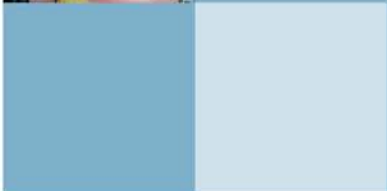
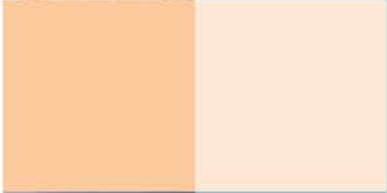
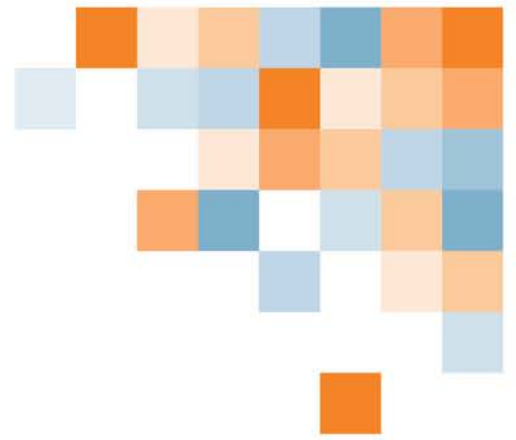


ita
YOUR TICKET.



PROGRAM OUTLINE

Metal Fabricator (Fitter)



The latest version of this document is available in PDF format on the ITA website
www.itabc.ca

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METAL FABRICATOR (FITTER) HARMONIZED PROGRAM OUTLINE

**APPROVED BY INDUSTRY
OCTOBER 2016**

**BASED ON
NOA 2012
AND
CCDA HARMONIZATION
RECOMMENDATIONS 2015**

**Developed by
Industry Training Authority
Province of British Columbia**

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Section 1

INTRODUCTION

Metal Fabricator (Fitter)



Foreword

This Program Outline is for use in Metal Fabricating industry apprenticeship training classes sponsored by the Industry Training Authority and will be used as a curriculum planning guide for instructors in the formal classroom portions of apprenticeship training.

Practical demonstration and student participation should always be integrated with classroom sessions.

Safe working practices, though not always specified in each of the competencies and learning tasks, are an implied part of the program and should be stressed throughout the apprenticeship.

Achievement Criteria set a common minimum standard for training providers to measure achievement of practical competencies. Where Achievement Criteria are specified, the apprentice must achieve the specifications, safety standards and timeframes described.

Competencies that are solely theory-based will be assessed through a multiple choice test(s) for which the apprentice must achieve a minimum score of 70%.

This Program Outline includes a list of recommended reference textbooks that are available to support the learning objectives and the minimum shop requirements needed to support instruction.

SAFETY ADVISORY

Be advised that references to the WorkSafeBC safety regulations contained within these materials do not/may not reflect the most recent Occupational Health and Safety Regulation (the current Standards and Regulation in BC can be obtained on the following website: <http://www.worksafebc.com>). Please note that it is always the responsibility of any person using these materials to inform him/herself about the Occupational Health and Safety Regulation pertaining to his/her work.



Acknowledgements

Subject Matter Experts retained in 2013 to assist in reviewing the Program Outline to address the 2012 NOA updates:

- Robert Finlayson Kwantlen Polytechnic University
- John Folkers Weldco Beales
- Nathan Van Seters Intercontinental Truck Body
- Henry Ostermann British Columbia Institute of Technology (BCIT)
- John Sutton Thompson Rivers University (TRU)
- Dave Marcinew Canron Western Constructors
- Al White Teck Resources Ltd. (accompanied by Sean Horton)

In 2015, Subject Matter Experts were convened to review and re-sequence the Metal Fabricator trade as part of the Pan-Canadian Harmonization Initiative. The following are the Subject Matter Experts who participated in this review:

- Larry Meier British Columbia Institute of Technology (BCIT)
- Kevin Neustaedter Coquitlam Steel Products Ltd.
- Nick Williams Marcon Metal Fab
- Steve Binning Eagle Iron Ltd.
- Matt Horst Coastal Pacific Crane & Hoist Engineering Ltd.
- James Cai British Columbia Institute of Technology (BCIT)

In 2016, Subject Matter Experts were convened to review the BC Occupational Analysis Chart (OAC) and Program Outline with respect to the Pan-Canadian Harmonization Initiative changes. The following are the Subject Matter Experts who participated in this review:

- Mike MacIntosh Int. Assn. of Bridge, Structural, Ornamental & Reinforcing Iron Workers
- Peter Thomas British Columbia Institute of Technology (BCIT)
- Stephen Plain College of New Caledonia (CNC)
- Brad Harder Penticton Fabricating
- Dave Marcinew Canron Western Constructors
- Eric Bohne Int. Assn. of Bridge, Structural, Ornamental & Reinforcing Iron Workers
- Gord Lane Teck Resources Ltd.
- Kevin Neustaedter Coquitlam Steel Products Ltd.
- Rick Fenwick Solid Rock Steel
- Rodney Morris George Third & Son
- Don Smith British Columbia Institute of Technology (BCIT)

The Industry Training Authority would like to acknowledge the dedication and hard work of all the industry representatives appointed to identify the training requirements of the Metal Fabrication occupation.

Committee members and consultation groups involved with prior editions of the BC Program Outline can be found in the Previous Contributors section in the appendices at the end of this document.



How to Use this Document

This Program Outline has been developed for the use of individuals from several different audiences. The table below describes how each section can be used by each intended audience.

Section	Training Providers	Employers/ Sponsors	Apprentices	Challengers
Program Credentialing Model	Communicate program length and structure, and all pathways to completion	Understand the length and structure of the program	Understand the length and structure of the program, and pathway to completion	Understand challenger pathway to Certificate of Qualification
OAC	Communicate the competencies that industry has defined as representing the scope of the occupation	Understand the competencies that an apprentice is expected to demonstrate in order to achieve certification	View the competencies they will achieve as a result of program completion	Understand the competencies they must demonstrate in order to challenge the program
Training Topics and Suggested Time Allocation	Shows proportionate representation of general areas of competency (GACs) at each program level, the suggested proportion of time spent on each GAC, and percentage of time spent on theory versus practical application	Understand the scope of competencies covered in the technical training, the suggested proportion of time spent on each GAC, and the percentage of that time spent on theory versus practical application	Understand the scope of competencies covered in the technical training, the suggested proportion of time spent on each GAC, and the percentage of that time spent on theory versus practical application	Understand the relative weightings of various competencies of the occupation on which assessment is based
Program Content	Defines the objectives, learning tasks, high level content that must be covered for each competency, as well as defining observable, measurable achievement criteria for objectives with a practical component	Identifies detailed program content and performance expectations for competencies with a practical component; may be used as a checklist prior to signing a recommendation for certification (RFC) for an apprentice	Provides detailed information on program content and performance expectations for demonstrating competency	Allows individual to check program content areas against their own knowledge and performance expectations against their own skill levels



Section	Training Providers	Employers/ Sponsors	Apprentices	Challengers
Training Provider Standards	Defines the facility requirements, tools and equipment, reference materials (if any) and instructor requirements for the program	Identifies the tools and equipment an apprentice is expected to have access to; which are supplied by the training provider and which the student is expected to own	Provides information on the training facility, tools and equipment provided by the school and the student, reference materials they may be expected to acquire, and minimum qualification levels of program instructors	Identifies the tools and equipment a tradesperson is expected to be competent in using or operating; which may be used or provided in a practical assessment
Appendix – Glossary of Acronyms			Defines program specific acronyms	



Section 2

PROGRAM OVERVIEW

Metal Fabricator (Fitter)

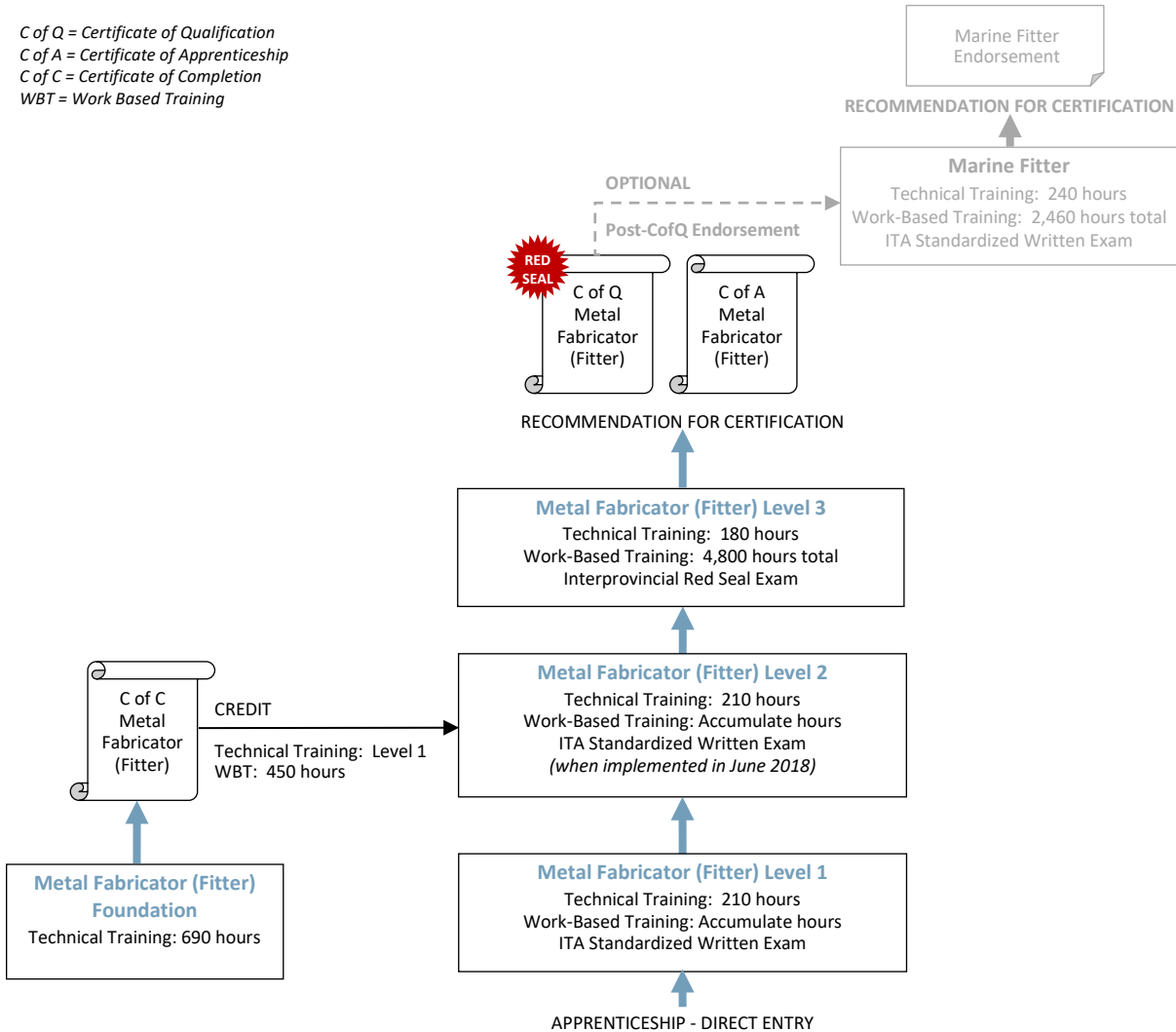


Program Credentialing Model

Apprenticeship Pathway with Optional Endorsement

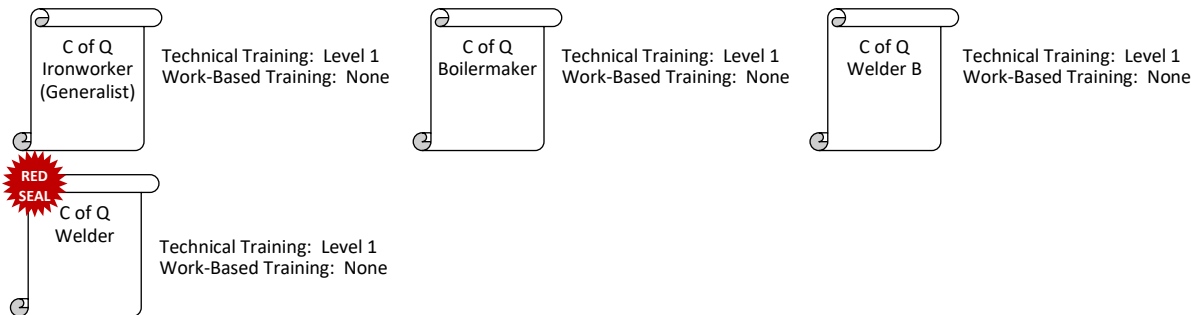
This graphic provides an overview of the Metal Fabricator (Fitter) apprenticeship pathway.

C of Q = Certificate of Qualification
C of A = Certificate of Apprenticeship
C of C = Certificate of Completion
WBT = Work Based Training



CROSS-PROGRAM CREDITS

Individuals who hold the credentials listed below are entitled to receive partial credit toward the completion requirements of this program





Occupational Analysis Chart

METAL FABRICATOR (FITTER)

Occupation Description: “Metal Fabricator” means a person who interprets drawings and is involved in the development, layout, marking, cutting (e.g., burning, sawing, shearing), hole punching, rolling, bending, drilling, shaping, forming, straightening, fitting and assembling, reaming, bolting, welding, testing, inspecting, painting, rigging, and handling of structural and mechanical fabrications constructed from plates and structural shapes of ferrous and non-ferrous metals in the Metal Fabrication Trade.

Metal Fabricators typically work in the following industries: shipbuilding, aerospace, oil and gas, commercial and residential buildings, mechanical, mining, architectural structural steel, transportation, infrastructure, bridges, and forestry.

PERFORM SAFETY-RELATED FUNCTIONS A	Maintain safe work environment A1																								
	1	2	3																						
USE TOOLS AND EQUIPMENT B	Use hand, power, layout and measuring tools and equipment B1					Use stationary machinery B2					Use thermal cutting and welding equipment B3					Use access equipment B4					Use computer numerical controlled (CNC) equipment B5				
	1					1					1	2				1						2	3		
INTERPRET PLANS, DRAWINGS AND SPECIFICATIONS C	Interpret blueprints C1					Interpret structural steel drawings C2																			
	1	2	3			1	2	3																	
PERFORM QUALITY CONTROL D	Perform inspection D1					Verify structural measurements, welds and layout D2					Track structural materials, consumables and parts for traceability D3					Apply principles of metallurgy D4					Control distortion D5				
	1						2	3				2	3			1	2				1	2	3		

*



HARMONIZED PROGRAM OUTLINE Program Overview

HANDLE MATERIALS E	Organize specialty materials and products E1	Calculate mass for structural steel E2	Apply rigging practices E3	Operate material handling equipment E4					
	1	1	1	1	1	1	1	1	1
PERFORM TRADE MATH AND LAYOUT F	Perform line development F1	Calculate bending allowances and stretch outs F2	Calculate diagonals, volume, mass and capacity F3						
	1	1	1	1	1	1	1	1	1
FORM MATERIALS G	Form material using plate rolls G1	Form material using shape rolls G2	Form material using a brake press G3	Form material using computer numerical controlled (CNC) brake press G4	Fabricate plate G5				
	2	2	2	2	1	1	1	1	1
FABRICATE COMPONENTS H	Construct templates and jigs H1	Construct sub-components H2	Determine proper sequence for assembly and welding H3	Assemble sub-components and components H4	Set fabricated component in place H5	Fabricate structural components H6			
	1	1	1	1	1	1	1	1	1
PERFORM WELDING ACTIVITIES I	Apply weld symbols I1	Use welding processes I2							
	1	1	1	1	1	1	1	1	1
COMPLETE PROJECT J	Determine finishing process J1	Prepare material for finishing J2							
	3	3	3	3	3	3	3	3	3



Training Topics and Suggested Time Allocation: Level 1

Metal Fabricator (Fitter) – Level 1

		% of Time Allocated to:			
		% of Time	Theory	Practical	Total
Line A	PERFORM SAFETY-RELATED FUNCTIONS	3%	85%	15%	100%
A1	Maintain safe work environment		✓	✓	
Line B	USE TOOLS AND EQUIPMENT	14%	50%	50%	100%
B1	Use hand, power, layout and measuring tools and equipment		✓	✓	
B2	Use stationary machinery		✓	✓	
B3	Use thermal cutting and welding equipment		✓	✓	
B4	Use access equipment		✓	✓	
Line C	INTERPRET PLANS, DRAWINGS AND SPECIFICATIONS	24%	50%	50%	100%
C1	Interpret blueprints		✓	✓	
C2	Interpret structural steel drawings		✓	✓	
Line D	PERFORM QUALITY CONTROL	6%	75%	25%	100%
D1	Perform inspection		✓	✓	
D4	Apply principles of metallurgy		✓		
D5	Control distortion		✓	✓	
Line E	HANDLE MATERIALS	6%	85%	15%	100%
E2	Calculate mass for structural steel		✓		
E3	Apply rigging practices		✓	✓	
E4	Operate material handling equipment		✓		
Line F	PERFORM TRADE MATH AND LAYOUT	24%	50%	50%	100%
F1	Perform line development		✓	✓	
F2	Calculate bending allowances and stretch outs		✓	✓	
F3	Calculate diagonals, volume, mass and capacity		✓	✓	
Line G	FORM MATERIALS	8.5%	50%	50%	100%
G5	Fabricate plate		✓	✓	
Line H	FABRICATE COMPONENTS	8.5%	50%	50%	100%
H1	Construct templates and jigs		✓	✓	
H6	Fabricate structural components		✓	✓	



% of Time Allocated to:

		% of Time	Theory	Practical	Total
Line I	PERFORM WELDING ACTIVITIES	6%	50%	50%	100%
I1	Apply weld symbols		✓	✓	
I2	Use welding processes		✓	✓	
Total Percentage for Metal Fabricator (Fitter) Level 1		100%			



Training Topics and Suggested Time Allocation: Level 2

Metal Fabricator (Fitter) – Level 2

		% of Time Allocated to:			
		% of Time	Theory	Practical	Total
Line A	PERFORM SAFETY-RELATED FUNCTIONS	3%	70%	30%	100%
A1	Maintain safe work environment		✓	✓	
Line B	USE TOOLS AND EQUIPMENT	5%	70%	30%	100%
B3	Use thermal cutting and welding equipment		✓	✓	
B5	Use computer numerical controlled (CNC) equipment		✓	✓	
Line C	INTERPRET PLANS, DRAWINGS AND SPECIFICATIONS	29%	60%	40%	100%
C1	Interpret blueprints		✓	✓	
C2	Interpret structural steel drawings		✓	✓	
Line D	PERFORM QUALITY CONTROL	5%	60%	40%	100%
D2	Verify structural measurements, welds and layout		✓	✓	
D3	Track structural materials, consumables and parts for traceability		✓	✓	
D4	Apply principles of metallurgy		✓		
D5	Control distortion		✓	✓	
Line F	PERFORM TRADE MATH AND LAYOUT	19%	50%	50%	100%
F1	Perform line development		✓	✓	
F2	Calculate bending allowances and stretch outs		✓	✓	
F3	Calculate diagonals, volume, mass and capacity		✓	✓	
Line G	FORM MATERIALS	14%	60%	40%	100%
G1	Form material using plate rolls		✓	✓	
G2	Form material using shape rolls		✓	✓	
G3	Form material using a brake press		✓	✓	
G4	Form material using computer numerical controlled (CNC) brake press		✓	✓	
G5	Fabricate plate		✓	✓	
Line H	FABRICATE COMPONENTS	17%	70%	30%	100%
H1	Construct templates and jigs		✓		
H2	Construct sub-components		✓	✓	
H3	Determine proper sequence for assembly and welding		✓		
H4	Assemble sub-components and components		✓	✓	
H5	Set fabricated component in place		✓		
H6	Fabricate structural components		✓	✓	



% of Time Allocated to:

		% of Time	Theory	Practical	Total
Line I	PERFORM WELDING ACTIVITIES	8%	70%	30%	100%
I1	Apply weld symbols		✓	✓	
I2	Use welding processes		✓	✓	
Total Percentage for Metal Fabricator (Fitter) Level 2		100%			



Training Topics and Suggested Time Allocation: Level 3

Metal Fabricator (Fitter) – Level 3

		% of Time Allocated to:			
		% of Time	Theory	Practical	Total
Line A	PERFORM SAFETY-RELATED FUNCTIONS	3%	70%	30%	100%
A1	Maintain safe work environment		✓	✓	
Line B	USE TOOLS AND EQUIPMENT	6%	60%	40%	100%
B5	Use computer numerical controlled (CNC) equipment		✓	✓	
Line C	INTERPRET PLANS, DRAWINGS AND SPECIFICATIONS	24%	50%	50%	100%
C1	Interpret blueprints		✓	✓	
C2	Interpret structural steel drawings		✓	✓	
Line D	PERFORM QUALITY CONTROL	7%	60%	40%	100%
D2	Verify structural measurements, welds and layout		✓		
D3	Track structural materials, consumables and parts for traceability		✓		
D5	Control distortion		✓	✓	
Line E	HANDLE MATERIALS	3%	80%	20%	100%
E1	Organize specialty materials and products		✓	✓	
Line F	PERFORM TRADE MATH AND LAYOUT	23%	50%	50%	100%
F1	Perform line development		✓	✓	
F2	Calculate bending allowances and stretch outs		✓	✓	
F3	Calculate diagonals, volume, mass and capacity		✓	✓	
Line G	FORM MATERIALS	14%	50%	50%	100%
G2	Form material using shape rolls		✓	✓	
G3	Form material using a brake press		✓	✓	
G4	Form material using computer numerical controlled (CNC) brake press		✓	✓	
G5	Fabricate plate		✓	✓	
Line H	FABRICATE COMPONENTS	14%	40%	60%	100%
H1	Construct templates and jigs		✓	✓	
H2	Construct sub-components		✓	✓	
H3	Determine proper sequence for assembly and welding		✓	✓	
H4	Assemble sub-components and components		✓	✓	
H5	Set fabricated component in place		✓	✓	
H6	Fabricate structural components		✓	✓	
Line I	PERFORM WELDING ACTIVITIES	3%	70%	30%	100%



% of Time Allocated to:

		% of Time	Theory	Practical	Total
I1	Apply weld symbols		✓	✓	
Line J	COMPLETE PROJECT	3%	80%	20%	100%
J1	Determine finishing process		✓	✓	
J2	Prepare material for finishing		✓	✓	
Total Percentage for Metal Fabricator (Fitter) Level 3		100%			



Section 3

PROGRAM CONTENT

Metal Fabricator (Fitter)



Level 1

Metal Fabricator (Fitter)



Line (GAC): **A** **PERFORM SAFETY-RELATED FUNCTIONS**
Competency: **A1** **Maintain safe work environment**

Objectives

To be competent in this area, the individual must be able to:

- Describe safe work rules and procedures.
- Describe fire prevention methods and precautions.
- Describe requirements for working in confined spaces.

LEARNING TASKS

1. Describe first aid and emergency procedures

2. Describe communication equipment

CONTENT

- Site orientation
- Safety bulletins
- Initial first aid procedures
 - First aid stations
 - Muster stations
 - Eye wash stations
 - Fire extinguisher
- Limits of untrained persons
- Location of first aid attendant and their responsibilities
- Recognition of emergency circumstances
 - Unconsciousness
 - Cardio pulmonary emergency
 - Severe bleeding
 - Burns
- Report hazards
 - Company policy
 - OH&S requirements
- Communications
- Accident reporting procedures
- Field level risk assessment (FLRA)
- Job hazard assessment (JHA)
- Applications
- Operational procedures
- Types
 - Radios
 - Cell phones
 - Computers
- Care
 - Maintenance
 - Storage



LEARNING TASKS

CONTENT

- | | |
|---|---|
| <p>3. Describe chain of command</p> <p>4. Describe safe practices, equipment and processes</p> <p>5. Describe safety precautions</p> <p>6. Describe the standard classifications of fires and fire extinguishers</p> <p>7. Describe handling and storage of hazardous and toxic materials</p> | <ul style="list-style-type: none"> • Professionalism • Respectful communication
 • Personal Protective Equipment (PPE) <ul style="list-style-type: none"> ○ Eye protection • Body mechanics <ul style="list-style-type: none"> ○ Lifting and carrying loads • Housekeeping • Confined space • Access and egress <ul style="list-style-type: none"> ○ Flash screens ○ Barriers • Air quality <ul style="list-style-type: none"> ○ Respiratory equipment • Tools and equipment • Mobile equipment • Lock out and isolation • Electrical and mechanical hazards <ul style="list-style-type: none"> ○ Pinch points • Power operated machinery <ul style="list-style-type: none"> ○ Safe operating capacity ○ Starting and stopping ○ Emergency shut off ○ Calibration ○ Securing material ○ General maintenance • Hand and power operated tools • Fire hazards • Flammable liquids, gases and metals <ul style="list-style-type: none"> ○ Oily rags ○ Paper or wood products ○ Electrical apparatus • Classes of fires • Types of extinguishers • Prevention methods
 • Workplace Hazardous Materials Identification System (WHMIS) <ul style="list-style-type: none"> ○ Waste disposal ○ Material Safety Data Sheets (MSDS) |
|---|---|



LEARNING TASKS

8. Define key terms used in the Workers Compensation Act
9. Describe applications of the Occupational Health and Safety Regulations of WorkSafeBC
10. Describe applications of the federal Occupational Safety and Health Regulations

CONTENT

- Applicable terms
- Applicable regulation (WorkSafe parts 1-19)
- Applicable regulation (Bill C-45)



Line (GAC): B USE TOOLS AND EQUIPMENT
Competency: B1 Use hand, power, layout and measuring tools and equipment

Objectives

To be competent in this area, the individual must be able to:

- Describe and maintain measuring, layout and hand tools.
- Describe the procedures for using various specialized measuring tools.
- Describe and maintain bench and hand grinders.
- Describe and maintain handheld power tools.
- Describe the use of nibblers.

LEARNING TASKS

1. Describe and maintain hand tools

2. Describe and maintain layout tools

3. Describe and maintain grinders

CONTENT

- Hammers
- Wrenches
- Clamps
- Drill bits
- Files
- Drift pins
- Chisels
- Care
 - Maintenance
 - Storage
- Layout tools
- Specialty tools
- Care
 - Maintenance
 - Storage
 - Calibration
 - Specialized measuring tools
- Types
- Applications
- Safety considerations
- Care
 - Maintenance
 - Storage



LEARNING TASKS

4. Use grinders

5. Describe and maintain power and pneumatic tools

6. Use magnetic drill

7. Describe and maintain nibbler

CONTENT

- Procedures
- Manufacturer's specifications
- Deburr edges
- Bevel plate edge
- Remove plate corner radius square corners

- Applications
- Safety considerations
- Operational procedures
- Types and features
- Care
 - Maintenance
 - Storage

- Marking
- Centering
- Reaming

- Safety considerations
- Applications
- Types
- Capacity
 - Type and thickness
 - Material characteristics
- Cut considerations



LEARNING TASKS

- 10. Describe band saws

- 11. Use band saws

- 12. Describe ironworker

CONTENT

- Applications
- Advantages and disadvantages
- Safety considerations
- Components
- Types
- Automatic feed
- Machine operation
- Procedure
- Blades
 - Types
 - Styles
 - Tooth pitch
 - Rake
- Capacity

- Structural shapes
 - Seam
 - Part orientation
 - Stack cutting/nested cuts
- Shop tolerances
- Cuts
 - Mitre
 - Square
 - Compound

- Applications
- Safety considerations
- Types
 - Mechanical
 - Hydraulic
- Components
- Automatic feed
- Machine operation
- Procedure
 - Back stops
 - Gauges
 - Jigs
- Capacity



LEARNING TASKS

13. Use ironworker

14. Describe drill presses

CONTENT

- Structural shapes
- Shop tolerances
- Cuts
 - Mitre
 - Square
 - Compound
- Applications
- Safety considerations
- Types
 - Bench top
 - Floor
 - Radial arm
 - Sensitive
 - Magnetic base
- Components and tools
- Capacity
 - Type and thickness
 - Material characteristics
 - Drill considerations
- Procedure
 - Set up
 - Speed/feed rate
 - Material
 - Hole dimensions
 - Cutter/drill bit
 - Sharpening



LEARNING TASKS

15. Describe the thread cutting machine

CONTENT

- Applications
- Safety considerations
- Types
 - Manual
 - Electric
 - Hydraulic
- Components
 - Carriage
 - Chucks
- Procedure
 - Speed/feed rates
 - Die installation
 - Mounting material in chuck
 - Ream/cut pipe
 - Round stock
 - Pipe
- Capacity
 - Type and thickness
 - Material characteristics
 - Thread considerations
- Maintenance



Line (GAC): **B USE TOOLS AND EQUIPMENT**
Competency: **B3 Use thermal cutting and welding equipment**

Objectives

To be competent in this area, the individual must be able to:

- Describe various thermal cutting methods.
- Describe welding equipment.
- Use oxy-fuel cutting equipment.

LEARNING TASKS

CONTENT

- | | |
|--|---|
| <ol style="list-style-type: none"> 1. Describe various thermal cutting processes
 2. Identify oxy-fuel cutting and welding equipment
 3. Use oxy-fuel cutting equipment
 4. Identify plasma arc cutting equipment | <ul style="list-style-type: none"> • Oxy-fuel • Air arc • Plasma • Manual and Semi-automatic • Maintenance • Advantages and disadvantages
 • Safety considerations • Operational considerations • Components <ul style="list-style-type: none"> ○ Consummables ○ Maintenance
 • Set up and shutdown • Operation • Maintenance • Storage
 • Advantages and disadvantages • Safety considerations • Capacity/material • Components • Types of gases |
|--|---|



LEARNING TASKS

5. Describe air-arc cutting (AAC)

CONTENT

- Applications
- Advantages and disadvantages
- Capacity
- Components
- Safety considerations
- Procedures
- Trouble shooting
 - Slag
 - Carbon deposit
 - Control

Achievement Criteria

Performance The learner will be able to correctly set up and operate oxy-fuel cutting equipment to produce a profile burned coupon.

Conditions Shop projects will be completed in a training provider facility, given:

- 1/2" plate material
- Tools and equipment
- A prescribed time limit

Criteria The learner will be evaluated on:

- Project completion within 4 hours
- Accuracy and tolerances (+/- 1/16")
 - Circles
 - Squares
 - Triangles
 - Bevels
 - Slots
 - Guided cuts
- Cut edge quality
- Manual cleaning processes (only)



Line (GAC): C INTERPRET PLANS, DRAWINGS AND SPECIFICATIONS
Competency: C1 Interpret blueprints

Objectives

To be competent in this area, the individual must be able to:

- Describe an orthographic drawing.
- Sketch multi-view drawings of objects using isometric and orthographic projection.
- Identify standard symbols and abbreviations on drawings.
- Sketch detail, auxiliary and section views.
- Interpret specifications.
- Interpret welding symbols.
- Describe advantages and disadvantages of CAD drawings.

LEARNING TASKS

1. Identify the alphabet of lines

2. Describe the principles of orthographic and isometric projection

3. Draw and dimension orthographic sketches of simple objects

4. Make an isometric drawing of a given object

5. Draw auxiliary views of features on simple objects

CONTENT

- Types
 - Object
 - Hidden
 - Centre
 - Extension
 - Dimension
 - Cutting plane
 - Break
 - Section

- Views
- Projection method
- Auxiliary
- Section

- Rules and principles for dimensioning
- Drawing units

- Orientation
- Development of construction lines
- Drawing to scale
- Non-isometric features

- Proportion
- Orientation
- Dimensioning



LEARNING TASKS

6. Draw section views of simple objects

7. Interpret standard symbols and abbreviations

8. Interpret welding symbols

9. Describe CAD drawings

CONTENT

- Cutting plane axis and orientation
- Scale
- Types of lines
- Dimensioning

- Symbols
- Abbreviations
- Notes
- Marks

- Reference line
- Arrow side/other side
- Reading sequence
- Weld symbols
- Joint profile

- Advantages and disadvantages
- Uniformity
- Scale
- Object presentation



Line (GAC): C INTERPRET PLANS, DRAWING AND SPECIFICATIONS

Competency: C2 Interpret structural steel drawings

Objectives

To be competent in this area, the individual must be able to:

- Interpret structural steel drawing.
- Draw views.
- Construct a bill of material.
- Develop a simple estimate.

LEARNING TASKS

1. Interpret a structural drawing

2. Draw section views

3. Interpret standard symbols and abbreviations

4. Describe a bill of material

CONTENT

- Title block
- Revisions
- General layout
 - Orientation of beam or column on given drawing paper
- Material list
 - Identification of main structural member(s)
- Specifications
- Cutting plane axis and orientation
- Scale
- Types of lines
- Dimensioning
- Centre line
- Base line
- Workpoint
- Structural shapes
- Location
- Purpose
- Format
 - Item number
 - Piece mark
 - Quantity
 - Description
 - Length
 - Weight
 - Remarks



LEARNING TASKS

5. Develop a material list

6. Label and detail drawings

CONTENT

- Simple structural drawing
- Content
- Structural shapes
- Special instructions
- Hole location
- Cut details
- Plate edge preparation
- Dimensions



Line (GAC): **D PERFORM QUALITY CONTROL**
Competency: **D1 Perform inspection**

Objectives

To be competent in this area, the individual must be able to:

- Describe types and applications of fabrication codes.
- Describe inspection and non-destructive inspection techniques.

LEARNING TASKS

CONTENT

- | | |
|---|--|
| <p>1. Identify codes used in metal fabrication</p> | <ul style="list-style-type: none"> • CSA S16 • CSA W59 • CSA G40.20 M • AWS 3.1 • AWS D1.1 • CSA G40.21 • CSA G40.12 • CSA W47.1 (steel) • CSA W47.2 (aluminum) • BC Building Code • Lloyds • API 650 • CISC • ASME • AISC • CWB W59 • ANSI |
| <p>2. Describe critical inspections for fabrication</p> | <ul style="list-style-type: none"> • Welding code tolerances • Material characteristics • Piece count • Minimum quality requirements • Mill materials <ul style="list-style-type: none"> ○ Deformities ○ Dimensional inaccuracy • Obvious omissions <ul style="list-style-type: none"> ○ Welds ○ Parts • Surface imperfections <ul style="list-style-type: none"> ○ Spatter ○ Gouges |



LEARNING TASKS

3. Describe various non-destructive testing techniques

4. Describe visual inspection techniques

CONTENT

- Sharp edges
- Weld defects
 - Location
 - Weld size
 - Porosity
 - Undercut
 - Crater cracks
- Fabrication defects
 - Distortion
 - Improper fit up
 - Piece alignment
- Radiography - gamma and X-ray
- Dye and fluorescent penetrants
- Ultrasonic
- Magnetic particle
- Hydrostatic - air and water
- Material
- Welds
- Completed unit



Line (GAC): **D PERFORM QUALITY CONTROL**
Competency: **D4 Apply principles of metallurgy**

Objectives

To be competent in this area, the individual must be able to:

- Describe the characteristics of various types of steels.
- Describe effects of heat on metals.
- Describe methods of relieving stress on metals.
- Describe standard types and methods of testing common metals.

LEARNING TASKS

CONTENT

1. Describe the basic ways of manufacturing steel	<ul style="list-style-type: none"> • Bessemer converter • Open hearth furnace • Crucible furnace • Electrical furnace
2. Describe the general characteristics of structural metals	<ul style="list-style-type: none"> • Elements • Grades • Regulatory organizations • CSA standard types • ASTM standard types
3. Describe important properties of types of metals	<ul style="list-style-type: none"> • Body centre cubic (BCC) • Face centre cubic (FCC) • Density • Tensile strength • Hardness • Ductility • Weldability • Chemical resistance • Atmospheric resistance • Heat resistance
4. Describe the effects of heat on metals	<ul style="list-style-type: none"> • Hardening • Tempering • Annealing • Normalizing • Distortion control



LEARNING TASKS

5. Identify standards processes for testing metals

CONTENT

- Charpy V notch
- Rockwell
- Brinell
- Tensile



Line (GAC): **D PERFORM QUALITY CONTROL**
Competency: **D5 Control distortion**

Objectives

To be competent in this area, the individual must be able to:

- Describe the elements that contribute to distortion in fabrication.
- Describe how distortion can be observed and measured.

LEARNING TASKS

1. Identify fabricated assemblies where distortion must be considered

2. Describe stress that may develop in fabricated metal structures

3. Identify measures and controls to minimize distortion

CONTENT

- Engine and mechanical bases
- Pipe/flange connections
- Drive units
- Bolted connections
- Spliced connections
- Trial assemblies
- Drilling operations
- Heat straightening
- Dowel connections during trial assembly

- Types
 - Longitudinal
 - Transverse
 - Angular
 - Residual
- Sub-assemblies
- Jigs and fixtures
 - Strong back
 - Clamps
 - Braces
- Welding sequences
- Proper fit-up
- Counter bending



Line (GAC): E HANDLE MATERIALS

Competency: E2 Calculate mass for structural steel

Objectives

To be competent in this area, the individual must be able to:

- Convert metric and imperial units.
- Calculate area and weights/mass of various plate shapes.

LEARNING TASKS

CONTENT

<p>1. Select and use tools and equipment</p>	<ul style="list-style-type: none"> • Load indicators • Calipers • Measuring tapes • Gauges <ul style="list-style-type: none"> ○ Sheet ○ Plate
<p>2. Describe key terms and concepts necessary for correct calculation of plate weight</p>	<ul style="list-style-type: none"> • Drawings • Manuals • Suppliers' catalogues • Plate shape <ul style="list-style-type: none"> ○ Square ○ Rectangular ○ Triangular ○ Circular • Plate weight constants • Dimensions required for calculation • Required formulas
<p>3. Convert imperial dimensions to decimal values and vice versa</p>	<ul style="list-style-type: none"> • Decimal expression in feet or inches • Inch and fraction to decimal of a foot • Convert between Imperial and Metric • Convert feet and inches to decimals • Rounding numbers
<p>4. Calculate imperial weights and areas of plate shapes</p>	<ul style="list-style-type: none"> • Plate shape • Appropriate formula • Required variables
<p>5. Calculate metric weights and areas of plate shapes</p>	<ul style="list-style-type: none"> • Plate shape • Appropriate formula • Required variables



6. Use a steel handbook to determine mass of structural shapes
 - Beams
 - Channels
 - Angles



LEARNING TASKS

5. Use cranes and hoists

6. Describe communications

7. Describe safe procedures for disconnecting and removing rigging

8. Describe and demonstrate rigging methods when moving loads

9. Identify and use knots, bends and hitches

CONTENT

- Types of cranes
 - Overhead
 - Gantry
 - Hoist
 - Jib
- Centre of gravity
- Lift points
- Potential damage to object being lifted
- Capacity of cranes

- Hand signals
 - Boom signals
 - Line signals
- Radio communications
- Dangers of load collapse or rollover
- Tensioned chokers or Tirlors
- Tag line
- Balance

- Hoisting
- Rotating (turning)
- Rolling
- Guiding
- Aligning
- Safety Considerations

- Parts of a rope
- Attaching to a fixed object
- Tying down a load
- Joining ropes together

Achievement Criteria

Performance The learner will perform an inspection on a hoist and single sling configuration.

- Conditions** The learner will be given:
- Jib crane complete with hoist
 - Single sling configuration
 - Access to codes and standards
 - A prescribed time limit

- Criteria** The learner will be evaluated on:
- Project completion within 1 hour
 - In accordance with WorkSafe BC regulations



Line (GAC): **F PERFORM TRADE MATH AND LAYOUT**
Competency: **F1 Perform line development**

Objectives

To be competent in this area, the individual must be able to:

- Define basic layout terms and sequences.
- Create patterns using parallel line development.

LEARNING TASKS

CONTENT

- | | |
|--|--|
| <p>1. Define basic layout terms</p> | <ul style="list-style-type: none"> • Seam • Mitre • Base line • Tangent • Stretch out • Battle line • Ordinate • Centre line |
| <p>2. Develop geometric line construction</p> | <ul style="list-style-type: none"> • Perpendicular • Bisect <ul style="list-style-type: none"> ○ Line segment ○ Arc • External radius • Segment <ul style="list-style-type: none"> ○ Circle ○ Line |
| <p>3. Describe essential views for developing patterns</p> | <ul style="list-style-type: none"> • Elevation • Plan |
| <p>4. Define basic layout sequences</p> | <ul style="list-style-type: none"> • Truncated rectangular pipe • Truncated round pipe • Pipe tee-joint • Offset-pipe tee-joint • Inclined (lateral) pipe joint • Multi-piece pipe elbow complete with branch |



Line (GAC): **F PERFORM TRADE MATH AND LAYOUT**
Competency: **F2 Calculate bending allowances and stretch outs**

Objectives

To be competent in this area, the individual must be able to:

- Determine stretch out lengths.
- Develop sketches of flat plate layout.

LEARNING TASKS

1. Use a scientific calculator

2. Describe process terminology

3. Determine the stretch out dimensions using flange calculations

4. Determine the stretch out dimensions using mean calculations

5. Develop sketches of flat plate layouts.

CONTENT

- Functions
 - Add, subtract, multiply, divide
 - Squares and square root
 - Convert dimensions

- Inside dimensions
- Mean dimensions
- Bend allowance
- Mean arc length
- Material thickness

- Flanged shape

- Cylinder
- Rolled segments

- Rolled shape
- Flanged shape
- Dimensions
- Labelling
- Plate gauge



LEARNING TASKS

6. Identify types of plate fit up used on vessels

7. Solve for cylindrical vessel weight/mass

8. Solve for cylindrical vessel capacity

9. Identify information required to detail box-shaped vessels

10. Solve for box-shaped vessel weight/mass

11. Solve for box-shaped vessel capacity

CONTENT

- Cylindrical
- Box-shaped
- End plate/corner to corner
 - Open
 - Closed
 - Half

- Selection of correct formula
- Determine required dimensions

- Selection of correct formula
- Determine required dimensions

- Dimensions of individual sides
- Thickness of material
- Type of plate fit

- Individual plate dimensions
- Correct formulas

- Required dimensions for formula used



- Ring to ring
 - A 3-piece, 90° elbow complete with branch
- Conditions Shop projects will be completed in a training provider facility, given:
- Drawings
 - 1/8" mild steel/low carbon material
 - A prescribed time limit
- Criteria The learner will be evaluated on:
- Completion of all three projects within 18 hours in a shop environment
 - Dimension and tolerance
 - Alignment
 - Form and fit
 - Appearance
 - Neat and feathered tack welds
 - Tack spacing
 - Tack location
 - Edge finish



Line (GAC): H FABRICATE COMPONENTS

Competency: H1 Construct templates and jigs

Objectives

To be competent in this area, the individual must be able to:

- Assemble and use jigs.
- Layout and design templates.

LEARNING TASKS

CONTENT

- | | |
|---|---|
| <ol style="list-style-type: none"> 1. Describe basic planning considerations for jigs
 2. Describe the different types of jigs used in fabrication
 3. Define standard edge distances
 4. Describe templates | <ul style="list-style-type: none"> • Advantages and disadvantages • Required materials • Tooling • Materials • Reference points • Tolerances • Allowances
 • Advantages and disadvantages • Internal • External • Incremental • Alignment • Bolted • Welded
 • Sheared or thermal • Connecting bolt • Anchor bolt • CISC/AISC
 • Advantages and disadvantages • Purpose and types <ul style="list-style-type: none"> ○ Templates • Materials <ul style="list-style-type: none"> ○ Cardboard ○ Sheet metal ○ Wood ○ Steel |
|---|---|



LEARNING TASKS

5. Lay out template

CONTENT

- Workpoint
- Sequence
- Quality Control
- Labelling and marking
- Edge distance



LEARNING TASKS

3. Fabricate a structural beam assembly

CONTENT

- Structural drawings
- Canadian Institute of Steel Construction (CISC) material classification
- Templates
- Working bevels
- Edge distance
- Fasteners
- Running dimensions
- Gauge and pitch
- Structural terminology

Achievement Criteria

Performance The learner will be able to fabricate the following:

- Structural beam assembly

Conditions Shop project will be completed in a training provider facility, given:

- Drawings
- Suitable CISC references
- Structural steel components
- Shop tools and equipment
- A prescribed time limit

Criteria The learner will be evaluated on:

- Project completion within 12 hours
- Dimension
- Alignment
- Tolerance and fit up
- Edge preparation
- Hole locations
- Edge distance
- Appearance
 - Orientation
 - Mark up
 - Edge finish



Level 2

Metal Fabricator (Fitter)



Line (GAC): **A** **PERFORM SAFETY-RELATED FUNCTIONS**
Competency: **A1** **Maintain safe work environment**

Objectives

To be competent in this area, the individual must be able to:

- Use fall arrest/prevention equipment.
- Design a confined space entry plan.

LEARNING TASKS

1. Select appropriate fall arrest/prevention equipment

2. Use fall arrest/prevention equipment

3. Design a confined space entry plan

CONTENT

- Heights
- Obstacles
- Access and egress
- Mobility
- Work activity

- Equipment
 - Lanyards
 - Harness
- Anchors
- Fit and serviceability

- Work activity assessment
- Air quality
- Access and egress
- Equipment
- Documentation/administration
- Personnel
- Rescue



Line (GAC): **B USE TOOLS AND EQUIPMENT**
Competency: **B3 Use thermal cutting and welding equipment**

Objectives

To be competent in this area, the individual must be able to:

- Use plasma-arc cutting process

LEARNING TASKS

1. Use plasma-arc cutting equipment

CONTENT

- Set up
- Operator position
- Cutting procedure
- Maintenance
 - Consummables
- Trouble-shooting



Line (GAC): C INTERPRET PLANS, DRAWINGS AND SPECIFICATIONS
Competency: C1 Interpret blueprints

Objectives

To be competent in this area, the individual must be able to:

- Sketch views of complex objects.
- Apply standard symbols, abbreviations and specifications.
- Interpret complex drawings and specifications.
- Draw complex welding symbols.
- Describe CAD generated drawings.

LEARNING TASKS

1. Develop and detail orthographic drawings

2. Apply standard symbols, abbreviations and specifications

3. Draw complex welding symbols

4. Describe CAD detailing to generate layout

CONTENT

- Various views
 - Detail
 - Section
 - Auxiliary
- Isometric
- Centre line
- Base line
- Elevation
- Work point
- Extension and dimension lines
- Welding procedure data sheet (WPDS)
- Multiple reference lines
- Plate
- Component



LEARNING TASKS

7. Describe electronic detailing

CONTENT

- AutoCAD Inventor
- SigmaNEST
- Solidworks
- SDS



LEARNING TASKS

6. Confirm markings

7. Confirm torque and dimensions

8. Inspect weldments

9. Confirm diagonals

CONTENT

- Pieces
 - Detail
 - Main
- Fasteners
- Components
- Size and location
- Layout
- Components
- Assemblies
- Marquee



Line (GAC): **D PERFORM QUALITY CONTROL**
Competency: **D3 Track structural materials, consumables and parts for traceability**

Objectives

To be competent in this area, the individual must be able to:

- Describe the purpose and method of labelling structural components.
- Describe methods and equipment used in metal identification.
- Develop a bill of material.

LEARNING TASKS

1. Describe the purpose of identifying parts required on a shop or field blueprint
2. Describe the importance of applying field identification marks in their proper location and specification
3. Describe record keeping and other requirements in the process operation

CONTENT

- Detail pieces
- Completed units
- Piece mark
- Direction mark
- Field assembly marks
- Match marks after trial assembly
- Marking devices
- Manual tracking systems
 - Tagging
 - Number stamping
 - Engraving
- Identify sources and availability of materials
- Quality control information
 - Mill certification
 - Heat number
 - Information transfer to crop material
 - Weld maps
 - Welder's identification
 - Welder qualification
 - Company policy quality assurance (QA)
- Document MTR and HIN for project
 - Material test report (MTR)
 - Heat identification number (HIN)
- Coordinate receipt of materials
- Document a bill of lading
- Coordinate receipt of fabricated components
- Inspect components for defects



LEARNING TASKS

4. Develop a bill of material

CONTENT

- Parts
- Material
- Weights



Line (GAC): **D PERFORM QUALITY CONTROL**
Competency: **D4 Apply principles of metallurgy**

Objectives

To be competent in this area, the individual must be able to:

- Identify methods of relieving stress on metals.
- Describe standard types and methods of testing common metals.
- Describe the tools and equipment used to measure preheat temperatures.

LEARNING TASKS

CONTENT

- | | |
|--|--|
| <ol style="list-style-type: none"> 1. Identify methods of stress relieving on metals
 2. Describe standard material tests
 3. Determine heat temperatures and tools required
 4. Interpret technical specifications | <ul style="list-style-type: none"> • Peening • Vibration • Heat treating • Flame straightening • Ultrasonic stress relieving • Heat pads
 • Spark spray pattern • Tensile strength • Surface indentation • Notch toughness
 • Preheat/interpass/post • Worksite welding procedures • Blueprint • Crack prevention • Temperature measuring tools <ul style="list-style-type: none"> ○ Temperature stick ○ Digital heat sensor ○ Rosebud ○ Tiger torch • Induction heater
 • Physical characteristics • Spark spray pattern • Tensile testing and graph interpretation • Surface hardness • Brittleness/toughness |
|--|--|



Line (GAC): D PERFORM QUALITY CONTROL

Competency: D5 Control distortion

Objectives

To be competent in this area, the individual must be able to:

- Describe distortion allowances.
- Describe processes to control distortion.
- Describe procedures to minimize distortion.

LEARNING TASKS

CONTENT

- | | |
|--|---|
| <ol style="list-style-type: none"> 1. Estimate possible distortion allowances
 2. Describe how to help control and minimize the effects of heat distortion
 3. Identify methods of distortion control
 4. Select and use tools and equipment
 5. Define the steps to correct distortion | <ul style="list-style-type: none"> • CISC allowance tables • Customer specifications
 • Sub-assemblies • Jigs and fixtures <ul style="list-style-type: none"> ○ Strong back ○ Clamps ○ Braces • Welding sequences • Proper fit-up • Counterbalance/shrinkage forces
 • Mechanical • Induction • Flame
 • Come-alongs • Hydraulic rams • Peening • Torches • Temperature control devices • Induction heaters and ovens <ul style="list-style-type: none"> ○ Stress relief
 • Evaluate • Correct • Measure |
|--|---|



Line (GAC): **F PERFORM TRADE MATH AND LAYOUT**
Competency: **F1 Perform line development**

Objectives

To be competent in this area, the individual must be able to:

- Develop various patterns using radial line development.

LEARNING TASKS

1. Develop a true length diagram (TLD)

2. Develop patterns and scaled models involving radial line methods

3. Calculate and layout complex formed pattern

CONTENT

- Elevation
- Offset
- Mean dimension

- Concentric cone
- Frustum of a concentric cone
- Truncated cone
- 90° cone to T
- Cone transition to a cylinder
- Round or square branch intersecting a cone
- Inclined cone intersecting a cylinder

- Plate gauge and size
- Nesting
- Quality control
- Labelling
- Required patterns



Line (GAC): **F** **PERFORM TRADE MATH AND LAYOUT**
Competency: **F2** **Calculate bending allowances and stretch outs**

Objectives

To be competent in this area, the individual must be able to:

- Determine stretch out lengths.
- Interpret complex sketches to develop flat plate layout.
- Calculate mass and diagonals.

LEARNING TASKS

CONTENT

- | | |
|--|--|
| <ol style="list-style-type: none"> 1. Interpret complex sketches to develop flat plate layout. 2. Determine mass of flat plate stretch outs 3. Calculate stretch out diagonal | <ul style="list-style-type: none"> • Cylinder • Rolled segments • Flanged shape • Cylinder • Rolled segments • Flanged shape • Plate gauge • Pythagoras' theorem |
|--|--|



Line (GAC): **G** **FORM MATERIALS**
Competency: **G1** **Form material using plate rolls**

Objectives

To be competent in this area, the individual must be able to:

- Describe power plate rolls.

LEARNING TASKS

1. Review elements of plate roll operation

CONTENT

- Applications
- Safety considerations
- Components
- Machine operation
- Procedure
 - Control console
 - Drive mechanisms
 - Roll adjustment mechanism
 - Pre-form material/pinching
 - Brake press, if required
 - Adjust plate roller
 - Sweep/template
 - Monitor material
- Measurement verification
- Removal of completed material
- Capacity
 - Formability of material
 - Grade
 - Quality
 - Thickness
 - Cut considerations
- Commercial and single pass rolling



Line (GAC): G FORM MATERIALS
Competency: G3 Form material using a brake press

Objectives

To be competent in this area, the individual must be able to:

- Use the hydraulic brake press.
- Perform complex forming operations.

LEARNING TASKS

CONTENT

- | | |
|--|---|
| <ol style="list-style-type: none"> 1. Describe hydraulic brake press operation and capabilities
 2. Use the hydraulic brake press to form metal
 3. Apply quality control and assurance | <ul style="list-style-type: none"> • Operational theory • Types of forming operations • Component parts • Calibration
 • Set up • Complex forming operations involving radial line development • Soft radius bending
 • Sweeps and patterns • Check dimensions • True length dimensions |
|--|---|



Achievement Criteria

- | | |
|-------------|--|
| Performance | <p>The learner will be able to fabricate the following:</p> <ul style="list-style-type: none"> • Hopper • Cone • Four-nozzle tank assembly |
| Conditions | <p>Shop projects will be completed in a training provider facility, given:</p> <ul style="list-style-type: none"> • Drawings • Tools and equipment • Manual plasma cutting equipment • 1/8" mild steel/low carbon material • A prescribed time limit |
| Criteria | <p>The learner will be evaluated on:</p> <ul style="list-style-type: none"> • Completion of three projects within 24 hours • Dimension and tolerance • Alignment • Form and fit • Appearance <ul style="list-style-type: none"> ○ Neat and feathered tack welds ○ Tack spacing ○ Tack location ○ Edge finish |



Line (GAC): H FABRICATE COMPONENTS

Competency: H1 Construct templates and jigs

Objectives

To be competent in this area, the individual must be able to:

- Construct a jig.
- Construct a template.

LEARNING TASKS

1. Describe considerations for jig construction

2. Construct a simple jig

3. Construct a template

CONTENT

- Distortion
- Interference
- Clearance
- Wear
- Welding sequence and distortion
- Design
- Cost
- Computer-based design
- Tolerances
 - Axis
 - Plane
 - Work point
- Internal and external constraints
- Hold downs
 - Dogging
 - Clamping
 - Manipulation
- Interpret drawing
- Reference datum
- Hole set
- Edge distance
- Plate size
- Codes and standards
- Marking and identification



Line (GAC): **H FABRICATE COMPONENTS**
Competency: **H3 Determine proper sequence for assembly and welding**

Objectives

To be competent in this area, the individual must be able to:

- Plan for the installation and assembly of all components on site.

LEARNING TASKS

1. Describe the operation process for planning the installation and assembly of all components on-site

2. Apply quality control

3. Describe welding sequences

CONTENT

- Codes and standards
- Contractual requirements
- Site dimensions
- Elevations
- Revisions
- Staffing

- Dimensions
- Alignment
- Holes
- Fit up
- Marking
- Geometry

- Distortion control
- Weld
 - Spacing
 - Distribution
 - Sequence



Line (GAC): H FABRICATE COMPONENTS
Competency: H5 Set fabricated component in place

Objectives

To be competent in this area, the individual must be able to:

- Describe levelling fabricated components using the builder's level.

LEARNING TASKS

1. Read drawings

2. Describe installation considerations

3. Describe the builder's level

CONTENT

- Location
- Access
- Grade
- Timing

- Shimming
- Shot elevations
- Sight reduction
- Sight maps
- Alignment
- Securing component

- Purpose
- Types
- Characteristics
- Components
- Set up
- Use
- Correction
- Maintenance
- Calculations
- Terminology



Line (GAC): **H FABRICATE COMPONENTS**
Competency: **H6 Fabricate structural components**

Objectives

To be competent in this area, the individual must be able to:

- Fabricate a stair assembly complete with handrail.

LEARNING TASKS

1. Fabricate a stair assembly complete with handrail

CONTENT

- Codes and standards
- Layout
- Run and rise
- Structural stair terminology

Achievement Criteria

Performance	The learner will be able to fabricate the following: <ul style="list-style-type: none"> • Stair with handrail assembly
Conditions	Shop project will be completed in a training provider facility, given: <ul style="list-style-type: none"> • Drawings • Structural steel components • Shop tools and equipment • Manual plasma cutting equipment • A prescribed time limit
Criteria	The learner will be evaluated on: <ul style="list-style-type: none"> • Project completion within 12 hours • Dimension • Alignment • Fit up • Hole locations • Appearance <ul style="list-style-type: none"> ○ Mark up ○ Edge finish



Line (GAC): **I** **PERFORM WELDING ACTIVITIES**
Competency: **I1** **Apply weld symbols**

Objectives

To be competent in this area, the individual must be able to:

- Apply complex weld symbols.
- Interpret welding codes and standards.
- Interpret welding procedure data sheet (WPDS)
- Describe standard weld inspection symbols.

LEARNING TASKS

1. Apply complex weld symbols

2. Interpret welding codes and standards
3. Interpret welding procedure data sheet (WPDS)

4. Describe standard weld inspection symbols

CONTENT

- Multiple reference line
- Terminology
- Types
- Design
- Dimensions
- Five basic joints
- Edge preparation

- CWB W59, 47.1
- Design
- Interpret
- Apply

- Radiography
- Dye penetrant
- Magnetic particle
- Acoustic
- Ultrasonic
- Visual



Line (GAC): **I** **PERFORM WELDING ACTIVITIES**
Competency: **I2** **Use welding processes**

Objectives

To be competent in this area, the individual must be able to:

- Describe FCAW and GTAW welding processes.

LEARNING TASKS

1. Describe FCAW and GTAW

CONTENT

- Safety
- Applications
- Power sources
- Components
- Current design
- Set up
- Operation
- Maintenance
- Consumables
- Gases and electrodes



Level 3

Metal Fabricator (Fitter)



Line (GAC): **A** **PERFORM SAFETY-RELATED FUNCTIONS**
Competency: **A1** **Maintain safe work environment**

Objectives

To be competent in this area, the individual must be able to:

- Apply the Field Level Risk Assessment (FLRA)
- Apply the Job Hazard Assessment (JHA)
- Conduct an eccentric lift.

LEARNING TASKS

CONTENT

<p>1. Apply the Field Level Risk Assessment (FLRA)</p> <p>2. Apply the Job Hazard Assessment (JHA)</p> <p>3. Conduct an eccentric lift</p>	<ul style="list-style-type: none"> • Plans • Equipment • Safety parameters • PPE • Actions on • Task • Equipment • Duration • PPE • Rigging components • Sling configurations • Centre of balance • Working load limits
--	--

Achievement Criteria

Performance The learner will work in pairs to rotate an eccentric load in a controlled fashion.

Conditions The learner will be given:

- Rigging components
- Hoist
- Eccentric structural shape
- Saw horses
- Dunnage
- A prescribed time limit

Criteria The learner will be evaluated on:

- Project completion within 1 hour
- Safety
- Control
- Sling configuration



Line (GAC): C INTERPRET PLANS, DRAWINGS AND SPECIFICATIONS
Competency: C1 Interpret blueprints

Objectives

To be competent in this area, the individual must be able to:

- Interpret advanced multi-drawing sets.
- Apply specifications.
- Apply welding symbols.
- Develop simple CAD details.
- Develop a detailed estimate.

LEARNING TASKS

1. Interpret multi-drawing sets

2. Apply specifications

3. Apply welding symbols
4. Use weld procedure data sheet (WPDS)

5. Use CAD software to produce details

CONTENT

- Drawing sets
 - Equipment
 - Machinery
 - Mechanical
 - Tanks
 - Vessels
 - Conveyance
 - Transportation
- Codes and standards
 - BC Building Code
 - S16
 - CSA
- Inspection
- Design
- Layout
- Content
- Application
- Plate
- Component
- Part configuration
- Identification
- Nests



LEARNING TASKS

6. Create a detailed estimate

CONTENT

- Material list
- Quantity
- Mass
- Description
- Time
- Process requirements
- Shipping
- Cost



Line (GAC): C INTERPRET PLANS, DRAWINGS AND SPECIFICATIONS
Competency: C2 Interpret structural steel drawings

Objectives

To be competent in this area, the individual must be able to:

- Interpret an advanced structural steel drawing.
- Use computer software to conduct a simple take-off.
- Develop an advanced estimate.

LEARNING TASKS

1. Interpret an advanced structural drawing

2. Apply welding symbols and abbreviations

3. Develop an advanced estimate

CONTENT

- Title block
- Material list
- Specifications

- Detail drawings
- Shop projects
- Templates
- Overlays

- Computer software
- Bill of material
- Structural drawings and details
- Table of specifications
- Codes and standards
- Cranes
- Shipping
- Special considerations
 - Traffic control
 - Pilot car
 - Overtime



Line (GAC): **D PERFORM QUALITY CONTROL**
Competency: **D2 Verify structural measurements, welds and layout**

Objectives

To be competent in this area, the individual must be able to:

- Apply quality control to structural components.

LEARNING TASKS

1. Identify processes which contribute to measureable change of components

2. Apply structural allowances

3. Apply appropriate codes to determine permitted tolerances

4. Verify measurements

CONTENT

- Machining
- Rolling
- Shaft clearances
- Faying surface alignment
- Thermal fitting (shrink fitting)
- Interference fit
- Alignment fit
- Deflection
- Twist
- Alignment
- Distortion
- CSA, CISC, ASME, AISC, API, CWB, ANSI
- Camber tolerances
- Sweep tolerances
- Mill tolerances
- Layout tolerances
- Cutting to length
- Finishing of ends
- Cutting of bevel ends
- Work points (WP)
- Datum
- Elevations
- Offsets



Line (GAC): **D PERFORM QUALITY CONTROL**
Competency: **D3 Track structural materials, consumables and parts for traceability**

Objectives

To be competent in this area, the individual must be able to:

- Develop a complex bill of material.
- Create an estimate.

LEARNING TASKS

CONTENT

- | | |
|--|--|
| 1. Develop a complex bill of material based on a sub-assembly | <ul style="list-style-type: none"> • Beam • Column • Structural shape |
| 2. Develop a complex bill of material based on a structural detail | <ul style="list-style-type: none"> • Plasma • Burned components • Machined items • Fasteners |
| 3. Develop a complex bill of material based on a handrail | <ul style="list-style-type: none"> • Cost per lineal foot • Jigs |
| 4. Create an estimate | <ul style="list-style-type: none"> • Bill of material |



Line (GAC): **D PERFORM QUALITY CONTROL**
Competency: **D5 Control distortion**

Objectives

To be competent in this area, the individual must be able to:

- Apply control methods to prevent distortion.

LEARNING TASKS

1. Identify material classifications
2. Apply welding sequences
3. Apply pre-forming considerations
4. Apply pre and post heat

CONTENT

- Compatability
- Pre-heatability
- Offset
- Balance
- Deposition
- Angular
- Offset
- Linear
- Material grade
- Plate gauge



Line (GAC): **F PERFORM TRADE MATH AND LAYOUT**
Competency: **F1 Perform line development**

Objectives

To be competent in this area, the individual must be able to:

- Develop patterns using the triangulation method.

LEARNING TASKS

1. Describe the procedure for developing patterns using triangulation

2. Develop patterns and scaled models using the triangulation method

3. Calculate and layout intersecting branches

CONTENT

- Views
- Dimensions
- Ordinates
- True lengths

- Chutes
- Square to round transitions
- Round to round transitions

- Round to square
- Shape/profile
- Angle
- Geometric construction requirements
- Ordinate plane
- Cardboard mock-up (metering valve)



Line (GAC): **F** **PERFORM TRADE MATH AND LAYOUT**
Competency: **F2** **Calculate bending allowances and stretch outs**

Objectives

To be competent in this area, the individual must be able to:

- Determine stretch out lengths.
- Interpret advanced sketches to develop flat plate layout.
- Calculate mass and diagonals.

LEARNING TASKS

1. Interpret advanced sketches to develop flat plate layout

2. Determine mass of flat plate stretch outs

3. Calculate stretch out diagonal

CONTENT

- Cylinder
- Rolled segments
- Flanged shape

- Cylinder
- Rolled segments
- Flanged shape
- Plate gauge

- Pythagoras' theorem



Line (GAC): **F PERFORM TRADE MATH AND LAYOUT**
Competency: **F3 Calculate diagonals, volume, mass and capacity**

Objectives

To be competent in this area, the individual must be able to:

- Solve problems using trigonometric functions.
- Use triangulation to develop patterns.
- Solve advanced problems involving mass and the capacity of vessels.

LEARNING TASKS

CONTENT

- | | |
|--|--|
| <ol style="list-style-type: none"> 1. Describe terms and names used in geometric construction
 2. Solve problems using trigonometry
 3. Develop flat patterns for transition shapes
 4. Calculate dimensions using trigonometry and triangulation | <ul style="list-style-type: none"> • Tangent • Arc • Chord
 • Tangent • Sine • Cosine • Trusses • Cones • Hoppers <ul style="list-style-type: none"> ○ Bend sets • Arc lengths
 • Square to round • Offset
 • Advanced problems <ul style="list-style-type: none"> ○ Slope ○ Rise ○ Base • Pattern angle • Identify right angle triangles within given shapes • True lengths of sides • Trigonometry <ul style="list-style-type: none"> ○ Trusses ○ Hoppers ○ Conical shapes |
|--|--|



Line (GAC): G FORM MATERIALS
Competency: G2 Form material using shape rolls

Objectives

To be competent in this area, the individual must be able to:

- Form material using shape rolls.

LEARNING TASKS

1. Review the components and procedures for the use of shape rolls

2. Use shape rolls to form structural sections

CONTENT

- Capacity
- Direction
- Set up and maintenance

- Hard way/easy way
- Machine adjustment
- Sweeps
- Removal of completed material



Line (GAC): **G** **FORM MATERIALS**
Competency: **G3** **Form material using a brake press**

Objectives

To be competent in this area, the individual must be able to:

- Perform complex forming operations.

LEARNING TASKS

1. Use the hydraulic brake press to form metal

2. Apply quality control and assurance

CONTENT

- Radial line development
- Triangulation
- Programming

- Sweeps and patterns
- Check dimensions
- True length dimensions



Line (GAC): **G** **FORM MATERIALS**
Competency: **G5** **Fabricate plate**

Objectives

To be competent in this area, the individual must be able to:

- Fabricate a square to round transition.

LEARNING TASKS

1. Fabricate a square to round transition

CONTENT

- Offsets
- Calculations
- Triangulated layout
- CNC machine operation
- CAD drawing
- Nesting software
- Forming
- Fitting considerations
 - Seam orientation
- Cardboard mock-up

Achievement Criteria

Performance	The learner will be able to fabricate the following: <ul style="list-style-type: none"> • Square to round transition • OPTIONAL – spiral staircase complete with handrail (CNC) – <i>technical training time permitting</i>
Conditions	Shop projects will be completed in a training provider facility, given: <ul style="list-style-type: none"> • Drawings • Tools and equipment • 1/8" mild steel/low carbon material • A prescribed time limit
Criteria	The learner will be evaluated on: <ul style="list-style-type: none"> • Completion of the square to round transition project within 12 hours • OPTIONAL – spiral staircase project complete with handrail completed within 18 hours • Fitting accuracy • Alignment <ul style="list-style-type: none"> ○ Appearance ○ Tack spacing ○ Tack location ○ Edge finish



Line (GAC): H FABRICATE COMPONENTS

Competency: H1 Construct templates and jigs

Objectives

To be competent in this area, the individual must be able to:

- Construct a complex jig.
- Layout a complex template.

LEARNING TASKS

1. Construct a complex jig

2. Layout a complex template

CONTENT

- Efficiencies
- Construction materials
- Time

- Interpret complex drawing
- Material list
- Orientation
- Marks and labelling



Line (GAC): **H FABRICATE COMPONENTS**
Competency: **H6 Fabricate structural components**

Objectives

To be competent in this area, the individual must be able to:

- Fabricate a structural frame assembly.

LEARNING TASKS

1. Fabricate a structural frame assembly

2. Manage project requirements

CONTENT

- Electronic nesting software
- Layout
- Machine operation

- Coordinate
- Conflict resolution
- Roles and responsibilities
- Troubleshooting
- Quality control
- Time management

Achievement Criteria

Performance	The learner will work in pairs and will be able to fabricate the following: <ul style="list-style-type: none"> • Structural frame assembly
Conditions	As part of a practical shop project completed in a training provider facility, given: <ul style="list-style-type: none"> • Structural detail drawing • Computer lab <ul style="list-style-type: none"> ○ Electronic drawing and detailing software ○ Nesting software • Structural steel components • Shop tools and equipment • Code and standards • A prescribed time limit
Criteria	The learner will be evaluated on: <ul style="list-style-type: none"> • Project completion within 12 hours • CNC/machinery selection and operation • Quality control <ul style="list-style-type: none"> ○ Conforms to specifications • Accuracy <ul style="list-style-type: none"> ○ Time ○ Estimate • Troubleshooting



Line (GAC): **I** **PERFORM WELDING ACTIVITIES**
Competency: **I1** **Apply weld symbols**

Objectives

To be competent in this area, the individual must be able to:

- Apply advanced weld symbols.
- Interpret welding codes and standards.

LEARNING TASKS

1. Apply advanced weld symbols
2. Interpret welding codes and standards
3. Apply weld inspection symbols

CONTENT

- Component to drawing (and vice versa)
- Field marking
- CWB W59, 47.1
- Radiography
- Dye penetrant
- Magnetic particle
- Acoustic
- Ultrasonic
- Visual



Line (GAC): **J COMPLETE PROJECT**
Competency: **J2 Prepare material for finishing**

Objectives

To be competent in this area, the individual must be able to:

- Describe methods used to prepare material for finishing.

LEARNING TASKS

CONTENT

- | | |
|--|--|
| <ol style="list-style-type: none"> 1. Describe the different grades of finish required on metal 2. Describe tools used for surface preparation 3. Describe equipment used for surface preparation 4. Describe chemical agents used for surface preparation 5. Inspect material edge and surface preparation | <ul style="list-style-type: none"> • Society for Protective Coatings (SSPC) • Brushes • Chipper • Scraper • Grinder • Sander • Rotary wire wheel • Wheelabrator • Sandblaster • Portable vacuum blaster • Abrasives • Petroleum • Chlorinated solvents • Acid • Burrs • Sharp edges • Cross-contamination • Surface blemishes <ul style="list-style-type: none"> ○ Plate clamp gouges ○ Arc strikes ○ Welding defects ○ Profile weld ○ Spatter ○ Slag |
|--|--|



Section 4

ASSESSMENT GUIDELINES

Metal Fabricator (Fitter)



Assessment Guidelines – Level 1

Level 1 Grading Sheet: Subject Competency and Weightings

PROGRAM: IN-SCHOOL TRAINING:		Metal Fabricator LEVEL 1	
LINE	SUBJECT COMPETENCIES	THEORY WEIGHTING	PRACTICAL WEIGHTING
A	PERFORM SAFETY RELATED FUNCTIONS	3	0
B	USE TOOLS AND EQUIPMENT	15	20
C	INTERPRET PLANS, DRAWINGS AND SPECIFICATIONS	20	0
D	PERFORM QUALITY CONTROL	5	0
E	HANDLE MATERIALS	3	10
F	PERFORM TRADE MATH AND LAYOUT	20	0
G	FORM MATERIALS	7	40
H	FABRICATE COMPONENTS	20	30
I	PERFORM WELDING ACTIVITIES	7	0
	Total	100%	100%
In-school theory / practical subject competency weighting		60	40
Final in-school percentage score		IN-SCHOOL %	

In-school Percentage Score Combined theory and practical subject competency multiplied by	80%
Standard Level Exam Percentage Score The exam score is multiplied by	20%
Final Percentage Score	FINAL%



Assessment Guidelines – Level 2

Level 2 Grading Sheet: Subject Competency and Weightings

PROGRAM: IN-SCHOOL TRAINING:	Metal Fabricator LEVEL 2		
LINE	SUBJECT COMPETENCIES	THEORY WEIGHTING	PRACTICAL WEIGHTING
A	PERFORM SAFETY-RELATED FUNCTIONS	3	0
B	USE TOOLS AND EQUIPMENT	15	0
C	INTERPRET PLANS, DRAWINGS AND SPECIFICATIONS	20	0
D	PERFORM QUALITY CONTROL	5	0
F	PERFORM TRADE MATH AND LAYOUT	20	0
G	FORM MATERIALS	10	55
H	FABRICATE COMPONENTS	20	45
I	PERFORM WELDING ACTIVITIES	7	0
	Total	100%	100%
In-school theory / practical subject competency weighting		60	40
Final in-school percentage score		IN-SCHOOL %	

In-school Percentage Score Combined theory and practical subject competency multiplied by	80%
Standard Level Exam Percentage Score The exam score is multiplied by	20%
Final Percentage Score	FINAL%



Assessment Guidelines – Level 3

Level 3 Grading Sheet: Subject Competency and Weightings

PROGRAM: IN-SCHOOL TRAINING:		Metal Fabricator LEVEL 3	
LINE	SUBJECT COMPETENCIES	THEORY WEIGHTING	PRACTICAL WEIGHTING
A	PERFORM SAFETY-RELATED FUNCTIONS	2	10
B	USE TOOLS AND EQUIPMENT	18	0
C	INTERPRET PLANS, DRAWINGS AND SPECIFICATIONS	20	0
D	PERFORM QUALITY CONTROL	5	0
E	HANDLE MATERIALS	3	0
F	PERFORM TRADE MATH AND LAYOUT	25	0
G	FORM MATERIALS	9	50
H	FABRICATE COMPONENTS	10	40
I	PERFORM WELDING ACTIVITIES	6	0
J	COMPLETE PROJECT	2	0
	Total	100%	100%
In-school theory / practical subject competency weighting		60	40

<p>Final in-school percentage score</p> <p>Apprentices must achieve a minimum 70% as the final in-school percentage score to be eligible to write the Interprovincial Red Seal or ITA CofQ exam.</p>	IN-SCHOOL %
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All apprentices who complete Level 3 of the Metal Fabricator program with a FINAL level percentage score of 70% or greater will write the Interprovincial Red Seal examination as their final assessment.

ITA will enter the apprentices' Metal Fabricator Interprovincial Red Seal examination percentage score in ITA Direct Access.

A minimum percentage score of 70% on the examination is required for a pass.



Section 5

TRAINING PROVIDER STANDARDS

Metal Fabricator (Fitter)



Facility Requirements

Classroom Area

- 900 sq. ft. for a class size of 12 - 16 students, with moveable tables and chairs
- Instructional media to include multimedia projector, projection screen, DVD player, and whiteboard

Shop Area

- 175 sq. ft. per student
- Well heated and ventilated
- 22 ft. high ceilings
- Lighting appropriate for detailed work
- Student locker and changeroom facilities
- 200 sq. ft. clean-up/waste area

Storage

- 200 sq. ft. raw materials storage (may be outdoors)
- 20 sq. ft. per student for tools storage (indoors)

Instructor's Office Space

- 150 sq. ft. per instructor, with a desk, chairs and materials storage/filing system



Tools and Equipment

CUTTING EQUIPMENT

- Angle shear
- Nibblers
- Band saw
- Oxy-fuel torches
- Bevellers
- Pipe cutters
- Dry cutter saw
- Power hack saw
- Friction saw
- Vertical saw
- Hand shear
- Mechanical, electric and hydraulic shears
- Hand-help plasma cutter
- CNC cutting centre

DRILLING EQUIPMENT

- Blocks
- Micrometers
- Calipers
- Pedestal drill
- Core drills (cutters)
- Portable hand drill
- Drill bits
- Punches and dies
- Drill gauges
- Radial arm drill
- Drill press
- Reamers
- Drill press vise
- Standard upright drill
- Hold down clamps
- Tap and dies
- Magnetic drill

BENDING AND SHAPING EQUIPMENT

- Porta power
- CNC process equipment
- Brake press
- Punches
- Fixed and portable mechanical and hydraulic
- Punch presses
- Ironworker
- Various dies
- Manual shape bender
- Plate rolls

FINISHING TOOLS AND EQUIPMENT

- Angle grinder
- Pencil grinder (die)
- Assorted finishing discs
- Sand blaster
- Belt sander
- Sander
- Buffers
- Wheelabrator
- Chippers
- Wire brush
- Hand brush
- Wire wheels



HAND TOOLS

- Assorted wrenches
- Ballpeen hammer
- Bar clamps
- C-clamps
- Dogs and wedges
- Drift pins
- File
- Hand magnets
- Hi/low gauge
- Locking grips
- Measuring tools
- Plumb bob
- Punches
- Sledge hammer
- Squares
- Steel thickness gauge
- Tape measure
- Toggle clamps
- Torque wrench
- Transits
- Various levels
- Vernier calipers

SAFETY EQUIPMENT

- Dust mask
- Face shields
- Fire resistant clothing
- Gloves
- Hard hats
- Hearing protectors
- Reflective gauntlet
- Reflective vest and coveralls
- Respirator
- Safety glasses
- Safety harness
- Self-contained breathing apparatus (SCBA)
- Welding helmets

POWER TOOLS

- Angle grinder
- Air tools
- Bench grinder
- Concrete drills
- Core drill
- Explosive activated tools
- Hammer drill
- Hydraulic power tools
- Magnetic drill
- Pneumatic tools
- Power actuated tools (wrenches, riveters)
- Punches/rams
- Reamer drill

WELDING EQUIPMENT

- Anti spatter paste/gel/spray
- Carbon air arc gouging
- Chipping hammer
- Electrical resistance welding (ERW)
- Equipment for shielded metal arc
- Flux core welding (FCAW)
- Gas metal arc welding (MIG)
- Gas tungsten arc welding (TIG)
- Ground clamps
- Mig pliers
- Oxy-fuel welding
- Thermal electrode device (TED)
- Welding (SMAW)
- Welding cables
- Welding gauge
- Wire brush



RIGGING EQUIPMENT

- Blocks
- Chain cinch
- Chain falls
- Chain slings
- Come-along
- Endless sling assemblies
- Hydraulic and manual jacks
- Manila rope
- Mesh slings
- Personnel basket
- Plate clamps
- Rope and tackle
- Shackles
- Spreader bars
- Synthetic ropes
- Synthetic slings
- Tirfor®
- Tuggers
- Turnbuckles
- Wire rope slings

ELEVATED WORK PLATFORMS

- Ladders
- Personnel basket
- Powered personnel lifts
- Scaffolds

MATERIAL HANDLING EQUIPMENT

- Bridge crane
- Fork lift
- Hydraulic cranes
- Magnetic lifting devices
- Overhead crane
- Mobile cranes and lifts

LAYOUT TOOLS

- Ballpeen hammer
- Beam board
- Beam gauge
- Bevel square
- Centre finder
- Centre punch
- Chalk line
- Combination square
- Divider
- Hand magnet
- Measuring tape
- Paint marker
- Piano wire
- Protractor
- Scribe
- Small clamps
- Soap stone
- Straight edge
- Templates
- Transfer punches
- Transits
- Trammel points
- Various squares
- Laser level



Reference Materials

Required Reference Materials

- Metal Fabrication – a Practical Guide, Third Edition – R.L O'Con and R.H. Carr, 2010
- IPT's Metal Trades & Welding Training Manual – R.G. Garby and B.J. Ashton, 2007
- WorkSafeBC Regulations Online
- Student Materials Package

Recommended

- IPT's Guide to Blueprint Interpretation – G.E. Jacobs, 2004
- AccurPress Accell User Manuals, No. 1 - 3
- American Institute of Steel Construction (AISC) website - Bolting & Welding, ppt.
- Steel Fabrication Modules (BCIT) – 1994, 1995, 2002
- Koike CNC Plus Cutting Machine Operation Modules – No. 1 - 5 (Robotronic Oy, 1997-2004)
- Koike Aronson Instruction Manual MI0549A, 2006 (Kwantlen Polytechnic University)
- EHRT Punching Machine Holecut 40-9 Professional Operation Modules (CNC) - (Kwantlen Polytechnic University)
- Tool Change – Metal Forming Magazine, March 2007
- Canadian Welding Bureau (CWB) Learning Centre Modules, No. 1, 2, 3, 4, 6, 7 and 10 – CWB Group Industry Services, 2006
- Metal Fabrication Apprentice Modules, Level 1, 2 and 3 (Kwantlen Polytechnic University, 2008, 2009)
- Welder Training Program Modules, Level A & B (ITAC 2001)
- Welder Fitting Skills Modules (ITAC 1999)
- Alberta Learning ILM Welder Modules 204a-e, 204h, 2007

NOTE:

This list of Reference Materials is for training providers. Apprentices should contact their preferred training provider for a list of recommended or required texts for this program.



Instructor Requirements

Qualifications and Work Experience

A Metal Fabricator Instructor must have a combination of the following occupational qualifications and work experience:

- Metal Fabricator Interprovincial Red Seal certification
- A minimum of 5 years' experience working in the industry as a journeyperson after earning Red Seal certification
- Demonstrated effectiveness of communication skills, instructional and interpersonal
- Experienced user of relevant software for:
 - Word processing
 - Spreadsheets
 - Presentations

Instructional Experience and Education

It is preferred that the instructor also possesses one of the following:

- Provincial (BC) Instructor Diploma or completion of a similar Trainer Training/Instructional Methods program, plus
- 1 year of supervisory or administrative experience
- Welding certification level "C" or equivalent
- Experienced user of relevant software for CAD



Appendices



Appendix A: Previous Contributors

The Program Outline was prepared with the advice and direction of an industry steering committee convened initially by the Resource Training Organization of British Columbia. Members include: Industry Subject Matter Experts retained in 2008-2009 to assist in the development of Program Outline content:

- Eric Bohne, Int Assn of Bridge, Ornamental & Reinforcing Iron Workers, Local 712
- Alex Bunt, DC Welding
- Garry Callander, Canadian Forces
- Derek Critchley, Canron
- Lorne Cook, Elk Valley Coal Corp.
- Robert Finlayson, Kwantlen Polytechnic University
- Gary George, Nahanni Manufacturing Ltd
- John Mortimer, Vancouver Shipyards Co. Ltd.
- Mike Pellett, Nahanni Manufacturing Ltd
- Terry Subtelny, BCIT
- Peter Thomas, BCIT
- Allen White, Teck
- Les Wiebe, Thompson Rivers University

Key stakeholders from industry sectors, including employers, associations, training providers, and trades workers, were integral to the guidance of this program development project. Members of the Project Steering Committee who contributed their valuable time and insights to the project were:

- Steve Anderson, Department of National Defence
- Danny Bradford, BC Federation of Labour
- Larry Daskoch, Teck
- Dana Goedbloed, Kwantlen Polytechnic University
- Wayne Muzylowski, West Fraser (Eurocan Pulp and Paper)
- James Piwek, Teck
- Brad Smith, Catalyst Paper
- Cindy Soderstrom, CAODC (Rig Tech Trade)
- Gene Von Matt, Elk Valley Coal
- Wayne Wetmore, Enform Training
- Trevor Williams, BCIT

Industry Subject Matter Experts retained in 2013 to assist in reviewing the Program Outline to address the 2012 NOA updates:

- Robert Finlayson, Kwantlen Polytechnic University
- John Folkers, Weldco Beales
- Nathan Van Seters, Intercontinental Truck Body
- Henry Ostermann, BCIT
- John Sutton, Thompson Rivers University
- Dave Marcinew, Canron
- Al White, Teck (accompanied by Sean Horton)

The Industry Training Authority would like to acknowledge the dedication and hard work of all the industry representatives appointed to identify the training requirements of the Metal Fabrication occupation.