

SKILLED**TRADES**<sup>BC</sup>

PROGRAM OUTLINE

Boilermaker

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# **BOILERMAKER PROGRAM OUTLINE**

**APPROVED BY INDUSTRY  
OCTOBER 2017**

**BASED ON  
RSOS 2017**

**Developed by  
SkilledTradesBC  
Province of British Columbia**

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**Section 1**  
**INTRODUCTION**  
**Boilermaker**

## **Foreword**

The revised Boilermaker Program Outline is intended as a guide for instructors, apprentices and employers of apprentices as well as for the use of industry organizations, regulatory bodies, and provincial and federal governments. It reflects updated standards based on the new Boilermaker Occupational Analysis (2017) and British Columbia industry and instructor subject matter experts.

Practical instruction by demonstration and student participation should be integrated with the classroom session. Safe working practices, even though not always specified in each operation or topic, are an implied part of the program and should be stressed throughout the apprenticeship.

Practical exercises are included for those competencies that require a practical component. The intent of including practical exercises is to ensure consistency in training across the many training institutions in British Columbia. Their purpose is to reinforce the theory and to provide a mechanism for evaluation of the learner's ability to apply the theory to practice. It is important that these performances be observable and measureable and that they reflect the skills spelled out in the competency as those required of a competent journeyman. The conditions, under which these performances will be observed, as well as the criteria by which the learner will be evaluated and measured, must be clear to the learner. The learner must also be given the level of expectation of success.

### **SAFETY ADVISORY**

Be advised that references to the WorkSafe BC 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**

Industry Subject Matter Experts retained to assist in the development of Program Outline content:

- Paul Hucal
- John Cole
- Russell Osborne
- Gord Weel
- David French
- Matthew Hudson-Gray

SkilledTradesBC would like to acknowledge the dedication and hard work of all the industry representatives appointed to identify the training requirements of the Boilermaker occupation.

## 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
<b>Program Credentialing Model</b>	Communicates 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
<b>OAC</b>	Communicates 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
<b>Training Topics and Suggested Time Allocation</b>	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
<b>Program Content</b>	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
<b>Training Provider Standards</b>	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



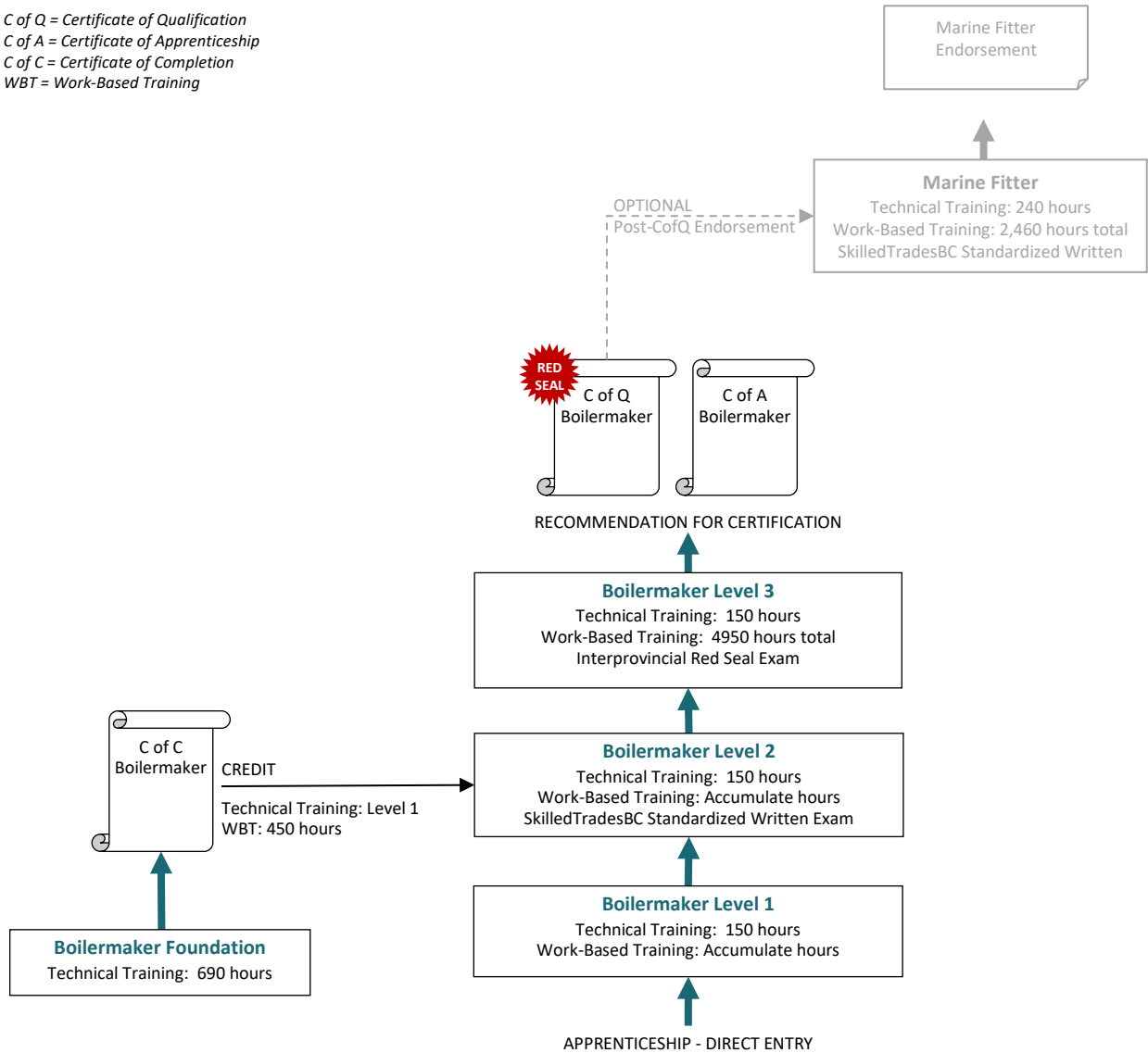
<b>Section</b>	<b>Training Providers</b>	<b>Employers/ Sponsors</b>	<b>Apprentices</b>	<b>Challengers</b>
<b>Appendix – Glossary of Acronyms</b>			Defines program specific acronyms	

**Section 2**  
**PROGRAM OVERVIEW**  
**Boilermaker**

## Program Credentialing Model

### 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

None

## Occupational Analysis Chart

### BOILERMAKER

**Occupation Description:** “Boilermaker” is a tradesperson who must possess the full range of knowledge, abilities and skills required to fabricate, construct, install, assemble, erect, demolish, repair and maintain a wide variety of vessels, tanks, towers, boilers, hoists and other structures, ancillary equipment and fixtures made of steel, other metals, fiberglass, and other materials. The broad scope of the boilermaker trade includes the construction and maintenance activities performed in the field and in industrial and commercial plants such as: cement plants, fertilizer plants, water treatment facilities, breweries, sawmills, iron and steel production facilities, steam generation plants, electric power generation (thermal, nuclear, hydro) plants, gas turbines, refineries (oil, chemical), shipbuilding and repair docks, pulp and paper mills, wind and fusion sites, and many other industrial and commercial facilities.

<b>PERFORM SAFETY-RELATED FUNCTIONS</b>  <b>A</b>	Use Personal Protective Equipment  <b>A1</b>	Use Fall Protection Systems  <b>A2</b>	Use Fire Safety Procedures  <b>A3</b>	Control Workplace Hazards  <b>A4</b>	Interpret OHS Regulations and WorkSafeBC Standards  <b>A5</b>	Monitor Confined Space  <b>A6</b>
	1	1	1	1	1	1
<b>USE TOOLS, EQUIPMENT AND WORK PLATFORMS</b>  <b>B</b>	Use Hand Tools  <b>B1</b>	Use Power Tools and Shop Fabrication Tools  <b>B2</b>	Use Cutting Tools and Equipment  <b>B3</b>	Use Work Platforms and Access Equipment  <b>B4</b>		
	1	1   2   3	1   2   3	1   2   3		
<b>ORGANIZE WORK</b>  <b>C</b>	Use Mathematics  <b>C1</b>	Use Drawings and Specifications  <b>C2</b>	Handle Materials and Components  <b>C3</b>	Use Communication and Mentoring Techniques  <b>C4</b>		
	1	1   2   3	1   2   3	1       3		
<b>PERFORM CUTTING AND WELDING ACTIVITIES</b>  <b>D</b>	Cut Material  <b>D1</b>	Perform Welding  <b>D2</b>				
	1   2   3	1   2   3				
<b>USE RIGGING HOISTING AND LIFTING EQUIPMENT</b>  <b>E</b>	Plan Lifts  <b>E1</b>	Rig Loads  <b>E2</b>	Hoist Loads  <b>E3</b>	Fabricate Rigging Equipment  <b>E4</b>		

**Program Overview**

	1	2	3			1	2	3			1	2	3					3		
<b>LAY OUT, FABRICATE AND ASSEMBLE VESSELS AND COMPONENTS</b> <b>F</b>	Perform Fabrication					Align and Fit Vessels and Components					Fasten Components									
	F1					F2					F3									
	1	2	3			1	2	3			1	2	3							
<b>MAINTAIN, UPGRADE, REPAIR VESSELS AND COMPONENTS</b> <b>G</b>	Inspect and Test Vessels and Components					Service Vessels and Components					Remove and Dismantle Vessels and Components									
	G1					G2					G3									
	1	2	3			1	2	3			1	2	3							

**Training Topics and Suggested Time Allocation: Level 1**

**BOILERMAKER – LEVEL 1**

		% of Time Allocated to:			
		% of Time	Theory	Practical	Total
<b>Line A</b>	<b>PERFORM SAFETY-RELATED FUNCTIONS</b>	<b>5%</b>	<b>90%</b>	<b>10%</b>	<b>100%</b>
A1	Use Personal Protective Equipment		✓	✓	
A2	Use Fall Protection Systems		✓	✓	
A3	Use Fire Safety Procedures		✓		
A4	Control Workplace Hazards		✓		
A5	Interpret OHS Regulations and WorkSafeBC Standards		✓		
A6	Monitor Confined Space		✓		
<b>Line B</b>	<b>USE TOOLS, EQUIPMENT AND WORK PLATFORMS</b>	<b>5%</b>	<b>20%</b>	<b>80%</b>	<b>100%</b>
B1	Use Hand Tools		✓	✓	
B2	Use Power Tools and Shop Fabrication Tools		✓	✓	
B3	Use Cutting Tools and Equipment		✓	✓	
B4	Use Work Platforms and Access Equipment		✓	✓	
<b>Line C</b>	<b>ORGANIZE WORK</b>	<b>10%</b>	<b>90%</b>	<b>10%</b>	<b>100%</b>
C1	Use Mathematics		✓		
C2	Use Drawings and Specifications		✓	✓	
C3	Handle Materials and Components		✓	✓	
C4	Use Communication and Mentoring Techniques		✓		
<b>Line D</b>	<b>PERFORM CUTTING AND WELDING ACTIVITIES</b>	<b>27%</b>	<b>40%</b>	<b>60%</b>	<b>100%</b>
D1	Cut Material		✓	✓	
D2	Perform Welding		✓	✓	
<b>Line E</b>	<b>USE RIGGING, HOISTING AND LIFTING EQUIPMENT</b>	<b>22%</b>	<b>50%</b>	<b>50%</b>	<b>100%</b>
E1	Plan Lifts		✓	✓	
E2	Rig Loads		✓	✓	
E3	Hoist Loads		✓	✓	
<b>Line F</b>	<b>LAY OUT, FABRICATE AND ASSEMBLE VESSELS AND COMPONENTS</b>	<b>27%</b>	<b>30%</b>	<b>70%</b>	<b>100%</b>
F1	Perform Fabrication		✓	✓	
F2	Align and Fit Vessels and Components		✓	✓	
F3	Fasten Components		✓	✓	
<b>Line G</b>	<b>MAINTAIN, UPGRADE, REPAIR VESSELS AND COMPONENTS</b>	<b>4%</b>	<b>70%</b>	<b>30%</b>	<b>100%</b>
G1	Inspect and Test Vessels and Components		✓		
G2	Service Vessels and Components		✓		
G3	Remove and Dismantle Vessels and Components		✓	✓	
<b>Total Percentage for Boilermaker Level 1</b>		<b>100%</b>			

**Training Topics and Suggested Time Allocation: Level 2**

**BOILERMAKER – LEVEL 2**

		% of Time	% of Time Allocated to:		
			Theory	Practical	Total
<b>Line B</b>	<b>USE TOOLS, EQUIPMENT AND WORK PLATFORMS</b>	<b>10%</b>	<b>20%</b>	<b>80%</b>	<b>100%</b>
B2	Use Power Tools and Shop Fabrication Tools		✓	✓	
B3	Use Cutting Tools and Equipment		✓	✓	
B4	Use Work Platforms and Access Equipment		✓		
<b>Line C</b>	<b>ORGANIZE WORK</b>	<b>12%</b>	<b>90%</b>	<b>10%</b>	<b>100%</b>
C2	Use Drawings and Specifications		✓		
C3	Handle Materials and Components		✓	✓	
<b>Line D</b>	<b>PERFORM CUTTING AND WELDING ACTIVITIES</b>	<b>10%</b>	<b>30%</b>	<b>70%</b>	<b>100%</b>
D1	Cut Material		✓	✓	
D2	Perform Welding		✓	✓	
<b>Line E</b>	<b>USE RIGGING, HOISTING AND LIFTING EQUIPMENT</b>	<b>34%</b>	<b>50%</b>	<b>50%</b>	<b>100%</b>
E1	Plan Lifts		✓	✓	
E2	Rig Loads		✓	✓	
E3	Hoist Loads		✓	✓	
<b>Line F</b>	<b>LAY OUT, FABRICATE AND ASSEMBLE VESSELS AND COMPONENTS</b>	<b>25%</b>	<b>50%</b>	<b>50%</b>	<b>100%</b>
F1	Perform Fabrication		✓	✓	
F2	Align and Fit Vessels and Components		✓		
F3	Fasten Components		✓	✓	
<b>Line G</b>	<b>MAINTAIN, UPGRADE, REPAIR VESSELS AND COMPONENTS</b>	<b>9%</b>	<b>60%</b>	<b>40%</b>	<b>100%</b>
G1	Inspect and Test Vessels and Components		✓	✓	
G2	Service Vessels and Components		✓		
G3	Remove and Dismantle Vessels and Components		✓	✓	
<b>Total Percentage for Boilermaker Level 2</b>		<b>100%</b>			

**Training Topics and Suggested Time Allocation: Level 3**

**BOILERMAKER – LEVEL 3**

		% of Time Allocated to:			
		% of Time	Theory	Practical	Total
<b>Line B</b>	<b>USE TOOLS, EQUIPMENT AND WORK PLATFORMS</b>	<b>5%</b>	<b>80%</b>	<b>20%</b>	<b>100%</b>
B2	Use Power Tools and Shop Fabrication Tools		✓	✓	
B3	Use Cutting Tools and Equipment		✓	✓	
B4	Use Work Platforms and Access Equipment		✓	✓	
<b>Line C</b>	<b>ORGANIZE WORK</b>	<b>10%</b>	<b>90%</b>	<b>10%</b>	<b>100%</b>
C2	Use Drawings and Specifications		✓		
C3	Handle Materials and Components		✓		
C4	Use Communication and Mentoring Techniques		✓		
<b>Line D</b>	<b>PERFORM CUTTING AND WELDING ACTIVITIES</b>	<b>5%</b>	<b>30%</b>	<b>70%</b>	<b>100%</b>
D1	Cut Material		✓	✓	
D2	Perform Welding		✓	✓	
<b>Line E</b>	<b>USE RIGGING, HOISTING AND LIFTING EQUIPMENT</b>	<b>35%</b>	<b>50%</b>	<b>50%</b>	<b>100%</b>
E1	Plan Lifts		✓	✓	
E2	Rig Loads		✓	✓	
E3	Hoist Loads		✓	✓	
E4	Fabricate Rigging Equipment		✓		
<b>Line F</b>	<b>LAY OUT, FABRICATE AND ASSEMBLE VESSELS AND COMPONENTS</b>	<b>35%</b>	<b>50%</b>	<b>50%</b>	<b>100%</b>
F1	Perform Fabrication		✓	✓	
F2	Align and Fit Vessels and Components		✓	✓	
F3	Fasten Components		✓	✓	
<b>Line G</b>	<b>MAINTAIN, UPGRADE, REPAIR VESSELS AND COMPONENTS</b>	<b>10%</b>	<b>50%</b>	<b>50%</b>	<b>100%</b>
G1	Inspect and Test Vessels and Components		✓		
G2	Service Vessels and Components		✓	✓	
G3	Remove and Dismantle Vessels and Components		✓	✓	
<b>Total Percentage for Boilermaker Level 3</b>		<b>100%</b>			



**Section 3**  
**PROGRAM CONTENT**  
**Boilermaker**

# **Level 1 Boilermaker**



**Achievement Criteria**

Performance	The learner will perform a respirator fit check.
Conditions	The learner will be given: <ul style="list-style-type: none"><li>• Respirator</li></ul>
Criteria	The learner will score 70% or better on a rating sheet that reflects the following criteria: <ul style="list-style-type: none"><li>• Correct inspection of the mask prior to use</li><li>• Proper tensioning sequence</li><li>• Appropriate size</li><li>• Snugness of fit</li><li>• Accuracy of positioning</li></ul>

**Line (GAC):**        **A    PERFORM SAFETY-RELATED FUNCTIONS**  
**Competency:**      **A2    Use Fall Protection Systems**

**Objectives**

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

- Use fall protection equipment and systems as per job requirements.

**LEARNING TASKS**

1. Describe fall protection equipment

**CONTENT**

- Fall arrest/restraint/work positioning equipment
  - Harnesses
    - Hardware
    - Rolling tie-off
    - Lanyard
    - Carbineer
    - Shock-absorbing devices
    - Retractable devices
    - Vertical line grab (fibre and wire)
    - Connectors
    - Work positioning systems

2. Describe fall protection systems

- Inspection and maintenance
- Worksite awareness
- OHS Regulations Part 11
- Standards (Canadian Standards Association (CSA))
- Railings/scaffolds
- Nets
- Hardware
- Anchor points
- Assembly
- Ladder systems
- Vertical and horizontal systems

3. Use fall protection equipment and systems

- OHS Regulations Part 11
- Daily inspection
- Assembly/disassembly
- Fall protection plan
  - Identify work area and risks
  - List and choose equipment
  - Rescue procedures
- Harness fit test (practical demonstration)

**Achievement Criteria**

Performance	The learner will perform a safety harness fit test.
Conditions	The learner will be given: <ul style="list-style-type: none"><li>• Safety harness</li><li>• D-ring</li></ul>
Criteria	The learner will score 70% or better on a rating sheet that reflects the following criteria: <ul style="list-style-type: none"><li>• D-ring position (between shoulders)</li><li>• Snugness of fit</li></ul>

**Line (GAC):**        **A    PERFORM SAFETY-RELATED FUNCTIONS**  
**Competency:**       **A3   Use Fire Safety Procedures**

**Objectives**

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

- Identify various classes of fires.
- Apply preventative fire safety precautions.
- Select appropriate fire extinguishers for the class of fire and environmental condition.
- Use equipment to prevent various classes of fires.

**LEARNING TASKS**

**CONTENT**

<p>1. Describe the conditions necessary to support a fire</p> <p>2. Describe the classes of fires according to the materials being burned</p> <p>3. Identify combustible hazards</p> <p>4. Apply preventative fire safety precautions when working near, handling, or storing, flammable liquids or gases, combustible materials and electrical apparatus</p> <p>5. Describe the considerations and steps to be taken prior to fighting a fire</p>	<ul style="list-style-type: none"> <li>• Air</li> <li>• Fuel</li> <li>• Heat</li> <li>• Flashpoint</li> <li>• Class A</li> <li>• Class B</li> <li>• Class C</li> <li>• Class D</li> <li>• Symbols and colours</li> <li>• Diesel</li> <li>• Gasoline</li> <li>• Propane</li> <li>• Natural Gas</li> <li>• Lubricants</li> <li>• Oily rags</li> <li>• Aerosols</li> <li>• Mill fines</li> <li>• Ventilation</li> <li>• Purging</li> <li>• Fire blanketing</li> <li>• Spark control</li> <li>• Spark watch</li> <li>• Use of fire hoses</li> <li>• Awareness of surroundings</li> <li>• Warning others and fire department</li> <li>• Evacuation of others</li> <li>• Fire contained and not spreading</li> <li>• Personal method of egress</li> <li>• Training</li> </ul>
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**LEARNING TASKS**

6. Use fire extinguishers

**CONTENT**

- Extinguisher selection
- P.A.S.S
- Pull
- Aim
- Squeeze
- Sweep



**Line (GAC):**        **A    PERFORM SAFETY-RELATED FUNCTIONS**  
**Competency:**       **A4   Control Workplace Hazards**

**Objectives**

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

- Apply Level 1 First Aid certification principles.
- Identify workplace hazards.
- Apply worksite safety policies.

**LEARNING TASKS**

1. Describe short term hazards

**CONTENT**

- Overhead hazards
- Slip hazards
- Fall hazards
- Swing hazards
- Pinch points and bites
- Sharp objects
- Ladders
- Work platforms
- Electrical
- Lockout procedures
- Compressed gas
- Explosive material (dust)
- Lifting/ergonomics
- Personal apparel
  - Clothing
  - Hair and beards
  - Jewellery
- Housekeeping
- Respect for others' safety
  - Workplace conduct
  - Workplace violence
- Constant awareness of surroundings
- Safe attitude
- Identification of local hazards
- Reporting procedures
- Noise
- Cell phone usage
- Environmental
  - Water
  - Wildlife
  - Heat stroke

**LEARNING TASKS**

**CONTENT**

- |   |   |
|---|---|
| <p>2. Describe long term hazards</p> <p>3. Describe safety precautions when working at elevations</p> <p>4. Describe control zone procedures</p> <p>5. Demonstrate emergency procedures</p> <p>6. Describe non-emergency injury reporting procedures</p> <p>7. Apply worksite safety policies</p> | <ul style="list-style-type: none"> <li>○ Fatigue</li> <li>○ Dehydration</li> <li>○ Cold weather</li> <li>● Respiratory disease</li> <li>● Asbestos and silica</li> <li>● Noise</li> <li>● Repetitive strain injuries</li> <li>● Floor openings</li> <li>● Guard rails</li> <li>● Safety lines</li> <li>● Weather</li> <li>● Access and egress</li> <li>● Barricades</li> <li>● Communication</li> <li>● Emergency evacuation</li> <li>● Barricades</li> <li>● Flag off</li> <li>● Information tags</li> <li>● Permits</li> <li>● Emergency shutoffs</li> <li>● Fire control systems</li> <li>● Eye wash facilities</li> <li>● Emergency exits</li> <li>● Emergency contact/phone numbers</li> <li>● Muster areas</li> <li>● First aid facilities</li> <li>● Reports and investigations</li> <li>● Process             <ul style="list-style-type: none"> <li>○ Risk assessment</li> <li>○ Risk management</li> <li>○ Meeting requirements</li> <li>○ Immediate reporting of hazards and incidents</li> <li>○ Committees</li> <li>○ Employee orientation</li> <li>○ Level 1 First-aid Certification</li> <li>○ Hearing</li> <li>○ Records and statistics</li> <li>○ Lock-out</li> <li>○ Non-compliance procedures</li> </ul> </li> </ul> |
|---|---|

**LEARNING TASKS**

8. Describe WHMIS 2015 requirements

**CONTENT**

- Minimum standards
- Fall protection plan
- Acts and regulations
- Hierarchy of safety policies
- Following safe work procedures as per task requirements
- Site specific policies
- As per WHMIS 2015 documentations

**Line (GAC):**            **A**    **PERFORM SAFETY-RELATED FUNCTIONS**  
**Competency:**         **A5**    **Interpret OHS Regulations and WorkSafeBC Standards**

**Objectives**

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

- Locate the relevant parts of the Occupational Health and Safety (OHS) Regulation.
- Apply the relevant parts of the Occupational Health and Safety Regulation.

**LEARNING TASKS**

**CONTENT**

- |  |   |
|--|---|
| <ol style="list-style-type: none"> <li>1. Locate terms used in the Occupational Health and Safety (OHS) Regulation</li> <li>2. Locate the general duties of employers, employees and others in the Occupational Health and Safety (OHS) Regulation</li> <li>3. Locate the Occupational Health and Safety (OHS) Regulation requirements for the reporting of accidents</li> <li>4. Locate the “Core Requirements” of the Occupational Health and Safety (OHS) Regulation</li> </ol> | <ul style="list-style-type: none"> <li>• Definitions</li> <br/> <li>• As per current regulation</li> <br/> <li>• As per current regulation</li> <br/> <li>• Application</li> <li>• Rights and responsibilities <ul style="list-style-type: none"> <li>○ Health and safety programs <ul style="list-style-type: none"> <li>– Tool box talks</li> <li>– Safety committee meetings</li> </ul> </li> <li>○ Investigations and reports</li> <li>○ Workplace inspections</li> <li>○ Right to refuse work</li> </ul> </li> <li>• General conditions <ul style="list-style-type: none"> <li>○ Building and equipment safety</li> <li>○ Emergency preparedness</li> <li>○ Preventing violence</li> <li>○ Working alone</li> <li>○ Ergonomics</li> <li>○ Illumination</li> <li>○ Indoor air quality</li> <li>○ Smoking</li> <li>○ Lunchrooms</li> </ul> </li> </ul> |
|--|---|

**LEARNING TASKS**

5. Locate the “General Hazard Requirements” of the Occupational Health and Safety (OHS) Regulation

**CONTENT**

- Chemical and biological substances
  - Substance specific requirements
  - Noise, vibration, radiation and temperature
  - Personal protective clothing and equipment
  - Confined spaces
  - De-energization and lockout
  - Fall protection
  - Tools, machinery and equipment
  - Ladders, scaffolds and temporary work platforms
  - Cranes and hoists
  - Rigging
  - Mobile transport
  - Transportation of workers
  - Traffic control
  - Electrical safety
  - As per documentation
6. Apply Occupational Health and Safety information

**Line (GAC): A PERFORM SAFETY-RELATED FUNCTIONS**  
**Competency: A6 Monitor Confined Space**

**Objectives**

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

- Apply confined space awareness principles.
- Recognize a confined space.
- Monitor confined spaces.

**LEARNING TASKS**

1. Describe a confined space
  
  
  
  
  
  
  
  
  
  
2. Identify equipment used when working in a confined space

**CONTENT**

- Current section of OHS
- Responsibilities of worker and employer
- Procedures
  - Access/egress
  - Hole watch
  - Air quality testing
  - Explosive environments
  - Lock out and isolation
  - Ventilation
  - Cleaning/purging/venting/inerting
  - Rescue procedures
- Entry permits
  - Authorized signatures
  - Posted hazard assessment
  - Posted air quality tests
- Respirators
- Ladders
- Tripod
- Harnesses
- Air quality monitor
- Ventilation
- Fresh air equipment
  - SCBA
  - SABA
- Tools as per conditions
  - Non-sparking
  - Explosion proof
- Proper lighting

**LEARNING TASKS**

3. Monitor confined spaces

**CONTENT**

- Location requiring monitoring
- Hazards
  - Gases and surrounding conditions
- Properties and types of gases
  - Chlorine
  - Carbon dioxide
  - Hydrogen sulphide
  - Mercaptin
- Site-specific requirements for monitoring
- Site-specific requirements for securing confined space during inactivity
- Site-specific training requirements
- Communicating with emergency personnel
- Recognizing and responding to emergency situations
- Directing evacuation
- Documenting personnel entering and exiting confined spaces
- Monitoring and documenting atmospheric conditions of confined spaces
- Maintaining contact with personnel in confined spaces as per OHS regulations
  - Visual
  - Radio
  - Lifeline







**LEARNING TASKS**

**CONTENT**

- |   |   |
|---|---|
| <p>3. Use power tools and shop fabrication tools</p> <p>4. Inspect power tools and shop fabrication tools</p> <p>5. Shape and check components</p> <p>6. Finish fabricated material</p> | <ul style="list-style-type: none"> <li>• Types</li> <li>• Parts</li> <li>• Purpose/uses</li> <li>• Procedures/order of operations</li> <li>• Safe use</li> <li>• Lubricants and fluids</li> <li>• Adjustment</li> <li>• Assured grounding</li> <li>• Inspection</li> <li>• Storage</li> <li>• As per job requirement and manufacturer specifications</li> <li>• Forming methods</li> <li>• Dimensions</li> <li>• Tolerances</li> <li>• Buffing</li> <li>• Cleaning</li> <li>• Grinding</li> </ul> |
|---|---|

**Achievement Criteria**

- |  |  |
|--|--|
| <p>Performance</p> <p>Conditions</p> <p>Criteria</p> | <p>The learner will demonstrate the proper selection, set-up and use of shop equipment for shaping and forming.</p> <p>The learner will be given:</p> <ul style="list-style-type: none"> <li>• Equipment</li> <li>• Materials</li> <li>• Task instructions</li> </ul> <p>The learner will score 70% or better on a rating sheet that reflects the following criteria:</p> <ul style="list-style-type: none"> <li>• Safety</li> <li>• Appearance</li> <li>• Inspection of equipment</li> <li>• Tolerances</li> <li>• Adherence to the checklist of tasks</li> </ul> |
|--|--|

**Line (GAC):**        **B    USE TOOLS, EQUIPMENT AND WORK PLATFORMS**  
**Competency:**      **B3   Use Cutting Tools and Equipment**

**Objectives**

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

- Perform various methods of cutting.

**LEARNING TASKS**

1. Describe different methods of cutting

**CONTENT**

- Oxy fuel torch
  - Purpose/use
  - Limitations
  - Equipment
    - Torch head
    - Rose bud
    - Combination torch
    - Standards hand torch
    - Lance
    - Striker
    - Tip cleaner
  - Materials to be cut
  - Consumables
  - Safety
- Plasma
  - Purpose/Use
  - Limitations
  - Equipment
  - Materials to be cut
  - Consumables
  - Safety
- Abrasive disk
  - Purpose/Use
  - Limitations
  - Equipment
  - Materials to be cut
  - Consumables
  - Safety
- Carbon arc
  - Purpose/Use
  - Limitations
  - Equipment
  - Materials to be cut
  - Consumables
  - Safety
- High pressure water cutting system

**LEARNING TASKS**

**CONTENT**

- Purpose/Use
- Limitations
- Equipment
- Materials to be cut
  - Consumables
- Safety

**Achievement Criteria**

Performance	The learner will set-up an oxy-acetylene burning outfit.
Conditions	<p>The learner will be given:</p> <ul style="list-style-type: none"> <li>• Materials</li> <li>• Equipment</li> <li>• Specifications</li> </ul>
Criteria	<p>The learner will score 70% or better on a rating sheet that reflects the following criteria:</p> <ul style="list-style-type: none"> <li>• Safety</li> <li>• Pressure leak test</li> </ul>

**Line (GAC):**        **B    USE TOOLS, EQUIPMENT AND WORK PLATFORMS**  
**Competency:**     **B4    Use Work Platforms and Access Equipment**

**Objectives**

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

- Use ladders and platforms.
- Use access equipment.
- Apply aerial work platform certification principles.

**LEARNING TASKS**

1. Describe ladders and elevated platforms

**CONTENT**

- Types
  - Scaffolds
    - Manufactured
    - Layer systems
    - Tube and clamp
    - Tank
    - Spring board
  - Aerial work platforms
  - Aluminum and wooden planks
  - Extension ladders
  - Swing stages
  - Tank buggy
  - Step ladders
  - Man basket
  - Boatswain’s chair
- Uses
- Safety
  - Hazard recognition
  - Occupational Health and Safety (OHS)
  - Daily inspections and tagging

2. Use ladders and elevated platforms

- Selection
- Set up
- Moving ladders
- Limitations
- Securing
- Inspection
- Maintenance
- Storage

**LEARNING TASKS**

3. Use aerial access equipment

**CONTENT**

- Types
- Anchor points
  - Safety Harness
- Location considerations
- Rescue plan in case of swing stage failure
- Jurisdictional certification requirements for equipment
- Selecting and inspecting aerial access equipment
- Assembly of aerial access equipment

**Note:** *Re-certification requirements for aerial lifts and forklifts are employee and/or employer's responsibility.*

**Line (GAC):** C ORGANIZE WORK  
**Competency:** C1 Use Mathematics

**Objectives**

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

- Apply mathematical principals to solve problems.

**LEARNING TASKS**

1. Use fractions to solve problems
  
2. Use decimal fractions to solve problems
  
3. Solve problems of ratio and proportion
  
4. Describe metric and imperial measurements
  
5. Solve geometric problems
  
6. Calculate load weights

**CONTENT**

- Add, subtract, multiply, divide
- Express in higher terms
- Simplify fractions
  
- Add, subtract, multiply, divide
- Convert between decimals and fractions
- Decimal notation
  
- Ratio
  - Equivalent
- Proportion
- Unknown quantities
- Similar triangles
  
- Units of measurement
  - Metric
  - Imperial
  
- Area
- Chord length
- Circumference
- Volume
- Angles
- Arc
- Radius and diameter
- Formulas for area of:
  - Square and rectangles
  - Triangles
  - Circle
  - Sector
  - Segment
  
- Area
- Volume
- Material types

**Line (GAC):** C **ORGANIZE WORK**  
**Competency:** C2 **Use Drawings and Specifications**

**Objectives**

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

- Analyse a drawing.
- Sketch structural shapes.

**LEARNING TASKS**

1. Describe types of drawings

2. Identify elements on drawings

**CONTENT**

- Hierarchy of drawings
- Types
  - Assembly
  - Shop
  - Erection
  - General arrangement
  - Engineered lift
  - Orthographic
    - Auxiliary
    - Sectional
    - Exploded
  - Pictorial
    - Isometric
    - Oblique
- Basic format
  - Lines
  - Symbols/welding
  - General notes
  - Legends
  - Title block
  - Abbreviations
  - Material list
  - Tolerance and fitting requirements
  - Direction marks and placement marks
  - Centres and work points
  - Scale
  - Rise and run
  - Revisions
  - Details



**LEARNING TASKS**

3. Identify views on drawings

4. Analyse a drawing

**CONTENT**

- Orthographic projections
- Pictorial
- Isometric
- Oblique
- Plan
- Elevation
- Sections
- Identify common structural shapes and their symbols
- Reference dimension point (running dimensions)
- Working point
- Orientations
- Elevations
- Rise and run
- Cut out size
- Discuss relevant codes and standards

**Achievement Criteria**

Performance            The learner will produce a sketch.

Conditions            The learner will be given:

- Materials
- Instructions

Criteria                The learner will score 70% or better on a rating sheet that reflects the following criteria:

- Accuracy

**Line (GAC):** C **ORGANIZE WORK**  
**Competency:** C3 **Handle Materials and Components**

**Objectives**

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

- Apply fork lift certification principles.
- Describe considerations when handling, ordering and coordinating materials.
- Handle materials according to job requirements.

**LEARNING TASKS**

1. Describe considerations and responsibilities when handling, ordering and coordinating materials

**CONTENT**

- Safety/Occupation Health and Safety
- Ergonomics
- Storage
- Contamination
- Timing
- Transportation
  - Method of transportation
- Off-loading/ Loading
  - Crane type
  - Fork lift
  - Tools
  - Equipment
  - Excess materials
- Cribbing and blocking
- Use of plate clamps and plate racks
- Product protection
- Disposal
- Recycling
- Identification of materials
  - Weights
  - Tubes
  - Plates
  - Studs
  - Fibreglass
  - Nuts and bolts
  - Gas cylinders
- Inventory

**LEARNING TASKS**

2. Describe procedures for handling materials
  
  
  
  
  
  
  
  
  
  
  
3. Handle materials
  
  
  
  
  
  
  
  
  
  
  
4. Demobilize site

**CONTENT**

- Safety
- Loading/unloading procedures
- Securing
- Packaging/shipping
- Pallets
- Shipping containers
- Equipment
- According to job/site requirements
  - Moving plate
- Safety procedures
- Shipping and storage considerations
- Inventory of Tools and Equipment
- Return of Tools and Equipment
- Restore work area

**Line (GAC):** C **ORGANIZE WORK**  
**Competency:** C4 **Use Communication and Mentoring Techniques**

**Objectives**

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

- Describe methods of communication.
- Communicate with others.

**LEARNING TASKS**

1. Describe methods of communication

**CONTENT**

- Listening
- Verbal
- Written
- Drawings
- Trade terminology
- Use of:
  - Two-way radios
    - Etiquette
  - Computers
  - Tool box talk
  - Emergency communication
  - Worker proximity
- Interpersonal skills
  - Active listening
  - Provide feedback
- Ethics/responsibilities
  - Cell phone usage
  - Bullying
  - Harassment
- Other trades
- Co-workers
- Industry people
- Apprentices (mentoring)
- Public

2. Communicate with others

**Line (GAC):** D **PERFORM CUTTING AND WELDING ACTIVITIES**  
**Competency:** D1 **Cut Material**

**Objectives**

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

- Perform various methods of cutting.

**LEARNING TASKS**

1. Cut using various tools

**CONTENT**

- Basic procedures/operations
- Set-up
- Adjustment
- Take down
- Inspection
- Maintenance
- Storage
- Cutting tools
- Oxy-fuel torch
- Adjustment (working pressures and flame types)
- Transport
- Plasma
- Abrasive disk
- Carbon arc

**Achievement Criteria**

**Performance** The learner will layout and cut carbon steel.

**Conditions** The learner will be given:

- Materials
- Equipment
- Specifications

**Criteria** The learner will score 70% or better on a rating sheet that reflects the following criteria:

- Safety
- Appearance of layout and cut
- Accuracy

**Line (GAC):** D PERFORM CUTTING AND WELDING ACTIVITIES  
**Competency:** D2 Perform Welding

**Objectives**

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

- Identify standard weld and joint symbols.
- Describe welding joints and weld types.
- Perform basic welding.
- Use distortion control.
- Describe weld testing procedures.

**LEARNING TASKS**

1. Identify welding joint symbols

**CONTENT**

- Types of welding joints
  - Butt
  - Lap
  - Corner
  - Tee
  - Edge
- Types of welds
  - Groove
  - Fillet
  - Plug
- Standard welding symbols
  - Type of weld
  - Type of joint
  - Size of weld
  - Dimensions of the joint
  - Finish of the weld
- Welding joint symbols
  - Reference line
  - Basic weld symbols
  - Typical welding symbols

2. Identify arc welding equipment

- Safety
- Types of processes
- Types of welding machines
- Cables
- Ground clamp
- Electrode holder
- Remote controls
- Hydraulic test piece bender
- Personal protective equipment

3. Identify arc welding consumables

- Electrodes

**LEARNING TASKS**

**CONTENT**

4. Apply welding procedures

- Filler wire
- Flux
- Tungsten
- Shielding gases
- Anti-spatter
- Safety
- Procedures
- Material to be welded
- Process used
- Consumables
- Pre-heats
- Post-heats
- Inter-pass temperatures
- Techniques

5. Use distortion controls

- Jigs
- Bracing
- Tacking
- Pre-offset
- Heat
- Welding
- Back stepping
- Sequential

6. Describe weld testing procedures

- Non-destructive
- Visual inspection
- Liquid penetrant inspection
- Magnetic particle inspection
- Ultrasonic inspection
- Gamma ray inspection
- Hardness test
- Destructive test
  - Bend test
  - Tensile test

7. Prepare joints for fitting

- Weld analysis
- Tool and equipment selection
- Joint set up
- Material preparation
- Dam and purge components
- Joint cleaning

8. Fit joints

- Tool and equipment selection

**LEARNING TASKS**

9. Perform tack welds

**CONTENT**

- Alignment tolerances
- Set gap
- Set offset
- Fit-up joints
- Tool and equipment selection
- Consumables required
- Pre- and post- heat materials
- Tack weld placement
- Tack weld removal
- Welding symbol interpretation

**Achievement Criteria 1**

Performance	The learner will prepare joints for fittings.
Conditions	The learner will be given: <ul style="list-style-type: none"> <li>• Materials</li> <li>• Equipment</li> <li>• Specifications</li> </ul>
Criteria	The learner will score 70% or better on a rating sheet that reflects the following criteria: <ul style="list-style-type: none"> <li>• Safety</li> <li>• Accuracy</li> <li>• Appearance</li> </ul>

**Achievement Criteria 2**

Performance	The learner will fit joints.
Conditions	The learner will be given: <ul style="list-style-type: none"> <li>• Materials</li> <li>• Equipment</li> <li>• Specifications</li> </ul>
Criteria	The learner will score 70% or better on a rating sheet that reflects the following criteria: <ul style="list-style-type: none"> <li>• Safety</li> <li>• Accuracy</li> <li>• Appearance</li> </ul>



**Achievement Criteria 3**

Performance	The learner will perform tack welds.
Conditions	The learner will be given: <ul style="list-style-type: none"><li>• Materials</li><li>• Equipment</li><li>• Specifications</li></ul>
Criteria	The learner will score 70% or better on a rating sheet that reflects the following criteria: <ul style="list-style-type: none"><li>• Safety</li><li>• Accuracy</li><li>• Appearance</li></ul>

**Achievement Criteria 4**

Performance	The learner will perform basic welding.
Conditions	The learner will be given: <ul style="list-style-type: none"><li>• Materials</li><li>• Equipment</li><li>• Specifications</li></ul>
Criteria	The learner will score 70% or better on a rating sheet that reflects the following criteria: <ul style="list-style-type: none"><li>• Safety</li><li>• Penetration</li><li>• Accuracy</li><li>• Appearance</li><li>• Bend test</li></ul>



**LEARNING TASKS**

3. Determine load

4. Perform pre-lift analysis

**CONTENT**

- Rigging formulas and Working Load Limit (WLL)
- Reading prints
- Check load
  - Material integrity
- Measuring load dimensions
- Calculating weights of loads using required formulas
- Verify weight load
- Determining centre of gravity of loads
- Load properties
  - Dimensions
  - Shape
  - Weight
- Lift type
  - Regular
  - Tandem
  - Critical
- Area surrounding lift
- Signalling methods
  - Two-way radios
  - Hand signals
- Load securing methods
- Delegate responsibilities
  - Operator
  - Signaller
  - Tag line person
- Dry run procedures
- Recognize hazards
  - Overhead wires
  - Load drift
  - Wind speed
  - Unstable ground conditions
  - Obstructions
  - Weather conditions
- Interpret engineered lift drawings
- Interpret load charts
- Perform load calculations
- Walk-through inspection
- Permit requirements
- Anticipate equipment required for

**LEARNING TASKS**

**CONTENT**

- |   |  |
|---|--|
| <p>5. Select rigging and hoisting equipment for a given application</p>                           | <ul style="list-style-type: none"> <li>rigging removal               <ul style="list-style-type: none"> <li>○ Manlifts</li> <li>○ Scissor lifts</li> <li>○ Man baskets</li> <li>○ Scaffolding</li> </ul> </li> <li>• Determine the rigging and hoisting capacity</li> <li>• Mechanical advantage</li> <li>• Ensure rigging and hoisting equipment meets parameters of Working Load Limits (WLL)</li> <li>• Protection of rigging and hoisting equipment</li> </ul> |
| <p>6. Secure a lift area</p>  | <ul style="list-style-type: none"> <li>• Swing zone and swing clearance</li> <li>• Setting up barricades and barriers</li> <li>• Conducting pre-lift safety checks</li> </ul>  |
| <p>7. Demonstrate knowledge of regulatory requirements pertaining to rigging hoisting/lifting</p> | <ul style="list-style-type: none"> <li>• WorkSafeBC</li> <li>• Site specific</li> </ul>  |

**Achievement Criteria 1**

- |                    |   |
|--------------------|---|
| <p>Performance</p> | <p>The learner will inspect rigging gear prior to use.</p>  |
| <p>Conditions</p>  | <p>The learner will be given:</p> <ul style="list-style-type: none"> <li>• Materials</li> <li>• Equipment</li> <li>• Instructions</li> </ul>  |
| <p>Criteria</p>    | <p>The learner will score 70% or better on a rating sheet that reflects the following criteria:</p> <ul style="list-style-type: none"> <li>• Accuracy of written inspection report</li> </ul> |

**Achievement Criteria 2**

- |                    |   |
|--------------------|---|
| <p>Performance</p> | <p>The learner will write a lift plan</p>   |
| <p>Conditions</p>  | <p>The learner will be given:</p> <ul style="list-style-type: none"> <li>• Materials</li> <li>• Equipment</li> <li>• Instructions</li> </ul>  |
| <p>Criteria</p>    | <p>The learner will score 70% or better on a rating sheet that reflects the following criteria:</p> <ul style="list-style-type: none"> <li>• Accuracy of written lift plan</li> </ul> |

**Line (GAC):** E USE RIGGING, HOISTING AND LIFTING EQUIPMENT  
**Competency:** E2 Rig Loads

**Objectives**

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

- Rig loads.
- Tie knots, bends and hitches.
- Maintain rigging equipment.

**LEARNING TASKS**

1. Select ropes, slings and hitches

**CONTENT**

- Strength
- Wear resistance
- Fibre rope
  - Types
  - Properties
  - Efficiencies
    - Knots
    - Bends
    - Hitches
    - Splices
- Working load limits
- Calculate using rigger’s rule of thumb
- Wire rope
  - Types
    - Cores and lays
  - Properties
    - Fatigue
    - Abrasion
    - Corrosion
    - Bending
    - Crushing
    - Strength
    - Flexibility
  - Efficiencies
    - Clipped eye
    - Flemish eye
    - Flemish eye with one wire rope clip
    - Mechanical eye
    - Swedge socket
  - Working load limits
    - Calculate using rigger’s rule of thumb
    - Use of charts
- Slings

**LEARNING TASKS**

**CONTENT**

- 2. Inspect rigging equipment
  
- 3. Tie knots, bends, hitches and splices

- Compositions
  - Wire rope
  - Synthetics
  - Chain
  - Fibre
  - Metal/chain mesh
- Sling configurations
  - Load control
  - Vertical
  - Baskets
  - Choker hitches
  - Bridle hitches
  - Efficiencies
- Working load limit
  - Calculate using rigger’s rule of thumb
  - Use of charts
- Storage
- Handling
- Safety considerations
- Sheet bend, double sheet bend
- Hitches
  - Clove
  - Rolling
  - Timber
  - Hammer
- Snubber
- Knots
  - Figure 8 – single and double
  - Bowline
    - Standard
    - Running
  - Clove hitch
  - Reef knot
  - Sheet bend

**LEARNING TASKS**

4. Attach rigging equipment to the load

5. Maintain rigging equipment

**CONTENT**

- Rigging plan requirements
- Rigging equipment practices
  - Using softeners
  - Positioning shackles
  - Setting spreaders
- Selection of lifting location or pick point
  - Lifting lug location
  - Sling arrangements
  - Function
  - Advantages and limitations of various sling arrangements
- Determining the centre of gravity of load
- Accessing rigging points using various equipment
  - Scissor lifts
  - Manual lifts
  - Ladders
- Adjustment or adding of rigging equipment
- Anchorage and hold back
- Safety
- Securing loads
  - Tag line
  - Lashing
- Cleaning and lubricating rigging equipment
- Inspection
- Recognizing damaged and defective rigging equipment

**Achievement Criteria 1**

Performance

The learner will tie a prescribed set of knots in a working manner.

Conditions

The learner will be given:

- Equipment
- Instructions

Criteria

The learner will score 70% or better on a rating sheet that reflects the following criteria:

- Accuracy
- Shaping

**Achievement Criteria 2**

Performance	The learner will construct a Flemish eye to a specified size.
Conditions	The learner will be given: <ul style="list-style-type: none"> <li>• Equipment</li> <li>• Instructions</li> </ul>
Criteria	The learner will score 70% or better on a rating sheet that reflects the following criteria: <ul style="list-style-type: none"> <li>• Accuracy</li> <li>• Measured eye size</li> <li>• Marriage</li> <li>• Tail length</li> </ul>

**Achievement Criteria 3**

Performance	The learner will apply minimum size choker(s) required for a given task.
Conditions	The learner will be given: <ul style="list-style-type: none"> <li>• Materials</li> <li>• Equipment</li> <li>• Instructions</li> </ul>
Criteria	The learner will score 70% or better on a rating sheet that reflects the following criteria: <ul style="list-style-type: none"> <li>• Configuration</li> <li>• Mass</li> <li>• Physical condition</li> </ul>

**Achievement Criteria 4**

Performance	The learner will be able to perform a multi-part reeve-up.
Conditions	The learner will be given: <ul style="list-style-type: none"> <li>• Equipment</li> <li>• Materials</li> <li>• Instructions</li> </ul>
Criteria	The learner will score 70% or better on a rating sheet that reflects the following criteria: <ul style="list-style-type: none"> <li>• Block position</li> <li>• Reeving of rope</li> <li>• Proper alignment of reeving</li> <li>• Starting and finishing point</li> <li>• Installation of becket</li> </ul>



**Line (GAC):** E **USE RIGGING, HOISTING AND LIFTING EQUIPMENT**  
**Competency:** E3 **Hoist Loads**

**Objectives**

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

- Hoist loads with cranes.
- Hoist loads with tuggers.
- Hoist loads with manually operated hoisting equipment.

**LEARNING TASKS**

1. Use manually operated hoisting equipment
  
2. Prepare cranes for hoisting
  
3. Prepare tuggers for hoisting

**CONTENT**

- Come-alongs
- Chain falls
- Tirsors®
- Knowledge of crane components
- Set up
- Blocks
- Reeving sequences
- Crane procedures
  - Load charts
  - Outriggers
  - Walk-around inspection
- Tuggers
- Operation specifications
- Set up
  - Ensuring structural integrity of tugger and anchor points
  - Installation of wire rope on tugger drum
  - Connecting air compressor to tugger
  - Lead blocks (fleet angles)
- Compressed air requirements for operation of tuggers



**Achievement Criteria**

Performance	The learner will lift a given object.
Conditions	The learner will be given: <ul style="list-style-type: none"><li>• Tools</li><li>• Equipment</li><li>• Instructions</li></ul>
Criteria	The learner will score 70% or better on a rating sheet that reflects the following criteria: <ul style="list-style-type: none"><li>• Lift plan</li><li>• Safety</li><li>• Set-up</li><li>• Hand signals/communication</li><li>• Lift load</li><li>• Securing load</li></ul>

**Line (GAC):**        **F    LAY OUT, FABRICATE AND ASSEMBLE VESSELS AND COMPONENTS**

**Competency:**     **F1   Perform Fabrication**

### **Objectives**

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

- Use measurement and layout tools.
- Use parallel and radial line development techniques.
- Inspect and maintain measurement and layout tools.
- Apply layout techniques.

### **LEARNING TASKS**

1. Describe layout tools

### **CONTENT**

- Tape measure
- Levels
- Water level
- Lasers
- Distance finder
- Squares
- Dividers
- Trammel points
- Straight edge
- Scribe
- Soapstone
- Plumb bob
- Chalk line
- Centre punch
- Hammer
- Piano wire
- See Tools & Equipment for complete list of tools

**LEARNING TASKS**

2. Use measurement and layout tools

3. Inspect and maintain measurement and layout tools

4. Apply layout techniques

5. Make jigs and templates

**CONTENT**

- Purpose/use
  - Lines
  - Circles
  - Rectangles
  - Triangles
  - Flanges
  - Bolt holes
- Proper use
- Procedures/operations
- Set-up
- Safe use and storage
- Adjustment
- Inspection
- Maintenance
- Storage
- Applying layout methods
  - Parallel-line
  - Triangulation
  - Radial-line development
- Selecting layout and measuring tools and equipment
- Performing mathematical calculations
- Transferring measurements and elevations
- Verifying measurements
- According to task at hand
- According to specifications

**Achievement Criteria 1**

**Performance** The learner will demonstrate the proper set up, use, care and handling of a Builder's Level.

**Conditions** The learner will be given:

- Level
- Task instructions

**Criteria** The learner will score 70% or better on a rating sheet that reflects the following criteria:

- Adherence to the checklist of tasks

**Achievement Criteria 2**

Performance	The learner will develop layout patterns for assembly.
Conditions	The learner will be given: <ul style="list-style-type: none"><li>• Tools</li><li>• Equipment</li><li>• Dimensions</li><li>• Instructions</li></ul>
Criteria	The learner will score 70% or better on a rating sheet that reflects the following criteria: <ul style="list-style-type: none"><li>• Accuracy</li></ul>

**Line (GAC): F LAY OUT, FABRICATE AND ASSEMBLE VESSELS AND COMPONENTS**

**Competency: F2 Align and Fit Vessels and Components**

**Objectives**

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

- Erect boilers and tanks according to job specifications.

**LEARNING TASKS**

**CONTENT**

- |   |  |
|---|--|
| 1. Describe types of tanks                        | <ul style="list-style-type: none"> <li>• Wet storage</li> <li>• Dry storage</li> <li>• Mixing</li> <li>• Thickening</li> <li>• Gas storage</li> </ul>  |
| 2. Describe types of roofs                        | <ul style="list-style-type: none"> <li>• Conical</li> <li>• Floating</li> <li>• Pan</li> <li>• Self-supporting</li> <li>• Lifter roof</li> </ul>   |
| 3. Describe types of floor joints                 | <ul style="list-style-type: none"> <li>• Lap</li> <li>• Square butt with backing</li> <li>• V-butt with backing</li> </ul>   |
| 4. Describe types of grades                       | <ul style="list-style-type: none"> <li>• Soil</li> <li>• Built-up</li> <li>• Concrete ring</li> <li>• Concrete pad</li> <li>• Grillage and beams</li> </ul>  |
| 5. Describe the steps involved in erecting a tank | <ul style="list-style-type: none"> <li>• Establish work point</li> <li>• Use of chord charts</li> <li>• Staging</li> <li>• Base preparation</li> <li>• Annular ring</li> <li>• Layout of floor plates</li> <li>• Orientation of shell</li> <li>• Layout of first course</li> <li>• Erect first course</li> <li>• Weld vertical seams</li> <li>• Fit floor to shell</li> <li>• Erect subsequent courses</li> <li>• Weld horizontal seams</li> </ul> |

**LEARNING TASKS**

**CONTENT**

- 6. Select tools
  
- 7. Erect tanks
- 8. Describe boiler types
  
- 9. Describe boiler components

- Fittings
  - Ladders
  - Stairs
  - Platforms
  - Nozzles
  - Access hatches
- Rim angle
- Roof
  - Centre column
  - Roof trusses
  - Roof plates
- Testing
- Ensuring fit before fastening
  - Welding on stopper bars
  - Dogs and wedges
- Checking for fit and function
  - Temporary fastening
  - Modifying components
- Shims
- Dogs and wedges
- Key plates and blank nuts
- U-bars
- Bull pins
- Pry bars
- Hickey bar
- Leaf springs
- Sweep
- As per job requirements
- Fire tube
- Water tube
- Radiant
- Convection
- Power
- Chemical recovery
- Waste heat
- Package
- Hanger rods
- Drums/headers
- Generating section
- Wall platens



**LEARNING TASKS**

**CONTENT**

10. Describe boiler tubing

11. Describe the boiler tube installation process

- Super heater elements
- Reheaters
- Economizer bundles
- Buck stays
- Air heater
- Tube sheets
- Ducting
- Wind boxes
- Doors and ports
- Scoot blowers
- Burner boxes
- Casing
- Stack
- Multi cones
- Induced and Forced Draft fans
- Screen tubes
- Sizes
- Shapes
- Materials
- Hardness
- Tube wall configurations
- Expanding (rolling)
- Calculating optimum expansion
- Tack tubes
- Stabbing
- Setting stock
- Peening
- First roll
- Second roll
- Belling
- Over roll
- Under roll
- Setting retractors
- Rolling blind nipples
- Reroll
- Testing
- Welding
- Tube bending
- Milling

**LEARNING TASKS**

**CONTENT**

12. Describe process equipment

13. Select specialty tools and equipment for boiler erection

14. Describe the steps involved in erecting (dismantling) boilers

15. Erect/dismantle boilers

- Beading
- Annealing
- Codes
- Purging
- Digesters
- Evaporator train
- Tanks and vessels
- Electrostatic precipitator
- Tube expanders
  - Rolls
    - Self-feed
    - Retractive
    - Modified retractor
    - Ball drift expander
  - Expanding (rolling)
    - Lubrication
    - Mandrel selection
    - Peening tool
    - Ball drift expanders
    - Hydraulic/water
- Portable milling equipment
- Welding equipment
- Tuggers
- See Tools & Equipment for complete list of tools
- Erecting (dismantling) sequence
- Hangar rods
- Drums/headers
- Generating section
- Wall platens
- Super heater elements
- Economizer bundles
- Buck stays
- Air heater/tube sheets
- Ducting
- Wind boxes
- Doors and ports
- Soot blowers
- Burner boxes
- Casing
- As per job requirements

**Achievement Criteria 1**

Performance	The learner will erect annular ring floor and tank.
Conditions	The learner will be given: <ul style="list-style-type: none"><li>• Tools</li><li>• Equipment</li><li>• Drawings</li></ul>
Criteria	The learner will score 70% or better on a rating sheet that reflects the following criteria: <ul style="list-style-type: none"><li>• Accuracy with specified tolerances</li><li>• Rigging practices</li><li>• Communication</li><li>• Fit-up of vertical seams</li></ul>

**Achievement Criteria 2**

Performance	The learner will dismantle a mock-up boiler.
Conditions	The learner will be given: <ul style="list-style-type: none"><li>• Tools</li><li>• Equipment</li><li>• Boiler</li><li>• Instructions</li></ul>
Criteria	The learner will score 70% or better on a rating sheet that reflects the following criteria: <ul style="list-style-type: none"><li>• Site work procedures</li><li>• Rigging plan</li><li>• Equipment setup</li><li>• Proper communication</li><li>• Proper sequence</li><li>• Material handling</li><li>• Secure equipment</li></ul>

**Line (GAC): F LAY OUT, FABRICATE AND ASSEMBLE VESSELS AND COMPONENTS**

**Competency: F3 Fasten Components**

**Objectives**

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

- Install fittings.
- Expand tubes.
- Describe bolt components.

**LEARNING TASKS**

1. Install fittings

2. Expand tubes

**CONTENT**

- Types
  - Nozzles
  - Access hatches
  - Ports
  - Instrument connections
    - Level indicator
    - Temperature probes
    - Draft connections
- Accessories
  - Reinforcing plates (Doublers)
  - Flanges
  - Connections
- Aligning vessel or component with existing component
- Expansion theory and techniques
- Tools and equipment
- Measuring devices
- Tube expansion calculations

**LEARNING TASKS**

3. Describe bolt components

**CONTENT**

- Preparing components prior to fastening
  - Cleaning
  - Buffing
  - Lubricating
- Ensuring proper fit before tightening
  - Connections
    - Types
    - Flanges
    - Structure
    - Access hatches
- Bolt tensioning equipment/tools
- Hardware
  - Grades
  - Size
  - Locking mechanisms
- Gaskets
- Sequence of installation
- Techniques
  - Alignment of components
  - Gaskets
  - Initial bolt installation
  - Tightening sequence
  - Torque and tensioning sequence



**LEARNING TASKS**

4. Inspect vessels and components for defects

**CONTENT**

- Cleaning welded surfaces for inspection
- Recognizing common defects
- Identifying weld deficiencies
- Visual inspection
- Purging tubes to carry out an inspection
- Inspecting components for alignment
- Reporting deficiencies and defects
- Permit requirements as needed

**Line (GAC):**           **G    MAINTAIN, UPGRADE, REPAIR VESSELS AND COMPONENTS**  
**Competency:**       **G2   Service Vessels and Components**

**Objectives**

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

- Describe upgrades to vessels and components.
- Describe preventative maintenance on vessels and components.

**LEARNING TASKS**

1. Describe upgrades to vessels and components

**CONTENT**

- Site conditions
- Permit requirements
  - Gas tests
  - Hot and cold work
  - Confined space
- Fasteners
- Verifying that permit requirements are met
- Isolating
- Blinding
- Blanking
- Locking and tagging
- Identifying site modification requirements
  - Demolition
  - Component removal
  - Adjustments
- Creating access to work area
- Moving materials to appropriate location
- Disposing of materials
- Fitting and fastening components to existing systems
- Recognizing hazards of removing and adding components
- Replacing material
- Re-using materials and components





**Line (GAC):** G MAINTAIN, UPGRADE, REPAIR VESSELS AND COMPONENTS  
**Competency:** G3 Remove and Dismantle Vessels and Components

**Objectives**

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

- Describe vessels and components.
- Describe how to demolish vessels and components.
- Remove materials from vessels and components.

**LEARNING TASKS**

1. Dismantle vessels and components
  
2. Describe how to demolish vessels and components
  
3. Remove materials from vessels

**CONTENT**

- Dismantling methods and procedures
- Safety coordination and planning
- Planning the dismantling of components
- Tools and equipment
- Coordination with other trades
- Numbering and match marking components to organize dismantled pieces
- Salvaging materials
  
- Demolition methods and procedures
- Safety coordination and planning
- Identifying re-usable material
- Identifying components and vessels for demolition
- Planning the demolition
- Coordination with other trades
- Securing the work area
- Salvaging materials
  
- Lifting, hoisting, handling and storage methods
- Safety coordination and planning
- Proper disposal of waste material
- Material and scrap removal procedures
- Coordination with other workers
- Securing the work area
- Identify material for re-use or scrap

**Achievement Criteria**

**Performance** The learner will remove and replace a tube bundle in a heat exchanger.

Conditions

The learner will be given:

- Equipment
- Material
- Instructions

Criteria

The learner will score 70% or better on a rating sheet that reflects the following criteria:

- Organization
- Safety
- Procedures
- Piece marking/tagging
- Final assembly
- Communication

# **Level 2 Boilermaker**



**LEARNING TASKS**

**CONTENT**

- |   |  |
|---|--|
| 3. Use power tools and shop fabrication tools               | <ul style="list-style-type: none"> <li>• Types</li> <li>• Parts</li> <li>• Purpose/use</li> <li>• Procedures/order of operations</li> <li>• Safe use</li> <li>• Adjustment</li> <li>• Assured grounding</li> </ul> |
| 4. Inspect power tools and shop fabrication tools           | <ul style="list-style-type: none"> <li>• Inspection</li> <li>• Storage</li> <li>• As per job requirement and manufacturer specifications</li> </ul>  |
| 5. Describe tube removal/ expansion tools                   | <ul style="list-style-type: none"> <li>• Tube rolls</li> <li>• Mandrel</li> <li>• Rolling gun</li> <li>• Milling machine</li> <li>• Micrometers</li> <li>• See Tool list, section 4</li> </ul>                     |
| 6. Describe bolt tensioning and torquing equipment          | <ul style="list-style-type: none"> <li>• Hydraulic pumps</li> <li>• Torquing and tensioning equipment</li> </ul>   |
| 7. Inspect tube tools and tensioning and torquing equipment | <ul style="list-style-type: none"> <li>• Visual</li> <li>• Operational</li> </ul>  |

**Achievement Criteria 1**

- |             |   |
|-------------|---|
| Performance | The learner will demonstrate the proper set up and use of given tools.  |
| Conditions  | <p>The learner will be given:</p> <ul style="list-style-type: none"> <li>• Tools</li> <li>• Equipment</li> <li>• Specifications</li> </ul>  |
| Criteria    | <p>The learner will score 70% or better on a rating sheet that reflects the following criteria:</p> <ul style="list-style-type: none"> <li>• Accuracy of finished product</li> <li>• Fit-up</li> <li>• Operation</li> </ul> |

**Achievement Criteria 2**

Performance	The learner will demonstrate the proper set-up and use of shop equipment.
Conditions	The learner will be given: <ul style="list-style-type: none"><li>• Equipment</li><li>• Materials</li><li>• Task instructions</li></ul>
Criteria	The learner will score 70% or better on a rating sheet that reflects the following criteria: <ul style="list-style-type: none"><li>• Safety</li><li>• Appearance</li><li>• Tolerances</li><li>• Adherence to the checklist of tasks</li></ul>

**Line (GAC):            B    USE TOOLS, EQUIPMENT AND WORK PLATFORMS**  
**Competency:           B3    Use Cutting Tools and Equipment**

**Objectives**

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

- Perform various methods of cutting plate.

**LEARNING TASKS**

1. Cut plate using various tools

2. Identify arc welding equipment

3. Identify arc welding consumables

**CONTENT**

- Basic procedures/operations
- Set-up
- Adjustment
- Take down
- Inspection
- Maintenance
- Storage
- Cutting tools
- Oxy-fuel torch
  - Adjustment
    - Working pressures
    - Flame types
  - Transport
- Plasma
- Abrasive disk
- Carbon arc
- Safety
- Types of processes
- Types of welding machines
- Cables
- Ground clamp
- Electrode holder
- Remote controls
- Hydraulic test piece bender
- Personal protective equipment
- Electrodes
- Filler wire
- Flux
- Tungsten
- Shielding gases
- Anti-spatter





**Achievement Criteria**

Performance	The learner will perform basic welding.
Conditions	The learner will be given: <ul style="list-style-type: none"><li>• Materials</li><li>• Equipment</li><li>• Specifications</li></ul>
Criteria	The learner will score 70% or better on a rating sheet that reflects the following criteria: <ul style="list-style-type: none"><li>• Safety</li><li>• Penetration</li><li>• Accuracy</li><li>• Appearance</li><li>• Bend test</li></ul>

**Line (GAC):**        **B    USE TOOLS, EQUIPMENT AND WORK PLATFORMS**  
**Competency:**      **B4   Use Work Platforms and Access Equipment**

**Objectives**

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

- Perform a rigging removal analysis.
- Plan access for rigging removal.

**LEARNING TASKS**

**CONTENT**

- |  |  |
|--|--|
| <ol style="list-style-type: none"> <li>1. Determine appropriate access for rigging removal</li> <br/> <li>2. Determine appropriate considerations for rigging removal</li> <br/> <li>3. Determine mobile equipment required for rigging removal</li> </ol> | <ul style="list-style-type: none"> <li>• Mobile</li> <li>• Mechanical</li> <li>• Stationary</li> <br/> <li>• Methods</li> <li>• Area surrounding lift <ul style="list-style-type: none"> <li>○ Impact on others</li> </ul> </li> <li>• Dry run procedures</li> <li>• Recognize hazards <ul style="list-style-type: none"> <li>○ Overhead wires</li> <li>○ Load drift</li> <li>○ Wind speed</li> <li>○ Ground conditions</li> </ul> </li> <li>• Interpret engineered lift drawings</li> <li>• Interpret load charts</li> <br/> <li>• Manlifts <ul style="list-style-type: none"> <li>○ Size</li> <li>○ Boom styles</li> <li>○ Capability</li> </ul> </li> <li>• Scissor lifts</li> <li>• Man baskets <ul style="list-style-type: none"> <li>○ Communication methods <ul style="list-style-type: none"> <li>– Two-way radios</li> <li>– Hand signals</li> </ul> </li> <li>○ Delegate responsibilities <ul style="list-style-type: none"> <li>– Operator</li> <li>– Signal person</li> <li>– Tag line person</li> </ul> </li> </ul> </li> </ul> |
|--|--|

**Line (GAC):** C ORGANIZE WORK  
**Competency:** C2 Use Drawings and Specifications

**Objectives**

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

- Analyse a drawing in detail.

**LEARNING TASKS**

1. Identify elements on advanced drawings

2. Analyse a drawing in detail

**CONTENT**

- Basic format
  - Symbols/welding
  - Abbreviations
  - Material list
  - Tolerance and fitting requirements
  - Direction marks and placement marks
  - Centres and work points
  - Revisions
  - Details
- Reference dimension point (running dimensions)
- Working point
- Orientations
- Elevations
- Rise and run
- Cut out size
- Discuss relevant codes and standards

**Line (GAC):** C ORGANIZE WORK  
**Competency:** C3 Handle Materials and Components

**Objectives**

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

- Describe considerations when handling materials and relevant components.
- Handle materials and relevant components according to job requirements.

**LEARNING TASKS**

**CONTENT**

- |  |  |
|--|--|
| <p>1. Describe considerations and responsibilities when handling plates, tubes and fasteners</p> <p>2. Describe procedures for handling materials</p> <p>3. Handle materials</p> | <ul style="list-style-type: none"> <li>• Safety/Occupation Health and Safety</li> <li>• Ergonomics</li> <li>• Storage</li> <li>• Transportation             <ul style="list-style-type: none"> <li>○ Method of transportation</li> </ul> </li> <li>• Off-loading             <ul style="list-style-type: none"> <li>○ Crane</li> <li>○ Fork lift</li> <li>○ Manual</li> </ul> </li> <li>• Cribbing and blocking</li> <li>• Use of plate clamps and plate racks</li> <li>• Product protection</li> <li>• Disposal</li> <li>• Recycling</li> <li>• Identification of materials</li> <li>• Safety</li> <li>• Loading/unloading procedures</li> <li>• Securing</li> <li>• Packaging/shipping</li> <li>• Pallets</li> <li>• Shipping containers</li> <li>• Equipment</li> <li>• According to job/site requirements             <ul style="list-style-type: none"> <li>○ Moving plate</li> <li>○ Moving tubes</li> <li>○ Moving fasteners</li> </ul> </li> <li>• Safety procedures</li> <li>• Shipping and storage considerations</li> </ul> |
|--|--|

**Line (GAC):** D **PERFORM CUTTING AND WELDING ACTIVITIES**  
**Competency:** D1 **Cut Material**

**Objectives**

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

- Perform various methods of cutting on plate and tubes.

**LEARNING TASKS**

1. Cut plate and tubes using various tools

**CONTENT**

- Basic procedures/operations
- Set-up
- Adjustment
- Take down
- Inspection
- Maintenance
- Storage
- Cutting tools
- Oxy-fuel torch
- Adjustment (working pressures and flame types)
- Transport
- Plasma
- Abrasive disk
- Carbon arc

**Line (GAC):** D **PERFORM CUTTING AND WELDING ACTIVITIES**  
**Competency:** D2 **Perform Welding**

**Objectives**

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

- Prepare and fit joints for a hopper
- Perform basic welding for a hopper.
- Use distortion control.

**LEARNING TASKS**

1. Prepare joints for fitting
  
2. Fit joints
  
3. Identify arc welding equipment
  
4. Identify arc welding consumables
  
5. Perform tack welds

**CONTENT**

- Tool and equipment selection
- Joint set up
- Material preparation
- Joint cleaning
  
- Tool and equipment selection
- Alignment tolerances
- Set gap
  
- Safety
- Types of processes
- Types of welding machines
  - AC
  - DC
- Cables
- Ground clamp
- Electrode holder
- Personal protective equipment
  
- Electrodes
- Filler wire
- Flux
- Shielding gases
- Anti-spatter
  
- Tool and equipment selection
- Consumables required
- Tack weld placement
- Tack weld removal







- 3. Select rigging and hoisting equipment for a given application
  - Determine the rigging and hoisting capacity
  - Mechanical advantage
  - Ensure rigging and hoisting equipment meets parameters of Working Load Limits (WLL)
- 4. Secure the lift area
  - Swing zone and swing clearance
  - Setting up barricades
  - Conducting pre-lift safety checks

**Achievement Criteria**

- |             |   |
|-------------|---|
| Performance | The learner will plan and perform a lift.   |
| Conditions  | The learner will be given: <ul style="list-style-type: none"> <li>• Materials</li> <li>• Equipment</li> <li>• Instructions</li> </ul>   |
| Criteria    | The learner will score 70% or better on a rating sheet that reflects the following criteria: <ul style="list-style-type: none"> <li>• Safety</li> <li>• Accuracy of lift plan</li> <li>• Proper choice of rigging gear</li> <li>• Rigging gear inspection</li> <li>• Transferring and securing the load</li> <li>• Cooperation/communication among group</li> </ul> |

**Line (GAC):** E USE RIGGING, HOISTING AND LIFTING EQUIPMENT  
**Competency:** E2 Rig Loads

**Objectives**

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

- Apply formulas for rigging loads.
- Rig and secure loads.

**LEARNING TASKS**

1. Apply formulas for rigging loads

2. Rig loads

**CONTENT**

- Working load limits
  - Calculate using rigger's rule of thumb
  - Use of charts
  - Using appropriate formulas
- Slings
  - Sling configurations
    - Load control
    - Vertical
    - Baskets
    - Choker hitches
    - Bridle hitches
    - Efficiencies
- Rigging equipment practices
  - Using softeners
  - Positioning shackles
- Inspect rigging equipment
- Selection of lifting attachment location or pick point
  - Lifting lug location
  - Sling arrangements
  - Advantages and limitations of various sling arrangements
- Determining the centre of gravity of load
- Securing of loads
  - Tag line
  - Knots
    - Bowline
    - Clove hitch
    - Reef knot
    - Sheet bend
- According to job requirements

**Achievement Criteria 1**

Performance	The learner will determine sling stress at a given angle.
Conditions	The learner will be given: <ul style="list-style-type: none"> <li>• Equipment</li> <li>• Instructions</li> </ul>
Criteria	The learner will score 70% or better on a rating sheet that reflects the following criteria: <ul style="list-style-type: none"> <li>• Accuracy of calculations</li> <li>• Proper sling configuration</li> <li>• Correct choice of rigging</li> </ul>

**Achievement Criteria 2**

Performance	The learner will apply slings to exercise maximum load control.
Conditions	The learner will be given: <ul style="list-style-type: none"> <li>• Materials</li> <li>• Equipment</li> <li>• Instructions</li> </ul>
Criteria	The learner will score 70% or better on a rating sheet that reflects the following criteria: <ul style="list-style-type: none"> <li>• Correct sling configuration</li> <li>• Correct sling size</li> <li>• Proper load control</li> </ul>

**Achievement Criteria 3**

Performance	The learner will choose and tie appropriate knots for given applications.
Conditions	The learner will be given: <ul style="list-style-type: none"> <li>• Equipment</li> <li>• Instructions</li> </ul>
Criteria	The learner will score 70% or better on a rating sheet that reflects the following criteria: <ul style="list-style-type: none"> <li>• Accuracy</li> <li>• Proper knot choice</li> <li>• Proper rope</li> </ul>

**Line (GAC): E USE RIGGING, HOISTING AND LIFTING EQUIPMENT**  
**Competency: E3 Hoist Loads**

**Objectives**

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

- Hoist loads with cranes.
- Assemble and disassemble jib.

**LEARNING TASKS**

**CONTENT**

- |   |  |
|---|--|
| 1. Prepare crane for hoisting             | <ul style="list-style-type: none"> <li>• Set up           <ul style="list-style-type: none"> <li>○ Jib</li> <li>○ Headache ball</li> </ul> </li> <li>• Crane procedures           <ul style="list-style-type: none"> <li>○ Load charts</li> <li>○ Outriggers</li> <li>○ Walk-around inspection</li> </ul> </li> </ul>  |
| 2. Hoist loads with cranes                | <ul style="list-style-type: none"> <li>• Inspect rigging equipment</li> <li>• Hoisting communication methods           <ul style="list-style-type: none"> <li>○ Hand signals</li> <li>○ Two-way radios</li> </ul> </li> <li>• Recognizing and correcting lift irregularities</li> <li>• Establishing lift plan</li> <li>• Securing required lift area</li> <li>• Load control</li> </ul> |
| 3. Secure the load before rigging removal | <ul style="list-style-type: none"> <li>• Securing loads</li> <li>• Ensuring load stability</li> </ul>  |

**Achievement Criteria**

Performance	The learner will attach and stow a jib.
Conditions	The learner will be given: <ul style="list-style-type: none"> <li>• Tools</li> <li>• Equipment</li> <li>• Instructions</li> </ul>
Criteria	The learner will score 70% or better on a rating sheet that reflects the following criteria: <ul style="list-style-type: none"> <li>• Safety</li> <li>• Proper procedures</li> <li>• Removal and re-attachment of headache ball</li> <li>• Confirm proper attachment and stowing of jib</li> </ul>

**Line (GAC): F LAY OUT, FABRICATE AND ASSEMBLE VESSELS AND COMPONENTS**

**Competency: F1 Perform Fabrication**

**Objectives**

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

- Use measurement and layout tools to lay out a hopper.
- Construct a metal hopper.

**LEARNING TASKS**

1. Develop a hopper pattern
2. Use measurement and layout tools to lay out a hopper
3. Construct cardboard model
4. Apply fabrication patterns
5. Cut out components

**CONTENT**

- Specifications
- Measurement and layout tools
- Purpose/use
  - Lines
  - Rectangles
  - Triangles
- Proper use
- Procedures/operations
- Template set-up
- Material utilization
- True line length
- Measurement and layout accuracy
- Assembly
- Layout and nesting
- Oxy fuel
- Plasma

**LEARNING TASKS**

6. Assemble a hopper

**CONTENT**

- Fitting methods and procedures
- Pre-assembly requirements
- Tolerances for conditions
  - Out of level
  - Out of plumb
  - High/low
  - Squareness
- Selecting and using tools and equipment
- Ensure proper fit:
  - Welding on stopper bars
  - Dogs and wedges
  - Jigs
  - Plate fitting techniques
  - Distortion controls
  - Clamping
- Welding

**Achievement Criteria 1**

Performance

The learner will lay out and construct a cardboard hopper.

Conditions

The learner will be given:

- Tools
- Equipment
- Specifications
- Materials

Criteria

The learner will score 70% or better on a rating sheet that reflects the following criteria:

- Accuracy of finished product and layout
- Fit-up

**Achievement Criteria 2**

Performance	The learner will layout, fabricate and construct a metal hopper.
Conditions	The learner will be given: <ul style="list-style-type: none"><li>• Material</li><li>• Equipment</li><li>• Specifications</li></ul>
Criteria	The learner will score 70% or better on a rating sheet that reflects the following criteria: <ul style="list-style-type: none"><li>• Accuracy of template</li><li>• Fit-up</li><li>• Burning</li><li>• Welding</li><li>• Adherence to specifications</li></ul>



**Line (GAC):**        **F    LAY OUT, FABRICATE AND ASSEMBLE VESSELS AND COMPONENTS**

**Competency:**     **F2   Align and Fit Vessels and Components**

### **Objectives**

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

- Perform hand lay-ups of fibreglass.

### **LEARNING TASKS**

1. Describe fibre-reinforced components

### **CONTENT**

- Methyl ethyl ketone peroxide
- Styrene
- Dimethylamine
- Cobalt naphthenate
- Acetone
- Resins
- Glass reinforcements
- Cure systems
- Catalysts
- Uses
- Applications
- Storage
- Installation techniques
  - Preparation of joints
  - Fabrication techniques
  - Laminate design and inspection
  - Lay up joints



**Achievement Criteria 1**

Performance	The learner will bolt components.
Conditions	The learner will be given: <ul style="list-style-type: none"><li>• Material</li><li>• Instructions</li><li>• Equipment</li></ul>
Criteria	The learner will score 70% or better on a rating sheet that reflects the following criteria: <ul style="list-style-type: none"><li>• Hardware preparation</li><li>• Installation sequence</li><li>• Adherence to proper technique</li><li>• Torquing and tensioning<ul style="list-style-type: none"><li>○ Adherence to torque specifications</li></ul></li></ul>

**Achievement Criteria 2**

Performance	The learner will remove and install exchanger tubes.
Conditions	The learner will be given: <ul style="list-style-type: none"><li>• Material</li><li>• Instructions</li><li>• Equipment</li><li>• Specifications</li></ul>
Criteria	The learner will score 70% or better on a rating sheet that reflects the following criteria: <ul style="list-style-type: none"><li>• Preparation of tube sheet and tube</li><li>• Expansion of tube</li><li>• Final ID</li></ul>





**LEARNING TASKS**

3. Perform preventative maintenance on vessels and components

**CONTENT**

- Inspection methods and procedures
- Company policies and procedures
- Overlay and thermal spray procedures
- Scraping and cleaning components
- Visual inspections
- Recognizing worn damaged and defective vessels and components
- Informing appropriate authority of possible defects



**Achievement Criteria**

Performance	The learner will dismantle a bolted up joint.
Conditions	The learner will be given: <ul style="list-style-type: none"><li>• Equipment</li><li>• Material</li><li>• Instructions</li></ul>
Criteria	The learner will score 70% or better on a rating sheet that reflects the following criteria: <ul style="list-style-type: none"><li>• Organization</li><li>• Safety</li><li>• Procedures</li><li>• Piece marking/tagging</li><li>• Communication</li></ul>



# **Level 3 Boilermaker**

**Line (GAC):            B    USE TOOLS, EQUIPMENT AND WORK PLATFORMS**  
**Competency:           B2    Use Power Tools and Shop Fabrication Equipment**

**Objectives**

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

- Select appropriate grinders for pipe and nozzle application.
- Use appropriate grinders for pipe and nozzle application.
- Inspect power tools.

**LEARNING TASKS**

1. Select appropriate grinders for pipe and nozzle application
  
2. Use appropriate grinders for pipe and nozzle application
  
3. Inspect power tools

**CONTENT**

- Die grinders
- Angle grinders
- See Tool list
  
- Die grinders
- Angle grinders
- See Tool list
  
- Operational
- Visual

**Line (GAC):**        **B    USE TOOLS, EQUIPMENT AND WORK PLATFORMS**  
**Competency:**     **B3   Use Cutting Tools and Equipment**

**Objectives**

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

- Cut pipe and vessel shells using various methods and tools.

**LEARNING TASKS**

1. Cut pipe and vessel shells using various tools

**CONTENT**

- Basic procedures/operations
- Set-up
- Adjustment
- Take down
- Inspection
- Maintenance
- Storage
- Cutting tools
- Oxy fuel torch
  - Adjustment (working pressures and flame types)
  - Transport
- Plasma
- Abrasive disk
- Carbon arc

**Line (GAC):**        **B    USE TOOLS, EQUIPMENT AND WORK PLATFORMS**  
**Competency:**      **B4   Use Work Platforms and Access Equipment**

**Objectives**

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

- Plan access to attachment points for rigging purposes.

**LEARNING TASKS**

**CONTENT**

- |   |  |
|---|--|
| <ol style="list-style-type: none"> <li>1. Determine appropriate access to attachment points</li> <br/> <li>2. Determine appropriate considerations for access to attachment points</li> <br/> <li>3. Determine stationary equipment required for rigging removal</li> <br/> <li>4. Determine mechanical equipment required for rigging removal</li> </ol> | <ul style="list-style-type: none"> <li>• Stationary</li> <li>• Mobile</li> <li>• Mechanical</li> <br/> <li>• Methods</li> <li>• Area surrounding lift <ul style="list-style-type: none"> <li>○ Impact on others</li> </ul> </li> <li>• Recognize hazards</li> <li>• Interpret engineered drawings</li> <br/> <li>• Stationary equipment <ul style="list-style-type: none"> <li>○ Manufactured</li> <li>○ Tube clamp</li> </ul> </li> <li>• Inspection <ul style="list-style-type: none"> <li>○ Valid tagging</li> </ul> </li> <li>• Purpose</li> <br/> <li>• Swing staging</li> <li>• Boatswain’s chair</li> </ul> |
|---|--|

**Line (GAC):** C **ORGANIZE WORK**  
**Competency:** C2 **Use Drawings and Specifications**

**Objectives**

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

- Analyse multiple technical drawings in detail.
- Apply information to perform layout for fabrication.

**LEARNING TASKS**

1. Identify elements on technically advanced drawings
  
2. Analyse multiple drawings in detail
  
3. Use drawings to determine layout for pipe fabrication

**CONTENT**

- Basic format
  - Symbols/welding
  - Abbreviations
  - Material list
  - Tolerance and fitting requirements
  - Direction marks and placement marks
  - Centres and work points
  - Revisions
  - Details
  
- Reference dimension point (running dimensions)
- Working point
- Orientations
- Elevations
- Rise and run
- Discuss relevant codes and standards
  
- Cut out size
- Cutbacks
- Angles
- Dimensions
- Orientation

**Line (GAC):** C ORGANIZE WORK  
**Competency:** C3 Handle Materials and Components

**Objectives**

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

- Describe considerations when handling materials and relevant components.
- Handle materials and relevant components according to job requirements.

**LEARNING TASKS**

**CONTENT**

- |  |  |
|--|--|
| <p>1. Describe considerations and responsibilities when handling piping, nozzles and flanges</p> <p>2. Describe procedures for handling materials</p> <p>3. Handle materials</p> | <ul style="list-style-type: none"> <li>• Safety/Occupation Health and Safety</li> <li>• Ergonomics</li> <li>• Storage</li> <li>• Transportation             <ul style="list-style-type: none"> <li>○ Method of transportation</li> </ul> </li> <li>• Off-loading             <ul style="list-style-type: none"> <li>○ Crane</li> <li>○ Fork lift</li> <li>○ Manual</li> </ul> </li> <li>• Cribbing and blocking</li> <li>• Product protection</li> <li>• Disposal</li> <li>• Recycling</li> <li>• Identification of materials</li> <li>• Safety</li> <li>• Loading/unloading procedures</li> <li>• Securing</li> <li>• Packaging/shipping</li> <li>• Pallets</li> <li>• Shipping containers</li> <li>• Equipment</li> <li>• According to job/site requirements             <ul style="list-style-type: none"> <li>○ Moving pipe</li> <li>○ Moving nozzles</li> <li>○ Moving flanges</li> </ul> </li> <li>• Safety procedures</li> <li>• Shipping and storage considerations</li> </ul> |
|--|--|

**Line (GAC):** C **ORGANIZE WORK**  
**Competency:** C4 **Use Communication and Mentoring Techniques**

**Objectives**

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

- Demonstrate knowledge of learning skills.
- Demonstrate knowledge of teaching skills.

**LEARNING TASKS**

1. Demonstrate knowledge of strategies for learning skills in the workplace
  
2. Demonstrate knowledge of strategies for teaching workplace skills

**CONTENT**

- Learning preferences
- Skill types
- Essential skills
- Best practices
- Mentor roles
- Steps in teaching skills
- Providing feedback
- Opportunities for improvement
- Assessing progress

**Line (GAC):** D **PERFORM CUTTING AND WELDING ACTIVITIES**  
**Competency:** D1 **Cut Material**

**Objectives**

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

- Cut pipe using various methods and tools.

**LEARNING TASKS**

1. Cut pipe using various tools

**CONTENT**

- Basic procedures/operations
- Set-up
- Adjustment
- Take down
- Inspection
- Maintenance
- Storage
- Cutting tools
- Oxy fuel torch
  - Adjustment (working pressures and flame types)
  - Transport
- Plasma
- Abrasive disk
- Carbon arc



**Line (GAC):** D **PERFORM CUTTING AND WELDING ACTIVITIES**  
**Competency:** D2 **Perform Welding**

**Objectives**

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

- Prepare and fit joints for piping, nozzle installation and patch.
- Perform basic welding for piping, nozzle installation and patch.
- Use distortion control.

**LEARNING TASKS**

**CONTENT**

- |                                     |  |
|-------------------------------------|--|
| 1. Prepare joints for fitting       | <ul style="list-style-type: none"> <li>• Tool and equipment selection</li> <li>• Joint set up</li> <li>• Material preparation</li> <li>• Joint cleaning</li> </ul>   |
| 2. Fit joints                       | <ul style="list-style-type: none"> <li>• Tool and equipment selection</li> <li>• Alignment tolerances</li> <li>• Set gap</li> <li>• Elevation</li> <li>• Orientation</li> <li>• Projection</li> </ul>  |
| 3. Identify arc welding equipment   | <ul style="list-style-type: none"> <li>• Safety</li> <li>• Types of processes</li> <li>• Types of welding machines               <ul style="list-style-type: none"> <li>○ AC</li> <li>○ DC</li> </ul> </li> <li>• Cables</li> <li>• Ground clamp</li> <li>• Electrode holder</li> <li>• Personal protective equipment</li> </ul> |
| 4. Identify arc welding consumables | <ul style="list-style-type: none"> <li>• Electrodes</li> <li>• Filler wire</li> <li>• Flux</li> <li>• Shielding gases</li> <li>• Anti-spatter</li> </ul>   |
| 5. Perform tack welds               | <ul style="list-style-type: none"> <li>• Tool and equipment selection</li> <li>• Consumables required</li> <li>• Tack weld placement</li> <li>• Tack weld removal</li> </ul>   |



**Line (GAC):** E **USE RIGGING, HOISTING AND LIFTING EQUIPMENT**  
**Competency:** E1 **Plan Lifts**

**Objectives**

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

- Plan and make a lift using a spreader bar.

**LEARNING TASKS**

1. Determine weight of load
  
2. Define lift requirements
  
3. Select rigging and hoisting equipment for a given application
  
4. Secure lift area

**CONTENT**

- Measuring load dimensions
- Calculating weights of loads using required formulas
- Load properties
  - Dimensions
  - Shape
  - Weight
  - Determining centre of gravity of loads
- Signalling methods
  - Hand signals
  - Verbal communication
- Recognizing hazards
- Interpreting load charts
- Spreader bar selection
- Ensure rigging and hoisting equipment meets parameters of Working Load Limits (WLL)
- Swing zone and swing clearance
- Setting up barricades and barriers
- Conducting pre-lift safety checks

**Achievement Criteria**

Performance	The learner will make a lift using a spreader bar.
Conditions	The learner will be given: <ul style="list-style-type: none"><li>• Materials</li><li>• Equipment</li><li>• Instructions</li></ul>
Criteria	The learner will score 70% or better on a rating sheet that reflects the following criteria: <ul style="list-style-type: none"><li>• Safety</li><li>• Spreader bar set-up</li><li>• Proper choice of rigging gear</li><li>• Effective communication for signaling</li></ul>

**Line (GAC):** E USE RIGGING, HOISTING AND LIFTING EQUIPMENT  
**Competency:** E2 Rig Loads

**Objectives**

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

- Lift and transfer loads through an obstacle course.

**LEARNING TASKS**

1. Apply formulas for rigging loads
  
2. Plan a lift
  
3. Rig loads
  
4. Transfer loads

**CONTENT**

- Rigging stress formulas
  - Unequal leg length
  - Efficiencies
  - Stresses/angles
- Working load limits
  - Calculate using rigger’s rule of thumb
  - Using appropriate formulas
- Pre-lift planning
  - Detailed planning and coordination
- Types of lift
  - Regular
  - Tandem
  - Critical
- Rigging equipment practices
  - Using softeners
  - Positioning of anchor points
  - Inspect equipment
- Securing of loads
  - Tag line
    - Knots
- Maintenance of correct elevations
- Obstacle avoidance
- Communication

**Achievement Criteria**

Performance	The learner will lift and transfer loads through an obstacle course.
Conditions	The learner will be given: <ul style="list-style-type: none"><li>• Materials</li><li>• Equipment</li><li>• Instructions</li></ul>
Criteria	The learner will score 70% or better on a rating sheet that reflects the following criteria: <ul style="list-style-type: none"><li>• Safety</li><li>• Detail of lift plan</li><li>• Transferring of load</li><li>• Equipment placement</li><li>• Obstacle avoidance</li><li>• Calculation of rigging stress</li></ul>

**Line (GAC):** E **USE RIGGING, HOISTING AND LIFTING EQUIPMENT**  
**Competency:** E3 **Hoist Loads**

**Objectives**

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

- Plan and execute a multiple-component lift.
- Plan and execute lifts using tuggers.

**LEARNING TASKS**

1. Plan the lift
2. Prepare tuggers for hoisting
3. Hoist loads

**CONTENT**

- Determination of lift requirements and load path for lifts
- Inspect rigging equipment
- Type of lift
- Calculated mechanical advantages
- Rigging placement
  - Initial
  - Relocation
  - Location of equipment placement
  - Hold back
  - Block locations
  - Communication/coordination
  - Attachment of rigging
  - Rigging choice
- Set up
- Location
- Anchoring
- Wire rope inspection
- Air requirements
- Hoisting communication methods
  - Hand signals
  - Two-way radios
  - Verbal communication
- Recognizing and correcting lift irregularities
- Securing required lift area
- Load control

- 4. Secure the load before removing rigging
  - Ensuring load stability
  - Securing loads
    - Material handling
  
- 5. Disassemble rigging equipment
  - Wire rope respooling
  - Blocks
  - Inspection
  - Storage
  - As per job requirements

**Achievement Criteria**

Performance	The learner will plan and execute a multiple-component lift.
Conditions	The learner will be given: <ul style="list-style-type: none"> <li>• Materials</li> <li>• Equipment</li> <li>• Instructions</li> </ul>
Criteria	The learner will score 70% or better on a rating sheet that reflects the following criteria: <ul style="list-style-type: none"> <li>• Safety</li> <li>• Detail of lift plan</li> <li>• Execution and accuracy</li> </ul>



**Line (GAC):** E USE RIGGING, HOISTING AND LIFTING EQUIPMENT  
**Competency:** E4 Fabricate Rigging Equipment

**Objectives**

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

- Follow regulations for fabricating rigging equipment.

**LEARNING TASKS**

1. Recognize limitations of fabricating rigging equipment
2. Follow regulations for fabricating rigging equipment

**CONTENT**

- Safety branch acceptance
- Working Load Limit (WLL) specified
- WorkSafeBC
  - Part 15
- Site specific standards
- Engineering standards

**Line (GAC): F LAY OUT, FABRICATE AND ASSEMBLE VESSELS AND COMPONENTS**

**Competency: F1 Perform Fabrication**

**Objectives**

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

- Use measurement and layout tools to layout pipe.
- Lay out and fabricate given pipe configurations.

**LEARNING TASKS**

1. Use layout tools
  
2. Lay out pipe
  
3. Fabricate pipe configurations
  
4. Assemble pipe components

**CONTENT**

- Pipe centre finder
- Wrap-around
- Straight edge
  - Angle iron
- Use of correct formulas for various pipe configurations
- Laying out and marking on pipe
- Quartering pipe
- Pipe off-sets
  - Tangents
  - Ordinates
  - Coordinates
- Alignment methods and procedures
- Orientation
- Tolerances
- Aligning component with existing component
- Assembly and installation using methods such as match-marking
  - Two-piece ninety° turn
  - Three-piece ninety° turn
  - Full sized T
  - Reducing lateral
  - True-Y
- Burning
- Fitting methods and procedures
- Inspection of fit up
- Welding
- Final inspection

**Achievement Criteria**

Performance	<p>The learner will lay out and fabricate various pipe configurations:</p> <ul style="list-style-type: none"><li>• 2 piece 90° from 6-inch pipe</li><li>• 3 piece 90° from 3-inch pipe</li><li>• 6-inch pipe tee</li><li>• Reducing lateral from 4-inch pipe</li><li>• True wye from 6-inch pipe</li></ul>
Conditions	<p>The learner will be given:</p> <ul style="list-style-type: none"><li>• Tools</li><li>• Pipe</li><li>• Instructions</li><li>• Drawings</li></ul>
Criteria	<p>The learner will score 70% or better on a rating sheet that reflects the following criteria:</p> <ul style="list-style-type: none"><li>• Accuracy of layout</li><li>• Fit-up</li><li>• Burning</li><li>• Welding</li></ul>

**Line (GAC): F LAY OUT, FABRICATE AND ASSEMBLE VESSELS AND COMPONENTS**

**Competency: F2 Align and Fit Vessels and Components**

**Objectives**

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

- Fabricate and install a nozzle in a vessel and use the cut-out to complete a flush patch.
- Lay out and install nozzle.
- Install flush patch.

**LEARNING TASKS**

1. Lay out nozzle
  
2. Fabricate and install a nozzle
  
3. Prepare and install a flush patch
  
4. Use stress relief techniques

**CONTENT**

- Nozzle flange
- Orientation
- Elevation
  
- Layout
- Orientation
- Elevation
- Projection
- Preparation
- Fit
- Attachment
  
- Preparation
- Fit up
- Welding procedures
- Tack
- Weld out
- Specifications
  
- As per job requirements

**Achievement Criteria 1**

Performance	The learner will fabricate and install a nozzle in a vessel.
Conditions	The learner will be given: <ul style="list-style-type: none"><li>• Material</li><li>• Equipment</li><li>• Specifications</li></ul>
Criteria	The learner will score 70% or better on a rating sheet that reflects the following criteria: <ul style="list-style-type: none"><li>• Accuracy of nozzle fabrication</li><li>• Correct elevation and orientation</li><li>• Projection</li><li>• Flange bolt hole orientation</li><li>• Fit-up</li></ul>

**Achievement Criteria 2**

Performance	The learner will install a flush patch.
Conditions	The learner will be given: <ul style="list-style-type: none"><li>• Materials</li><li>• Equipment</li><li>• Instructions</li></ul>
Criteria	The learner will score 70% or better on a rating sheet that reflects the following criteria: <ul style="list-style-type: none"><li>• Accuracy of fit-up</li><li>• Distortion control</li><li>• Welding quality</li><li>• Stress relief hole</li></ul>

**Line (GAC): F LAY OUT, FABRICATE AND ASSEMBLE VESSELS AND COMPONENTS**

**Competency: F3 Fasten Components**

**Objectives**

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

- Remove and replace fire tubes.
- Perform hand lay-ups of fibreglass.

**LEARNING TASKS**

1. Install a tube in a fire tube boiler
  
2. Describe the process of installing a fire tube in a fire tube boiler
  
3. Lay-up fibreglass

**CONTENT**

- Annealing of tube
- Preparation of tube sheet and tube
- Expansion
- Set stock
- Beading
  
- Theory of fire tubes and installation
  - Annealing
  - Use of rolling equipment
  - Technique of beading the tube
  - Tube sheet preparation
  
- Types and grades of fibreglass materials
- Mixing and curing procedures
- Tools
- Personal Protective Equipment (PPE)
- Environmental factors
  - Humidity
  - Temperature
- Accelerators, retarders and promoters
- Hazards of working with fibreglass
- Mixing resins
- Applying lay-up techniques
  - Rolling
  - Brushing
  - Spraying
- Ventilation equipment
- Storage and disposal of fibreglass materials

**Achievement Criteria**

Performance

The learner will perform hand lay-ups of fibreglass.

Conditions

The learner will be given:

- Materials
- Equipment
- Instructions
- Specifications

Criteria

The learner will score 70% or better on a rating sheet that reflects the following criteria:

- Proper handling of chemicals
- Strict adherence to safety protocol
- Accuracy of lay out
- Visual inspection

**Line (GAC):**           **G**   **MAINTAIN, UPGRADE, REPAIR VESSELS AND COMPONENTS**  
**Competency:**       **G1**   **Inspect and Test Vessels and Components**

**Objectives**

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

- Describe codes for vessel inspection and construction.
- Describe advanced testing.

**LEARNING TASKS**

1. Describe codes for boiler and vessel inspection and construction
  
  
  
  
  
  
  
  
  
  
2. Describe hydrostatic testing

**CONTENT**

- American Society of Mechanical Engineers (ASME)
- Canadian Standards Association (CSA)
- BC Boiler and Pressure Vessel Safety Authority
- Other applicable codes
  
- Codes
- Procedures
  - Gauges
  - Pumps
  - Valves
  - Fittings
  - Venting point
  - Attachment points





**Achievement Criteria**

Performance	The learner will open towers and replace defective components.
Conditions	The learner will be given: <ul style="list-style-type: none"><li>• Material</li><li>• Equipment</li><li>• Instructions</li></ul>
Criteria	The learner will score 70% or better on a rating sheet that reflects the following criteria: <ul style="list-style-type: none"><li>• Material handling</li><li>• Installation procedures</li><li>• Communication</li></ul>



# **Section 4**

## **ASSESSMENT GUIDELINES**

**Assessment Guidelines – Level 1**

**Level 1 Grading Sheet: Subject Competency and Weightings**

PROGRAM: IN-SCHOOL TRAINING:		BOILERMAKER LEVEL 1	
LINE	SUBJECT COMPETENCIES	THEORY WEIGHTING	PRACTICAL WEIGHTING
A	Perform Safety-Related Functions	4%	3%
B	Use Tools, Equipment and Work Practices	4%	5%
C	Organize Work	10%	7%
D	Perform Cutting and Welding Activities	15%	15%
E	Use Rigging, Hoisting and Lifting Equipment	30%	25%
F	Lay Out, Fabricate and Assemble Vessels and Components	30%	40%
G	Maintain, Upgrade, Repair Vessels and Components	7%	5%
	Total	100%	100%
<b>In-school theory / practical subject competency weighting</b>		60%	40%
<b>Final in-school mark</b> Apprentices must achieve a minimum 70% for the final in-school mark to be eligible to write the Boilermaker Standardized Level exam		IN-SCHOOL%	

<b>In-school Mark</b> Combined theory and practical subject competency multiplied by	80%
<b>Standardized Level Exam Mark</b> The exam score is multiplied by	20%
<b>Final Level Mark</b>	FINAL%

**Assessment Guidelines – Level 2**

**Level 2 Grading Sheet: Subject Competency and Weightings**

PROGRAM: IN-SCHOOL TRAINING:		BOILERMAKER LEVEL 2	
LINE	SUBJECT COMPETENCIES	THEORY WEIGHTING	PRACTICAL WEIGHTING
B	Use Tools, Equipment and Work Practices	5%	5%
C	Organize Work	15%	10%
D	Perform Cutting and Welding Activities	20%	10%
E	Use Rigging, Hoisting and Lifting Equipment	30%	20%
F	Lay Out, Fabricate and Assemble Vessels and Components	25%	50%
G	Maintain, Upgrade, Repair Vessels and Components	5%	5%
	Total	100%	100%
<b>In-school theory / practical subject competency weighting</b>		60%	40%
<b>Final in-school mark</b> Apprentices must achieve a minimum 70% for the final in-school mark to be eligible to write the Boilermaker Standardized Level exam		IN-SCHOOL%	

<b>In-school Mark</b> Combined theory and practical subject competency multiplied by	80%
<b>Standardized Level Exam Mark</b> The exam score is multiplied by	20%
<b>Final Level Mark</b>	FINAL%

### Assessment Guidelines – Level 3

Level 3 Grading Sheet: Subject Competency and Weightings

PROGRAM: IN-SCHOOL TRAINING:		BOILERMAKER LEVEL 3	
LINE	SUBJECT COMPETENCIES	THEORY WEIGHTING	PRACTICAL WEIGHTING
B	Use Tools, Equipment and Work Practices	5%	5%
C	Organize Work	15%	10%
D	Perform Cutting and Welding Activities	5%	10%
E	Use Rigging, Hoisting and Lifting Equipment	30%	15%
F	Lay Out, Fabricate and Assemble Vessels and Components	35%	50%
G	Maintain, Upgrade, Repair Vessels and Components	10%	10%
	Total	100%	100%
<b>In-school theory / practical subject competency weighting</b>		60%	40%
<b>Final in-school mark</b> Apprentices must achieve a minimum 70% for the final in-school mark to be eligible to write the Boilermaker Standardized Level exam		IN-SCHOOL%	

All apprentices who complete Level 3 of the Boilermaker program with a FINAL level percentage score of 70% or greater will write the Interprovincial Red Seal examination as their final assessment.

SkilledTradesBC will enter the apprentices' Boilermaker Interprovincial Red Seal examination percentage score into SkilledTradesBC Portal.

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

# **Section 5**

## **TRAINING PROVIDER STANDARDS**



## **Facility Requirements**

### **Classroom Area**

- Comfortable seating and tables suitable for learning
- Compliance with the local and national fire code and occupational safety requirements
- Overhead and multimedia projectors with a projection screen
- Whiteboard with marking pens and erasers
- Lighting controls to allow easy visibility of the projection screen while allowing students to take notes
- Windows must have shades or blinds to adjust sunlight
- Heating/Air conditioning for comfort all year round
- In-room temperature control to ensure comfortable room temperature
- Acoustics in the room must allow audibility of the instructor
- Computer lab complete with 16 computers and internet access
- Space for reference material for instructor use

### **Shop Area**

- 5,000 square foot steel fabrication workshop with ceiling height sufficient to allow safe movement of materials
- Overhead Hoist
- 13,600 square foot mock-up/storage area which includes:
  - Tool crib
  - Lockers
- Adequate lighting and lighting control
- Ventilation as per WorkSafeBC standards
- Refuse and recycling bins for used shop materials

### **Student Facilities**

- Adequate lunch room as per WorkSafeBC requirements
- Adequate washroom facilities as per WorkSafeBC requirements
- Personal Storage lockers

### **Instructor's Office Space**

- Desk and filing space
- Computer
- Photocopier

## Tools and Equipment

### Shop Equipment

#### *Required - All Levels*

#### Personal Protective Equipment (PPE) and Safety Equipment

- Atmospheric testing equipment
- Coveralls (fire retardant, acid-resistant, plastic over-suit) Tyvec®
- Cutting goggles
- Dust masks
- Ear plugs and ear muffs
- Explosion-proof lights
- Fall arrest equipment (lanyards, harnesses, retractable lanyards, tripods)
- Grinding shields
- Ground fault interrupter
- Hard hat
- Kevlar gauntlets and gloves
- Leather protective clothing and gloves
- Protective gloves
- Respirator (half mask and full face)
- Safety glasses and mono goggles
- Smoke eaters and ventilation
- Systems
- Tarpaulins
- Warning tape, tags, signs, barricades
- Welding glass
- Welding masks
- Welding screens
- Welding shields
- Whip checks and pins

#### Welding Equipment

- Chipping hammer
- Electrode holders (whips/stingers)
- Electrode ovens (stationary/portable)
- Files
- Gougers
- Ground clamps
- Hand wire brush (mild steel and stainless steel)
- Leather welding shield
- Power sources (welding machines)
- C/W ancillary equipment for welding processes such as ESW, FCAW, GMAW, GTAW and SAW
- Pre-heating torch and equipment
- Purge hoses
- Regulators
- Remote amperage controls
- Stud welding equipment
- Temperature (“temp”) sticks
- TIG torch
- Welding cable
- Welding cable “y” connectors
- Welding electrodes

#### Cutting Tools and Equipment

##### Hand Type

- Bolt cutters
- Files
- Hacksaw and blades
- Handsaw

##### Oxy-Fuel Cutting Equipment

- Adapters
- Burning and heating tips
- Flashback arrestors
- Friction lighters (strickers)

- Metal-cutting chisels
- Metal-cutting snips
- Pipe/tube cutters
- Scissors
- Tap and die sets
- Utility knife

**Powered Type**

- Abrasive cut-off saw
- Band saw
- Circular saw
- Grinders (air and electric)
- Nibblers
- Reciprocating saw
- Tube milling machine

**Fuel Cutting Equipment**

- Oxygen lance

**Pneumatic Tools and Equipment**

- Air chippers
- Air compressor
- Air grinders
- Air hammers
- Air manifolds/receiver
- Air scalers
- Air supply hose
- Air utility hoist (air tugger)
- Drills

**Electric-Powered Tools and Equipment**

- Cut-off saw
- Circular saw
- Drills/presses
- Electric supply panel

- Manifold systems
- Manual cutting torches
- Oxy-fuel cart c/w fire extinguishers
- Oxy-fuel couplings and wrenches
- Oxy-fuel cylinders
- Oxy-fuel hoses and repair kits
- Radiograph and related equipment
- Regulators
- Tip cleaners

**Plasma-Arc Cutting Equipment**

- Air line
- Compressed air source
- Power supply c/w cables and torch
- Regulators
- Replacement ceramic cups and tips

**Air Carbon-Arc Cutting Equipment**

- Air-arc gouger
- Air and power supply
- Air line
- Carbon-cutting electrodes (round/flat)
- Replacement electrode holder
- Replacement insulators

- Filters/oilers
- Hydraulic and pneumatic tensioning and torquing equipment
- Hydrostatic test pump
- Impact wrenches/sockets
- Milling machine
- Regulator
- Rolling motor

- Hammer drill
- Impact wrench (electric and battery)
- Jigsaw
- Nibblers/shears

- Exhaust fans
- Extension cords
- Floodlights
- Grinder

- Die grinder
- Reciprocating saw
- String/trouble light

**Powered Shop Equipment**

- Brake press
- Drill press
- Horizontal bandsaw
- Iron Worker
- Overhead Hoist

- Pipe threader
- Plate rolls
- Plate shear
- Radial drilling machine
- Vertical bandsaw
- Mobile crane

**Rigging Equipment**

- Beam clamps
- Beam trolleys
- Blocks (tackle, wire rope, snatch)
- Chain falls
- Come-along
- Crane (Mobile)
- Equalizer plates
- Equalizer sheaves
- Fibre rope
- Headache ball
- Hooks/latches
- Jacks (hydraulic, screw, air bags, steamboat ratchet)
- Links, swivels, rings, thimbles, eye bolts

- Load binders
- Plate clamps
- Shackles
- Slings (wire rope, kevlar, fibre material, chain, synthetic web, wire/chain mesh)
- Softeners
- Spreader and equalizer beams
- Swivel hoist ring
- Terminal end connections for wire rope
- Two-way radios
- Wire rope (clips, sockets)
- Tirfor™ jacks (wire rope pullers)
- Tuggers
- Wire rope

**Tube Removal/Expansion Tools and Equipment**

- Air motor c/w adapter sleeves
- Beading tool
- Collapsing tools
- Expansion accessories (e.g., driving links, universals, gear drive)
- Expanders for boilers and heat exchangers c/w mandrels
- Flaring/belling tools
- Hydraulic tube stub puller
- Induction heat gun

- Internal tube cutters (one revolution tube cutter, fly cutter)
- Knockout tool
- Splitting chisels
- Torque controlled rolling motor
- Tube drift
- Tube end facers
- Tube plugs
- Tube pulling spear
- Tube wall reducing tool

**Tube Preparation/Installation Tools and Equipment**

- Die grinder c/w variety of stones
- Files
- Flapper wheels/emery cloth
- Hand/power brushes (twist)
- Hydraulic expander
- Lead hammer
- Peening tool
- Serrating tool
- Tube cut-off saw
- Tube guide
- Tube hold reamer
- Tube milling machine

**Tools and Equipment for Fibreglass**

- Aluminum-serrated rollers
- Barrel heater
- Brooms
- Carborundum grinding discs (16-36 grit)
- Catalyst dispenser
- Fiberglass material cutting tools
- Grinder c/w flexible disc back
- Heat lamps
- Kilo scale
- Masking tape
- Mohair rollers
- Paint brushes
- Plastic buckets (5 L – 20 L)
- Putty knife
- Roll of cardboard
- Roll of un-waxed paper
- Rubber gloves
- Shovels
- Wooden mixing spatulas

***Recommended***

- Rigging belt
- Sand blasting equipment
- Track saw
- Resin spray gun/hoses

**Shop (Facility) Tools**

***Standard Tools***

***Required***

**Measuring Tools**

- Angle and radius gauges
- Calipers/dividers
- Combination square (with interchangeable heads)
- Compass
- Compound tube gauge
- Framing squares
- Laser levels
- Measuring tapes
- Micrometers
- Scale rule
- Sliding t-bevel
- Steel tapes
- String line
- Telescoping gauge
- Vernier caliper

**Measuring and Layout Tools**

- Ball peen hammer
- Chalk
- Chalk-line
- Contour marker
- Dividers
- Dye
- Felt pen
- Laser level
- Lumber crayon
- Paint brush
- Paint marker
- Plumb bob
- Prick/center punch
- Protractor
- Scribe and awl
- Soapstone and holder
- Spirit level
- Squares
- Steel letter/number set
- Straight edge
- Trammel points
- Transit (theodolite)
- Water level
- Wrap-around

**Hand Tools**

- Holding Tools
- Bar clamp
- Bench vice
- C-clamp
- End-cut pliers (nippers)
- Hammer wrench holder
- Lineman pliers
- Locking (vise-grip™) wrench pliers
- Needle-nose pliers
- Pipe vise (portable tri-stand)
- Pony clamp
- Side-cutter pliers
- Sliding clamp (bessey clamp)
- Slip-joint pliers
- Water-pump (utility) pliers/channel
- Lock pliers
- Holding/Turning Tools
- Adjustable (crescent) wrench
- Box-end wrench
- Chain wrench
- Combination wrench
- Hammer (slug) wrench
- Hex keys (allen wrench)
- Open-end wrench
- Pipe wrench
- Screwdrivers
- Ratchet and socket wrench sets
- Strap wrench
- Spud wrench
- Torque wrench

**Fitting Tools**

- Hammering Tools
- 4 lb. Mini-sledge hammer
- Alignment pins
- Ball peen hammer
- Bull pin
- C-clamps
- Clamping angles
- Hydraulic jack
- Hydraulic ram
- Key plates and blank nuts
- Metal-cutting chisel
- Non-sparking hammer
- Pin punch
- Pry bar

- Claw hammer
- Come-alongs
- Dogs and wedges, screw dogs
- Drift pin
- Flange spreader
- Hickey bars
- Hose clamps
- Shims and wedges
- Sledges
- Soft-face hammer (lead-face)
- Spud wrench
- Steel, brass and wood wedges
- Strongbacks

***Recommended***

- Wall-banger™
- Induction heat gun
- Electric screwdriver

***Specialty Tools***

- n/a

**Student Equipment (supplied by school)**

***Required***

- n/a

***Recommended***

- n/a

**Student Tools (supplied by student)**

***Required***

- CSA protective footwear
- Rigging knife
- Cotton work clothes / coveralls

***Recommended***

- n/a

## Reference Materials

### Required Reference Materials

- Contact Training Facility for Required Reference Material

### Recommended Resources

- SkilledTradesBC [www.skilledtradesbc.ca](http://www.skilledtradesbc.ca)
- Workplace Hazardous Materials Information System (WHMIS) and First Aid <http://www.hc-sc.gc.ca/ewh-semt/occup-travail/whmis-simdut/index-eng.php>
- WorkSafeBC (WCB) [www.worksafebc.com](http://www.worksafebc.com)
- Codes
  - National Fire Code of Canada <http://www.nrc-cnrc.gc.ca/eng/ibp/irc/codes/2010-national-fire-code.html>
  - BC Ministry of Housing [www.housing.gov.bc.ca/building](http://www.housing.gov.bc.ca/building) Queen's Printer for BC Code books <http://www.bccodes.ca/default.htm>
    - BC Building Code
    - BC Fire Code
    - BC Electrical Code
  - National Fire Protection Association [www.nfpa.org](http://www.nfpa.org)
    - NFPA 80 - Standards for Fire Doors and Fire Windows
    - NFPA 101 - Life Safety Code
  - Canadian National Building Code <http://www.nrc-cnrc.gc.ca/eng/ibp/irc/codes/2010-national-building-code.html>

### Suggested Texts

- Contact Training Facility for Suggested Texts

**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**

### **Occupation Qualification**

The instructor must possess:

- A BC Certificate of Qualification with a Red Seal Endorsement as a Boilermaker
- A Boilermaker - Certificate of Qualification with Interprovincial Red Seal endorsement

### **Work Experience**

A minimum of 5 years of experience working in the industry as a journeyman.

### **Instructional Experience and Education**

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

- An Instructor's Diploma or equivalent
- A Bachelor's Degree in Education