partaking in decision-making experiences
- listening to and watching audiovisual materials
- listening to and taking part in classroom discussion
- analysing and clarifying the nature of technological problems
- identifying, consulting and using reference sources
- discriminating between relevant and irrelevant information
- organising and recording information
- applying relevant knowledge to the resolution of technological problems
- working with individuals and in groups to solve technological problems
- deciding on appropriate solutions to problems
- planning and monitoring progress
- applying safe practices.

Teachers should organise industrial excursions, audiovisual resources, and visits from industrial personnel, and should draw upon library and resource centre facilities to supplement classroom activities.

6. Assessment

The purposes of assessment are to provide feedback to students and parents about learning that has occurred, to provide feedback to teachers about the teaching and learning processes, and to provide information on which to base judgments about how well students meet the general objectives of the course. In designing an assessment program, it is important that the assessment tasks, conditions and criteria are compatible with the general objectives and the learning experiences. Assessment then is an integral aspect of a course of study.

Assessment can be formative or summative. The distinction between formative and summative assessment lies in the purpose for which that assessment is used. Formative assessment is used to provide feedback to students, parents, and teachers about achievement over the course of study. This enables students and teachers to identify the students' strengths and weaknesses so students may improve their achievement and better manage their own learning. The formative techniques used should be similar to summative assessment techniques, which students will meet later in the course. This provides students with experience in responding to particular types of tasks, under appropriate conditions. So that students can prepare, it may be that feedback on any early assessment tasks can be used in a formative sense also to assist students prepare for later assessment tasks.

Summative assessment, while also providing feedback to students, parents and teachers, provides cumulative information on which levels of achievement are determined at exit from the course of study. It follows, therefore, that it is necessary to plan the range of assessment techniques and instruments/tasks to be used, when they will be administered, and how they contribute to the determination of exit levels of achievement. Students' achievements are matched to the standards of exit criteria, which are derived from the general objectives of the course. Thus, summative assessment provides the information for certification at the end of the course.

6.1 Underlying principles of exit assessment

The policy on exit assessment requires consideration to be given to the following principles when devising an assessment program for the two-year course of study.

- Information is gathered through a process of continuous assessment.
- Balance of assessments is a balance over the course of study and not necessarily a balance over a semester or between semesters.
- Exit achievement levels are devised from student achievement in all areas identified in the SAS as being mandatory.
- Assessment of a student's achievement is in the significant aspects of the course of study identified in the SAS and the school's work program.
- Selective updating of a student's profile of achievement is undertaken over the course of study.
- Exit assessment is devised to provide the fullest and latest information on a student's achievement in the course of study.

These principles are to be considered together and not individually in the development of an assessment program. Exit assessment must satisfy concurrently the six principles associated with it.

6.1.1 Continuous assessment

The major operating principle is *continuous assessment*. The process of continuous assessment provides the framework in which all the other five principles of balance, mandatory aspects of the SAS, significant aspects of the course, selective updating, and fullest and latest information exist and operate.

Continuous assessment is the means by which assessment instruments are administered at suitable intervals and by which information on student achievement is collected. It involves a continuous gathering of information and the making of judgments in terms of the stated criteria and standards throughout a two-year course of study.

Decisions about levels of achievement are based on information gathered, through the process of continuous assessment, at points in the course of study appropriate to the organisation of the learning experiences. Levels of achievement must not be based on students' responses to a single assessment task at the end of a course or instruments set at arbitrary intervals that are unrelated to the developmental course of study.

6.1.2 Balance

Balance of assessments is a balance over the course of study and not necessarily a balance within a semester or between semesters.

Within the strand course it is necessary to establish a suitable balance in the general objectives, assessment techniques and instruments/tasks, conditions and across the criteria. The exit criteria are to have equal emphasis across the range of summative assessment. The exit assessment program must ensure an appropriate balance over the course of study as a whole.

6.1.3 Mandatory aspects of the SAS

Judgment of student achievement at exit must be derived from information gathered about student achievement in those aspects stated in the study area specification as being mandatory, namely:

- the general objectives of *Knowledge & understanding, Applied processes* and *Practical skills*
- the study area core; and
- the key elements and key ideas for the relevant strand.

The exit criteria and standards stated for Approach B must be used to make the judgment of student achievement at exit from a course of study.

6.1.4 Significant aspects of the course of study

Significant aspects refer to those units/electives/contexts that the school selects in accordance with the particular structure of the strand. Significant aspects can complement mandatory aspects or be in addition to them. They will be determined by the context of the school and the needs of students at that school to provide a choice of learning experiences suitable to the location of the school, the local environment and the resources available.

The significant aspects must be consistent with the general objectives of the study area specification and complement the developmental nature of learning in the strand course.

6.1.5 Selective updating

In conjunction with the principle of fullest and latest information, information on student achievement should be selectively updated throughout the course.

Selective updating is related to the developmental nature of the course of study and operates within the context of continuous assessment. As subject matter is treated at increasing levels of complexity, assessment information gathered at earlier stages of the course may no longer be representative of student achievement. The information therefore should be selectively and continually updated (not averaged) to accurately reflect student achievement.

The following conceptions of the principle of selective updating apply:

- a systemic whole subject-group approach in which considerations about the whole group of students are made according to the developmental nature of the course and, in turn, the assessment program; in this conception, developmental aspects of the course are revisited so that later summative assessment replaces earlier formative information
- an act of decision making about individual students — deciding from a set of assessment results the subset which meets study area specification requirements and typically represents a student's achievements, thus forming the basis for a decision about a level of achievement. In applying decisions about individual students, the set of assessment results does not have to be the same for all students; however, the subset which represents the typical achievement of a student must conform to the parameters outlined in the school's study plan for the strand.

Selective updating must not involve students reworking and resubmitting previously graded assessment tasks. Opportunities may be provided for students to complete and submit additional tasks. Such tasks may provide information for making judgments where achievement on an earlier task was unrepresentative or atypical, or where there was insufficient information upon which to base a judgment.

6.1.6 Fullest and latest information

Judgments about student achievement made at exit from a school course of study must be based on the fullest and latest information available. This information is recorded on a student profile.

"Fullest" refers to information about student achievement gathered across the range of general objectives. "Latest" refers to information about student achievement gathered from the most recent period in which the general objectives are assessed. As the assessment program in a strand is developmental, fullest and latest information will most likely come from Year 12.

Information recorded on a student profile will consist of the latest assessment data on mandatory and significant aspects of the course, which includes the data gathered in the summative assessment program that is not superseded.

6.2 Exit criteria

In Manufacturing there are three criteria from which a student's exit level of achievement is derived:

- Knowledge & understanding
- Applied processes
- Practical skills.

The criteria are of equal weighting in determining a student's exit level of achievement. The three criteria with their dimensions are stated and defined in the following.

6.2.1 Criterion 1: Knowledge & understanding

Dimensions:

- knowledge recall
- familiar application

"Knowledge recall" is the recall of facts, content related to the key elements and key ideas, processes and procedures, technical information and terminology. Descriptive terms may include: *identify, label, list, state, match, name, define, describe, give examples*.

"Familiar application" involves students demonstrating an understanding of industry-specific knowledge in familiar situations. Descriptive terms may include: *explain, classify, illustrate, compile, paraphrase*.

6.2.2 Criterion 2: Applied processes

Dimensions:

- interpretation
- development
- evaluation

"Interpretation" involves the ability to select, use and explain available information (industry processes, procedures, safe work practices, plans, instructions, guidelines, specifications, etc..) to achieve a practical outcome. Descriptive terms may include: *calculate, estimate, select, translate, convert, clarify*.

"Development" is the ability to apply available information to develop processes and procedures, and organise materials and resources to complete a given task or project in accordance with industry guidelines and to industry standards. Descriptive terms may include: *sort, create, plan, sequence, stage, devise, investigate*.

"Evaluation" is the ability to propose possible solutions, revise choices, and justify the decisions made while undertaking a given task or project. It also includes the ability to assess outcomes set by the original requirements and/or specifications. Descriptive terms may include: *appraise, judge, consider, suggest, revise, compare, contrast, analyse, propose, review, conclude.*

6.2.3 Criterion 3: Practical skills

Dimensions:

- production
- utilisation
- housekeeping
- communication

"Production" is the ability to make or repair a product, or produce a drawing, within an agreed timeframe, with due precision and attention to industry standards. Descriptive terms may include: *measure, make, manufacture, construct, draw, service, machine, shape, form, join*.

"Utilisation" is the ability to use and exploit the capabilities of available physical resources. Descriptive terms may include: *control, manipulate, interact, operate*.

"Housekeeping" is the ability to put into practice methods to keep tools, machines and equipment functioning in working order in a safe work environment. Descriptive terms may include: *adjust, lubricate, clean, repair, store, transport*.

Note: In the delivery of the Industrial Graphics strand, housekeeping *could involve processes of file management*.

"Communication" is the ability to present verbal and graphical information using industry-specific terminology and standards. Descriptive terms may include: *sketch, write, speak, journal, log, read, listen.*

6.3 Suggested assessment techniques

It is recommended that assessment in this subject be undertaken through a series of projects. These projects could be single-unit projects or could integrate several units. A folio of work should be compiled for each student.

Projects could include:

- multimedia or single-media presentations
- integrated or thematic tasks
- product design, development and construction
- case studies
- research
- simulations

or any combination of the above.

Performance in the safety component of the core may be assessed in the following ways:

- observation of safe behaviour
- evidence of safe features in student's finished artefacts
- written tests which assess knowledge and understanding.

Areas of investigation will include:

- legislation
- planning
- personal safety
- working safely
- emergency procedures.

During the course, a variety of assessment techniques should be used and might include:

- objective and short-answer or response tests
- written responses
- oral presentations
- practical work
- teacher observation of student skills.

6.3.1 Objective and short-answer or response tests

These could include both closed questions (those to which there is a limited or precise response), and structured, short-answer, open questions (questions for which multiple answers are possible). They are mainly used as a quick, effective method of assessing the student's grasp of the *Knowledge & understanding* objectives of the course. Some examples are:

- multiple choice
- definitions of terms
- questions requiring short answers or paragraph responses
- alternative responses
- matching/classification.

6.3.2 Written responses

This technique is particularly useful with tasks requiring responses to open questions.

Stimulus material for writing tasks may include:

- newspaper and journal articles
- documents such as industrial awards, legislation, software or training manuals
- industry-based products, pamphlets, manuals
- brochures, advertisements
- cartoons
- graphs, charts, tables, statistics
- guest speakers
- excursions
- computer software packages
- audiotapes and videotapes, photographs
- films and television programs.

6.3.3 Oral presentations

Oral presentations can occur in a range of situations, including one-to-one and small-group presentations, individual presentations to a large group (seminars), and can include demonstrations, debates, interviews and simulations of hypothetical situations.

The length and degree of complexity of oral presentations would be expected to increase as students progress through the course. Oral presentations should be accompanied by visual and other aids to enhance the presentation.

6.3.4 Practical work

This may take a variety of forms, such as:

- practical demonstrations
- activities performed in simulated industry or workplace situations
- planning, preparing and producing a product to meet determined specifications.

Practical work may also be linked with oral or written response components.

6.3.5 Teacher observation of student skills

This technique requires teacher observation of a defined activity such as:

- observing group or team situations where group members undertake tasks and allocate responsibilities
- applying knowledge or following industry guidelines and procedures in a workplace or workplace-related situation
- team tasks
- operating tools and equipment
- completing defined tasks within a designated timeline
- occupational health and safety requirements.

6.4 Determining exit levels of achievement

At the end of the course, the school is required to award each student an exit level of achievement from one of the five categories:

- Very High Achievement
- High Achievement
- Sound Achievement
- Limited Achievement
- Very Limited Achievement.

The school must award an exit standard for each of the three criteria *Knowledge & understanding*, *Applied processes* and *Practical skills*, based on the principles of assessment described in this SAS. The criteria are derived from the general objectives and are described in section 7.2. The standards associated with the three exit criteria are described in section 7.4. When teachers are determining a standard for each criterion, it is not always necessary for the student to have met each descriptor for a particular standard; the standard awarded should be informed by how the qualities of the work match the descriptors overall.

For Year 11, particular standards descriptors may be selected from the matrix and/or adapted to suit the task. These standards are used to inform the teaching and learning process. For Year 12 tasks, students should be provided with opportunities to understand and become familiar with the expectations for exit. The exit standards are applied to the summative body of work selected for exit.

Of the seven key competencies, six[2] are relevant to assessment in this subject and are embedded in the descriptors in the standards matrix. The descriptors refer mainly to aspects of knowledge and understanding in familiar situations; interpretation of data; development of procedures; application of safe work practices; evaluation of tasks and projects; assessment of task and project outcomes; practical skills involved in the production or repair of articles; the use of resources, and maintenance of tools and equipment; and verbal and graphical communication.

When standards have been determined in each of the three criteria of *Knowledge & understanding*, *Applied processes* and *Practical skills*, the following table is used to award exit levels of achievement, where *A* represents the highest standard and *E* the lowest. The table indicates the *minimum combination of standards* across the criteria for each level.

Table 2: Awarding exit levels of achievement

Exit level of achievement	Minimum combination of standards
Very High Achievement	Standard *A* in any two exit criteria and a *B* in the third criterion.
High Achievement	Standard *B* in any two exit criteria and a *C* in the third criterion.
Sound Achievement	Standard *C* in any two exit criteria and a *D* in the third criterion.
Limited Achievement	Standard *D* in any two exit criteria.
Very Limited Achievement	Standard *E* in the three criteria.

[2] KC1: collecting, analysing and organising information; KC2: communicating ideas and information, KC3: planning and organising activities; KC5: using mathematical ideas and techniques; KC6: solving problems; KC7: using technology

Table 3: Standards associated with exit criteria

Criteria	Standard A	Standard B	Standard C	Standard D	Standard E
Knowledge & understanding • knowledge recall • familiar application	The student: • consistently demonstrates a breadth and depth of knowledge in recalling a comprehensive range of facts, processes and procedures, technical information, techniques and terminology related to the key elements and key ideas • consistently demonstrates, through explanation and illustration, a thorough understanding of industry-specific knowledge in familiar situations.	The student: • demonstrates a breadth and/or depth of knowledge in recalling a range of facts, processes and procedures, technical information, techniques and terminology related to the key elements and key ideas • demonstrates, through explanation and/or illustration, an understanding of industry-specific knowledge in most familiar situations.	The student: • demonstrates fundamental knowledge in recalling facts, processes and procedures, technical information, techniques and/or terminology related to the key elements and key ideas • demonstrates, through explanation or illustration, a basic understanding of fundamental industry-specific knowledge in familiar situations.	The student: • recalls some facts, processes and procedures, technical information, techniques and/or terminology related to the key elements and key ideas • demonstrates, through explanation or illustration, some understanding of a limited range of industry-specific knowledge in familiar situations.	The student: • recalls a few basic facts related to the key elements and key ideas.

Criteria	Standard A	Standard B	Standard C	Standard D	Standard E
Applied processes • interpretation • development • evaluation	The student: • accurately selects and interprets the most appropriate information to achieve practical outcomes • develops effective processes and procedures and independently organises materials and resources to efficiently complete given tasks • effectively analyses processes and procedures to propose elegant solutions and justify decisions and choices made in the completion of tasks and projects to industry standard.	The student: • selects from and interprets available information to achieve practical outcomes • develops processes and procedures and organises materials and resources to complete given tasks • analyses processes and procedures to propose solutions and justify decisions and choices made in the completion of tasks and projects to industry standard.	The student: • uses available information to achieve most practical outcomes • develops simple processes and procedures and organises materials and resources to complete most given tasks • considers processes and procedures to propose possible solutions and justify some decisions and choices made in the completion of most tasks and projects to industry standard.	The student: • occasionally uses basic information to achieve some practical outcomes • shows an awareness of some processes and procedures when undertaking tasks and projects.	The student: • uses some basic information, although few practical outcomes are achieved • follows some simple procedures and uses allocated resources to undertake given tasks.

Criteria	Standard A	Standard B	Standard C	Standard D	Standard E
Practical skills • production • utilisation • housekeeping • communication	The student: • effectively and competently manages resources to make or repair a product or produce a drawing within agreed timeframes, with attention to industry standards and minimal variation in precision and/or finish • independently uses suitable methods for maintaining tools and equipment and continually practises safe work procedures • consistently and effectively presents verbal and/or graphical information using industry-specific terminology and standards.	The student: • manages resources efficiently to make or repair a product or produce a drawing within agreed timeframes, with attention to industry standards and minor variation in precision and/or finish • generally uses suitable methods for maintaining tools and equipment and practises safe work procedures • effectively presents verbal and/or graphical information using industry-specific terminology and standards.	The student: • uses resources to make or repair a product or produce a drawing, within agreed timeframes, although the product or drawing may vary in precision and/or finish • is aware of, and usually practises, basic maintenance requirements and safety procedures • presents verbal and/or graphical information using some industry-specific terminology and standards.	The student: • uses resources to make or repair a product or produce a drawing which may vary considerably in precision and/or finish • needs to be reminded of maintenance requirements, safety procedures and the need to practise them • presents some verbal and/or graphical information.	The student: • is generally unable to make or repair a product or produce a drawing without major defect • needs to be constantly reminded of maintenance requirements, safety procedures and the need to practise them • attempts to present some information.

7. Language education

It is the responsibility of all teachers to develop students' language skills and to monitor their progress in using language. This responsibility entails developing students' abilities to understand what they read and hear. They can then communicate this information in effective language when they speak and write about the subject matter.

Teachers should help students to:

- develop reading skills for manufacturing, such as being able to read pamphlets, brochures, manuals, tables
- develop writing and speaking skills
- use technical terms such as the names of parts of machinery, materials and equipment in manufacturing
- use language conventions of grammar, spelling, punctuation and presentation
- use scientific conventions for diagrams, graphs and information technology related to manufacturing
- select and sequence relevant information in a variety of forms, such as procedures, descriptions, reports and explanations.

Students should be encouraged to use language in a meaningful way within realistic contexts where possible. Opportunities should be provided for students to access, process and present information in various forms and media as suggested in the following lists.

Drawing upon sources of information, such as:	**Using language for the purposes of:**	**Presenting information in forms such as:**
• observations	• restating information	• discussions
• experiments	• identifying/recognising	• short responses
• textbooks	• listening/responding	• oral presentations
• handbooks	• collecting	• demonstrations
• manuals	• selecting	• audiovisual presentations
• product brochures	• listing	• charts
• journal articles	• classifying	• brochures
• magazines	• sequencing	• pamphlets
• newspaper articles	• explaining/describing	• graphs
• advertisements	• analysing	• diagrams
• videos and films	• solving problems	• sketches
• discussions	• reaching conclusions	• models and prototypes
• internet		• photographs and captions

Students should be familiar with both the format and the language of the tasks used for assessment.

8. Quantitative concepts and skills

Success in dealing with situations in life and work depends on the development and integration of various abilities, such as being able to:

- comprehend basic concepts and terms underpinning number, space and measurement
- calculate and apply numerical procedures
- use calculators and computers
- use skills and apply concepts from one problem to another.

Students should be encouraged to develop their understanding and to learn through the incorporation — to varying degrees — of mathematical strategies and approaches to tasks. They should be presented with experiences that stimulate their mathematical interest and hone those quantitative skills that contribute to operating effectively within a practical industrial environment, and to participating successfully in society.

The distinctive nature of Manufacturing may require that new mathematical concepts be introduced and new skills developed to prepare students to cope with the quantitative demand of their personal lives or to participate in a specific workplace environment. In many cases, however, it will be a matter of teachers encouraging the use of quantitative skills and understandings that were developed previously. Within suitable learning contexts and experiences, opportunities are to be provided for the revision, maintenance, and extension of such skills and understandings.

9. Educational equity

Equity means fair treatment of all. In developing work programs from this SAS, schools are urged to consider the most appropriate means of incorporating the following notions of equity.

Schools need to provide opportunities for all students to demonstrate what they know and what they can do. All students, therefore, should have equitable access to educational programs and human and material resources. Teachers should ensure that the particular needs of the following groups of students are met: female students; male students; Aboriginal students; Torres Strait Islander students; students from non-English-speaking backgrounds; students with disabilities; students with gifts and talents; geographically isolated students; and students from low socioeconomic backgrounds.

The subject matter chosen should include, whenever possible, the contributions and experiences of all groups of people. Learning contexts and community needs and aspirations should also be considered when selecting subject matter. In choosing appropriate learning experiences, teachers can introduce and reinforce non-racist, non-sexist, culturally sensitive and unprejudiced attitudes and behaviour. Learning experiences should encourage the participation of students with disabilities and accommodate different learning styles.

It is desirable that the resource materials chosen recognise and value the contributions of both females and males to society and include the social experiences of both sexes. Resource materials should also reflect the cultural diversity within the community and draw from the experiences of the range of cultural groups in the community.

Efforts should be made to identify, investigate and remove barriers to equal opportunity to demonstrate achievement. This may involve being proactive in finding out about the best ways to meet the special needs, in terms of learning and assessment, of particular students. The variety of assessment techniques in the work program should allow students of *all* backgrounds to demonstrate their knowledge and skills in a subject. The SAS criteria and standards should be applied in the same way to all students.

Teachers may find the following resources useful for devising an inclusive work program:

ACACA 1996, *Guidelines for Assessment Quality and Equity*, available from <www.acaca.org.au>

ANTA 2004, *A Guide to Equity and the AQTF*, available from Australian Training Products Ltd <www.atpl.net.au>

QSA 2009, *Special provisions for school-based assessments in Authority and Authority-registered subjects*, available from <www.qsa.qld.edu.au>

QSA 2006, *Policy Statement: Equity*, available from <www.qsa.qld.edu.au>

EQ 2006, *CRP-PR-009: Inclusive Education*, available from <http://education.qld.gov.au/strategic/eppr>

EQ 2005, *Inclusive education*, available from <http://education.qld.gov.au/studentservices/inclusive>

QSCC 2001, *Equity Considerations for the Development of Curriculum and Test Material*, available from <www.qsa.qld.edu.au>.

10. Resources

Selecting resource material to support a course in the manufacturing industries will be governed to some extent by local factors. Schools should draw upon their own resources and local facilities as well as from the resources described below.

10.1 Text and reference books

A wide variety of textbooks and resource materials that could be used as sources of information about the manufacturing industries is available. Book suppliers provide information regarding current publications. A range of manuals arts texts and workbooks by D. Schlyder are available from P.C.S. Publications, PO Box 1535, Toowoomba QLD 4350; phone (07) 4734 8820; fax (07) 4634 8812. Current series include Engineering, Furnishing, General Construction and Graphics.

10.2 World Wide Web

Many interactive and static websites can be used to enhance a course in the manufacturing industries, and often include useful resources. Some particularly useful sites include:

- Curriculum Corporation (CC) — a professional resource for teachers: <www.curriculum.edu.au/ccsite>
- Resource Generator — a resource for training packages: <www.resourcegenerator.gov.au>
- Standards Australia: <www.standards.org.au>
- TVET Australia Product Services: <www.atpl.net.au>

10.3 Electronic media and learning technology

Videos, DVDs and television recordings are available on a variety of topics related to the manufacturing industries. Computer programs and CD-ROMs may be useful as learning tools to access information presented in a variety of forms, and to help students gain ICT skills.

10.4 Government and industry resources

Various government and industry organisations provide personnel, advice, resources and information to help construct and implement a course in the manufacturing industries. Some of these include:

- Aviation Australia: <www.aviationaustralia.net.au>
- Be Constructive — Construction Skills Queensland (CSQ): <www.beconstructive.com.au>
- Construct my career — Construction and Property Services Industry Skills Council: <www.constructmycareer.com.au>
- Construction Training Centre Queensland: <www.ctc.qld.edu.au>
- Industrial Technology and Design Teachers' Association (INTAD): <www.intad.asn.au>
- Industry Skills Councils (ISCs): <www.isc.org.au>
- Manufacturing Skills Australia (MSA): <www.mskills.com.au>
- Motor Trades Association of Queensland (MTAQ): <www.mtaq.com.au>
- National Training Information Service (NTIS): <www.ntis.gov.au>
- Plastics and Rubber Technical Educational Centre (PARTEC): <www.partec.qld.edu.au>

Approach C: Strand allowing for a VET outcome

1. Overview

Students will complete this strand in two separate parts:

- the Certificate I Furnishing qualification outlined in Approach A, delivered over two semesters

and

- an Authority-registered subject based on units of study selected from those outlined in Approach B, delivered in the remaining two semesters.

2. Course organisation

2.1 Two semesters

Teachers should refer to Approach A of this SAS for information regarding requirements for delivering the Certificate I furnishing qualification.

As the certificate will be assessed using a competency-based approach, students will *not* receive a level of achievement. The school must issue the student with a qualification or statement of attainment.

2.2 Two semesters

Teachers should refer to Approach B of this SAS for information regarding planning for the two-semester course, taking into account the information below.

The study area core, as described in Approach B, is mandatory and must be integrated into and progressively developed throughout the one-year course. A minimum of **two**, and a maximum of **four** units of study should be chosen from Approach B.

This section of the course will be assessed using the criteria and standards detailed in Approach B of the SAS. The school must award an exit standard for each of the three criteria based on the principles of assessment, according to the information provided in Approach B.

Appendix 1: Safety

Administrative controls

"Administrative controls" are defined processes and procedures that contribute to a safe and efficient working environment.

Examples include:

- codes of behaviour
- job descriptions
- workplace guidelines
- responsibilities and expectations
- inductions
- training
- documentation
- ongoing monitoring and review.

Administrative controls are often implemented as part of a risk-management process.

Risk-management process

This is an ongoing process designed to develop and maintain a safe working environment. It promotes best practice through procedures aimed at minimising risk associated with hazards in the workplace.

This process should be undertaken at various times, including:

- immediately, if it has not been done before
- when a change occurs
- after an incident or near accident
- at regularly scheduled times.

Hazards and risks are NOT the same thing.

- A **hazard** is something with the potential to cause harm.
- **Risk** is the likelihood that death, injury or illness might result because of the hazard.

Risk management: the 5-step process

Step 1: Identify hazards in the work environment

Hazards may include:

- energy sources, e.g. electricity, gas or induced heat
- noise
- chemical substances, e.g. paints, oils, thinners, acids
- environmental substances, e.g. dust, radioactive materials, waste
- plant and equipment
- heights
- confined spaces
- elements, e.g. sun, heat
- poor work practices, e.g. incorrect manual and mechanical handling techniques, inappropriate use of personal protective equipment (PPE).

Step 2: Assess the risk

For each of the hazards:

- Estimate the likelihood of an incident occurring at your workplace, bearing in mind existing control measures.
- Estimate a range of consequences (i.e. any potential injuries) of an incident occurring in your workplace.
- Combine your likelihood and consequence estimates to assess the risk.
- Develop a list of priority actions to minimise or eliminate identified risks.

Note: Examples of risk management and rating processes are available in the Department of Education Manual (DOEM) and Australian Standards.

Step 3: Decide on control measures

A control measure is an action designed to eliminate or minimise identified risks.

In many cases it will be necessary to use more than one control measure to satisfactorily manage exposure to a risk. The control measures selected should:

- adequately control exposure to the risk
- not create another hazard
- allow participants to do their work without undue discomfort or distress.

- Try to eliminate the risk.
- If this is not possible, minimise the risk by one or a combination of either:
  - *substituting* a safer material, process or equipment
  - *redesigning* work processes
  - *isolating* the hazard, e.g. by using barriers or guards.
  - administrative controls, e.g. induction, instruction, training and signage
  - use of personal protective equipment (PPE).

Most effective

Least effective

Adapted from R*isk Management Code of Practice 2007*, <www.deir.qld.gov.au/workplace/law/codes/riskman>.

Step 4: Implement control measures

Measures include:

- work procedures
- communication
- training and instruction
- supervision
- resource maintenance.

Step 5: Monitoring and reviewing

The final step examines the effectiveness of chosen measures by determining whether:

- control measures have been implemented as planned
- control measures are working
- any new risks have been identified. To determine whether or not control measures are effective:
- consult with workers, supervisors, and health and safety representatives
- measure people's exposure to a hazard (e.g. measure noise to isolate its source)
- monitor incident reports.

It is vital that dates are set to review the entire workplace health and safety (WH&S) risk-management process.