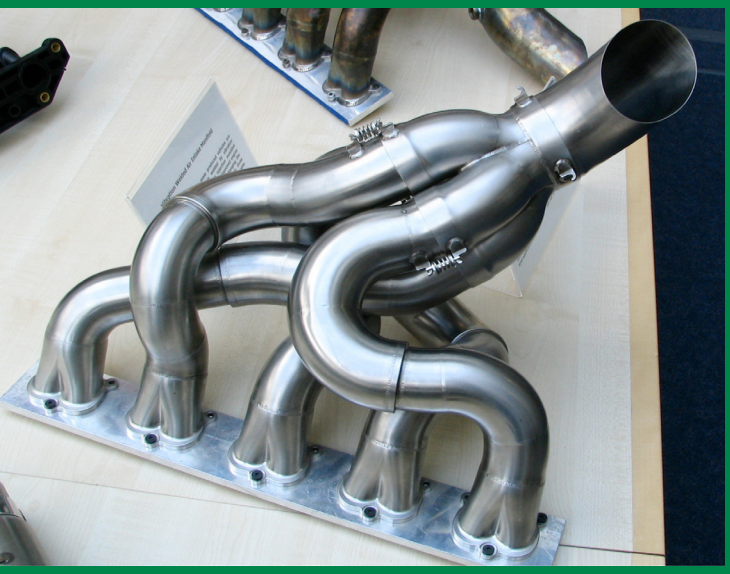
International
Specialised
Skills
Institute Inc

Australian Government
Department of Education, Science and Training

Welding of Titanium, Titanium Alloys and Exotic Materials



Stuart Graves
ISS Institute Overseas Fellowship

Fellowship supported by the
Department of Education, Science and Training,
Commonwealth of Australia

Contents

Published by International Specialised Skills Institute, Melbourne.

ISS Institute
101/685 Burke Road
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AUSTRALIA

February 2006

Also extract published on www.issinstitute.org.au

1: Acknowledgements

Fellowship organisation:

The International Specialised Skills Institute (ISS Institute).

Members of the Board of the Institute for considering the application and awarding the fellowship.

Carolynne Bourne, for her endless enthusiasm and belief in trades.

Numerous tradesmen, instructors and mentors who in the past have assisted and encouraged the West Australian Fellow to strive for excellence, including but not limited to:
Tommy Yeowart, Les Baker, Frank Whittle, Alan Kiel, Tony Sullivan, Harry Routledge, Fred Osborne, Don Tuxford, Adam Adaszko and Joe Bandiera

Fellowship sponsor:
Department of Education, Science and Technology (DEST)
Michael Reardon (Victorian State Manager DEST)

Employer support:

Challenger	TAFE WA
John Scott	Division director
Don Tuxford	Program manager metals
Bob Cousens	Co-ordinator “innovative teaching and learning strategies”

Without Bob none of this would have been possible.

Interested parties:

MERSITAB Metals Manufacturing and Services Industry Training Council Inc.
The above organisation produced and manage the training package which is used to train welders and fabricators throughout Australia.

WTIA Welding Technology Institute of Australia

The WTIA are the foremost body in Australia in regard to welding and joining technology and also fabrication, they work along side Standards Australia to assist in interpreting and implementing various standards pertinent to welding and fabrication.

Argus research
This organisation was commissioned by the West Australian Government (Department of Education and Training) to research employment demand and predicted skills requirements in Western Australia from 2003 to 2007

Score Practical Welding Solutions
Score are an employer who have carved a niche market as specialist fabricators and welders of Titanium and exotic metals for specific uses throughout Australia

Specialised Welding
Specialised Welding are an employer who are very similar to Score

WASA
Western Australian Shipbuilders' Association Inc are an employer group who are end users of the MERSITAB developed training package as are the above mentioned employers.

2: Introduction

International Specialised Skills Institute (ISS Institute)

Since 1990, ISS Institute, an independent, national, innovative organisation, has provided opportunities for Australian industry and commerce, learning institutions and public authorities to gain best-in-the-world skills and experience in traditional and leading-edge technology, design, innovation and management.

ISS Institute offers a broad array of services to upgrade Australia's capabilities in areas that lead to commercial and industrial capacity and, in turn, return direct benefits to Australia's metropolitan, rural and regional businesses and communities.

Our core service lines are identifying capabilities (knowledge, skills and insights) to fill skill gaps (skill deficiencies), which are not available in accredited university or TAFE courses; acquiring those capabilities from overseas (Overseas Skills Acquisition Plan - Fellowship Program); then placing those capabilities into firms, industry and commerce, learning institutions and public authorities through the ISS Research Institute.

Skill Deficiency

This is where a demand for labour has not been recognised and where accredited courses are not available through Australian higher education institutions. This demand is met where skills and knowledge are acquired on-the-job, gleaned from published material, or from working and/or study overseas. This is the key area targeted by ISS Institute.

Overseas Skills Acquisition Plan - Fellowship Program

Importantly, fellows must pass on what they have learnt through a report and ISS Institute education and training activities and events such as workshops, lectures, seminars, forums, demonstrations, showcases and conferences. The activities place these capabilities, plus insights (attitudinal change), into the minds and hands of those that use them - trades and professional people

alike - the multiplier effect.

ISS Research Institute

At ISS Institute we have significant human capital resources. We draw upon our staff, industry partners, specialists in their field and Fellows, here and around the world.

Based on our experience and acute insights gained over the past fifteen years, we have demonstrated our capabilities in identifying and filling skill deficiencies and delivering practical solutions.

Our holistic approach takes us to working across occupations and industry sectors and building bridges along the way:

- Filling skill deficiencies and skill shortages,
- Valuing the trades as equal, but different to professional disciplines,
- Using 'design' as a critical factor in all aspects of work.
- Working in collaboration and enhancing communication (trades and professional),
- Learning from the past and other contemporary cultures, then transposing those skills, knowledge and insights, where appropriate, into today's businesses.

The result has been highly effective in the creation of new business, the development of existing business and the return of lost skills and knowledge to our workforce, thus creating jobs.

We have no vested interest other that to see Australian talent flourish and, in turn, business succeed in local and global markets.

Carolynne Bourne AM, ISS Institute's CEO formula is "skills + knowledge + good design + innovation + collaboration = competitive edge • good business".

Individuals gain; industry and business gain; the Australian community gains economically, educationally and culturally.

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Sponsor

DEST Department Education Science and Training
DEST provides national leadership and works in collaboration with the States and Territories, industry, other agencies and the community in support of the Government's objectives. They develop and implement policies to ensure the continuing relevance of education, science and training to contemporary needs and the growing requirement for lifelong learning. They also ensure high quality and value for money in delivering Government funded programs

3: About the Fellow

Name *STUART L GRAVES*

Contact Details *Swan TAFE*
Lloyd Street
Midland
6936
Tel 08 9374 6343
Email stuart.graves@swantafe.wa.edu.au

Qualifications *Trade qualification as "Boilermaker" from City and Guilds of London Institute*
Australian trade recognition as "Boilermaker first class Welder first class"
Certificate IV in workplace training and assessment
"Coded" Welder, qualified to a wide range of international and Australian welding codes
Qualified to AS 1796 (highest welding qualification available in Australia)

Memberships *Member of The Welding Institute Welding and Joining Society (UK)*

Experience

1979-1991 Served an indentured apprenticeship as a Boilermaker with British Nuclear Fuels at the Sellafield nuclear plant. Went on to undertake further training to become a coded welder. Performed welding duties to nuclear standards on a variety of Stainless Steels on pressure vessels and associated nuclear liquor systems.

1991- Migrated to Australia worked in heavy engineering performing welding duties on heavy walled pressure vessels, decompression chambers and off shore gas rigs.

1991-1994 Employed as leading hand Boilermaker with a sheetmetal based company manufacturing dust extraction equipment for mining industry.

1994-1995 Self employed sub-contractor working in Aluminium Shipbuilding industry on Aluminium and Stainless Steel piping systems.

1995-Present employed by TAFE WA lecturing in metal fabrication and welding, teaching highest welding qualification available in Australia to mature adult welders as well as routine apprentice classes.

Throughout my career I have chosen to on one hand specialise my skills in Gas Tungsten Arc Welding, whilst on the other hand have chosen to work in a variety of industries to expand my experience and skill base.

Have a belief that good hand skills can be applied to any practical task given the appropriate mind set!

4: The Australian Context

The current situation within the Australian fabrication and welding industry is one of concern.
There are insufficient tradesmen to cover the work that is currently under construction or consideration within Western Australia, regardless of what the rest of Australia has in place.

The Australian fabrication and welding industry is now competing on a world stage where our Asian neighbours have the ability to produce the same product cheaper.
This as a continuation of the industrial revolution, where "third world" countries are now becoming smarter in their approach to manufacturing and are more than capable of producing a product cost effectively because of very cheap labour costs.

This can only make the Australian situation graver.

Australian manufacturing companies have failed to employ sufficient apprentices in the past and this is generating a chronic shortage of suitably qualified and experienced tradesmen.

There has been an upturn in the economy and a boom in the West Australian resource sector resulting in considerable investment in plant and infrastructure, and the problem is there are simply not enough qualified or experienced tradesmen to go around, to the extent where some projects are being put on hold unto there is an improvement in the availability of skilled labour.

A key factor in all of this has been the lack of foresight by successive governments at both state and federal levels. The privatisation of major manufacturing companies and the out sourcing of labour has seen a down turn in the availability of apprenticeships, the move towards casual labour has also impacted on the industry as the previous career paths are no longer available which in turn leads to attrition from the trade area.

The West Australian Government through the Department of Training has expended considerable amounts of money trying to entice people back to various trades; this so far appears to be folly as the amount of people returning to trades is negligible.

The education and training system in Australia is also responsible for the current situation, the system caters for the "under achiever". Often anyone who is a self motivated "high achiever" soon becomes disenfranchised with the reporting system where there is no distinction between someone who achieves at a high standard or someone who manages to drag themselves over the required "bar", all students are reported as "competent" or "not yet competent" this results in a plethora of mediocrity. This is likely to be compounded in Western Australia with the future introduction of Outcomes Based Education.

Industry organisations

- The Welding Technology Institute of Australia.

- Metals Manufacturing and Services Industry Training Council Incorporated.

- Australian National Training Authority (now defunct)

- Department of Education Science and Technology

- Education and training providers (both public and private)

5: Aim of fellowship

The aim of the fellowship is for the fellow to gain the required skills to be able to weld and fabricate using Titanium and Titanium alloys. The emerging use of Titanium and Titanium alloys in Australia, particularly in the construction of Nickel extraction facilities, has left industry with a skills gap in relation to the amount of suitably qualified and experienced welding operators.

Using this new skill coupled with my existing abilities it will be possible to train work colleagues and others in the required skills necessary to fabricate and weld Titanium and Titanium alloys.

The implementation of these skills by trained people will help to alleviate the critical skill shortage currently experienced in this area within Western Australia and Australia as a whole.
This will be achieved by travelling overseas to visit pre-eminent institutions that specialise in this area and to develop training that will assist to build skills in the areas where current deficiencies exist.

The skills/knowledge gaps

The skills gap identified in the fellowship is: The ability to fabricate and weld using Titanium and Titanium alloys and exotic materials used for cryogenic applications.
The fellow has extensive skills in the fabrication and welding of a range of materials but is deficient in the above-mentioned area.

6: The Fellowship Program – The International Context

I travelled to both the United Kingdom and the United States of America to undertake training in the area of fabrication and welding using Titanium and Titanium alloys. I also undertook the training at The Welding Institute in the UK and at Lincoln Electric Company in the US.
The two institution's contacts with industry were also used to network with companies in the respective countries who are leaders in the field of fabrication and welding using Titanium and Titanium alloys.

Institution	Contact person	Location	Email address	Telephone number	Schedule	Purpose
The Welding Institute	Colin Eileens	Abington United Kingdom	Colin.eileens@twi.co.uk	0011441 223891162	5/9/05	5 day training course
Lincoln Electric Company	Bill West	Cleveland Ohio USA	Bill_west@lincolnelectric.com	216-383-2259	12/9/05	10 day training course

Host organisations

The Welding Institute in the United Kingdom has been operational since 1946, is based at Great Abington near Cambridge in the UK.

The Welding Institute provides industry with engineering solutions in structures incorporating welding, fabrication and associated technologies (surface coatings, cutting and bonding); they do this through the provision of: information advice and technology transfer consultancy and project support contract research and development training and qualification personal and corporate membership

Lincoln Electric Company are based in Cleveland Ohio in the United States of America, they were founded in 1895 and are the current world leader in the design, development and manufacture of arc welding equipment. Recognition as world leaders has lead the company to develop and provide technological solutions to the

welding and fabrication industry. Lincoln has a dedicated in house welding school used to develop welding skills for its range of clients. Lincoln's clients have a broad industry representation from aerospace, and the nuclear industry to motor sport.

International Program content (England)

The fellowship program involved travelling to the United Kingdom and the United States of America to participate in practical welding courses. The courses were aimed specifically at welding Titanium and "exotic" materials using the Gas Tungsten Arc welding process.

The Welding Institute ran the course in the UK at its head quarters in Abington. TWI has a pre-eminent reputation for being at the forefront of technology and research and development. Whilst there, the fellow worked closely with a resident instructor to develop a welding technique to weld various thicknesses of Titanium, the resident instructor had a limited experience in the welding of Titanium but none the less had extensive experience welding using the Gas Tungsten Arc welding process.

During the course at TWI the fellow was introduced to the inventor of the "Friction Stir" welding process (Wayne Thomas), this proved to be a fortunate introduction as the fellow through his employment is involved in training people for the West Australian Aluminium Shipbuilding industry.
Friction Stir welding has revolutionised the Aluminium Shipbuilding industry and also the Aircraft industry through its use. The Australian Aluminium shipbuilding industry is yet to invest in the Friction Stir technology but is currently importing friction stir welded products for use throughout the construction of various vessels.

Outcome: Wayne Thomas continues to be in contact through email and hopes to be able to perform some form of presentation on the use of Friction Stir welding, to the Australian Shipbuilding industry.

International Program content (America)

Cleveland Ohio in the United States of America was the next destination and the host company there was the Lincoln Electric Company.
Lincoln Electric specialise in the manufacture of welding machines, consumables and welding related products. The company also has a large welding school on site at its Cleveland headquarters; the school can accommodate up to 120 students at a time and employs its own team of specialist instructors to deliver training across a range of welding processes.

The course was of two weeks duration that was centred on “motor sport” and although the course had a motor sport bias, it was exceptional in its content on the welding of Titanium and exotic materials.
The instructor of the course was well experienced and extremely knowledgeable in regard to all facets of welding the abovementioned materials.
Another course that was enrolled into at the Lincoln was called “The teacher observer program”, this turned out to be a fantastic bonus as the fellow was given an inordinate amount of teaching resources for use on his return to Australia. Plus he was also given a large discount on the course costs and the Lincoln Corporate rate for his accommodation.
The team-oriented approach of everyone at Lincoln was very impressive and the hospitality and friendliness of the Lincoln employees, was enjoyed from the production shop floor to executive level.
A significant part of the teacher observer program was the Alumni; through this the fellow has been invited to return to Lincoln free of charge to do a course of his choice for one week per year for the rest of his life.
Whilst at the Lincoln site there was also the opportunity to discuss training options and attitudes with the other course participants.
Two of the other course participants were welding lecturers from Canada, the fellow has since forwarded them the Australian training package for the “metals” disciplines and is in email contact with one of them. They are discussing the possibility of the Canadian lecturer travelling to Australia and the potential of a “job swap”; this is currently a “work in progress”.

Another bonus of the training at Lincoln was the opportunity to submit practical weld tests and through this opportunity the fellow became "qualified" to weld airframe structures for the aircraft construction and maintenance industry and also was qualified to weld "NASCAR" safety cages for the American NASCAR motor racing series.
Through the hospitality of the people at Lincoln there was also an escorted tour of the "Amish" district of Ohio and was introduced to some Amish people and their way of life. This experience was an excellent opportunity to observe first hand old methods of work and to see that some things still have a place in today's "hi-tech" society.

Further Outcomes of the fellowship program

Since my return I have been active in seeking to meet representatives of the companies who were generous enough to give letters of support for the fellowship.

I also met with management of the "metals" department at the College where I was employed to discuss the potential of running specific courses in the successful welding of Titanium and exotic materials.

However as there has been a change of management within the metals department, this has resulted in attention being more focussed on financial matters than academic. Consequently this is impeding progress towards running Titanium specific welder training courses due to the high cost of consumables and related equipment.

The skills gap is still significant in Western Australia though local employers are looking to import labour from overseas, Asia in particular.

While the local industry is focussed on "doing the job at hand" in the quickest mode possible, the local labour force is missing out on the specialised work and training opportunities and is not thinking or planning towards creating sound long term skilled employees.

7: Recommendations

The Opportunity Possibilities and Constraints

The opportunity for Australian industry to move forward in the area of specialist welding is alive and well, there are a number of well within a national qualification framework there will need to be changes made to the current national training package related to metal fabrication and welding. There are no units of competence within the package which differentiate between material types where welding is taking qualified and experienced people available to train to the required standard, however for the training to be delivered and assessed place, a unit of competence may be "contextualised" to suit a particular enterprise but most people welding "specialist" type materials would have previously exhausted the units of competence within the training package.

West Australian industry does not appear to put a lot of faith in the training package system beyond the apprentice level, if an employer has a vacancy for a welder the vacancy is generally filled by someone who can pass a pre-employment practical welding test with little regard for the applicant's depth of technical knowledge in relation to the type of work to be undertaken.

The current industry training package employs the wording "look for evidence that confirms knowledge of: "but does not go so far as to have the required knowledge listed as assessable elements or performance criteria. The wording of the training package is specifically designed to be "loose"; unfortunately this in turn leads to the lowest common denominator being used as the benchmark for assessment.

This type of competency based assessment simply panders to the low achievers and discourages high achievers. The fellow does not advocate a return to the prescriptive curriculum type of delivery and assessment but has grave reservations in regard to the current training package actually delivering what industry requires, this will no doubt become more obvious in time.

Australia has a raft of "Australian standards" and Australian industry also has a requirement to manufacture to international standards, possibly these standards should become the backbone of the Australian national training packages and as such create a curriculum around the required skills and knowledge and have both aspects formally assessable.

Its time to stop the "dumbing - down" of Australian apprentices to cater for an industry sector that has been remiss in regard to training for the future of the Australian manufacturing industry.
There are also grave reservations regarding the current push to shorten the duration of apprenticeships in Western Australia; this as a short sighted solution to a chronic situation.

Government

Argus research

This organisation was commissioned by the West Australian Government (Department of Education and Training) to research employment demand and predicted skills requirements in Western Australia from 2003 to 2007

Professional Bodies

There is a plan to meet with representatives of the Australian Welding Institute to discuss the issues raised above.
There are qualifications available through the Welding Institute, which are titled "International welding practitioner" and "International welding specialist".
The fellow intends to seek advice from the Welding Institute in regard to canvassing industry and government to see if there is widespread support for an international type qualification.
The fellow is also seeking to give a presentation to West Australian members of the welding institute to share his experiences of his overseas fellowship trip.

Education and Training

In ongoing work the fellow is working with management of Challenger TAFE (this has now changed to Swan TAFE as I no longer work for Challenger) in Western Australia to create a Titanium and "exotic materials" specific training course, he has had a good response from some of the industry members who supported him in his application, one of the supporting companies has offered to subsidise the cost of materials and consumables.

Community and Marketing (in this case the training)

The marketing of potential training courses is likely to be done through TAFE, with the industry contacts gained through the years of servicing industry, TAFE would be an obvious starting point to measure industry interest.

ISS Institute

ISS can assist the skills gap area identified as a key issue in training. Assist in providing workshops, conferences and seminars where changes in skills levels and policy can be initiated by the sharing and dissemination of information, the multiplier effect.

Further skill gaps

There is no doubt that at this time Australia is in the midst of a severe skills shortage across a range of industry sector encompassing a range of trades/skills.
The West Australian State Training Board has carried out an exercise to investigate the possibility of shortening the nominal duration of an Apprenticeship, it is noted that in general the recommendation is that the nominal duration is to be reduced from 4 years to 3.5, with the exclusion of Electrical and Aircraft maintenance, presumably the members of the "Skills formation taskforce Metal Industry working group" wish to have aeroplanes and electrical work carried out to a high standard, but their opinion of the other trades is that "they are not rocket science".
Part of the exercise carried out was to try to look at making trades more appealing to school leavers, surely this is a national issue which affects all states and is not exclusive to Western Australia.

A federal government could implement a strategic initiative to reduce the Australian youth unemployment rate and improve the uptake of trade apprenticeships.

If the federal government were to offer an “Australian youth job guarantee” to all school leavers who did not have full time employment or a tertiary education place the unemployment rate and the uptake in trades could be accomplished in one step. The “Australian youth job guarantee” would involve enrolling students into the Australian defence force for a one year traineeship, throughout which the student would be given the opportunity to experience a range of say three trades over the one year, at the same time be undertaking TAFE studies. On completion of the one year traineeship the students would be more mature better disciplined and “job ready” for employment in a range of industries/trades. Graduates of this type of “cadetship” would automatically receive one year good standing towards an apprenticeship in which they had previously participated as part of their traineeship.

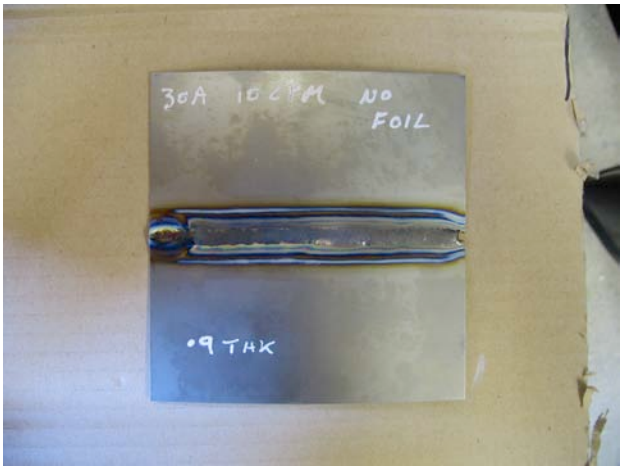
8: Appendices

TWI synopsis
Lincoln synopsis
TWI photographs
Lincoln photographs
West Australian skills formation taskforce documentation

The welding Institute in the United Kingdom has been operational since 1946, is based at Great Abington near Cambridge in the UK. The Welding Institute provides industry with engineering solutions in structures incorporating welding, fabrication and associated technologies (surface coatings, cutting and bonding); they do this through the provision of: information

Advice and technology transfer
Consultancy and project support
Contract research and development
Training and qualification
Personal and corporate membership

Lincoln Electric Company are based in Cleveland Ohio in the United States of America, they were founded in 1895 and are the current world leader in the design, development and manufacture of arc welding equipment. Recognition as world leaders has lead the company to develop and provide technological solutions to the welding and fabrication industry. Lincoln has a dedicated in house welding school used to develop welding skills for its range of clients. Lincoln's clients have a broad industry representation from aerospace, and the nuclear industry to motor sport.

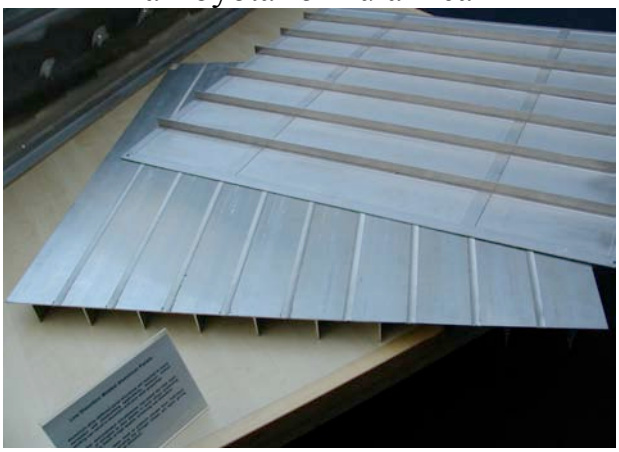


Welds on Titanium

Friction Stir welded components

Inconol exhaust manifold from a Toyota formula 1 car

TWI Abington



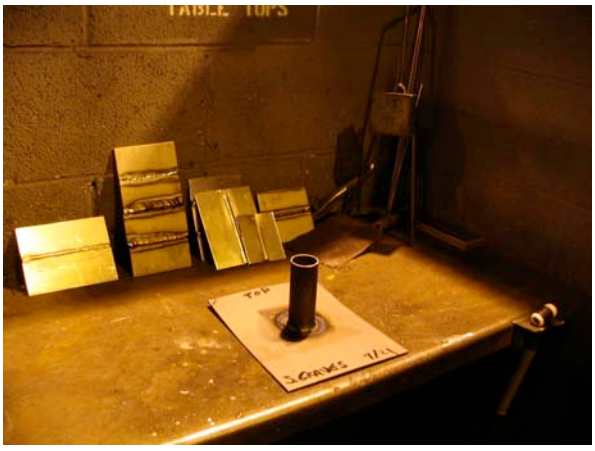
Friction stir welded Aluminium decking

Lincoln electric “welding hall”

Welding hall

State of the art classrooms

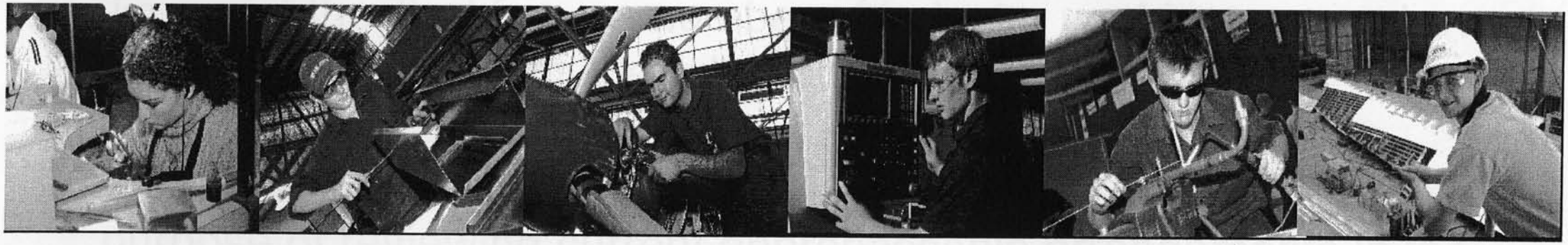
Approximately 120 bays



Aerospace test weld

METALS

INDUSTRY WORKING GROUP



Background

During 2005 the Skills Formation Taskforce was formed as a committee of the State Training Board to provide advice on the issues and impediments to growth in apprenticeships and traineeships.

To assist the Taskforce a number of industry working groups have been convened to provide advice on specific issues.

The Metal Industry Working Group (MIWG) was formed with the purpose of reviewing current apprenticeship arrangements in the light of major skill shortages within the industry.

Metals Industry Working Group Members

Stephen Murdoch	Chief Operating Officer - Austal Ships **(Chair)**
Terry Iannello	Managing Director - Total Corrosion
Bill Moss	Commissioning Manager - ALCOA
Paul Roberts	Chair Metals Industry - Training Advisory Body
Mark Simpson	Training Manager SFT - Member Hard Rock
Geoff Wrigley	General Manager - Employment Services - Chamber of Commerce and Industry (CCIWA)
John Hofmann	Executive Director - Hofmann Engineering
John Mossenton	State Organiser – Metals & Engineering - AMWU
Nicole Pettit	Training Adviser Education and Training - Chamber of Minerals and Energy
Bruce Lake	Operations Manager - APACHE Energy Limited
Karen Jamvold	Director - Apprenticeships and Traineeships
Greg Guppy **(Executive Officer)**	Manager - Apprenticeship and Traineeship Support Network (ATSN)

Terms of Reference

1. Determine the appropriate nominal duration for apprenticeship training in the following trades:

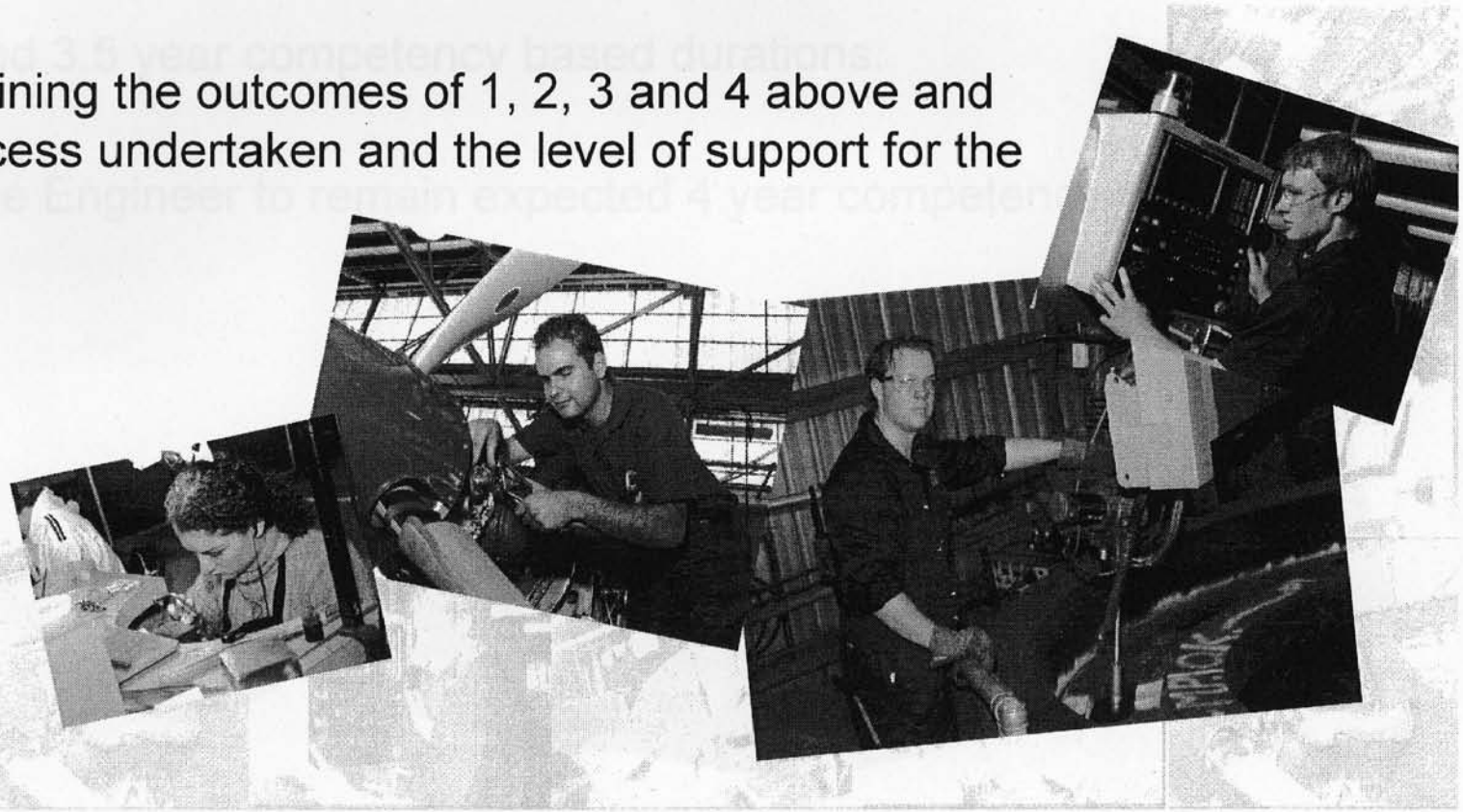
Engineering Tradesperson (Fabrication)
Engineering Tradesperson (Mechanical)
Engineering Tradesperson (Automotive)
Shipwrighting and Boatbuilding
In collaboration with the Automotive IWG determination of:
Engineering Tradesperson (Automotive)
Engineering Tradesperson [Mechanical (Plant Mechanic)]

2. Where a change in nominal duration is proposed, determine the off the job training delivery pattern.

3. Consider flexible arrangements or alternative training pathways that lead to a trade qualification and recognise specialisation, and provide advice on any agreed new models.

4. Provide advice on the appropriateness of the current nomenclature for the identified trades, giving consideration to improving the appeal to young people.

5. Provide a report outlining the outcomes of 1, 2, 3 and 4 above and the consultation process undertaken and the level of support for the outcomes.

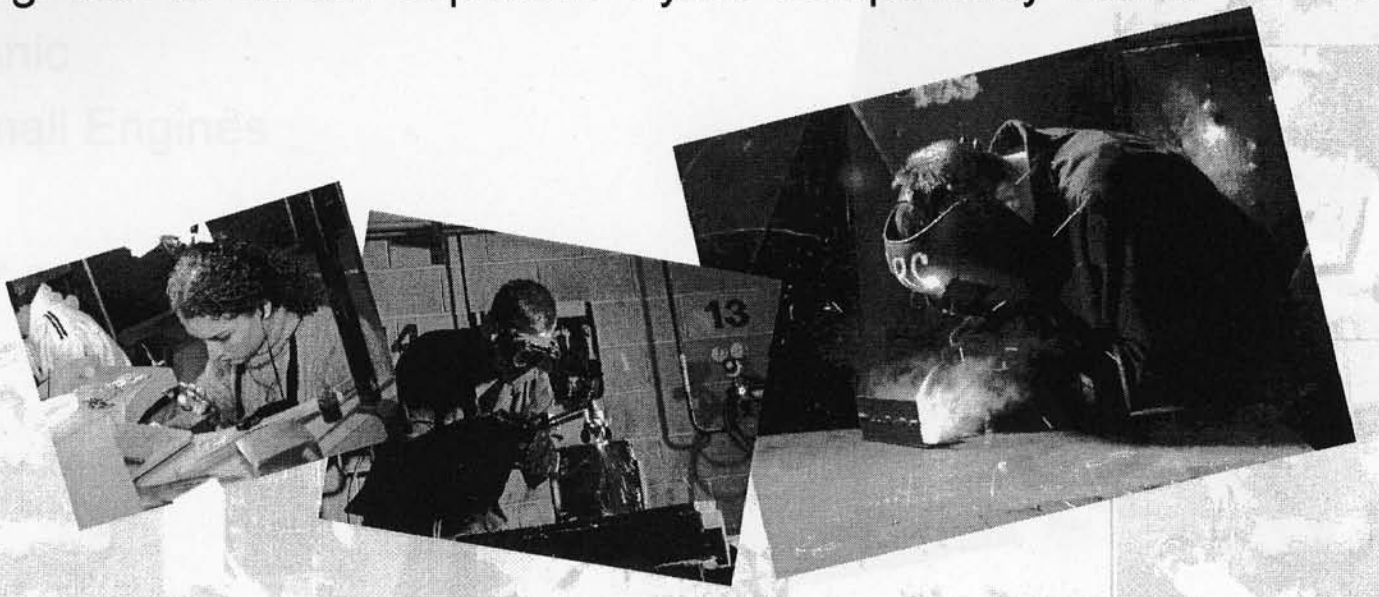


Draft Recommendations

1. a) Engineering Tradesperson – Fabrication Trade (with all subsequent streams)
   Engineering Tradesperson – Mechanical Trade (with all subsequent streams)
   Shipwrighting and Boatbuilding

   To have an expected 3.5 year competency based durations.

   b) Aircraft Maintenance Engineer to remain expected 4 year competency based durations.

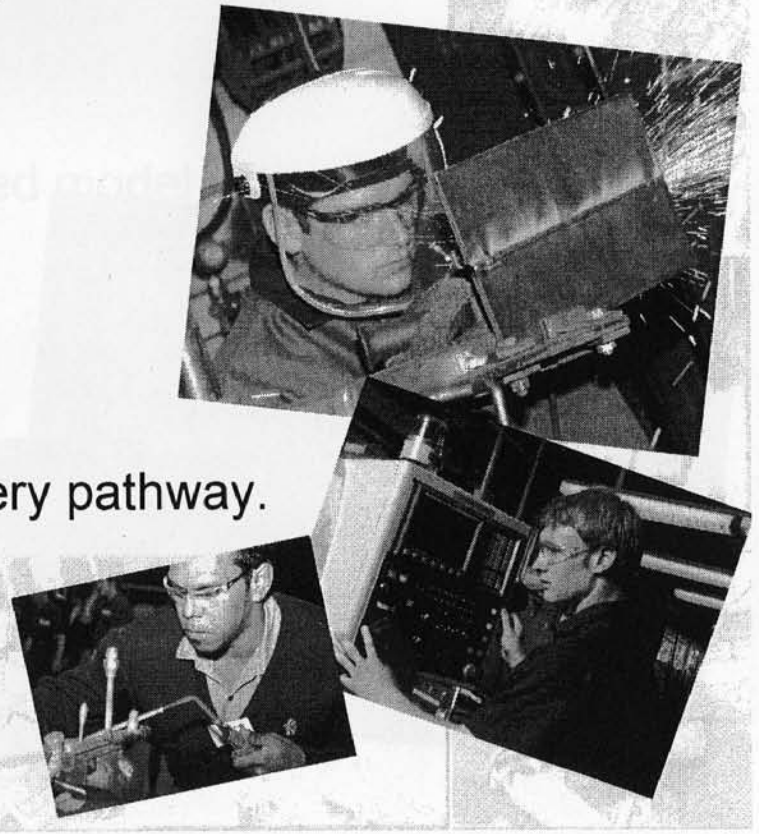


Draft Recommendations

2. Industrial relations - wages and industrial consultation issues associated with the recommendation to change the expected term of indenture must commence immediately to achieve the desired implementation dates for recommendations.

3. The trade of Engineering Tradesperson (Automotive) with Streams
   - Motor Mechanic Light
   - Motor Mechanic Heavy
   - Marine Mechanic
   - Motor Cycle Mechanic
   - Motor Mechanic Small Engines

   Be available only under an automotive training delivery pathway.



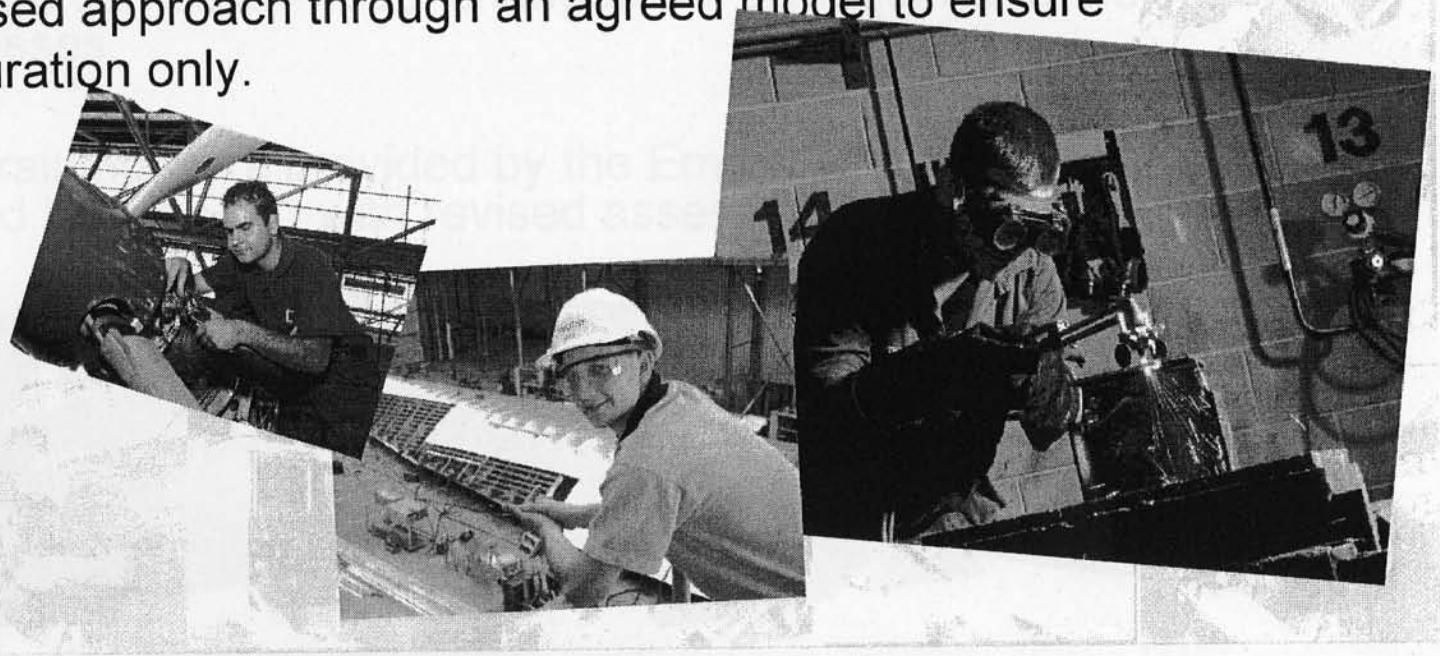
Draft Recommendations

4. (a) The nomenclature of the existing trades be retained however stream titles have been changed to reflect current metal trade business activity. (Appendix 1)

   (b) That the Engineering Tradesperson (Fabrication) streams Sheetmetal Painting and Vehicle Bodybuilding be deleted.

5. Adopt a competency based approach through an agreed model to ensure indenture is expected duration only.

   Appendix 2.



Draft Recommendations

6. Change the formal off the job training from six semesters to five semesters.

CONSIDERATIONS

- Changing the delivery pattern from 6-5 semesters is not about reducing the requirement to meet and pass all competencies necessary to qualify as a metals tradesperson.

- To enable the Registered Training Organisation (RTO) to compress the current six semesters delivery into a five semester model changes will be required to the delivery/assessment processes.

- Greater integration of the training/work provided by the Employer and the provision of the formal training delivered by the RTO with revised assessment processes is required.

Draft Recommendations

7. Formal credits should be provided based on a recognition of an individual's skills and current competencies that have been endorsed by industry.

METALS INDUSTRY WORKING GROUP

CREDITS

Flexible Entry Provisions

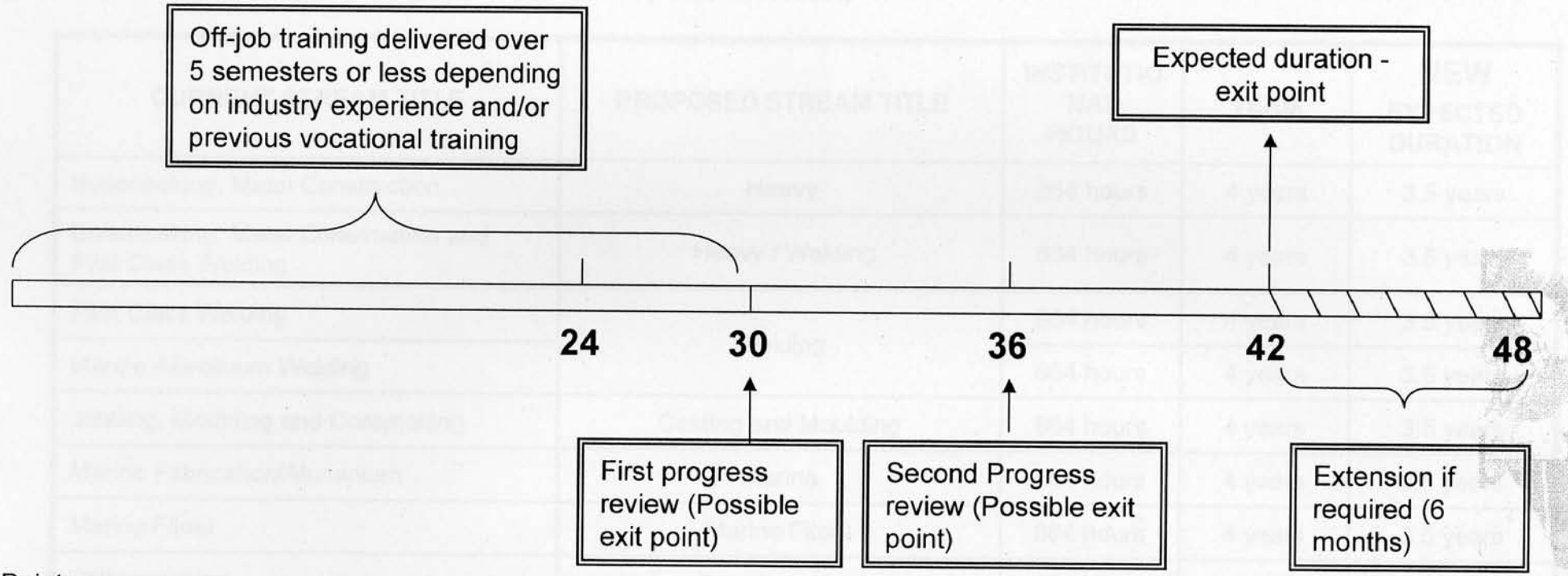
Metals apprentices

	Year 1		Year 2		Year 3.5		Expected Duration
New Entrant / School Leaver	Entry Point						3.5
School Apprenticeship Link (School Student)		Entry Point					3
Pre-Apprenticeship (New Entrant)		Entry Point					3
Fast Track (Industry Experienced)	X - dependent upon RPL	X	X	X	X	X	Variable

METAL TRADES

Appendix 2

COMPETENCY BASED MODEL



Points:

- The on and off the job training needs to be flexible.
- The standards and their specified outcomes must be maintained.
- Assessment process for both on and off the job training must be established.
- Standardisation of employer induction and employer assessment must be developed and implemented.

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Appendix 1

INSTITUTIONAL HOURS AND DURATION OF TRADE/STREAMS IN THE METALS INDUSTRY

TRADE: ENGINEERING TRADESPERSON (FABRICATION)

CURRENT STREAM TITLE	PROPOSED STREAM TITLE	INSTITUTIONAL HOURS	TERM	NEW EXPECTED DURATION
Boilermaking, Metal Construction	Heavy	864 hours	4 years	3.5 years
Boilermaking, Metal Construction and First Class Welding	Heavy / Welding	864 hours	4 years	3.5 years
First Class Welding	Welding	864 hours	4 years	3.5 years
Marine Aluminium Welding		864 hours	4 years	3.5 years
Jobbing, Moulding and Coremaking	Casting and Moulding	864 hours	4 years	3.5 years
Marine Fabrication/Aluminium	Marine	864 hours	4 years	3.5 years
Marine Fitout	Marine Fitout	864 hours	4 years	3.5 years
Patternmaking	Patternmaking	864 hours	4 years	3.5 years
Sheetmetal	Light	864 hours	4 years	3.5 years

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INSTITUTIONAL HOURS AND DURATION OF TRADE/STREAMS IN THE METALS INDUSTRY

TRADE: ENGINEERING TRADESPERSON (MECHANICAL)

STREAM	PROPOSED STREAM TITLE	INSTITUTIONAL HOURS	TERM	NEW EXPECTED DURATION
Electroplating	Metalplating	864 hours	4 years	3.5 years
First Class Machining	Machinist – Metal	864 hours	4 years	3.5 years
Fitting and First Class Machining	Fitter and Machinist	864 hours	4 years	3.5 years
Fitting and Turning		864 hours	4 years	3.5 years
Marine Fitting	Marine Fitter	864 hours	4 years	3.5 years
Mechanical Fitting	Mechanical Fitter	864 hours	4 years	3.5 years
Plant Mechanics (Agriculture)	Plant Mechanic	864 hours	4 years	3.5 years
Plant Mechanics (Industrial)		864 hours	4 years	3.5 years
Refrigeration Fitting	Refrigeration and Air-conditioning	864 hours	4 years	3.5 years

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INSTITUTIONAL HOURS AND DURATION OF TRADE/STREAMS IN THE METALS INDUSTRY

TRADE: AIRCRAFT MAINTENANCE TECHNICIAN

STREAM	INSTITUTIONAL HOURS	TERM	NEW EXPECTED DURATION
Aircraft Maintenance – Avionics	1120 hours	4 years	4 years
Aircraft Maintenance – Mechanics	1120 hours	4 years	4 years
Aircraft Maintenance – Structures	1120 hours	4 years	4 years

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INSTITUTIONAL HOURS AND DURATION OF TRADE/STREAMS IN THE METALS INDUSTRY

TRADE	INSTITUTIONAL HOURS	TERM	NEW EXPECTED DURATION
*Engineering Tradesperson (Electrical)	864 hours	4 years	4 years

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INSTITUTIONAL HOURS AND DURATION OF TRADE/STREAMS IN THE METALS INDUSTRY

TRADE	INSTITUTIONAL HOURS	TERM	NEW EXPECTED DURATION
*Jewellery	720	5 years	4 years
Shipwrighting and Boatbuilding	720 hours	4 years	3.5 years
*Toolmaking and Jigmaking (Metal Furniture)	720 hours	4 years	4 years
*Watch and Clock Repairing	(720) 864 hours	5 years	4 years
NOTE: (*) Not included in current discussions			