



Resource Training Organization

REQUEST FOR PROPOSAL

WELDING INDUSTRY STANDARDS REVIEW

PHASE 3

CLOSING DATE: October 31 / 07

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SECTION - A - INSTRUCTIONS FOR VENDORS

1. The purpose of this proposal is to provide information that will help the **Resource Training Organization (RTO)** in selecting a **Vendor to provide technical services to develop Program Outlines and Test Banks for the Welding Level "B" Apprenticeship Program and the Welding Level "A" Apprenticeship Program from October 29th, 2007 to March 31st, 2008**. The response format allows for a primary evaluation of proposals in an efficient and effective manner. It is therefore important that each vendor provide a clear and concise presentation.
2. The enclosed proposal format and questionnaire is designed to support a **dmaclaren@rtobc.com** systematic review of the submissions. Proposals that do not conform to the specified format may be excluded from the competition.
3. Vendors may attach further written elaboration of their proposal, providing a cross-reference to a question number on the proposal questionnaire.
4. There will be no pre-proposal conference for this RFP. Direct inquiries for clarification of information to **Doug MacLaren, CEO RTO** by e-mail at **dmaclaren@rtobc.com**. During the proposal period any addendum and any responses to questions from proponents will be issued to all persons/organizations who have indicated their intent to submit a proposal.
5. The RTO has attached the existing Occupational Analysis Chart for Welders Level "C", "B" and "A" that may be subject to change with this initiative.
6. ***The Vendor is requested to notify Doug MacLaren on or before October 24th, 2007 to indicate their intent to submit a proposal by e-mail at dmaclaren@rtobc.com.***
7. There is no set price for this project and the Subject Matter Experts (SME's) will be designated by RTO and the Project Review Committee. No stipends will be paid by the ITA or the RTO to the SME's.
8. The **Resource Training Organization (RTO)** will give consideration to **all proposals received via e-mail by 4:00 p.m. (local time), October 31th.2007.**
9. ***It shall be the sole responsibility of the Vendor to ensure that the proposal is received at the aforementioned e-mail address prior to the specified time of 4:00 p.m. (local time), October 31th.2007.***
10. Freedom of Information and Protection of Privacy (FOIP) Act: Welding Program Standards Review Project records may be subject to access under this Act. If documents submitted contain protected, proprietary or confidential information, please identify the specific issue and provide supporting reasons why the **Resource Training Organization (RTO)** should not release this information if requested by a FOIP inquiry.

11. Upon receipt of proposals, the **Resource Training Organization (RTO)** will examine each submission for compliance with bidding requirements, prior to carrying out the primary evaluation.

12. The **RTO** will use the following evaluation criteria to short-list the potential vendor.

- i. **Experience.....30%**
- ii. **Quality/Suitability.....15%**
- iii. **Service.....10%**
- iv. **Price.....10%**
- v. **Delivery.....15%**
- vi. **Total Offering.....20%**

13. The following evaluation factors will be used in determining the best-qualified offers:

- a. The plan for performing the required services
- b. The ability of the Vendor to perform the requested services and fulfill any reporting requirements as reflected by:
 - General experience
 - Technical training and education
 - Specific experience in providing the requested services
 - Qualifications and abilities of personnel proposed to be assigned to perform the services
 - The proposed equipment and facilities are currently available to perform the requested services
 - Favorable recommendations from referenced clients where similar or like services are being or have been performed
 - Compliance with the RFP specifications
 - Overall quality and completeness of response
 - Pricing

14. The **RTO** will determine the most suitable proposal(s) upon completion of the primary review. The RTO may choose to enter discussions with several vendors to further evaluate their proposals.

15. Not necessarily the lowest total price, but a combination of all weighted factors showing the greatest benefit to the **RTO** will be considered when assessing the proposals.

16. From the proposals received, the **RTO** will negotiate the final contractual arrangement(s).

17. If the Vendor intends to use subcontractors to perform any portion of the work described in this RFP, the Vendor must clearly state so. The Vendor's response must include a description of which portion(s) of the work will be subcontracted out, the names and addresses of potential subcontractors and the expected amount of money each will receive under the contract.

SECTION - B - BACKGROUND

Welding is designated as an Inter-Provincial “Red Seal” trade by the Canadian Council of Directors of Apprenticeship (CCDA) and is detailed in the National Occupational Analysis (NOA) in order to maintain current scope of practice, standards, and competencies. The last NOA on the welding trade was conducted in 2004.

Given the importance of the welding trade to British Columbia, the ITA has agreed to fund a comprehensive review led by industry to bring the welding programs current with industry priorities and requirements and to reflect economic and technology changes in the province.

The Provincial Welders Training Program is a competency based, directed learning program designed to provide learners with the skills required to function as safe entry-level tradespersons. The training is divided into Three Levels: “C”, “B”, and “A”.

Level “C” welders are restricted to structural and non-pressure applications as per Authorities having Jurisdiction. Level “B” welders are eligible to obtain pressure-welding certification as per Authorities having Jurisdiction. Certified “A” level welders are able to work throughout the welding industry as per Authorities having Jurisdiction.

Welding Industry Projects Completed to Date:

Phase 1:

In June 2006, the Industry Training Authority of BC (ITA) in association with the Mechanical Contractors Association of BC (MCABC) conducted an industry review of welding training and certification in this province. Here are the steps that were taken by this group to achieve the goals for Phase 1:

- ✓ Prepared a Letter of Introduction for Industry Stakeholders.
- ✓ Contacted Industry Stakeholders for Expression of Interest.
- ✓ Prepared a Directory of Stakeholders (contact list).
- ✓ Surveyed Stakeholders to determine Industry Satisfaction.
- ✓ Conducted a Needs Assessment Meeting with Stakeholders.
- ✓ Facilitated the establishment of an Industry Steering Committee.

Phase 2:

In response to an RFP, a Vendor was retained by the Industry Training Authority (ITA) in co-operation with the Mechanical Contractors Association of BC (MCABC) and other Industry Stakeholders to provide technical services to develop a Program Outline for a Welding Level “C” Apprenticeship Program from December 4th, 2006 to March 31st, 2007 and to prepare a report with other recommendations regarding the development of training for all Welder Qualifications

WELDER LEVEL “C” PROGRAM OUTLINE - TABLE OF CONTENTS

Foreword
Acknowledgements
Job Description Welder Level “C”

Section 1 – Occupational Analysis

Occupational Analysis Chart Welders “C”, “B”, “A”
Occupational Analysis Chart Welders “C”

Section 2 –Program Outline

Schedule of Time Allotment
Program Outline
Recommended Reference Textbooks
Training Provider Standards for Instructors
Training Provider Standards for Facilities
Tools and Equipment (as Recommended in the NOA)

Guidelines for Practical Examinations

Appendix One – Final Practical Examination #1
Appendix Two – Final Practical Examination #2
Appendix Three – Final Practical Examination #3
Appendix Four – Final Weld Test Project #1
Appendix Five – Final Weld Test Project #2
Appendix Six – Final Weld Test Project #3
Appendix Seven – Achievement Criteria for Weld Test Projects

WELDER LEVEL ‘C’ TEST BANK

This project initiated by the Industry Training Authority (ITA) in co-operation with Industry Stakeholders called for the development of a Table of Specifications and 300 test items for the assessment of competency for the Welder Level “C” Certificate of Qualification.

SECTION - C - PROJECT REQUIREMENTS

Under overall direction of the **Resource Training Organization (RTO)** and in close consultation with the Project Review Committee (PRC) and Subject Matter Experts Committee (SMEs), the contractor will conduct an extensive standards review and update the training standards for the Welder training programs for Levels “B” and “A” whereupon completion the learner will have achieved trades qualification as a Level “B” or Level “A” Welder. The contractor will also be required to develop the two test banks as outlined under Section - C - Deliverables in this RFP.

In addition, the review will look at broader industry satisfaction with the welding programs and the requirements to align our welding certifications with other jurisdictions. The review will engage Industry Stakeholders, including employers, associations, trade unions, public and private training providers, and trade practitioners, to include:

- **National Occupational Analysis** – The existing 2004 NOA will be reviewed to ensure that it reflects provincial requirements in the finalization of the new Level “B” and “A” standards where applicable.
- **Provincial Program Review** – The current Welder Level “B” and “A” programs being delivered by Training Providers will be reviewed against the 2004 NOA and the new proposed Program Outline with both the NOA and provincial specifications. This will include training provider standards such as learning resources, tools and facilities and instructor qualifications.
- **Program Profile Chart**– An updated program profile chart will be developed in accordance with ITA specifications for Occupational Analysis Charts, reflecting the updated program standards for the 3 classifications for Welders in British Columbia.
- **Supporting Tools and Educational Resources** – Support resources such as training guides, log books, and other educational resources will be reviewed and reflected in the new proposed Program Outline(s) as appropriate.
- **Learning Resources** – The B.C. Welding Modules published by the Queens Printers to identify gaps and/or deficiencies. The other curriculum used by the Training Providers will be reviewed along with other learning materials, such as the welding programs in other provinces, to identify the

best learning resources to address changes in technology and industry requirements and support trainees in achieving national and provincial standards.

- **Industry Satisfaction** – The Welding Industry Standards Review Steering Committee will be consulted to determine satisfaction with the existing Welder Program delivery and, if broader program changes than those outlined during Phase One are required, to improve Welder Apprenticeship to better serve B.C. industry and its apprentices.
- **TILMA** - is the Trade, Investment, and Labour Mobility Agreement between [British Columbia](#) and [Alberta](#). The agreement was signed on [28 April, 2006](#) and provides a virtual economic union between the two provinces. Other provinces such as Ontario are negotiating entry into this agreement as well. As a result of this agreement, the Alberta welding program must be considered to address mobility in qualifications.
- **Cross Trade Credits** – Other trades people that frequently require welding to perform their tasks may be interested in developing their welding skills to become more marketable as a trades-person. Common skills between related trades should be identified for the purpose of receiving credits to become certified in welding. These trades will include Boilermakers, Ironworkers, Machinists, Metal Fabricators, Millwrights, Pipefitters, Sheet Metal Workers, Shipfitters, Steamfitters, Tool and Die Makers and any others identified by the RTO and the PRC.
- **Recognition of Prior Learning, Prior Learning Assessment, or Prior Learning Assessment and Recognition** - Describes the set of standards and procedures put in place by educational institutions to assign advanced standing to prospective students. These factors must be considered in the design and development of the training standards for all three Levels of Welder Certification.
- **Implementation Plan** – Prepare a “go-forward” plan for RTO regarding implementing approved program changes.

SECTION - D - DELIVERABLES

The Vendor will be expected to deliver two electronic copies (CD's) and two hard copies of these documents that will meet or exceed current Industry Training Authority standards.

1. DELIVERABLE ONE

PROGRAM OUTLINE WELDER LEVEL "B" (FORMAT)

Foreword
Acknowledgements
Job Description Welder Level "B"

Section 1 – Occupational Analysis

Occupational Analysis Chart Welders "C", "B", "A" (updated version)
Occupational Analysis Chart Welders "B"

Section 2 –Program Outline

Schedule of Time Allotment
Program Outline
Recommended Reference Textbooks
Training Provider Standards for Instructors
Training Provider Standards for Facilities
Tools and Equipment (as Recommended in the NOA)

Guidelines for Practical Examinations

To be determined by Industry Subject Matter Experts and approved by Resource Training Organization in consultation with Project Review Committee and Stakeholders. (See examples for Welder Level "C" on page 6).

2. DELIVERABLE TWO

Upon completion of the new Welder Level "B", the vendor will develop a Table of Specifications and an examination test bank with a minimum of 300 items. All test items must be weighted in accordance with the Table of Specifications and in compliance with ITA guidelines (e.g. to Red Seal standards).

3. DELIVERABLE THREE

PROGRAM OUTLINE WELDER LEVEL “A” (FORMAT)

Foreword
Acknowledgements
Job Description Welder Level “A”

Section 1 – Occupational Analysis

Occupational Analysis Chart Welders “C”, “B”, “A” (updated version)
Occupational Analysis Chart Welders “A”

Section 2 –Program Outline

Schedule of Time Allotment
Program Outline
Recommended Reference Textbooks
Training Provider Standards for Instructors
Training Provider Standards for Facilities
Tools and Equipment (as Recommended in the NOA)

Guidelines for Practical Examinations

To be determined by Industry Subject Matter Experts and approved by the Resource Training Organization in consultation with Project Review Committee and Stakeholders. (See examples for Welder Level “C” on page 6).

4. DELIVERABLE FOUR

Upon completion of the new Welder Level “A”, the vendor will develop a Table of Specifications and an examination test bank with a minimum of 300 items. All test items must be weighted in accordance with the Table of Specifications and in compliance with ITA guidelines (e.g. to Red Seal standards).

The Final Report

- Considerations and recommendations for delivery of the new Welding Level “B” and Welding Level “A” Apprenticeship Programs.
- Supporting Tools and Educational Resources that were identified during the development process.
- Learning Resources review and gap analysis for future program development (e.g. changes to Queen’s Printers curriculum currently being upgraded).
- Industry Satisfaction (e.g. any changes made to the new training program as a result of industry recommendations).
- How do the new B.C. Program Outlines for Welder Level “B” and Welder Level “A” consider the TILMA agreement when compared to the Alberta welding program to address mobility in qualifications?
- How will the new B.C. Program Outlines for Levels “B” and “A” welding affect Cross Trade Credits for other trades and which of those trades identified in this RFP include a portion (or all) of Level “B” and Level “A” welding as part of their apprenticeship training programs?
- How has Recognition of Prior Learning, Prior Learning Assessment, or Prior Learning Assessment and Recognition been taken into consideration during this phase of the program development process?
- Prepared implementation plan.

SECTION - E - PROPOSAL QUESTIONNAIRE

1. Organization Legal Name: _____

Street Address: _____

City, Province, Postal Code: _____

Telephone Number: _____ Fax Number: _____

Proposal Prepared by: _____

Title: _____ E-mail: _____

2. How long has your organization been in business? _____

3. What are your regular hours of operation? _____

4. Please provide a brief history and experience your organization has pertaining to the requirements of this proposal.

5. Key personnel that would be involved in the Welding Level "A" and "B" Program Standards Review Project.

What are the average years of service for your team? _____

6. Other projects of this nature that you have implemented.

7. Provide three references. They should be clients for which your organization provided similar services.

a) Name of organization: _____

Contact name: _____

Phone number: _____ Fax number: _____

Length of time and type of services provided:

b) Name of organization: _____

Contact name: _____

Phone number: _____ Fax number: _____

Length of time and type of services provided:

c) Name of organization: _____

Contact name: _____

Phone number: _____ Fax number: _____

Length of time and type of services provided:

8. Describe the features of your submission that meet or exceed the requirements of this proposal.

9. Provide a detailed schedule outlining the financial considerations you would propose to undertake the Welding Program Standards Review Project. All assumptions should be clearly stated.

10. Estimate the start-up time required and describe the implementation process you would put in place if selected to undertake the Welding Program Standards Review Project.

11. Explain your invoicing procedures:

12. What other information would you like RTO to consider when evaluating this proposal?

GUARANTEE OF TENDER PRICE

I guarantee my quoted prices for a period of _____ following the closing date for proposal submissions (minimum of 60 days).

ACCEPTANCE OF THE PROPOSAL

I understand that the RTO and the ITA is in no way obliged to accept the lowest, or any Proposal. I also understand that the RTO and the ITA is in no way financially liable for any costs incurred by the Vendor in the application process for this project.

I have read the above conditions and terms and am in agreement with the complete context and hereby accept all conditions as outlined. Exceptions are to be listed and signed.

Organization Name

Date

Authorized Signature and Position

Type or Print Name

SECTION - F- APPENDIX 1

OCCUPATION ANALYSIS CHART

In alignment with the Welder 2004 National Occupational Analysis

WELDER LEVEL “C”, “B”, “A” Occupation Analysis Chart

APPLIES OCCUPATIONAL SKILLS A	Describe scope of trade and apprenticeship in BC, and other options. <div style="text-align: right;">A-1</div>	Describe safe working practices. <div style="text-align: right;">A-2</div>	Describe WHMIS training requirements. <div style="text-align: right;">A-3</div>	Describe training requirements for confined space entry. <div style="text-align: right;">A-4</div>	Describe requirements for H ₂ S training. <div style="text-align: right;">A-5</div>	Perform basic trade related mathematical calculations for linear measure. <div style="text-align: right;">A-6</div>
	C	C	C	C	C	C
	Use measuring and layout tools. <div style="text-align: right;">A-7</div>	Use hand tools. <div style="text-align: right;">A-8</div>	Use power tools (electric and pneumatic). <div style="text-align: right;">A-9</div>	Discuss basic welding quality control and inspection requirements. <div style="text-align: right;">A-10</div>		
	C	C	C	C		
PERFORMS OXY-FUEL CUTTING PROCESSES (OFC) B	Describe the OFC process and its application. <div style="text-align: right;">B-1</div>	Describe OFC equipment and its operation. <div style="text-align: right;">B-2</div>	Perform freehand and guided cuts on low carbon steel plate, sheet, round stock, structural shapes and pipe. <div style="text-align: right;">B-3</div>	Perform cuts with cutting machines, automatic and semi-automatic. <div style="text-align: right;">B-4</div>		
	C	C	C	C		
PERFORMS FUSION AND BRAZE WELDING USING OXY-FUEL PROCESSES (OFW) C	Describe fusion welding, braze welding and brazing processes and their applications. <div style="text-align: right;">C-1</div>	Describe fusion and braze welding equipment and their operation. <div style="text-align: right;">C-2</div>	Describe filler metals, fluxes and tips used for fusion and braze welding and brazing. <div style="text-align: right;">C-3</div>	Describe joint design and weld positions. <div style="text-align: right;">C-4</div>	Describe fusion welding on low carbon steel sheet. <div style="text-align: right;">C-5</div>	Fusion weld stringer beads and fillet welds on low carbon steel sheet. <div style="text-align: right;">C-6</div>
	C	C	C	C	C	C
	Fusion weld square groove welds on low carbon steel sheet. <div style="text-align: right;">C-7</div>	Braze weld fillet welds on low carbon steel sheet. <div style="text-align: right;">C-8</div>	Braze weld groove welds on grey cast iron. <div style="text-align: right;">C-9</div>	Silver alloy braze on similar and dissimilar metals. <div style="text-align: right;">C-10</div>		
	C	C	C	C		

PERFORMS SHIELDED METAL ARC WELDING (SMAW)
D

Describe the SMAW process and its application.
D-1
C

Describe SMAW equipment and its operation.
D-2
C

Describe and select low carbon steel electrodes for SMAW.
D-3
C

Describe basic joint design and weld positions.
D-4
C

Describe causes of weld faults and distortion in fabrications and methods for prevention and control.
D-5
C

Use the SMAW process to weld beads in the flat position.
D-6
C

Use the SMAW process to weld fillet welds on low carbon steel plate.
D-7
C

Use the SMAW process to weld fillet welds on low carbon steel sheet.
D-8
C

Describe and demonstrate surface build up and hardface in the flat position on low carbon steel plate.
D-9
C

Use the SMAW process to weld groove welds in the flat 1G position on grey cast iron.
D-10
C

Describe and demonstrate use of SMAW stainless steel electrodes on low carbon steel plate.
D-11
C A

Describe and demonstrate use of SMAW stainless steel electrodes on low carbon steel pipe.
D-12
A

Use the SMAW process to weld groove welds on low carbon steel pipe.
D-13
B

Use the SMAW process to weld groove welds using low-alloy electrodes on steel plate and pipe.
D-14
A

Use the SMAW process to weld groove welds on low carbon steel plate.
D-15
C B

PERFORMS ELECTRIC ARC CUTTING, GOUGING AND RELATED PROCESSES (AAC) (PAC) (SMAC)
E

Describe electric arc cutting and gouging processes and their applications.
E-1
C

Describe and demonstrate AAC equipment and its cutting and gouging operations.
E-2
C

Describe and demonstrate PAC equipment and its cutting and gouging operations.
E-3
C

PERFORMS SEMI-AUTOMATIC WELDING (GMAW) (GMAW-P) (FCAW) (GMAW/MC*)
F

Describe the GMAW, GMAW-P, FCAW and GMAW/MC* processes and their application.
F-1
C

Describe GMAW, GMAW-P, FCAW and GMAW/MC* equipment and their operation.
F-2
C B

Describe and select filler metal and shielding gases for GMAW.
F-3
C B

Use the GMAW process to weld stringer beads and fillet welds on low carbon steel plate.
F-4
C

Use the GMAW process to weld fillet welds on low carbon steel sheet.
F-5
C

Use the GMAW process to weld square groove welds on low carbon steel sheet.
F-6
C

Use the GMAW process to weld groove welds on low carbon steel plate.
F-7
C

Use the GMAW-P process to weld fillet welds on low carbon steel plate.
F-8
C

Use the GMAW-P process to weld fillet welds on low carbon steel sheet.
F-9
C

Use the GMAW-P process to weld square groove welds on low carbon steel sheet.
F-10
C

Use the GMAW-P process to weld groove welds on low carbon steel plate.
F-11
C B

Use the GMAW-P process to weld groove welds on low carbon steel pipe.
F-12
B

Describe and demonstrate GMAW-P weld fillet welds using stainless steel filler metal on low carbon steel plate and sheet. F-13 C B	Describe and demonstrate GMAW-P groove welds using stainless steel filler metal on low carbon steel plate. F-14 B A	Describe and demonstrate GMAW-P groove welds using stainless steel filler metal on low carbon steel pipe. F-15 A	Describe and demonstrate procedures specific to GMAW and GMAW-P on aluminum plate. F-16 C B	Use the GMAW process to weld fillet welds on aluminum plate. F-17 B	Use the GMAW process to weld groove welds on aluminum plate. F-18 B	
Use the GMAW-P process to weld fillet welds on aluminum plate. F-19 B	Use the GMAW-P process to weld groove welds on aluminium plate. F-20 B	Trouble shooting and maintenance of GMAW and GMAW-P equipment. F-21 B	Describe and select filler metals and shielding gases for FCAW and GMAW/MC*. F-22 C B	Use the FCAW self-shielding process to weld fillet welds on low carbon steel plate. F-23 C B	Use the FCAW gas-shielded process to weld fillet welds on low carbon steel plate. F-24 C B	
Use the FCAW process to weld groove welds on low carbon steel plate. F-25 C B	Use the GMAW/MC* process to weld fillet welds on low carbon steel plate. F-26 C B	Use the GMAW/MC* process to weld groove welds on low carbon steel plate. F-28 C B	Use the GMAW/MC* process to weld groove welds on low carbon steel pipe. F-27 B A	Describe and demonstrate FCAW fillet welds using stainless steel filler metal on low carbon steel plate. F-29 C B A		
DESCRIBE BASIC METALLURGY RELATING TO PRODUCTION, PROPERTIES AND WELDABILITY G	Describe production processes for manufacturing metals. G-1 C B A	Describe mechanical and physical properties of metals. G-2 C B A	Describe metals. G-3 C B A	Describe the grain structure of metals. G-4 B A	Describe the alloy content and heat treatments on the weldability of steel. G-5 C B	Describe aluminium, aluminium alloys and describe their weldability. G-6 B
PERFORMS GAS TUNGSTEN ARC WELDING (GTAW) H	Describe the GTAW process and its application. H-1 B	Describe GTAW equipment. H-2 B	Use the GTAW process to fillet weld using low carbon steel filler metal on low carbon steel plate. H-3 B	Use the GTAW process to fillet weld using stainless filler metal on low carbon steel sheet. H-4 B	Use the GTAW process to fillet weld using aluminium filler metal on aluminum plate. H-5 B	Use the GTAW process to fillet weld using aluminium filler metal on aluminum sheet. H-6 B

	Use the GTAW process to groove weld using low carbon steel filler metal on low carbon steel plate. H-7 B	Use the GTAW process to groove weld using stainless steel filler metal on low carbon steel sheet. H-8 B	Use the GTAW process to groove weld using low carbon steel filler metal on low carbon steel pipe. H-9 A	Use the GTAW process to groove weld using stainless steel filler metal on steel pipe. H-10 A	Describe the GTAW requirements and procedures for sanitary application. H-11 A	
DESCRIBES AND PERFORMS MATERIAL HANDLING AND RIGGING PROCEDURES I	Describe safety procedures for rigging and material handling. I-1 C	Perform safe working load calculations involving geometric formulas, volumes and capacities. I-2 C	Use fibre ropes to tie knots. I-3 C	Describe slings and rigging hardware uses. I-4 C	Describe hoisting equipment. I-5 C	Use hoisting equipment to perform lift. I-6 C
READS WELDING DRAWINGS J	Perform mathematical calculations involving formulas, angles, triangles and geometric construction. J-1 C	Sketch basic objects using orthographic projection. J-2 C	Sketch isometric drawings of basic objects. J-3 C B	Sketch a dimensioned drawing. J-4 C	Identify common welding symbols and bolted connections. J-5 C	Read structural drawings. J-6 C
	Read and interpret piping drawings. J-7 B	Perform basic pipe layout. J-8 B	Interpret detail drawings of a rolling offset. J-9 A	Interpret detail drawings on transition pieces. J-10 A	Estimate job material and labour costs for projects. J-11 A	
LAYOUT AND FABRICATE COMPONENTS K	Interpret and apply mechanical drawings. K-1 B A	Source required information. K-2 C B A	Prepare work area. K-3 C	Layout materials. K-4 C B A	Prepare materials. K-5 C B A	Fabricate weldment (shop projects). K-6 C B A
DESCRIBES QUALITY CONTROL AND INSPECTION L	Describe and perform inspections. L-1 B A	Verify materials and testing methods. L-2 B A	Comply with weld procedure specifications (WSP) and data sheets. L-3 B A	Describe the scope of the welding supervisor and inspector responsibilities. L-4 A		

DESCRIBES SCOPE OF WELDING STANDARDS, CODES, SPECIFICATIONS AND WELDER QUALIFICATIONS

M

Identify applicable standards, codes and specifications.

M-1

	B	A	
--	---	---	--

Describe CWB jurisdiction and welder qualifications.

M-2

	B	A	
--	---	---	--

Describe and perform inspections.

M-3

	B	A	
--	---	---	--

Describe BCSA jurisdiction.

M-4

	B		
--	---	--	--

Describe CWB standards.

M-5

	B		
--	---	--	--

Describe ASME standards and welder qualifications.

M-6

	B		
--	---	--	--

Describe ABS standards and welder qualifications.

M-7

	B		
--	---	--	--

Describe CSA Z-662 standards and welder qualifications.

M-8

	B		
--	---	--	--

Describe API standards and welder qualifications.

M-9

	B		
--	---	--	--

PERFORMS SUBMERGED ARC WELDING PROCESS (SAW)

N

Describe SAW process and equipment.

N-1

C			
---	--	--	--

Describe consumables and fluxes.

N-2

C			
---	--	--	--

Describe operating parameters

N-3

C			
---	--	--	--

Set up SAW equipment.

N-4

C			
---	--	--	--

Use SAW process to weld fillet welds on low carbon steel plate.

N-5

C			
---	--	--	--

DESCRIBES SPECIALIZED WELDING AND OTHER WELDING PROCESSES (AWS)

O

Describe orbital welding.

O-1

	A		
--	---	--	--

Describe plastic welding.

O-2

	A		
--	---	--	--

Describe thermal spray process.

O-3

	A		
--	---	--	--

Describe thermit welding.

O-4

	A		
--	---	--	--

Describe electro-gas welding.

O-5

	A		
--	---	--	--

Describe electro-slag welding.

O-6

	A		
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Describe laser welding.

O-7

	A		
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Describe plasma welding.

O-8

	A		
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Describe flash butt welding.

O-9

	A		
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Describe electron beam welding.

O-10

	A		
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Describe friction welding.

O-11

	A		
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Describe friction stir welding.

O-12

	A		
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Describe stud arc welding process.

O-13

	A		
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Describe resistance welding process.

O-14

	A		
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***Note: GMAW/MC is metal cored filler metals under the AWS: A5.18 specification. It is a FCAW/MC under CSA and/or CWB. Source: American Welding Society and Canadian Standards Association (03/2007)**

WELDER LEVEL "C"

Occupation Analysis Chart

980 ESTIMATED TOTAL HOURS

APPLIES OCCUPATIONAL SKILLS 40 hrs A	Describe scope of trade and apprenticeship in BC, and other options. 60 A-1 C <table border="1" style="width: 100%; height: 15px;"><tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr></table>						Describe safe working practices. 360 A-2 C <table border="1" style="width: 100%; height: 15px;"><tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr></table>						Describe WHMIS training requirements. 30 A-3 C <table border="1" style="width: 100%; height: 15px;"><tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr></table>						Describe training requirements for confined space entry. 30 A-4 C <table border="1" style="width: 100%; height: 15px;"><tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr></table>						Describe requirements for H ₂ S training. 30 A-5 C <table border="1" style="width: 100%; height: 15px;"><tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr></table>						Perform basic trade related mathematical calculations for linear measure. 720 A-6 C <table border="1" style="width: 100%; height: 15px;"><tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr></table>					
Use measuring and layout tools. 210 A-7 C <table border="1" style="width: 100%; height: 15px;"><tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr></table>						Use hand tools. 420 A-8 C <table border="1" style="width: 100%; height: 15px;"><tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr></table>						Use power tools (electric and pneumatic). 420 A-9 C <table border="1" style="width: 100%; height: 15px;"><tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr></table>						Discuss basic welding quality control and inspection requirements. 60 A-10 C <table border="1" style="width: 100%; height: 15px;"><tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr></table>																		
PERFORMS OXY-FUEL CUTTING PROCESSES (OFC) 30 hrs B	Describe the OFC process and its application. 240 B-1 C <table border="1" style="width: 100%; height: 15px;"><tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr></table>						Describe OFC equipment and its operation. 120 B-2 C <table border="1" style="width: 100%; height: 15px;"><tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr></table>						Perform freehand and guided cuts on low carbon steel plate, sheet, round stock, structural shapes and pipe. 1200 B-3 C <table border="1" style="width: 100%; height: 15px;"><tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr></table>						Perform cuts with cutting machines, automatic and semi-automatic. 240 B-4 C <table border="1" style="width: 100%; height: 15px;"><tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr></table>																	
Describe fusion welding, braze welding and brazing processes and their applications. 60 C-1 C <table border="1" style="width: 100%; height: 15px;"><tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr></table>						Describe fusion and braze welding equipment and their operation. 60 C-2 C <table border="1" style="width: 100%; height: 15px;"><tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr></table>						Describe filler metals, fluxes and tips used for fusion and braze welding and brazing. 90 C-3 C <table border="1" style="width: 100%; height: 15px;"><tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr></table>						Describe joint design and weld positions. 60 C-4 C <table border="1" style="width: 100%; height: 15px;"><tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr></table>						Describe fusion welding on low carbon steel sheet. 60 C-5 C <table border="1" style="width: 100%; height: 15px;"><tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr></table>						Fusion weld stringer beads and fillet welds on low carbon steel sheet. 750 C-6 C <table border="1" style="width: 100%; height: 15px;"><tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr></table>						
PERFORMS FUSION AND BRAZE WELDING USING OXY-FUEL PROCESSES (OFW) 27 hrs C	Fusion weld square groove welds on low carbon steel sheet. 240 C-7 C <table border="1" style="width: 100%; height: 15px;"><tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr></table>						Braze weld fillet welds on low carbon steel sheet. 120 C-8 C <table border="1" style="width: 100%; height: 15px;"><tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr></table>						Braze weld groove welds on grey cast iron. 120 C-9 C <table border="1" style="width: 100%; height: 15px;"><tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr></table>						Silver alloy braze on similar and dissimilar metals. 60 C-10 C <table border="1" style="width: 100%; height: 15px;"><tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr></table>																	

PERFORMS SHIELDED METAL ARC WELDING (SMAW)
382 hrs D

Describe the SMAW process and its application.
120 D-1
C

Describe SMAW equipment and its operation.
120 D-2
C

Describe and select low carbon steel electrodes for SMAW.
120 D-3
C

Describe basic joint design and weld positions.
60 D-4
C

Describe causes of weld faults and distortion in fabrications and methods for prevention and control.
300 D-5
C

Use the SMAW process to weld beads in the flat position.
1440 D-6
C

Use the SMAW process to weld fillet welds on low carbon steel plate.
9600 D-7
C

Use the SMAW process to weld fillet welds on low carbon steel sheet.
720 D-8
C

Describe and demonstrate surface build up and hardface in the flat position on low carbon steel plate.
240 D-9
C

Use the SMAW process to weld groove welds in the flat 1G position on grey cast iron.
240 D-10
C

Describe and demonstrate use of SMAW stainless steel electrodes on low carbon steel plate.
360 D-11
C

Use the SMAW process to weld groove welds on low carbon steel plate.
9600 D-15
C

PERFORMS ELECTRIC ARC CUTTING, GOUGING AND RELATED PROCESSES (AAC) (PAC) (SMAC)
9 hrs E

Describe electric arc cutting and gouging processes and their applications.
120 E-1
C

Describe and demonstrate AAC equipment and its cutting and gouging operations.
240 E-2
C

Describe and demonstrate PAC equipment and its cutting and gouging operations.
180 E-3
C

PERFORMS SEMI-AUTOMATIC WELDING (GMAW) (GMAW-P) (FCAW) (GMAW/MC*)
404 hrs F

Describe the GMAW, GMAW-P, FCAW and GMAW/MC* processes and their application.
180 F-1
C

Describe GMAW, GMAW-P, FCAW and GMAW/MC* equipment and their operation.
180 F-2
C

Describe and select filler metal and shielding gases for GMAW.
60 F-3
C

Use the GMAW process to weld stringer beads and fillet welds on low carbon steel plate.
4500 F-4
C

Use the GMAW process to weld fillet welds on low carbon steel sheet.
240 F-5
C

Use the GMAW process to weld square groove welds on low carbon steel sheet.
240 F-6
C

Use the GMAW process to weld groove welds on low carbon steel plate.
4500 F-7
C

Use the GMAW-P process to weld fillet welds on low carbon steel plate.
1440 F-8
C

Use the GMAW-P process to weld fillet welds on low carbon steel sheet.
360 F-9
C

Use the GMAW-P process to weld square groove welds on low carbon steel sheet.
180 F-10
C

Use the GMAW-P process to weld groove welds on low carbon steel plate.
1440 F-11
C

Describe and demonstrate GMAW-P weld fillet welds using stainless steel filler metal on low carbon steel plate and sheet.
360 F-13
C

Describe and demonstrate procedures specific to GMAW and GMAW-P on aluminum plate.

720 F-16

C				
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Describe and select filler metals and shielding gases for FCAW and GMAW/MC*.

120 F-22

C				
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Use the FCAW self-shielding process to weld fillet welds on low carbon steel plate.

1440 F-23

C				
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Use the FCAW gas-shielded process to weld fillet welds on low carbon steel plate.

1800 F-24

C				
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Use the FCAW process to weld groove welds on low carbon steel plate.

5400 F-25

C				
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Use the GMAW/MC* process to weld fillet welds on low carbon steel plate.

360 F-26

C				
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Use the GMAW/MC* process to weld groove welds on low carbon steel plate.

360 F-27

C				
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Describe and demonstrate FCAW fillet welds using stainless steel metal wire on low carbon steel plate.

360 F-29

C				
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DESCRIBE BASIC METALLURGY RELATING TO PRODUCTION, PROPERTIES AND WELDABILITY

8 hrs G

Describe production processes for manufacturing metals.

90 G-1

C				
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Describe mechanical and physical properties of metals.

120 G-2

C				
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Describe metals.

180 G-3

C				
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Describe the alloy content and heat treatments on the weldability of steel.

90 G-5

C				
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DESCRIBES AND PERFORMS MATERIAL HANDLING AND RIGGING PROCEDURES

16 hrs I

Describe safety procedures for rigging and material handling.

120 I-1

C				
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Perform safe working load calculations involving geometric formulas, volumes and capacities.

300 I-2

C				
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Use fibre ropes to tie knots.

120 I-3

C				
---	--	--	--	--

Describe slings and rigging hardware uses.

120 I-4

C				
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Describe hoisting equipment.

120 I-5

C				
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Use hoisting equipment to perform lift.

180 I-6

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READS WELDING DRAWINGS

28 hrs J

Perform mathematical calculations involving formulas, angles, triangles and geometric construction.

360 J-1

C				
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Sketch basic objects using orthographic projection.

240 J-2

C				
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Sketch isometric drawings of basic objects.

180 J-3

C				
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Sketch a dimensioned drawing.

180 J-4

C				
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Identify common welding symbols and bolted connections.

360 J-5

C				
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Read structural drawings.

360 J-6

C				
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LAYOUT AND FABRICATE COMPONENTS
30 hrs K

Source required information.				
120				K-2
C				

Prepare work area.				
120				K-3
C				

Layout materials.				
180				K-4
C				

Prepare materials.				
240				K-5
C				

Fabricate weldments (shop projects).				
1140				K-6
C				

PERFORMS SUBMERGED ARC WELDING PROCESS (SAW)
6 hrs N

Describe SAW process and equipment.				
60				N-1
C				

Describe consumables and fluxes.				
60				N-2
C				

Describe operating parameters				
60				N-3
C				

Set up SAW equipment.				
60				N-4
C				

Use SAW process to weld fillet welds on low carbon steel plate.				
120				N-5
C				

***Note: GMAW/MC is metal cored filler metals under the AWS: A5.18 specification. It is a FCAW/MC under CSA and/or CWB.
Source: American Welding Society and Canadian Standards Association (03/2007)**

