



NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

Final date for issue of award is 31 December 2008

NEW ZEALAND CERTIFICATE IN ENGINEERING – MECHANICAL WORK EXPERIENCE GUIDELINES

Aim of Work Experience

The aim of the work experience component for the New Zealand Certificate in Engineering is to supplement and integrate the academic learning with practical knowledge and experience, and hence to develop further competence in technician engineering through actual on-job experience.

Sources of Suitable Experience

Mechanical engineering has a wide field of application concerned primarily with the design and production of all mechanical contrivances or machines, including prime movers (conversion of energy to mechanical power), vehicles, machine tools and production machines. Work experience for this certificate can come from the following fields: aviation, automation, plant for civil engineering, diesel, electrical, gas, general engineering trades, building services, hydraulic, manufacturing, marine, mining, motor, pneumatic, precision, printing, the process industries, refrigeration, steam, water purification and special adaptations of these fields. Employers for many of the above fields are to be found in government enterprises, territorial authorities, the transport industry, industrial plants, manufacturing, and other parts of the private sector, including consultants.

Advising the Employer

The candidate's employer should be advised by the candidate of the requirements of these guidelines, preferably prior to the candidate commencing employment but in any event as early as possible in the work experience, in order to ensure that the employer is aware of the type of experience required and can make the appropriate arrangements to provide it. Mentoring services are available through organisations such as the Institution of Professional Engineers New Zealand (IPENZ) if the employer is unable to assist.

Core Expectations

Basic Academic Knowledge

The basic academic knowledge will be acquired through a course of full or part

time study generally at a polytechnic. Often this study is completed prior to commencing work experience. The requirements are specified in the Qualifications Authority's Advanced Vocational Awards Handbook.

Breadth

A broad range of experience is desirable including exposure to investigation, design or development, supervision, management, testing, operating, undertaking diagnostic support for the operation of complex systems, installing, commissioning and servicing. The work undertaken towards NZCE should have a variety of activities that require thought as to method, reliability, cost, and commercial as well as engineering factors. An exposure to real situations and equipment is advisable, as this will give an appreciation of what is feasible and practical in the design and operation of systems. A candidate should also be able to appreciate projects as a whole from specification through to completion, even if involved in only a small part.

Level of Accomplishment

On completion of academic and work experience the candidate should be capable of self-directed work, particularly in systems design, installation and commissioning, leading small teams, making judgements covered by defined methods or procedures, and then deciding, using readily available information, which procedure, system or component to use.

Work Experience Credit for Related Qualifications

Between six months and eighteen months work experience may be credited from a completed apprenticeship, a Trade Certificate, an Advanced Trade Certificate or a National Certificate at level 3 or above in any relevant area from the following:

- engineering trades such as maintenance and diagnostics, fabrication engineering, toolmaking and machining, welding engineering, fitting and turning
- automotive engineering (including heavy equipment)
- aircraft engineering (mechanical).

The time credited will be determined according to the details recorded in the Work Experience Record Book. Candidates should submit a certified copy of the certificate of completion of apprenticeship, Trade Certificate, Advanced Trade Certificate or National Certificate (a certified copy is one which is signed by a legally authorised person such as a justice of the peace, a solicitor, or a notary public as an authentic copy of the original).

It may be possible that time can be credited from qualifications other than those above. Advice should be sought from the Qualifications Authority.

Fundamental Practical Knowledge

Candidates should be able to demonstrate by the type of work undertaken during their work experience that they understand the capabilities, limitations and important requirements governing the use of the particular processes, devices or equipment. The work must include sufficient practical experience, either hands-on or by direct observation, to enable candidates to have a general

understanding of most of the following:

- using tools, engineering machinery and protective equipment
- working with (producing and/or reading) technical drawings
- using test equipment
- developing safe practices for work environments and working within statutory or industry standards for safety.

NZCE Work Experience Relevant to Mechanical Engineering

Candidates should gain experience in both mechanical engineering practice and in design, research and development as below. Further experience may be gained in a broader management role.

Note that the items in the following lists are not to be regarded as having equal weighting; it is important that the candidate completes a wide range of activities in the fields listed in the previous paragraph. The process of approving Work Experience Record Books will be assisted by cross-referencing activities entered in the book to these activities.

1 Mechanical Engineering Practice

- 1.1 Selecting materials and applying properties of common workshop materials.
- 1.2 Machining various tool insert profiles to the correct specifications.
- 1.3 Heat-treating metals.
- 1.4 Using all types of metal fasteners.
- 1.5 Using lathes, boring bars, surface grinders, cam grinders (automotive only), milling machines, valve and seat refacing equipment.
- 1.6 Detecting and repairing cracks.
- 1.7 Undertaking static and dynamic balancing.
- 1.8 Soldering, brazing, oxy-acetylene welding using electric, MIG and TIG welding techniques.
- 1.9 Moulding, casting and fabricating components. Identifying limitations and factors governing choice of process.
- 1.10 Maintaining, repairing or modifying hydraulics, cylinders and/or motors in automotive heavy vehicles, equipment or machinery such as tractors, trucks, heavy motor vehicles and equipment.
- 1.11 Using engineering instruments, vernier, micrometer, telescopic gauges etc.

- 1.12 Maintaining and overhauling plant, equipment and controls for all types of applications, such as power production and manufacturing machinery, and building services for industrial and commercial buildings. This includes an understanding of bearings and seals and their applications to differing duties, their correct fitting and adjustment.
- 1.13 Applying principles of preventative maintenance, condition based monitoring and other modern maintenance methods.
- 1.14 Working with services generation and reticulation, eg steam, water and compressed air.

2 Design, Research and Development

This category includes the process of developing mechanical devices and systems from a concept through sketching, producing working drawings, testing prototypes, to implementation, and includes costing and client liaison. Candidates must demonstrate an understanding of the design process.

- 2.1 Producing sketches and designs (including calculations) for pilot situations or adaptation of engines to operate machinery for industry and/or for use in a specific or general way.
- 2.2 Reading information from drawings which could be for mechanisms, plant design to suit manufacturing or other industrial applications.
- 2.3 Designing mechanical engineering components, devices or equipment (including calculations, draughting to current New Zealand standards, drawing up specifications and making cost estimates).
- 2.4 Carrying out non-destructive tests or tests-to-failure on materials or machine components.
- 2.5 Evaluating mechanical products and testing them against design objectives.
- 2.6 Developing and constructing specialised machinery.
- 2.7 Developing mechanical instruments and apparatus for research and scientific purposes.
- 2.8 Consulting with clients and colleagues on matters relevant to design, production and implementation.

2.9 Designing a commissioning programme for a new or recently installed plant, including staff training

Additional Relevant Activities

Involvement in the following activities also provides relevant work experience.

- Total Quality Management, including problem solving techniques.
- Total Productive Maintenance.
- Techniques for cost benefit analysis of expenditure.
- Team work related skills, e.g. conflict resolution, running meetings etc.
- Project management.
- Budgeting, reporting, and classification of expenditure, i.e. difference between R&M and capital expenditure and cost benefit analysis.
- Working with specific legislation affecting the work place such as:
 - Health and Safety in Employment Act, 1992
 - The Resource Management Act, 1991
 - The Building Act, 1991.