Field Engineering and Technology

Review of *Design* and *Technology* Level 2 achievement and unit standards

Unit standards

Subfield	Domain	ID
Design	Design - Computer Graphics	7481
	Design - Graphic Communication	7507-7509, 7512, 18995, 18996
	Generic Design	7489-7492
Technology	Materials Technology	7525-7528
	Process Technology	7537-7540
	Technology - General Education	13390, 13393, 13395, 13398, 13401, 13404, 13407, 13410, 13412

Achievement standards

Domain	ID	Subject reference
Design - Graphic Communication	90318	Graphics 2.1
	90319	Graphics 2.2
	90320	Graphics 2.3
	90321	Graphics 2.4
	90322	Graphics 2.5
	90323	Graphics 2.6
	90324	Graphics 2.7
	90325	Graphics 2.8
Technology - General Education	90339	Biotechnology 2.1
	90340	Electronics and Control Technology 2.1
	90341	Food Technology 2.1
	90342	Information and Communication Technology 2.1
	90343	Materials Technology 2.1
	90344	Structures and Mechanisms Technology 2.1
	90346	Biotechnology 2.2
	90347	Electronics and Control Technology 2.2
	90348	Food Technology 2.2
	90349	Information and Communication Technology 2.2
	90350	Materials Technology 2.2
	90351	Structures and Mechanisms Technology 2.2
	90352	Technology 2.3
	90360	Technology 2.5
	90361	Biotechnology 2.6
	90362	Biotechnology 2.7

	90363	Electronics and Control Technology 2.6
	90364	Electronics and Control Technology 2.7
	90365	Food Technology 2.6
	90366	Food Technology 2.7
	90367	Information and Communication Technology 2.6
	90368	Information and Communication Technology 2.7
	90371	Materials Technology 2.6
	90372	Materials Technology 2.7
	90373	Structures and Mechanisms 2.6
	90773	Technology 2.4

The Ministry of Education and NZQA National Qualifications Services have completed a review of the achievement and unit standards listed above.

New Registration date **November 2011**

Date new versions published **November 2011**

Planned review date **December 2014**

Summary of review and consultation process

In 2008 the Ministry of Education (MoE) and NZQA began to review achievement and unit standards in light of the revised New Zealand Curriculum (NZC). This Alignment of Standards (AoS) review also addressed duplication of outcomes, credit parity, fairness, consistency, and coherence. The AoS review was guided by the revised NZC itself and the Principles for Standards Review. A copy of the NZC is available at: http://nzcurriculum.tki.org.nz/Curriculum-documents/The-New-Zealand-Curriculum.

Teacher subject associations were involved in the review, and draft achievement standards were the focus of wide consultation, especially with secondary schools and teachers. Extensive resources, including student exemplars, were also developed to support these standards, and are available on the MoE and/or the NZQA websites.

The review of unit standards included consultation with tertiary providers to assess continued relevance and likely future use of the standards. Unit standards that duplicate achievement standard outcomes and those without the likelihood of future tertiary use were recommended for expiry.

National consultation was undertaken in 2010, with the results analysed by Research New Zealand. The responses were generally positive.

The review of these Level 2 unit and achievement standards was completed in time for implementation in schools in 2012. The review of unit and achievement standards at Level 1 was completed in time for implementation in schools in 2011. Standards at Level 3 will be implemented in 2013.

Main changes resulting from the review

- All NZC Level 7 (NZQF Level 2) outcomes derived from the NZC are now assessed using achievement standards, and there are no longer any unit standards linked to the NZC.
- Existing achievement standards were reviewed and new achievement standards were developed to align with the NZC. See table below.
- Grading criteria for achievement standards were reviewed in accordance with the Standards Review Guidelines.
- Unit standards that recognised similar outcomes as achievement standards were recommended for expiry. See table below.

For a more detailed description of the review of, and the changes to, the Design and Technology standards see the appendix at the end of this report.

Impact on existing organisations with consent to assess

Current consent for			Consent extended to		
Nature of consent	**Classification or ID**	**Level**	**Nature of consent**	**Classification or ID**	**Level**
Domain	Design – Graphic Communication	2	Domain	Design and Visual Communication	2
Domain	Generic Design	2	Domain	Design and Visual Communication	2
Domain	Materials Technology	2	Domain	Construction and Mechanical Technologies	2
Domain	Process Technology	2	Domain	Processing Technologies	2
Domain	Technology - General Education	2	Domain	Generic Technology	2
Domain	Design – Computer Graphics	2	Standard	91337	2
Standard	7481	2	Standard	91337	2
Standard	7490	2	Standard	91337	2
Standard	7491	2	Standard	91342, 91343	2
Standard	7492	2	Standard	91342, 91343	2
Standard	7507	2	Standard	91337	2
Standard	7508	2	Standard	91342, 91343	2
Standard	18995	2	Standard	91338	2
Standard	18996	2	Standard	91338	2

Impact on Consent and Moderation Requirements (CMR)
(Formerly known as AMAP)

All new achievement standards have been registered on CMR 0233.

Impact on registered qualifications

Key to type of impact	
Affected	The qualification lists a reviewed classification (domain or subfield) in an elective set The qualification lists a standard that has changes to level or credits The qualification lists a C or D category standard
Not materially affected	The qualification lists a standard that has a new title The qualification lists a standard that has a new classification

The following table identifies qualifications developed by other SSBs that are affected by the outcome of this review. The SSBs have been advised that the qualifications require revision.

Ref	Qualification Title	Classification or ID	SSB Name
0461	National Certificate in Design (Introductory Skills) (Level 2)	7481, 7489, 7490, 7491, 7492, 7507, 7508, 7509, 7512, 7525, 7526, 7527, 7528, 7537, 7538, 7539, 7540	InfraTrain New Zealand
0640	National Certificate in Design (Draughting) (Level 2)	7481, 7492	
0672	National Certificate in Engineering and Technology (for the Design and Construction Sector) (Level 4)	7481, 7489, 7490, 7491, 7492, 7507, 7508, 7509, 7525, 7526, 7527, 7528, 7537, 7538, 7539, 7540, 18995, 18996	
1368	National Certificate in Building, Construction, and Allied Trades Skills (Level 2)	90323	Building and Construction Industry Training Organisation

Impact of changes on NCEA Exclusions List

For transition purposes, the following exclusions will apply for new achievement standards.

New Achievement standard	Excluded against each of these standards
91337	7481, 7490, 7507
91338	18995,18996, 90318
91339	90319, 90320
91340	90321
91341	90323
91342	7491, 7492, 7508, 7509, 7512, 90324, 90325
91343	7491, 7492, 7508, 7509, 7512, 90324, 90325
91354	13410, 90347, 90348, 90349, 90350, 90351, 90352
91355	13410, 90347, 90348, 90349, 90350,

	90351, 90352
91356	13393, 13395, 13398, 13401, 13407, 90339, 90340, 90341, 90342, 90343, 90344, 90360, 90363
91357	13410, 90347, 90348, 90349, 90350, 90351, 90352
91358	13393, 13395, 13398, 13401, 13407, 90339, 90340, 90341, 90342, 90343, 90344, 90360, 90363

Review Categories and changes to classification, title, level, and credits

The following summary shows the changes made to the standards as a result of the review. All changes are in **bold**. Where a new or a new version of an externally assessed achievement standard is registered, the following designation appears after the title **[Externally Assessed]**.

Key to review category	
A	Dates changed, but no other changes are made - the new version of the standard carries the same ID and a new version number
B	Changes made, but the overall outcome remains the same - the new version of the standard carries the same ID and a new version number
C	Major changes that necessitate the registration of a replacement achievement standard with a new ID
D	Achievement standard will expire and not be replaced

Externally assessed achievement standards categorised as category C or D expire at the end of	**December 2011**

Internally assessed achievement standards categorised as category C or D expire at the end of	**December 2012**

Unit standards categorised as category C or D expire at the end of	**December 2013**

Engineering and Technology > Design > Design - Graphic Communication

ID	Title	Level	Credit	Review Category
90322	Produce a mock-up and model to explore design ideas	2	3	D

Engineering and Technology > Design > Generic Design

ID	Title	Level	Credit	Review Category
7489	Identify design problems and carry out investigation	2	4	D

Engineering and Technology > Design
Engineering and Technology > Technology

ID	Ref	Domain	Title	Level	Credit	Review Category
7481		Design – Computer Graphics	Produce design ideas and images using computer graphics programs	2	3	C
7490		Generic Design	Apply visual design elements to solve design problems	2	4	C
7507		Design – Graphic Communication	Use freehand sketching techniques to show design development	2	4	C
91337	**2.30**	**Design and Visual Communication**	**Use visual communication techniques to generate design ideas [Externally Assessed]**	**2**	**3**	
18995		Design – Graphic Communication	Produce axonometric drawings	2	3	C
18996		Design – Graphic Communication	Produce perspective and instrumental drawings	2	3	C
90318		Design – Graphic Communication	Produce two-dimensional and three-dimensional annotated freehand sketches to show design ideas	2	3	C
91338	**2.31**	**Design and Visual Communication**	**Produce working drawings to communicate technical details of a design [Externally Assessed]**	**2**	**4**	
90319		Design - Graphic Communication	Produce two-dimensional instrumental drawings	2	3	C
90320		Design - Graphic Communication	Produce three-dimensional instrumental drawings	2	3	C
91339	**2.32**	**Design and Visual Communication**	**Produce instrumental perspective projection drawings to communicate design ideas [Externally Assessed]**	**2**	**3**	
90321		Design - Graphic Communication	Describe and explain design and its implications for society	2	3	C

ID	Ref	Domain	Title	Level	Credit	Review Category
91340	**2.33**	**Design and Visual Communication**	**Use the characteristics of a design movement or era to inform own design ideas**	**2**	**3**	
90323		Design - Graphic Communication	Design and present a solution for an architectural or environmental brief	2	3	C
91341	**2.34**	**Design and Visual Communication**	**Develop a spatial design through graphics practice**	**2**	**6**	
7491		Generic Design	Develop and refine design solutions	2	3	C
7492		Generic Design	Present design work	2	3	C
7508		Design - Graphic Communication	Produce illustration and advertising graphics	2	4	C
7509		Design - Graphic Communication	Produce circuit and/or systems graphics	2	4	C
7512		Design - Graphic Communication	Produce production drawings to meet final design requirements	2	3	C
90324		Design - Graphic Communication	Design and present a solution for an engineering or technological brief	2	3	C
90325		Design - Graphic Communication	Design and present a solution for a media or technical illustration brief	2	3	C
91342	**2.35**	**Design and Visual Communication**	**Use visual communication techniques to compose a presentation of a design**	**2**	**6**	
91343	**2.36**	**Design and Visual Communication**	**Use visual communication techniques to compose a presentation of a design**	**2**	**4**	

Engineering and Technology > Technology > Materials Technology

ID	Title	Level	Credit	Review Category
7525	Select materials and establish processes for a manufacturing task	2	4	D
7526	Use, and care for, portable machine tools in materials technology	2	4	D
7527	Apply fabrication, assembly, and finishing methods in materials technology	2	4	D
7528	Work to design tolerances using marking out and measuring tools safely in materials technology	2	4	D

Engineering and Technology > Technology > Construction and Mechanical Technologies

ID	Ref	Title	Level	Credit	Review Category
91344	**2.20**	**Implement advanced procedures using resistant materials to make a specified product with special features**	**2**	**6**	**New**
91345	**2.21**	**Implement advanced procedures using textile materials to make a specified product with special features**	**2**	**6**	**New**
91346	**2.23**	**Demonstrate understanding of advanced concepts used to make textile products**	**2**	**4**	**New**
91347	**2.22**	**Demonstrate understanding of advanced concepts used to make products**	**2**	**4**	**New**
91348	**2.24**	**Demonstrate understanding of advanced concepts related to structural frameworks**	**2**	**3**	**New**
91349	**2.25**	**Demonstrate understanding of advanced concepts related to machines**	**2**	**3**	**New**
91350	**2.26**	**Make advanced adaptations to a pattern to change the structural and style features of a design**	**2**	**4**	**New**

Engineering and Technology > Technology > Process Technology

ID	Title	Level	Credit	Review Category
7537	Use information technology to obtain and present information for a project in process technology	2	3	D
7538	Develop, and apply time management and project organisation to, a design brief in process technology	2	3	D
7539	Produce project presentation using computers and reprographics in process technology	2	3	D
7540	Identify and obtain materials for manufacturing, and develop a sequence for manufacturing	2	3	D

Engineering and Technology > Technology > Processing Technologies

ID	Ref	Title	Level	Credit	Review Category
91351	**2.60**	**Implement advanced procedures to process a specified product**	**2**	**4**	**New**
91352	**2.61**	**Demonstrate understanding of advanced concepts used in processing**	**2**	**4**	**New**
91353	**2.62**	**Demonstrate understanding of advanced concepts used in preservation and packaging for product storage**	**2**	**4**	**New**

Engineering and Technology > Technology > Technology - General Education

ID	Title	Level	Credit	Review Category
13390	Develop technological solutions by using knowledge and analysis of technological practice	2	10	D
13404	Modify materials to produce a prototype of a technological solution	2	6	D
13412	Use engineering practices to construct a prototype of a structure capable of bearing a point load	2	6	D
90346	Develop and implement a one-off solution in biotechnology	2	6	D
90361	Examine technological knowledge in biotechnology practice	2	4	D
90362	Demonstrate skills in biotechnology	2	4	D
90364	Demonstrate skills in electronics and control technology	2	4	D
90365	Examine technological knowledge in food technology practice	2	4	D
90366	Demonstrate skills in food technology	2	4	D
90367	Examine technological knowledge in information and communication technology practice	2	4	D
90368	Demonstrate skills in information and communication technology	2	4	D
90371	Examine technological knowledge in materials technology practice	2	4	D
90372	Demonstrate skills in materials technology	2	4	D
90373	Examine technological knowledge in structures and mechanisms practice	2	4	D
90773	Examine how technological practice is influenced by responsibilities to the wider community	2	4	D

Engineering and Technology > Technology

ID	Ref	Domain	Title	Level	Credit	Review Category
13393		Technology - General Education	Use biological agents to develop a biotechnological system or environment	2	6	C
13395		Technology - General Education	Design and incorporate a control system into a prototype of a technological solution	2	6	C
13398		Technology - General Education	Use food technology to modify an existing food product to produce a technological solution	2	6	C
13401		Technology - General Education	Employ distance information and communication technologies to produce a technological solution	2	6	C
13407		Technology - General Education	Use a mechanism in a prototype of a technological solution to meet specified requirements	2	6	C
90339		Technology - General Education	Develop and model a conceptual design in biotechnology	2	6	C
90340		Technology - General Education	Develop and model a conceptual design in electronics and control technology	2	6	C
90341		Technology - General Education	Develop and model a conceptual design in food technology	2	6	C
90342		Technology - General Education	Develop and model a conceptual design in information and communication technology	2	6	C
90343		Technology - General Education	Develop and model a conceptual design in materials technology	2	6	C
90344		Technology - General Education	Develop and model a conceptual design in structures and mechanisms	2	6	C
90360		Technology - General Education	Inform own technological practice through the characterisation of an existing production process	2	4	C

ID	Ref	Domain	Title	Level	Credit	Review Category
90363		Technology - General Education	Examine technological knowledge in electronics and control technology practice	2	4	C
91356	**2.3**	**Generic Technology**	**Develop a conceptual design for an outcome**	**2**	**6**	
91358	**2.5**	**Generic Technology**	**Demonstrate understanding of how technological modelling supports risk management [Externally Assessed]**	**2**	**4**	
13410		Technology - General Education	Design and model a mass production process	2	6	C
90347		Technology - General Education	Develop and implement a one-off solution in electronics and control technology	2	6	C
90348		Technology - General Education	Develop and implement a one-off solution in food technology	2	6	C
90349		Technology - General Education	Develop and implement a one-off solution in information and communication technology	2	6	C
90350		Technology - General Education	Develop and implement a one-off solution in materials technology	2	6	C
90351		Technology - General Education	Develop and implement a one-off solution in structures and mechanisms	2	6	C
90352		Technology - General Education	Develop a means for multi-unit production of a technological outcome	2	6	C
91354	**2.1**	**Generic Technology**	**Undertake brief development to address an issue**	**2**	**4**	
91355	**2.2**	**Generic Technology**	**Select and use planning tools to manage the development of an outcome**	**2**	**4**	
91357	**2.4**	**Generic Technology**	**Undertake effective development to make and trial a prototype**	**2**	**6**	

Engineering and Technology > Technology > Generic Technology

ID	Ref	Title	Level	Credit	Review Category
91359	**2.6**	**Demonstrate understanding of the role of material evaluation in product development [Externally Assessed]**	**2**	**4**	**New**
91360	**2.7**	**Demonstrate understanding of redundancy and reliability in technological systems [Externally Assessed]**	**2**	**4**	**New**
91361	**2.8**	**Demonstrate understanding of sociocultural factors, and how competing priorities are managed, in technology**	**2**	**4**	**New**
91362	**2.9**	**Demonstrate understanding of the nature of technological outcomes**	**2**	**4**	**New**
91363	**2.10**	**Demonstrate understanding of sustainability in design [Externally Assessed]**	**2**	**4**	**New**
91364	**2.11**	**Demonstrate understanding of advanced concepts related to human factors in design**	**2**	**4**	**New**
91365	**2.12**	**Demonstrate understanding of advanced concepts used in manufacturing**	**2**	**4**	**New**
91366	**2.13**	**Undertake development and implementation of an effective manufacturing process**	**2**	**6**	**New**

Engineering and Technology > Technology > Digital Technologies

ID	Ref	Title	Level	Credit	Review Category
91367	**2.40**	**Demonstrate understanding of advanced concepts relating to managing shared information within information systems [Externally Assessed]**	**2**	**3**	**New**
91368	**2.41**	**Implement advanced procedures to produce a specified digital information outcome with dynamically linked data**	**2**	**6**	**New**
91369	**2.42**	**Demonstrate understanding of advanced concepts of digital media**	**2**	**4**	**New**
91370	**2.43**	**Implement advanced procedures to produce a specified digital media outcome**	**2**	**4**	**New**
91371	**2.44**	**Demonstrate understanding of advanced concepts from computer science [Externally Assessed]**	**2**	**4**	**New**
91372	**2.45**	**Construct a plan for an advanced computer program for a specified task**	**2**	**3**	**New**

ID	Ref	Title	Level	Credit	Review Category
91373	2.46	Construct an advanced computer program for a specified task	2	3	New
91374	2.47	Demonstrate understanding of advanced concepts used in the construction of electronic environments	2	3	New
91375	2.48	Implement advanced interfacing procedures in a specified electronic environment	2	3	New
91376	2.49	Implement advanced techniques in constructing a specified advanced electronic and embedded system	2	3	New
91377	2.50	Demonstrate understanding of local area network technologies	2	3	New
91378	2.51	Implement procedures for administering a local area network	2	4	New

Appendix

Level 2 Technology Generic Achievement Standards

Process of Aligning Standards with the New Zealand Curriculum

The draft Level 2 matrix and achievement standards have been derived from the achievement objectives in the Technology learning area of the *New Zealand Curriculum* (NZC) and the Technology Specialist Knowledge and Skills (referred to as the Technology Specialist Body of Knowledge or BoK). The Technology BoK used in this development can be found at: http://www.techlink.org.nz/curriculum-support/tks/resources/Technological-Context-Knowledge-and-Skills-07-2009.pdf.

The Level 2 Technology Matrix

As with the Level 1 Technology matrix, the Level 2 Technology matrix provides a framework that shows the relationships between the generic Technology standards and the specialist categories of specific knowledge and skill standards, as developed from the NZC and the Technology BoK. Teaching and learning programmes, or courses, in Technology can be assessed from anywhere across this matrix. The Level 1 and 2 matrix provides an indication of how knowledge, skills and practice are expected to progress, reflecting Levels 6 and 7 of the NZC.

Consistency of step ups across the matrix

The following terms have been agreed to in principle as the basis of between-level progressions and within-standard progressions (Achieved (A), Merit (M), and Excellence (E)) in the specialist categories of Construction and Mechanical Technologies, Digital Technologies and Processing Technologies.

- Descriptors that differentiate knowledge and skill at NCEA Levels 1, 2 and 3 are; Level 1 – Basic, Level 2 – Advanced, and Level 3 – Complex. Explanatory notes unpack these in detail for each focus area.

- Knowledge-related descriptors that differentiate A, M, and E are; A – demonstrate understanding, M – demonstrate in-depth understanding, and E – demonstrate comprehensive understanding. Explanatory notes unpack these in detail for each focus area.

- Skill-related descriptors that differentiate A, M, and E are; A – implement procedures, M – skilfully implement procedures, and E – efficiently implement procedures. Explanatory notes unpack these in detail for each focus area.

Please note, the achievement standards in the Design and Visual Communication category do not consistently use the terms specified above, and were largely developed prior to the specialist knowledge and skill development.

Addressing Duplication

Careful consideration of the unit standards showed that there was either significant duplication with the achievement standards, or the unit standards were rendered redundant by the changes in the new curriculum. The unit standards have been recommended for expiry.

Addressing Credit Parity

The Credit Parity principle - one credit should reflect a notional 10 hours of learning, practice and assessment for an average candidate - gives a clear guideline to the allocation of credit value. This principle has been used to allocate credits to all achievement standards.

External and Internal Assessment

The majority of technology achievement standards are drafted as standards to be internally assessed in recognition that this is the best mode of assessment for the learning being evidenced. Internal assessment allows assessment activities and /or outcomes produced by the students to be more varied and better suits the overall goals of the teaching and learning programme.

Nine standards have been drafted as external across the matrix to ensure sufficient external credits are available for a range of technology courses to be endorsed. The generic achievement standards drafted for external assessment are 2.5, 2.6, 2.7 and 2.10. All achievement standards within the Construction and Mechanical Technologies and Processing Technologies have been drafted as standards to be assessed internally. The Digital Technologies standards drafted for external assessment are 2.40 and 2.44. The Design and Visual Communication standards drafted for external assessment are 2.30, 2.31 and 2.32.

Specific Comments – Generic Technology

The first nine Generic Technology standards (2.1-2.9), which are derived from Level 7 NZC Curriculum objectives, provide progression from the Level 6 standards. Each achievement objective relates to one achievement standard with the exception of Outcome Development and Evaluation, which has again been separated into two standards (2.3 and 2.4).

The four additional standards added to the generic section of the Level 1 technology matrix have also all been progressed to Level 2. The two design-related standards have been progressed to focus on issues associated with sustainability (2.10) and innovation in design and advanced concepts related to human factors (2.11). The two manufacturing related standards have been progressed to focus on advanced concepts (2.12) and effective practices (2.13) in manufacturing. The two design standards are seen as likely to be used across all specialist categories of Technology. It is likely the two manufacturing standards will be most relevant and used across Processing and Construction and Mechanical categories, although there also are opportunities for use in Electronics within Digital Technologies.

Specific Comments – Construction and Mechanical Technologies

All Level 1 achievement standards in Construction and Mechanical Technologies have been progressed to focus on advanced concepts and/or procedures as appropriate to Level 2.

Advanced concepts related to products made from resistant or textile materials refer to knowledge of how and why techniques are brought together to achieve features of quality

crafting and knowledge of safe practice across school and industry settings. Advanced procedures related to working with resistant and textile materials refer to the scheduling of techniques to achieve required features.

Advanced concepts in structures refer to understandings related to how forces act in members of pin jointed structures. Advanced concepts in machines refer to understanding lifting machines and the relationships between efficiency and safety.

Specific Comments – Digital Technologies

All Level 1 achievement standards in Digital Technologies have been progressed to focus on advanced concepts, procedures, techniques, and tasks and/or programs as appropriate to Level 2.

Advanced concepts related to information management refer to the relationship between tools, techniques, design elements, and legal and ethical considerations in relation to information management. Advanced procedures related to information management refer to the use of advanced features and techniques in the development of an integrated compound document system, including object linking and embedding requirements.

Advanced concepts related to digital media refer to the relationship between tools, techniques, effective and appropriate asset management, file management, and naming and other standards and conventions in relation to digital media. Advanced procedures related to digital media refer to the use of advanced techniques in the development of a digital media outcome with original content, and that integrates media types.

Advanced concepts from computer science are the concepts of computability and tractability, the formal specification of programming languages, data representations and coding, and usability heuristics. Advanced tasks for computer science are those involving sequential data and requiring input, sequential, conditional, and iterative algorithmic structures and allowing for a modular solution. An advanced computer program refers to a program written in a programming language that:

- will include variables, assignment, predefined actions (may include but are not limited to predefined methods, functions, or procedures), and expressions
- will include sequence, selection, and iteration control structures
- will include multiple programmer defined modules (functions, methods, procedures, etc), and calls to these modules (the modules are not expected to have parameters)
- uses data in sequential data structures (arrays, lists, or files)
- obtains and uses input from a user, files, or other external sources
- has been tested and works correctly.

Advanced concepts related to electronics focus on understandings of how different sub-systems can be linked so that they work together compatibly in an electronic and embedded system and on the function of the components involved. Advanced interfacing procedures related to electronics refer to the selection, testing and debugging of the hardware and software that allow sensors and actuators to work together compatibly to meet the given specifications for the specified electronic environment. Advanced techniques related to electronics refer to such things as:

- laying out and constructing functional circuits on PCBs using CAD software and manufacturing systems eg photo resist or engraving machines

- soldering of high-quality joints on closely spaced pads
- calculations using Ohms Law, P = I2R or T = R.C
- fault finding using visual inspection and multimeters to test for voltage and continuity
- developing testing and debugging strategies for electronic and embedded systems to ensure they work properly
- employing safe workshop practice.

The infrastructure-related standards which focus on understanding basic infrastructure concepts and servicing personal computers at Level 1 have been progressed to focus on concepts and components of local area networks and administrating local area networks at Level 2.

Specific Comments – Processing Technologies

All Level 1 achievement standards in Processing Technologies have been progressed to focus on advanced concepts and procedures appropriate for Level 2.

Advanced concepts related to processing refer to knowledge of how and why techniques are brought together to achieve required outcomes and knowledge of safe practice across school and industry settings. Advanced procedures related to processing refer to performing a parallel sequence of processing operations and tests to make a successful product.

Advanced concepts in preservation and packaging refer to understandings related to how combinations of decay mechanisms can be resolved through preservation and packaging techniques suitable for storing across different national environments.