

Atlantic Workforce Partnership

Curriculum Standard



Boilermaker

Version : 2020

REVISED : N/A

Atlantic Apprenticeship



 COUNCIL OF
ATLANTIC PREMIERS
CONSEIL DES PREMIERS
MINISTRES DE L'ATLANTIQUE



Employment and
Social Development Canada

Emploi et
Développement social Canada

Atlantic Apprenticeship Curriculum Standard

Boilermaker

Preface

This Atlantic Apprenticeship Curriculum Standard is intended to assist instructional staff in the design and delivery of technical, in-class training in support of the Boilermaker program.

This document contains all the technical training elements required to complete the Boilermaker apprenticeship program and has been developed based on the 2016 Red Seal Occupational Standard (RSOS). The RSOS can be found on the Red Seal website (www.red-seal.ca).

Implementation of this AACS for Apprenticeship training is outlined in the following table.

Level	Implementation Effective
Level 1	2020-2021
Level 2	2021-2022
Level 3	2022-2023

*** The above implementation schedule was current at time of printing. Please **confirm** with Apprenticeship Staff prior to commencing training.*

Granting of credit or permission to challenge level examinations for pre-employment or pre-apprenticeship training for the Boilermaker trade will be based on the content outlined in this standard. Training providers must contact their provincial apprenticeship authority for more information on the process and requirements for determining eligibility for credit towards an apprenticeship program. Programs which have been deemed acceptable by the jurisdictional apprenticeship authority will be identified in transfer credit matrix developed through the Atlantic Apprenticeship Harmonization Project.

Acknowledgements

The development of the Atlantic Apprenticeship Curriculum Standard (AACS) is an initiative of the Atlantic Apprenticeship Council's Atlantic Apprenticeship Harmonization Project (AAHP) through the Atlantic Workforce Partnership and Employment and Social Development Canada.

The Atlantic Apprenticeship Council wishes to acknowledge the contributions of the following industry and instructional representatives on the Atlantic Trade Advisory Committee (ATAC) who participated in the development of this document in November, 2018.

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Alexander Macleod	Nova Scotia
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Advisory committees, industry representatives, instructors and apprenticeship staff provided valuable input to the development of this document. Without their dedication to quality apprenticeship training, this document could not have been produced.

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User Guide

Atlantic Apprenticeship Curriculum Standards (AACS) are developed based on the Red Seal Occupational Standard (RSOS) and extensive industry consultation. This document represents the minimum content to be delivered as part of the harmonized Atlantic program for the Boilermaker trade.

The AACS's are deliberately constructed for ease of use and flexibility of structure in order to adapt to all delivery requirements. They detail units of training, unit outcomes and objectives. They do not impose a delivery model or teaching format.

Jurisdictions and/or training providers will select and develop delivery materials and techniques that accommodate a variety of learning styles and delivery patterns. The AACS does not dictate study materials, textbooks or learning activities to be used in delivery.

The document includes a Level Structure to facilitate mobility for apprentices moving from one jurisdiction to another.

Structure

The content of the AACS is divided into units. Unit codes are used as a means of identification and are not intended to convey the order of delivery. It is at the discretion of the training provider to deliver the content in the required logical sequence of delivery within the level. Jurisdictions are free to deliver units one at a time or concurrently within a level, provided all outcomes are met.

The Learning Outcomes describe what the apprentice should know or be able to do at the end of training. Wording of the Learning Outcomes, "Demonstrate knowledge of..." acknowledges the broad spectrum of ways in which knowledge can be assessed (i.e. practical projects, multiple choice testing, presentations, etc.) by instructional staff within the training.

Summative evaluation will be through a multiple-choice Level Examination administered through the jurisdictional Apprenticeship Authority.

User Guide *(continued)*

The 2016 Red Seal Occupational Standard (RSOS) to AACS Comparison chart outlines the relation between each RSOS sub-task and the AACS units. RSOS References have also been detailed in each unit to highlight the direct link between the unit and relevant sub-tasks in the RSOS.

In the Level Structure section, the document identifies suggested hours in order to provide an indication of the time it should take to cover the material in the unit and is intended as a guide only. Adjustments to the suggested hours for each unit may be required to account for rate of apprentice learning, statutory holidays, storm days, registration and examinations. These suggested hours detailed for each unit will represent both theory and practical training (if relevant) and for consistency will be based on a standard of 30 hours per week of training. The actual length of time required to deliver an outcome successfully will depend upon the learning activities and teaching methods used.

There are two types of objectives found in the AACS document. theoretical and practical.

The theoretical objectives represent the material that is to be covered during the technical training in order to convey the required knowledge to the apprentice.

The practical objectives represent the tasks or skills that have been deemed by the Atlantic Trade Advisory Committee as critical for the apprentices to receive exposure to while attending technical training. For example, exposure could be done through instructor demonstration or individual or group performance of the skill or task. Training providers are encouraged to use practical demonstration and opportunities for hands-on learning whenever possible. Practical objectives are not intended to replace the on-the-job training component of the apprentice's program or to mirror or replace the logbook skills that are to be taught and evaluated in the workplace.

Detailed content for each objective has not been developed. Where detail is required for clarity, content has been provided.

Glossary of Terms

These definitions are intended as a guide to how language is used in the document.

ADJUST	To put in good working order; regulate; bring to a proper state or position.
APPLICATION	The use to which something is put and/or the circumstance in which an individual would use it.
CHARACTERISTIC	A feature that helps to identify, tell apart or describe recognizably; a distinguishing mark or trait.
COMPONENT	A part that can be separated from or attached to a system; a segment or unit.
DEFINE	To state the meaning of (a word, phrase, etc.).
DESCRIBE	To give a verbal account of; tell about in detail.
EXPLAIN	To make plain or clear; illustrate; rationalize.
IDENTIFY	To point out or name objectives or types.
INTERPRET	To translate information from observation, charts, tables, graphs and written material.
MAINTAIN	To keep in a condition of good repair or efficiency.
METHOD	A means or manner of doing something that has procedures attached to it.
OPERATE	How an object works; to control or direct the functioning of.
PROCEDURE	A prescribed series of steps taken to accomplish an end.
PURPOSE	The reason for which something exists or is done, made or used.

Glossary of Terms (*continued*)

TECHNIQUE	Within a procedure, the manner in which technical skills are applied.
TEST	<p>v. To subject to a procedure that ascertains effectiveness, value, proper function or other quality.</p> <p>n. A way of examining something to determine its characteristics or properties, or to determine whether or not it is working correctly.</p>

Essential Skills Profiles

Through extensive research, the Government of Canada and other national and international agencies have identified and validated key essential skills for the workplace. These skills are used in nearly every job and at different levels of complexity. They provide the foundation for learning all other skills and enable people to evolve with their jobs and adapt to workplace change.

Essential Skills Profiles describe how workers in various occupations use each of the key essential skills. They include.

- a brief description of the occupation;
- examples of tasks that illustrate how each essential skill is applied; and,
- complexity ratings that indicate the level of difficulty of the example tasks.

Essential Skills profiles can be found on the Employment and Social Development Canada (ESDC) website at www.esdc.gc.ca/eng/jobs/les/profiles/index.shtml

The development and improvement of these Essential Skills is inherent throughout the apprenticeship training program as apprentices work towards achieving journey person status.

Profile Chart

Performs Common Occupational Skills			
BLM-100 Safety	BLM-105 Confined Space	BLM-110 Tools and Equipment	BLM-115 Work Platforms and Access Equipment
BLM-120 Metallurgy I	BLM-125 Oxy-fuel Cutting	BLM-130 Electric Arc Cutting and Welding	BLM-135 Communication
BLM-140 Drawings	BLM-150 Basic Materials	BLM-170 Job Task Planning	BLM-200 Shop Equipment
BLM-210 Basic Cutting and Welding	BLM-305 Advanced Welding	BLM-220 Aerial Work Platforms	BLM-300 Mentoring
Performs Rigging and Hoisting			
BLM-145 Hoisting, Lifting and Rigging I	BLM-215 Hoisting, Lifting and Rigging II	BLM-310 Hoisting, Lifting and Rigging III	
Completes New Construction			
BLM-160 Fabrication Fundamentals	BLM-155 Layout and Template Development I	BLM-225 Layout and Template Development II	BLM-320 Layout and Template Development III
BLM-230 Component Fabrication I	BLM-235 Tube Expansion	BLM-240 Fiberglass Fitting	BLM-330 Boilers
BLM-335 Condensers and Exchangers	BLM-340 Tanks		
Performs Repairs, Maintenance, Upgrading and Testing			
BLM-165 Introduction to Pressure Vessels	BLM-205 Metallurgy II	BLM-245 Maintenance and Repair	BLM-315 Testing and Inspection
BLM-330 Boilers	BLM-335 Condensers and Exchangers	BLM-340 Tanks	

Level Structure

Level 1 – 8 Weeks

Unit Code	Unit Title	Suggested Hours*	Page Number	Practical Objectives*
MENT-1801	Workplace Mentoring I (NS Specific)	6	112	None
BLM-100	Safety	15	18	None
BLM-105	Confined Space	6	21	None
BLM-110	Tools and Equipment	30	24	None
BLM-115	Work Platforms and Access Equipment	9	26	Perform work platform set up.
BLM-120	Metallurgy I	12	28	None
BLM-125	Oxy-fuel Cutting	21	30	1. Set up, operate and shut down oxy-fuel equipment. 2. Perform oxy-fuel cutting operations.
BLM-130	Electric Arc Cutting and Welding	18	32	Perform a tack weld.
BLM-135	Communication	6	34	None
BLM-140	Drawings	18	36	Interpret information found on drawings.
BLM-145	Hoisting, Lifting and Rigging I	36	38	1. Tie knots. 2. Splice ropes. 3. Perform reeving. 4. Perform hand signals.
BLM-150	Basic Materials	15	42	None
BLM-155	Layout and Template Development I	18	44	1. Produce a template using parallel line development. 2. Layout bolt circles, flanges and ellipses.
BLM-160	Fabrication Fundamentals	18	46	1. Construct basic geometric shapes. 2. Perform bolting and torquing sequence.
BLM-165	Introduction to Pressure Vessels	12	48	None
BLM-170	Job Task Planning	6	50	Perform a field level risk assessment (FLRA).

Level Structure (*continued*)

Level 2 – 8 Weeks

Unit Code	Unit Title	Suggested Hours*	Page Number	Practical Objectives*
BLM-200	Shop Equipment	24	54	Use shop equipment.
BLM-205	Metallurgy II	12	56	N/A
BLM-210	Basic Cutting and Welding	60	58	Perform a basic joint weld.
BLM-215	Hoisting, Lifting and Rigging II	60	62	Perform a basic lift using a block and tackle.
BLM-220	Aerial Work Platforms	6	66	N/A
BLM-225	Layout and Template Development II	18	68	Develop a template to layout a cone or hopper.
BLM-230	Component Fabrication I	24	70	Fabricate and fit a cone or hopper.
BLM-235	Tube Expansion	12	73	Remove, install and expand a tube.
BLM-240	Fiberglass Fitting	6	76	N/A
BLM-245	Maintenance and Repair	18	79	Perform a hydro test.

Level 3 – 8 Weeks

Unit Code	Unit Title	Suggested Hours*	Page Number	Practical Objectives*
BLM-300	Mentoring	3	84	N/A
BLM-305	Advanced Welding	30	87	Perform a v-groove weld.
BLM-310	Hoisting, Lifting and Rigging III	30	89	N/A
BLM-315	Testing and Inspection	12	92	Perform a guided bend test.
BLM-320	Layout and Template Development III	15	94	Layout a tangential nozzle.
BLM-325	Component Fabrication II	12	96	Install a tangential nozzle.
BLM-330	Boilers	30	98	N/A
BLM-335	Condensers and Exchangers	36	101	Perform tube rolling.
BLM-340	Tanks	30	104	N/A
BLM-345	Introduction to Heavy Industry	12	107	N/A
BLM-350	Program Review	30	109	N/A

***Suggested Hours:** The time it should take to cover the unit (a guide only).

***Practical Objectives:** The tasks/skills apprentices must be exposed to during technical training. An individual or group performance of the task/skill is recommended; if not possible, an instructor demonstration is acceptable. Training Providers should use practical, hands-on learning whenever possible, whether identified in the curriculum as a practical objective or not.

2016 RSOS Sub-task to AACS Unit Comparison

RSOS Sub-task		AACS Unit	
Task 1 - Performs Safety-Related Functions.			
1.01	Uses personal protective equipment (PPE) and safety equipment	BLM-100	Safety
1.02	Maintains safe work environment	BLM-100	Safety
1.03	Monitors confined spaces	BLM-100 BLM-105	Safety Confined Space
Task 2 - Uses tools, equipment and work platforms			
2.01	Uses hand tools	BLM-110	Tools and Equipment
2.02	Uses power tools	BLM-110	Tools and Equipment
2.03	Uses shop equipment	BLM-200	Shop Equipment
2.04	Uses cutting and welding tools and equipment	BLM-125	Oxy-fuel Cutting
		BLM-130	Electric Arc Cutting and Welding
2.05	Uses work platforms and access equipment	BLM-115	Work Platforms and Access Equipment
		BLM-340	Tanks
2.06	Uses aerial work platforms	BLM-115	Work Platforms and Access Equipment
		BLM-220	Aerial Work Platforms
Task 3 - Organizes work			
3.01	Organizes project tasks and procedures	BLM-170	Job Task Planning
		BLM-230	Component Fabrication I
		BLM-240	Fiberglass Fitting
		BLM-325	Component Fabrication II
		BLM-330	Boilers
		BLM-335	Condensers and Exchangers
		BLM-340	Tanks
3.02	Uses drawings and specifications	BLM-140	Drawings
		BLM-330	Boilers
		BLM-335	Condensers and Exchangers
		BLM-340	Tanks
3.03	Handles materials and components	BLM-120	Metallurgy 1
		BLM-150	Basic Materials
		BLM-160	Fabrication Fundamentals
		BLM-170	Job Task Planning
		BLM-330	Boilers
		BLM-335	Condensers and Exchangers
3.04	Demobilizes site	BLM-170	Job Task Planning
		BLM-245	Maintenance and Repair

RSOS Sub-task		AACCS Unit	
Task 4 - Uses communication and mentoring techniques			
4.01	Uses communication techniques	BLM-135	Communication
		BLM-300	Mentoring
4.02	Uses mentoring techniques	BLM-300	Mentoring
Task 5 - Performs cutting and welding activities			
5.01	Cuts material	BLM-125	Oxy-fuel Cutting
		BLM-130	Electric Arc Cutting and Welding
		BLM-210	Basic Cutting and Welding
		BLM-340	Tanks
5.02	Prepares joints for fitting	BLM-130	Electric Arc Cutting and Welding
		BLM-160	Fabrication Fundamentals
		BLM-210	Basic Cutting and Welding
5.03	Fits joints	BLM-130	Electric Arc Cutting and Welding
		BLM-210	Basic Cutting and Welding
		BLM-340	Tanks
5.04	Performs tack welds	BLM-130	Electric Arc Cutting and Welding
5.05	Performs basic welding	BLM-210	Basic Cutting and Welding
		BLM-340	Tanks
5.06	Performs advanced welding	BLM-305	Advanced Welding
Task 6 - Plans lift			
6.01	Determines load	BLM-215	Hoisting, Lifting and Rigging II
		BLM-310	Hoisting Lifting and Rigging III
6.02	Performs pre-lift analysis	BLM-310	Hoisting Lifting and Rigging III
6.03	Selects rigging and hoisting equipment	BLM-145	Hoisting, Lifting and Rigging I
		BLM-215	Hoisting, Lifting and Rigging II
		BLM-310	Hoisting Lifting and Rigging III
6.04	Secures lift area	BLM-145	Hoisting, Lifting and Rigging I
		BLM-215	Hoisting, Lifting and Rigging II
		BLM-310	Hoisting Lifting and Rigging III
Task 7 - Rigs load			
7.01	Inspects rigging equipment	BLM-145	Hoisting, Lifting and Rigging I
		BLM-215	Hoisting, Lifting and Rigging II
7.02	Fabricates rigging equipment	BLM-310	Hoisting Lifting and Rigging III
7.03	Attaches rigging equipment to load	BLM-145	Hoisting, Lifting and Rigging I
		BLM-215	Hoisting, Lifting and Rigging II
		BLM-310	Hoisting Lifting and Rigging III
Task 8 - Hoists load			
8.01	Inspects hoisting equipment	BLM-145	Hoisting, Lifting and Rigging I
		BLM-215	Hoisting, Lifting and Rigging II
8.02	Assembles hoisting equipment	BLM-215	Hoisting, Lifting and Rigging II

RSOS Sub-task		AACS Unit	
		BLM-310	Hoisting Lifting and Rigging III
8.03	Performs hoisting operations	BLM-215	Hoisting, Lifting and Rigging II
		BLM-310	Hoisting Lifting and Rigging III
8.04	Secures load before rigging removal	BLM-215	Hoisting, Lifting and Rigging II
Task 9 - Performs post-lift activities			
9.01	Conducts post-lift inspection	BLM-215	Hoisting, Lifting and Rigging II
9.02	Disassembles hoisting equipment	BLM-215	Hoisting, Lifting and Rigging II
		BLM-310	Hoisting Lifting and Rigging III
9.03	Maintains rigging equipment	BLM-145	Hoisting, Lifting and Rigging I
Task 10 - Performs fabrication			
10.01	Lays out components for fabrication	BLM-155	Layout and Template Development I
		BLM-225	Layout and Template Development II
		BLM-320	Layout and template Development III
		BLM-330	Boilers
		BLM-335	Condensers and Exchangers
		BLM-340	Tanks
10.02	Cuts components for fabrication	BLM-230	Component Fabrication I
		BLM-325	Component Fabrication II
10.03	Forms components for fabrication	BLM-230	Component Fabrication I
		BLM-325	Component Fabrication II
10.04	Constructs components	BLM-160	Fabrication Fundamentals
		BLM-230	Component Fabrication I
		BLM-325	Component Fabrication II
		BLM-330	Boilers
		BLM-335	Condensers and Exchangers
		BLM-340	Tanks
Task 11 - Assembles and fits vessels and components			
11.01	Aligns vessels and components	BLM-230	Component Fabrication I
		BLM-325	Component Fabrication II
		BLM-330	Boilers
		BLM-335	Condensers and Exchangers
		BLM-340	Tanks
11.02	Fits vessels and components	BLM-230	Component Fabrication I
		BLM-325	Component Fabrication II
		BLM-330	Boilers
		BLM-335	Condensers and Exchangers

RSOS Sub-task		AACCS Unit	
		BLM-340	Tanks
Task 12 - Fastens components			
12.01	Bolts components	BLM-160	Fabrication Fundamentals
		BLM-230	Component Fabrication I
		BLM-325	Component Fabrication II
		BLM-330	Boilers
		BLM-335	Condensers and Exchangers
		BLM-340	Tanks
12.02	Expands tubes	BLM-235	Tube Expansion
		BLM-330	Boilers
		BLM-335	Condensers and Exchangers
		BLM-340	Tanks
12.03	Lays up fibreglass	BLM-240	Fiberglass Fitting
		BLM-330	Boilers
		BLM-335	Condensers and Exchangers
		BLM-340	Tanks
Task 13 - Services vessels and components			
13.01	Inspects vessels and components for defects	BLM-245	Maintenance and Repair
		BLM-315	Testing and Inspection
13.02	Prepares vessels and components for servicing	BLM-165	Introduction to Pressure Vessels
13.03	Repairs vessels and components	BLM-245	Maintenance and Repair
		BLM-245	Maintenance and Repair
		BLM-330	Boilers
		BLM-335	Condensers and Exchangers
		BLM-340	Tanks
13.04	Performs preventative maintenance and upgrades	BLM-245	Maintenance and Repair
13.05	Tests materials, vessels and components	BLM-205	Metallurgy II
		BLM-245	Maintenance and Repair
		BLM-315	Testing and Inspection
Task 14 - Removes vessels and components			
14.01	Dismantles vessels and components	BLM-245	Maintenance and Repair
		BLM-330	Boilers
14.02	Removes materials	BLM-245	Maintenance and Repair
		BLM-330	Boilers

Level 1

Unit Code	Unit Title	Suggested Hours	Page Number
MENT-1801	Workplace Mentoring I (NS Specific)	6	112
BLM-100	Safety	15	18
BLM-105	Confined Space	6	21
BLM-110	Tools and Equipment	30	24
BLM-115	Work Platforms and Access Equipment	9	26
BLM-120	Metallurgy I	12	28
BLM-125	Oxy-fuel Cutting	21	30
BLM-130	Electric Arc Cutting and Welding	18	32
BLM-135	Communication	6	34
BLM-140	Drawings	18	36
BLM-145	Hoisting, Lifting and Rigging I	36	38
BLM-150	Basic Materials	15	42
BLM-155	Layout and Template Development I	18	44
BLM-160	Fabrication Fundamentals	18	46
BLM-165	Introduction to Pressure Vessels	12	48
BLM-170	Job Task Planning	6	50

BLM-100 Safety

Learning Outcomes

- Demonstrate knowledge of safe work practices.
- Demonstrate knowledge of regulatory requirements pertaining to workplace safety.
- Demonstrate knowledge of personal protection equipment (PPE), their applications, maintenance and procedures for use.
- Demonstrate knowledge of safety equipment, their applications, maintenance and procedures for use.

2016 Red Seal Occupational Standard Reference

- 1.01 Uses personal protective equipment (PPE) and safety equipment
- 1.02 Maintains safe work environment

Suggested Hours

15 Hours

Objectives and Content

Theoretical Objectives

1. Identify types of personal protective equipment (PPE) and describe their applications, limitations and procedures for use.
 - i) respirators
 - ii) hard hats
 - iii) safety glasses
 - iv) CSA-approved boots
 - v) welding helmets
 - vi) goggles/shields
 - vii) safety harnesses
 - viii) fire retardant clothing
 - ix) hearing protection equipment
 - x) head protection
 - xi) gloves
 - xii) first aid kit
 - xiii) radioactive protective equipment

2. Identify types safety equipment and describe their applications, limitations and procedures for use.
 - i) fire extinguishers
 - ii) fall arrest system
 - iii) barrier tape
 - iv) fresh air breathing equipment
 - v) air movers
 - vi) safety showers
 - vii) eyewash stations
 - viii) wind socks
 - ix) confined space rescue equipment
3. Describe the procedures used to inspect, maintain and store PPE and safety equipment.
4. Identify certification and training requirements for PPE and safety equipment.
5. Identify on-site safety locations and requirements.
 - i) first aid stations
 - ii) safety showers
 - iii) eye wash stations
 - iv) muster points
6. Identify and interpret regulatory requirements and responsibilities.
7. Describe workplace safety and health regulations related to the use of PPE and safety equipment.
8. Describe federal, provincial/territorial and municipal health and safety acts and regulations.
 - i) Transportation of Dangerous Goods (TDG)
 - ii) WHMIS
 - iii) OH&S
 - iv) Workers' Compensation Board
9. Describe safety analysis cards, their purpose and application.
 - i) field level risk assessment (FLRA)
 - ii) job safety analysis (JSA)
 - iii) pre-safety inspection (PSI)
 - iv) lift plans
 - v) hazard assessments (HA)

10. Describe good housekeeping practices.
11. Identify safe disposal and recycling procedures for hazardous materials.
 - i) asbestos
 - ii) silica
 - iii) ceramic fibers
12. Identify workplace hazards and describe associated safe work practices.
 - i) fire
 - ii) chemical
 - iii) gases
 - iv) flying debris
 - v) arc flashes
 - vi) plant operations
 - vii) mobile equipment on-site
 - viii) overhead cranes
 - ix) spills
 - x) chromium
 - xi) manganese
 - xii) vanadium
 - xiii) asbestos
 - xiv) radiation
13. Identify classes of fires and the extinguishing medium in each case.
14. Identify reactive chemicals.

Practical Objectives

N/A

BLM-105 Confined Space

Learning Outcomes

- Demonstrate knowledge of the hazards and safe work practices associated with confined spaces.
- Demonstrate knowledge of regulatory requirements pertaining to confined space entry.

2016 Red Seal Occupational Standard Reference

1.03 Monitors confined spaces

Suggested Hours

6 Hours

Objectives and Content

Theoretical Objectives

1. Define confined spaces.
2. Identify legislation and regulations pertaining to confined space entry.
3. Identify locations requiring the monitoring of confined spaces.
 - i) vessels
 - ii) trenches
 - iii) boilers
 - iv) tanks
 - v) duct work
 - vi) precipitators
 - vii) stacks
4. Identify potential hazards of confined spaces.
 - i) gases
 - ii) surrounding conditions
5. Identify types of gases and their properties.
 - i) chlorine
 - ii) carbon monoxide

- iii) hydrogen sulfide
 - iv) nitrogen
 - v) argon
 - vi) oxygen
 - vii) acetylene
 - viii) propane
 - ix) sulphur dioxide
6. Describe site-specific requirements for monitoring confined spaces.
7. Identify confined space monitoring equipment.
- i) air horns
 - ii) radios
 - iii) flashlights
 - iv) identification vests
 - v) gas monitors
 - vi) rescue plans
8. Describe considerations to pre-plan confined space entry.
- i) atmospheric testing and monitoring
 - ii) procedures
 - iii) code of practice
 - iv) safety equipment and clothing
 - v) ground-fault interrupters
 - vi) explosion-proof lighting
 - vii) rescue equipment
9. Explain confined space rescue procedures.
10. Identify methods for securing confined spaces.
- i) signage
 - ii) tape
 - iii) barricades
 - iv) barriers
 - v) locks
 - vi) hole covers
11. Identify de-energization and lock out procedures.

Practical Objectives

N/A

BLM-110 Tools and Equipment

Learning Outcomes

- Demonstrate knowledge of hand tools, their applications, maintenance and procedures for use.
- Demonstrate knowledge of power tools and components, their applications, maintenance and procedures for use.

2016 Red Seal Occupational Standard Reference

- 2.01 Uses hand tools.
- 2.02 Uses power tools.
- 2.03 Uses shop equipment (introduction)

Suggested Hours

30 Hours

Objectives and Content

Theoretical Objectives

1. Identify hazards and describe safe work practices pertaining to the use of hand and power tools and shop equipment.
2. Identify types of hand tools and describe their applications and procedures for use.
3. Identify types of measuring tools and describe their applications and procedures for use.
4. Explain the setup of transits.
5. Explain the process to transfer elevation points using a water level.
6. Identify types of marking and layout tools and describe their applications and procedures for use.
7. Describe the use of threading equipment.

8. Identify types of power tools, and describe their components, applications and procedures for use.
 - i) grinders
 - ii) pneumatic torque wrenches
 - iii) milling guns
 - iv) drills
 - v) reamers
 - vi) tube expanders
 - vii) impact wrenches
 - viii) hammer drills
 - ix) pipe threading and cutting equipment
 - x) hydraulic jacks and rams
 - xi) hydraulic torque wrenches
 - xii) hydraulic tensioners
9. Describe installation procedures for grinding discs or stones.
10. Describe the procedures used to maintain and store hand and power tools.
11. Identify types of shop equipment and describe their application.

Practical Objectives

N/A

BLM-115

Work Platforms and Access Equipment

Learning Outcomes

- Demonstrate knowledge of work platforms and access equipment, their applications, limitations and procedures for use.
- Demonstrate knowledge of regulatory requirements pertaining to work platforms and access equipment.

2016 Red Seal Occupational Standard Reference

- 2.05 Uses work platforms and access equipment.
- 2.06 Uses aerial work platforms.

Suggested Hours

9 Hours

Objectives and Content

Theoretical Objectives

1. Define terminology associated with work platforms and access equipment.
2. Identify hazards and describe safe work practices pertaining to work platforms and access equipment.
3. Identify and interpret regulatory requirements pertaining to work platforms and access equipment.
4. Identify types of work platforms and describe their characteristics, limitations and applications.
 - i) needle beams
 - ii) modular platforms
 - iii) aerial
5. Identify types of access equipment and describe their characteristics, limitations and applications.
 - i) ladders
 - ii) suspended scaffolding

6. Describe the procedures used to secure and operate work platforms.
7. Describe the procedures used to erect, secure and dismantle work platforms and access equipment.
8. Describe the procedures used to inspect, maintain and store work platforms and access equipment.

Practical Objectives

1. Perform work platform set up.

BLM-120 Metallurgy I

Learning Outcomes

- Demonstrate knowledge of metals and their characteristics.

2016 Red Seal Occupational Standard Reference

3.03 Handles Basic materials and components

Suggested Hours

12 Hours

Objectives and Content

Theoretical Objectives

1. Define terminology associated with metallurgy.
2. Define terminology associated with making metals.
3. Identify types of metals and describe their characteristics and applications.
 - i) white cast iron
 - ii) gray cast iron
 - iii) carbon steels
 - iv) alloy steels
 - v) stainless steels
 - vi) copper
 - vii) aluminum
 - viii) clad steel
4. Describe classification numbering systems for metals.
 - i) Society of Automotive Engineers (SAE)
 - ii) American Iron and Steel Institute (ANSI)
 - iii) American Society of Testing and Materials (ASTM)
 - iv) Canadian Standards Association (CSA)
5. Describe the effects of hot and cold working of metals.
 - i) stress
 - ii) contraction

- iii) expansion
- iv) distortion
- v) work hardening

6. Describe the procedures used to prevent or correct problems that occur when working with metals.

Practical Objectives

N/A

BLM-125 Oxy-fuel Cutting

Learning Outcomes

- Demonstrate knowledge of oxy-fuel equipment and accessories.
- Demonstrate knowledge of the procedures used to cut with oxy-fuel equipment.

2016 Red Seal Occupational Standard Reference

- 2.04 Uses cutting and welding tools and equipment.
- 5.01 Cuts materials.

Suggested Hours

21 Hours

Objectives and Content

Theoretical Objectives

1. Define terminology associated with oxy-fuel cutting.
2. Identify hazards and describe safe work practices pertaining to oxy-fuel cutting.
 - i) personal
 - ii) shop/facility
 - iii) fire and explosion
 - iv) equipment
 - v) ventilation/fumes
 - vi) storage, handling and transportation
3. Identify and interpret codes and standards pertaining to oxy-fuel equipment and operations.
4. Identify oxy-fuel equipment and accessories and describe their applications and limitations.
 - i) cutting
 - ii) gouging
 - iii) welding
 - iv) brazing/braze-welding
 - iv) heating

5. Describe the procedures used to light and adjust a torch.
6. Identify fuel gases for manual and automatic flame cutting of carbon steel.
7. Identify types of flames and describe their application and the procedures for flame adjustment.
 - i) oxidizing
 - ii) carburizing
 - iii) neutral
8. Describe the procedures used to set up, adjust and shut down oxy-fuel equipment.
9. Describe the procedures used to inspect and maintain oxy-fuel equipment.
10. Describe the procedures used to cut materials using oxy-fuel equipment.
 - i) free hand
 - ii) guided
 - straight edge
 - pattern
 - iii) automated/semi-automated
11. Identify common cutting faults and describe the procedures to prevent and correct them.

Practical Objectives

1. Set up, operate and shut down oxy-fuel equipment.
2. Perform oxy-fuel cutting operations.

BLM-130

Electric Arc Cutting and Welding

Learning Outcomes

- Demonstrate knowledge of electric arc equipment and accessories.
- Demonstrate knowledge of the procedures used to cut with electric arc equipment.
- Demonstrate knowledge of the procedures used to weld with electric arc equipment.

2016 Red Seal Occupational Standard Reference

- 2.04 Uses cutting and welding tools and equipment.
- 5.01 Cuts materials.
- 5.02 Prepares joints for fitting.
- 5.03 Fits joints.
- 5.04 Performs tack welds.

Suggested Hours

18 Hours

Objectives and Content

Theoretical Objectives

1. Define terminology associated with electric arc processes.
2. Identify hazards and describe safe work practices pertaining to electric arc processes.
 - i) personal
 - ii) shop/facility
 - iii) fire and explosion
 - iv) equipment
 - v) ventilation/fumes
 - vi) storage, handling and transportation
 - vii) noise
3. Describe electric arc cutting processes and their applications.
 - i) air-carbon arc
 - ii) plasma arc

4. Identify electric arc equipment and accessories and describe their applications.
5. Describe the procedures used to set up, adjust and shut down electric arc equipment.
6. Describe the procedures used to inspect and maintain electric arc equipment.
7. Describe the procedures used to cut using electric arc equipment.
8. Describe the procedures used to weld using electric arc equipment.

Practical Objectives

1. Perform a tack weld.

BLM-135 Communication

Learning Outcomes

- Demonstrate knowledge of trade terminology.
- Demonstrate knowledge of effective communication practices.

2016 Red Seal Occupational Standard Reference

4.01 Uses communication techniques.

Suggested Hours

6 Hours

Objectives and Content

Theoretical Objectives

1. Define terminology used in the trade.

2. Describe the importance of using effective verbal and non-verbal communication with people in the workplace.
 - i) other tradespeople
 - ii) colleagues
 - iii) apprentices
 - iv) supervisors
 - v) clients
 - vi) authorities having jurisdiction
 - vii) manufacturers

3. Identify sources of information to effectively communicate.
 - i) regulations
 - ii) codes
 - iii) occupational health and safety requirements
 - iv) authorities having jurisdiction requirements
 - v) drawings
 - vi) specifications
 - vii) company and client documentation

4. Identify communication and learning styles.
 - i) visual (seeing it)
 - ii) auditory (hearing it)
 - iii) kinesthetic (doing it)
5. Describe effective listening and speaking skills.
6. Identify personal responsibilities and attitudes that contribute to on-the-job success.
 - i) asking questions
 - ii) working safely
 - iii) accepting constructive feedback
 - iv) time management and punctuality
 - v) respect for authority
 - vi) good stewardship of materials
 - vii) tools and property
 - viii) efficient work practice
7. Identify the value of diversity in the workplace.
8. Identify communication that constitutes harassment and discrimination.
 - i) objectionable conduct, comment or display
 - ii) race, national or ethnic origin
 - iii) colour
 - iv) religion
 - v) age
 - vi) sex
 - vii) sexual orientation
 - viii) marital status
 - ix) family status
 - x) disability or conviction for which a pardon has been granted

Practical Objectives

N/A

BLM-140 Drawings

Learning Outcomes

- Demonstrate knowledge of drawings, their use and interpretation.
- Demonstrate knowledge of calculations relevant to drawings.
- Demonstrate knowledge of basic drawing and sketching techniques.

2016 Red Seal Occupational Standard Reference

3.02 Uses drawings and specifications.

Suggested Hours

18 Hours

Objectives and Content

Theoretical Objectives

1. Identify types of drawings and describe their applications.
 - i) fabrication
 - ii) assembly
 - iii) structural
 - iv) detail
 - v) engineered lift
 - vi) erection
 - vii) as-builts
 - viii) orthographic

2. Identify parts of a drawing and their purpose.
 - i) scale
 - ii) not to scale
 - iii) colour code
 - iv) legend
 - v) title blocks
 - vi) current revisions
 - vii) bill of materials
 - viii) types of lines

3. Describe the procedures used to create a bill of materials from information found on a drawing.
4. Identify types of specifications.
 - i) measurements
 - ii) weights
 - iii) tolerances
 - iv) grades of material
 - v) welding criteria
5. Identify symbols and abbreviations found on technical drawings.
 - i) welding
 - ii) fasteners
6. Identify types, sizes, shapes, and grades of materials required from drawings.
7. Identify technological tools for drawings and specifications.
 - i) computer aided design (CAD)
 - ii) tablets
 - iii) digital photography
8. Describe metric and imperial systems of measurement and the procedures used to perform conversions.

Practical Objectives

1. Interpret information found on drawings.

Learning Outcomes

- Demonstrate knowledge of rigging, hoisting and lifting equipment, their applications, limitations and procedures.
- Demonstrate knowledge of safe practices related to hoisting, lifting and rigging.
- Demonstrate knowledge of the procedures used to rig materials and equipment for hoisting and lifting operations.
- Demonstrate knowledge of the procedures used to communicate during hoisting and lifting operations.

2016 Red Seal Occupational Standard Reference

- 6.03 Selects rigging and hoisting equipment.
- 6.04 Secures lift area.
- 7.01 Inspects rigging equipment.
- 7.03 Attaches rigging equipment to load.
- 8.01 Inspects hoisting equipment.
- 9.03 Maintains rigging and hoisting equipment.

Suggested Hours

36 Hours

Objectives and Content*Theoretical Objectives*

1. Define terminology associated with hoisting, lifting and rigging operations.
2. Identify hazards and describe safe work practices pertaining to hoisting, lifting and rigging operations.
3. Interpret jurisdictional regulations pertaining to hoisting, lifting and rigging operations.
4. Identify types of hoisting, lifting and rigging equipment and accessories and describe their applications, limitations and procedures for use.
 - i) slings
 - ii) blocks
 - iii) hardware

- iv) hooks
 - v) rollers
 - vi) softeners
 - vii) below the hook lifting devices (i.e. spreader, equalizer beams)
 - viii) cranes
 - ix) tirfor
 - x) tuggers
 - xi) chain falls
 - xii) come-alongs
 - xiii) jacks
5. Describe the procedures used to inspect, maintain and store hoisting, lifting and rigging equipment.
 6. Identify types of knots, hitches and bends and describe their applications and the procedures used to tie them.
 7. Identify reeving methods and describe their associated procedures.
 - i) lacing
 - ii) square
 8. Performs basic rigging calculations, excluding friction loss.
 9. Identify factors to consider when selecting hoisting, lifting and rigging equipment.
 - i) weight being hoisted
 - lead line pull
 - maximum load
 - parts of line
 - ii) radius and distance to be lifted
 - iii) swing clearance
 - iv) parts of line used
 - v) hoisting location
 - vi) properties of load
 - dimensions
 - shape
 - weight
 - centre of gravity
 10. Identify types of ropes and describe their characteristics and applications.
 - i) fibre

- ii) wire
11. Describe the procedures used to splice natural and synthetic fibre ropes.
 12. Interpret rigging tag information.
 - i) date
 - ii) size
 - iii) capacity
 - iv) material
 13. Describe the procedures used to attach material and/or equipment to a load.
 14. Identify communication methods used during hoisting and rigging operations.
 - i) Electronic communication
 - ii) Audible and visual
 - iii) Hand-signals
 - iv) Relay of signals
 15. Describe the procedures used to ensure the work area is safe for hoisting and lifting.
 - i) supervision of lift
 - ii) installing and tagging barriers
 - iii) assessing ground conditions
 - iv) ensuring that work area is not congested or obstructed for emergency access
 - v) limiting approach
 - vi) obtaining required permits
 - vii) company policies
 - viii) site procedures
 - ix) jurisdictional regulations
 - x) manufacturers' specifications

Practical Objectives

1. Tie knots.
2. Splice ropes.
3. Perform reeving.

4. Perform hand signals.

BLM-150 Basic Materials

Learning Outcomes

- Demonstrate knowledge of basic materials, their characteristics and applications.
- Demonstrate knowledge of basic calculations.

2016 Red Seal Occupational Standard Reference

3.03 Handles materials and components.

Suggested Hours

15 Hours

Objectives and Content

Theoretical Objectives

1. Identify basic materials and describe their characteristics and applications.
 - i) tube and pipe
 - ii) plate
 - iii) welded bar grating
 - iv) expanded metals

2. Interpret the designations for pipe and tube.

3. Identify types, grades and size of bolts, studs and screws.

4. Identify standard fittings, their sizing, designation, function and pressure rating.
 - i) nozzles
 - ii) couplings
 - iii) tees,
 - iv) elbows
 - v) flanges
 - slip-on
 - weld neck
 - vi) blind flanges
 - vii) blanking plates
 - viii) plugs

- ix) valves
 - backflow
 - check

- 5. Identify types of gaskets and flanges and describe their characteristics and applications.

- 6. Identify types of lubricants and describe their characteristics and applications.

- 7. Perform basic calculations.
 - i) Area
 - ii) Volume
 - iii) Weight
 - iv) Circumference

Practical Objectives

N/A

BLM-155 Layout and Template Development I

Learning Outcomes

- Demonstrate knowledge of the procedures used to develop a template using parallel line development.
- Demonstrate knowledge of the procedure used to lay out material and components for fabrication.
- Demonstrate knowledge of calculations required to layout components.

2016 Red Seal Occupational Standard Reference

10.01 Lays out components for fabrication.

Suggested Hours

18 Hours

Objectives and Content

Theoretical Objectives

1. Define terminology associated with layout and template development.
2. Identify hazards and describe safe work practices pertaining to layout and template development.
3. Interpret information pertaining to layout and development found on drawings and specifications.
4. Identify basic geometric shapes and describe their characteristics.
5. Calculate dimensions of squares, rectangles and circles for layout.
6. Calculate orientation, alignment and projections.
7. Identify types of components that are fabricated using parallel line development.
 - i) pipe turns
 - ii) offsets
 - iii) ducts

8. Identify types of layout methods and describe their applications.
 - i) parallel line
 - ii) radial line
 - iii) triangulation
 - iv) computerized
9. Identify types of computer technology used for template development and describe their application in the trade.
10. Identify layout tools and equipment and describe their applications and procedures for use.
11. Describe the procedures used to develop a template using parallel line development.
12. Describe the procedure used to lay out material and components for fabrication.

Practical Objectives

1. Produce a template using parallel line development.
2. Layout bolt circles, flanges and ellipses.

BLM-160 Fabrication Fundamentals

Learning Outcomes

- Demonstrate knowledge of joints, their applications and the procedures used to prepare them for fitting.
- Demonstrate knowledge of the procedures used to fabricate basic geometric shapes.
- Demonstrate knowledge of the techniques used to bolt components and their associated tools and equipment.

2016 Red Seal Occupational Standard Reference

- 3.03 Handles materials and components.
- 5.02 Prepares joints for fitting.
- 10.04 Constructs components
- 12.01 Bolts components.

Suggested Hours

18 Hours

Objectives and Content:

Theoretical Objectives

1. Define terminology associated with fabrication.
2. Identify hazards and describe safe work practices pertaining to fabrication.
3. Interpret information pertaining to fabrication found on drawings and specifications.
4. Identify types of joints and describe their characteristics and applications.
 - i) corner
 - ii) tee
 - iii) lap
 - iv) edge
 - v) butt
5. Describe the procedures used to prepare joints for fitting.

6. Describe the procedures used to construct basic geometric shapes.
7. Describe bolting and torquing procedures.

Practical Objectives

1. Construct basic geometric shapes.
2. Perform bolting and torquing sequence.

BLM-165 Introduction to Pressure Vessels

Learning Outcomes

- Demonstrate knowledge of pressure vessels, their components and operating principles.
- Demonstrate knowledge of the procedures used to prepare vessels and components to be serviced.

2016 Red Seal Occupational Standard Reference

13.02 Prepares vessels and components for servicing.

Suggested Hours

12 Hours

Objectives and Content

Theoretical Objectives

1. Define terminology associated with pressure vessels.
2. Identify hazards and describe safe work practices pertaining to pressure vessels.
3. Interpret regulatory requirements pertaining to pressure vessels.
4. Identify types of pressure vessels and describe their components and operation.
 - i) boilers
 - fire-tube
 - water-tube
 - ii) heat exchangers
 - iii) storage tanks
 - iv) distillation towers
5. Describe pressure and non-pressure components.
6. Describe access openings.
7. Describe the procedures used to prepare vessels and components to be serviced.

Practical Objectives

N/A

BLM-170 Job Task Planning

Learning Outcomes

- Demonstrate knowledge of the elements involved in planning and organizing job tasks and procedures.

2016 Red Seal Occupational Standard Reference

- 3.01 Organizes project tasks and procedures.
- 3.03 Handles materials and components.
- 3.04 Demobilizes site

Suggested Hours

6 Hours

Objectives and Content.

Theoretical Objectives

1. Identify hazards and describe safe work practices pertaining to planning and organizing work area.
 - i) loading/unloading materials and components
 - ii) contamination
 - iii) hazardous materials

2. Identify sources of information relevant to organizing job tasks and procedures.
 - i) drawings
 - ii) specifications
 - iii) client requirements
 - iv) codes

3. Describe the considerations to plan and organize job tasks and procedures.
 - i) available space
 - ii) schedule/sequence
 - iii) permits
 - iv) hazard assessment
 - v) personnel
 - vi) tools and equipment
 - vii) materials and supplies

- viii) storage location
- ix) sequence of job tasks and procedures
- x) coordination with other trades
- xi) time management

4. Describe the procedures to perform a field level risk assessment (FLRA).
5. Describe the procedures used to demobilize and restore the work area.

Practical Objectives

1. Perform a field level risk assessment (FLRA).

Level 2

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BLM-200 Shop Equipment

Learning Outcomes

- Demonstrate knowledge of shop equipment, their applications, maintenance and procedures for use.

2016 Red Seal Occupational Standard Reference

2.03 Uses shop equipment.

Suggested Hours

24 Hours

Objectives and Content

Theoretical Objectives

1. Identify hazards and describe safe work practices pertaining to the use of shop equipment.
 - i) hydraulic/pneumatic line ruptures
 - ii) electrical faults
 - iii) pinch points
 - iv) projectiles
 - v) moving materials

2. Identify types of shop equipment and describe their applications and procedures for use.
 - i) burning tables
 - ii) radial drill presses
 - iii) brake presses
 - iv) shears
 - v) power rolls
 - vi) iron workers
 - vii) positioning equipment
 - viii) pedestal grinders
 - ix) bandsaws

3. Describe the procedures used to maintain shop equipment.

Practical Objectives

1. Use shop equipment.

BLM-205 Metallurgy II

Learning Outcomes

- Demonstrate knowledge of material testing procedures.
- Demonstrate knowledge of heat treatment processes and their applications.

2016 Red Seal Occupational Standard Reference

13.05 Tests materials, vessels and components.

Suggested Hours

12 Hours

Objectives and Content

Theoretical Objectives

1. Define terminology associated with heat treatment.
2. Explain pre- and post-heat treatment processes.
3. Describe processes in the heat treatment of metals.
 - i) stress relieving
 - ii) quenching
 - iii) hardening
 - iv) tempering
 - v) annealing
 - vi) normalizing
4. Identify the causes of corrosion and describe the methods used to prevent or correct them.
 - i) oxidation
 - ii) galvanic corrosion
 - iii) chemical corrosion
5. Identify common metal testing techniques and describe their associated procedures.

- i) Rockwell hardness
- ii) Brinell hardness
- iii) Tensile
- iv) Charpy impact

Practical Objectives

N/A

BLM-210 Basic Cutting and Welding

Learning Outcomes

- Demonstrate knowledge of carbon arc cutting process, their associated equipment and accessories.
- Demonstrate knowledge of plasma-arc cutting process, their associated equipment and accessories.
- Demonstrate knowledge of processes of preparing joints for fitting.
- Demonstrate knowledge of basic welding processes, their associated equipment and accessories.
- Demonstrate knowledge of the procedures to weld a joint.

2016 Red Seal Occupational Standard Reference

- 5.01 Cuts material.
- 5.02 Prepares joints for fitting.
- 5.03 Fits joints.
- 5.05 Performs basic welding.

Suggested Hours

60 Hours

Objectives and Content

Theoretical Objectives

1. Identify hazards and describe safe work practices pertaining to cutting and welding processes.
2. Identify and interpret codes and standards pertaining to cutting and welding processes.
3. Identify materials to be cut and describe their characteristics and associated cutting procedures.
 - i) metals (alloy steels, ferrous or non-ferrous metals, carbon steels)
 - ii) fiberglass
 - iii) composites

4. Identify cold-cutting techniques and common cutting faults.
 - i) shearing
 - ii) milling
 - iii) band saw
 - iv) hack saw
 - v) carbide tooth blade
5. Identify hot-cutting techniques and common cutting faults.
 - i) flame cutting
 - ii) plasma arc
 - iii) air-carbon arc cutting
 - iv) abrasive disc
6. Describe the procedures used to set-up, adjust and shutdown CAC-A (air-carbon arc cutting) equipment.
7. Describe the procedures used to inspect and maintain CAC-A (air-carbon arc cutting) equipment.
8. Describe the procedures used to set-up, adjust and shut down plasma arc cutting equipment.
9. Describe the procedures used to inspect and maintain plasma arc-cutting equipment.
10. Identify types of joints.
 - i) groove type (u, v, j, bevel)
 - ii) b-c-t-e-l (butt, corner, tee, edge, lap)
11. Identify weld joint preparation and tolerances from drawings.
12. Describe the procedures used to lay out and fit up joints.
13. Describe the procedures used to tack joints.
14. Identify welding codes and symbols.
15. Identify types of arc welding processes and describe their applications and associated equipment.

- i) shielded metal arc welding (SMAW)
 - ii) gas metal arc welding (GMAW)
 - iii) gas tungsten arc welding (GTAW)
 - iv) flux core arc welding (FCAW)
16. Identify types of power sources for welding equipment and describe their applications and limitations.
- i) AC transformer
 - ii) AC/DC rectifier
 - iii) DC generator
 - iv) engine driven
 - alternators
 - generators
 - v) inverters
17. Identify the types of beads and describe their characteristics and applications.
- i) stringer
 - ii) weave
18. Identify types of welds and describe their characteristics and applications.
- i) fillet
 - ii) groove
 - iii) surfacing
 - iv) plug or slot
19. Identify welding positions and describe their applications.
20. Explain electrode classification and rod coating (flux).
21. Explain the relationship between rod diameter and amperage settings.
22. Identify the functions of slag.
23. Identify polarity settings and their applications.
24. Describe grounding techniques and methods.
25. Explain welding procedures used to minimize distortion.
26. Describe the procedures used to weld a joint.

27. Identify common weld faults and describe the procedures to prevent and correct them.
- i) porosity
 - ii) inclusion
 - iii) undercut
 - iv) cold lapping
 - v) lack of penetration
 - vi) incomplete fusion
 - vii) under-bead cracking

Practical Objectives

1. Perform a basic joint weld.

BLM-215 Hoisting, Lifting and Rigging II

Learning Outcomes

- Demonstrate knowledge of calculations required when performing hoisting and lifting operations.
- Demonstrate knowledge of the procedures used to rig material and equipment.
- Demonstrate knowledge of the procedures used to perform a lift.

2016 Red Seal Occupational Standard Reference

- 6.01 Determines load.
- 6.03 Selects rigging and hoisting equipment.
- 6.04 Secure lift area.
- 7.01 Inspects rigging equipment.
- 7.03 Attaches rigging equipment to load.
- 8.01 Inspects hoisting equipment.
- 8.02 Assembles hoisting equipment.
- 8.03 Performs hoisting operations.
- 8.04 Secures load before rigging removal.
- 9.01 Conducts post-lift inspection.
- 9.02 Disassembles hoisting equipment.

Suggested Hours

60 Hours

Objectives and Content

Theoretical Objectives

1. Identify hazards and describe safe work practices pertaining to hoisting, lifting and rigging operations.
2. Interpret jurisdictional regulations pertaining to hoisting, lifting and rigging operations.
3. Determine the characteristics of the load to be lifted.
 - i) dimensions
 - ii) shape

- iii) weight
 - iv) centre of gravity
4. Perform calculations pertaining to hoisting, lifting and rigging operations, including friction loss.
 - i) working load limit
 - lead line pull
 - maximum load
 - parts of line
 - ii) breaking strength
 5. Calculate sling tension and sling angle when preparing for hoisting and lifting operations.
 6. Identify sources of information for calculations and load weight.
 - i) reference materials
 - ii) catalogs
 - iii) drawings
 - iv) bills of lading
 7. Identify factors to consider when selecting hoisting, lifting and rigging equipment.
 - i) weight being hoisted
 - ii) radius and distance to be lifted
 - iii) parts of line used
 - iv) hoisting location
 8. Describe inspection requirements and procedures for hoisting, lifting and rigging equipment.
 9. Identify hitches and configurations and describe their applications and limitations.
 - i) basket
 - ii) choker
 - iii) bridle hitch
 - iv) vertical hitch
 10. Identify types of material handling attachments and describe their characteristics, applications and procedures for use.
 - i) hooks and shackles

- ii) wire rope clips
 - iii) eyebolts
 - iv) chains
11. Identify responsibilities of personnel.
- i) supervisor
 - ii) operator
 - iii) signaler
 - iv) rigger
 - v) tag line person
12. Identify type of lifts and describe their applications.
- i) simple
 - ii) tandem
 - iii) critical
13. Describe the procedures used to create a simple lift plan.
- i) attachment points
 - ii) jacking points and equipment.
 - iii) rolling equipment and placement
 - iv) pre-lift meeting
 - v) dry run
14. Describe a walk-around inspection of a rigging system.
15. Describe the basic procedures for the placement, assembly and installation of hoisting and lifting equipment and components.
16. Describe the use and location for slings, tag lines and sling configurations on loads for hoisting.
- i) smooth heavy loads
 - ii) long flexible loads
 - iii) off balance loads
 - iv) heavy fragile units
 - v) finished or coated loads
 - vi) large surface area (sail)
17. Identify and describe procedures to secure a load.
- i) dunnage
 - ii) cribbing

- iii) guylines
 - iv) lashing
18. Describe the procedures used to attach material and/or equipment to a load.
 19. Describe the procedures used to ensure the work area is safe for hoisting and lifting.
 20. Describe the procedures used to perform a basic lift.
 21. Describe the procedures used to disassemble hoisting equipment and components.
 22. Describe the procedures used to conduct a post-lift inspection.

Practical Objectives

1. Perform a basic lift using a block and tackle.

BLM-220 Aerial Work Platforms

Learning Outcomes

- Demonstrate knowledge of aerial work platforms, their applications, limitations and procedures for use.
- Demonstrate knowledge of regulatory requirements pertaining to aerial work platforms.

2016 Red Seal Occupational Standard Reference

2.06 Uses aerial work platforms.

Suggested Hours

6 Hours

Objectives and Content

Theoretical Objectives

1. Identify types of aerial work platforms and describe their characteristics, limitations and applications.
 - i) scissor lifts
 - ii) telescoping man lifts
 - iii) swing stages
 - iv) articulating booms
2. Describe the operating procedures and safe work practices pertaining to aerial work platforms.
3. Identify and describe the use of anchor points.
4. Identify work site environment conditions and the impact on aerial work platform setup and operation.
5. Describe a rescue plan and back-up features for aerial work platform operation failure.

6. Identify and interpret federal, provincial/territorial, municipal and site-specific regulations pertaining to aerial work platforms.
7. Identify the training and certification requirements for the use of aerial work platforms

Practical Objectives

N/A

BLM-225

Layout and Template Development II

Learning Outcomes

- Demonstrate knowledge of the procedures used to develop a template using radial line development.
- Demonstrate knowledge of the procedures used to lay out material and components for fabrication.
- Demonstrate knowledge of calculations required to layout components.

2016 Red Seal Occupational Standard Reference

10.01 Lays out components for fabrication.

Suggested Hours

18 Hours

Objectives and Content

Theoretical Objectives

1. Identify types of components that are fabricated using radial line development.
 - i) hoppers
 - ii) reducers
 - iii) cones
2. Identify geometric shapes of components developed using radial line methods.
3. Perform calculations required for radial line development.
4. Identify layout and template development tools and equipment and describe their applications and procedures for use.
5. Describe the procedures used to develop templates using radial line development.
6. Describe the procedures used to lay out material and components for fabrication.

Practical Objectives

1. Develop a template to layout a cone or hopper.

BLM-230 Component Fabrication I

Learning Outcomes

- Demonstrate knowledge of the procedures used to fabricate components.
- Demonstrate knowledge of the procedures used to fit and install components.

2016 Red Seal Occupational Standard Reference

- 3.01 Handles materials and components.
- 10.02 Cuts components for fabrication.
- 10.03 Forms components for fabrication.
- 10.04 Constructs components.
- 11.01 Aligns vessels and components.
- 11.02 Fits vessels and components.
- 12.01 Bolts components

Suggested Hours

24 Hours

Objectives and Content

Theoretical Objectives

1. Identify hazards and describe safe work practices pertaining to component fabrication and installation.
2. Interpret information pertaining to component fabrication and installation found on drawings and specifications.
 - i) dimensions
 - ii) symbols
 - iii) abbreviations
3. Describe methods used to identify fabricated fittings.
 - i) item numbers
 - ii) material identifiers
 - iii) job and contract numbers
 - iv) erection sequencing

4. Identify tools and equipment used to fabricate and install components and describe their applications and procedures for use.
 - i) threading
 - ii) forming
 - i) cutting
 - ii) assembling
 - iii) fitting
 - iv) fastening
 - v) torqueing and tensioning
5. Describe bolting and torqueing sequence.
6. Identify types of torqueing and tensioning equipment.
 - i) pneumatic torque wrench
 - ii) hydraulic torque wrench
 - iii) electric torque wrench
 - iv) hydraulic tensioning system
7. Identify fastening, securing and joining methods and describe their applications.
 - i) fastening
 - welding
 - bolting (torqueing and tensioning)
 - rigging
 - riveting
 - ii) securing
 - clamping
 - dogging
 - bracing
 - lashing
 - spiders
 - iii) joining
 - welding
 - bolting
 - riveting
8. Describe the procedures used to fasten, secure and join components.
9. Describe the procedures used to cut and thread pipe using manual and mechanical processes.

10. Describe the procedures used to mark-up materials for forming.
11. Identify forming methods and describe their associated procedures.
 - i) rolling
 - ii) bending
 - iii) breaking
 - iv) controlled heating
12. Describe the procedures used to construct components.
 - i) hoppers
 - ii) ladders
 - iii) platforms
 - iv) headers
 - v) pipe turns and offsets
 - vi) ducts
 - vii) cylinders and cones
 - viii) pressure vessel shells

Practical Objectives

1. Fabricate and fit a cone or hopper.

BLM-235 Tube Expansion

Learning Outcomes

- Demonstrate knowledge of tube expansion and its purpose.
- Demonstrate knowledge of the procedures used to install, expand and remove tubes.
- Demonstrate knowledge of calculations required for tube expansion.

2016 Red Seal Occupational Standard Reference

12.02 Expands tubes.

Suggested Hours

12 Hours

Objectives and Content

Theoretical Objectives

1. Define terminology pertaining to tube expansion.
2. Explain the principles of tube expansion.
3. Identify methods of tube expansion and describe their associated procedures.
 - i) under and over rolling
 - ii) checking and measuring
4. Describe the process of tube rolling.
5. Describe the procedures used to measure the inside diameter of a tube.
6. Perform calculations for tube expansion.
7. Identify types of lubricants and describe their applications.
8. Describe tube expanding procedures.

9. Describe the purpose of smooth and grooved seats.
10. Identify types of tube equipment and describe their limitations and applications.
 - i) tube guide
 - ii) compressor
 - iii) air motor
 - iv) electric motor tube end mills
 - v) tube expanders
 - vi) fly cutters
 - vii) tube cutters
 - viii) tube cleaners
 - ix) tube removal tools
 - x) micrometers
 - xi) gauges
 - xii) torque wrench
11. Identify factors affecting the quality of an expanded joint.
 - i) surface of hole
 - ii) roundness of hole
 - iii) cleanliness of hole
 - iv) expansion past the inner edge of tube sheet
 - v) overheating
 - vi) roller speed
 - vii) mechanical properties of tube and tube sheet
 - viii) lubrication or lack of it
 - ix) overexpansion
12. Describe the operational relationship of the mandrel and rolls.
13. Describe the purpose of bell rolls.
14. Describe the purpose and process of tube beading.
15. Identify and describe the propulsive type of expander.
16. Explain the principle involving explosive tube expansions.
17. Describe tube flaring using flaring tools.
18. Describe the procedures used to install and expand tubes.

19. Describe the procedures used to remove tubes.

Practical Objectives

1. Remove, install and expand a tube.

BLM-240 Fiberglass Fitting

Learning Outcomes

- Demonstrate knowledge of fiberglass fitting and its applications.
- Demonstrate knowledge of the procedures used to lay up fiberglass.

2016 Red Seal Occupational Standard Reference

- 3.01 Handles materials and components.
12.03 Lays up fiberglass.

Suggested Hours

6 Hours

Objectives and Content

Theoretical Objectives

1. Define terminology associated with fiberglass fitting.
2. Identify hazards and describe safe work practices pertaining to fiberglass.
3. Identify types and grades of fiberglass materials.
 - i) cloth
 - ii) resins
 - iii) fillers
4. Describe mixing and curing procedures.
5. Identify accelerators, retarders and promoters.
6. Describe procedures involved in fiberglass lay-up.
 - i) tight fit-up
 - ii) sanding saturate mat
 - iii) stagger cut lengths
 - iv) mix resin and catalyst
 - v) apply surface veil
 - vi) remove air

- vii) sand entire weld
 - viii) apply resin and air dry mix application method
 - ix) hand lay-up
 - x) spray lay-up
 - xi) cutting
 - xii) fitting
 - xiii) surface preparation
 - xiv) hot patches
7. Identify certification requirements.
 8. Describe the handling and storage process for the chemicals required to assemble fiberglass pipe and vessels.
 9. Describe the process of drilling.
 10. Describe the process of bolting.
 11. Describe process for handling and mixing resins, catalysts and associated chemicals.
 12. Describe safety considerations for handling and mixing resins, catalysts and associated chemicals.
 13. Describe the process of cutting.
 14. Describe the process of grinding.
 15. Describe the process of laminating glass.
 16. Identify and describe the resins and fiberglass materials required for lay-up and repairs.
 17. Describe the uses of fiberglass in tanks, silos, stacks, scrubbers, breeching and piping.
 18. Define the purpose of fiberglass materials.
 - i) polyester resins
 - ii) catalysts
 - iii) promoters

- iv) surfacing veil
 - v) mat
 - vi) woven roving
 - vii) acetone
 - viii) methylene chloride
 - ix) air dry additive
 - x) filler
19. Describe the process to facilitate repairs on round and flat surfaces.
20. Identify and describe the tools and materials used for preparation and assembly.
21. Identify and describe measuring equipment.
- i) paper or plastic mixing cups
 - ii) mixing sticks
 - iii) plastic bucket graduated for measuring resin
 - iv) glass for measuring promoters and catalysts
 - v) mixing pails
22. Identify and describe lay-up equipment.
- i) surfacing veil
 - ii) matting
 - iii) woven roving

Practical Objectives

N/A

BLM-245 Maintenance and Repair

Learning Outcomes

- Demonstrate knowledge of the procedures used to prepare vessels and components for service.
- Demonstrate knowledge of the procedures used to repair vessels and components.
- Demonstrate knowledge of the procedures used to dismantle and remove vessels and components.
- Demonstrate knowledge of the procedures used to restore the work area to its operational state.
- Demonstrate knowledge of the procedures used to perform preventative maintenance and upgrades.
- Demonstrate knowledge of inspection and testing methods.

2016 Red Seal Occupational Standard Reference

- 3.04 Demobilizes site.
- 13.01 Inspects vessels and components for defects.
- 13.02 Prepares vessels and components for servicing.
- 13.03 Repairs vessels and components.
- 13.04 Performs preventative maintenance and upgrades.
- 13.05 Tests materials, vessels and components.
- 14.01 Dismantles vessels and components.
- 14.02 Removes materials.

Suggested Hours

18 Hours

Objectives and Content

Theoretical Objectives

1. Define terminology associated with maintenance and repair.
2. Identify hazards and describe safe work practices pertaining to maintenance and repair of vessels and components.

3. Interpret codes and standards pertaining to vessel inspection and repair.
4. Interpret information pertaining to joint preparation found on drawings and specifications.
5. Identify tools and equipment associated with maintenance and repair procedures.
6. Identify vessels requiring maintenance and repair.
 - i) furnaces
 - ii) vats
 - iii) bins
 - iv) reactors
 - v) towers
 - vi) stacks
 - vii) penstocks
 - viii) economizers
 - ix) precipitators
 - x) scrubbers
 - xi) drums
 - xii) digesters
 - xiii) air heaters
7. Identify components requiring maintenance and repair.
 - i) curtains
 - ii) electrodes
 - iii) headers
 - iv) trays and hardware in towers
 - v) stairways
 - vi) support structures
 - vii) screens
 - viii) hoppers
 - ix) ductwork
 - x) platforms
 - xi) ladders
 - xii) breeching and expansion joints
8. Identify and describe fasteners and fastening methods.

9. Identify common vessel and component defects and explain their causes.
10. Identify tube defects.
 - i) wear
 - ii) dents
 - iii) bends
 - iv) corrosion
 - v) cracks
 - vi) rupture
 - vii) bulge
 - viii) deflection
11. Identify inspection methods to detect damaged and defective vessels and components and describe their associated procedures.
 - i) visual inspection
 - ii) hydro tests
 - iii) non-destructive testing (NDT)
12. Describe the procedures used to build a hydro test assembly.
13. Describe inspection and reporting procedures.
14. Identify methods used to prepare vessels and components for maintenance and repair.
 - i) cleaning
 - ii) grinding
 - iii) chipping
 - iv) buffing
 - v) welding
 - vi) sand blasting
 - vii) cutting
 - viii) milling
 - ix) gouging
 - x) water jet cutting
 - xi) blanking/blinding
15. Describe the procedures used to dismantle and remove vessels and components for replacement or repair.

16. Describe the procedures used to repair vessels and components.
 - i) prepare parent material and repair pieces
 - ii) install components
 - iii) perform orientation, alignment and fitting of components
 - iv) fasten components
 - v) reinstall components removed during repair preparation
 - vi) demolish or remove obsolete components and materials

17. Identify factors to consider in dismantling obsolete vessels and components.
 - i) job requirements
 - ii) site conditions
 - iii) sequence

18. Describe the procedures used to remove and dispose of vessels, components and materials.

19. Describe the procedures used to restore the work area to its operational state.

20. Describe the procedures used to perform preventative maintenance on vessels and components.
 - i) clean components
 - ii) remove contaminants and corrosion
 - iii) inspect and perform tests
 - iv) plug tubes to isolate them from the system
 - v) install shielding materials
 - vi) remove, maintain and replace components
 - vii) tighten loose components and replace missing hardware

Practical Objectives

1. Perform a hydro test.

Level 3

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BLM-300 Mentoring

Learning Outcomes

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

2016 Red Seal Occupational Standard Reference

- 4.01 Uses communication techniques.
- 4.02 Uses mentoring techniques.

Suggested Hours

3 Hours

Objectives and Content

Theoretical Objectives

1. Describe the importance of individual experience.
2. Describe the shared responsibilities for workplace learning.
3. Determine one's own learning preferences and explain how these relate to learning new skills.
4. Describe the importance of different types of skills in the workplace.
5. Describe the importance of essential skills in the workplace.
 - i) reading
 - ii) writing
 - iii) document use
 - iv) oral communication
 - v) numeracy
 - vi) thinking
 - vii) working with others
 - viii) digital technology
 - ix) continuous learning

6. Identify different learning needs and strategies to meet learning needs.
 - i) learning disabilities
 - ii) learning preferences
 - iii) language proficiency

7. Identify strategies to assist in learning a skill.
 - i) understanding the basic principles of instruction
 - ii) developing coaching skills
 - iii) being mature and patient
 - iv) providing feedback

8. Identify different roles played by a workplace mentor.

9. Describe the steps involved in teaching skills.
 - i) identifying the point of the lesson
 - ii) linking the lesson
 - iii) demonstrating the skill
 - iv) providing practice
 - v) giving feedback
 - vi) assessing skills and progress

10. Explain the importance of identifying the point of a lesson.

11. Identify how to choose an appropriate time to present a lesson.

12. Explain the importance of linking the lessons.

13. Identify the components of the skill (the context).

14. Describe considerations in setting up opportunities for skill practice.

15. Explain the importance of providing feedback.

16. Identify techniques for giving effective feedback.

17. Describe a skills assessment.

18. Identify methods of assessing progress.

19. Explain how to adjust a lesson to different situations.

Practical Objectives

N/A

BLM-305 Advanced Welding

Learning Outcomes

- Demonstrate knowledge of advanced welding processes, their associated equipment and accessories.
- Demonstrate knowledge of the procedures used to weld a groove joint.

2016 Red Seal Occupational Standard Reference

5.05 Performs advanced welding.

Suggested Hours

30 Hours

Objectives and Content

Theoretical Objectives

1. Identify hazards and describe safe work practices pertaining to advanced welding processes.
2. Identify and interpret codes and standards pertaining to advanced welding processes.
3. Identify types and sizes of welding consumables for alloy and specialty metals.
 - i) inconel
 - ii) stainless
 - iii) chromoly
 - iv) aluminum
 - v) titanium
4. Identify types of advanced welding equipment and describe their accessories and applications.
 - i) submerged arc welding (SAW)
 - ii) automated welding
 - iii) gas tungsten arc welding (GTAW)
5. Describe the elements and sequence of advanced welding processes.

6. Describe the damming and purging process.
7. Describe polarity settings and their applications.
8. Explain the effects of alloy additions to the coating for arc welding electrodes.
9. Interpret symbols for grooves.
10. Interpret supplementary symbols.
11. Describe the procedures used to set up and shut down advanced welding equipment.
12. Describe the procedures used to inspect and maintain advanced welding equipment.
13. Describe the procedures used to weld a groove joint.
14. Identify common weld faults and describe the procedures to prevent and correct them.

Practical Objectives

1. Perform a v-groove weld.

BLM-310 Hoisting, Lifting and Rigging III

Learning Outcomes

- Demonstrate knowledge of the procedures used to perform advanced hoisting and lifting operations.
- Demonstrate knowledge of calculations required when performing advanced hoisting and lifting operations.

2016 Red Seal Occupational Standard Reference

- 6.01 Determines load.
- 6.02 Performs pre-lift analysis.
- 6.03 Selects rigging and hoisting equipment.
- 6.04 Secure lift area.
- 7.02 Fabricates rigging equipment.
- 7.03 Attaches rigging equipment to load.
- 8.02 Assembles hoisting equipment.
- 8.03 Performs hoisting operations.
- 9.02 Disassembles hoisting equipment.

Suggested Hours

30 Hours

Objectives and Content

Theoretical Objectives

1. Identify hazards and describe safe work practices pertaining to advanced hoisting and lifting operations.
2. Identify regulatory requirements pertaining to advanced hoisting, lifting and rigging operations.

3. Identify types of advanced lifts and describe their applications.
 - i) complex lifts
 - off balance
 - off centre
 - ii) critical lifts
 - crane capacity
 - man basket
 - iii) engineered lifts
 - iv) tandem lifts

4. Perform calculations pertaining to advanced hoisting and lifting operations.
 - i) sling tension
 - ii) high lines
 - iii) sling angle
 - iv) load weight
 - v) centre of gravity
 - vi) lead line pull
 - vii) maximum load
 - viii) parts of line

5. Identify documentation required for engineered lifts.

6. Identify rigging equipment that may be fabricated.
 - i) lifting lugs
 - ii) spreader bars

7. Identify sources of information used in planning an advanced lift.
 - i) tables and charts
 - ii) engineering specifications
 - iii) manufacturer specifications
 - iv) engineered lift drawings
 - v) crane charts

8. Identify lifting, spreading and moving equipment and describe their components, applications, limitations and procedures for use.
 - i) strand jacks
 - ii) tuggers
 - iii) jack and roll equipment
 - iv) steam boat ratchet
 - v) air bags

9. Identify types of cranes and describe their components, applications and limitations.
 - i) lattice
 - ii) hydraulic
 - iii) boom truck
 - iv) rough terrain (RT)
 - v) tower
 - vi) derricks

10. Describe the procedures used to place, assemble and install hoisting equipment and components.
 - i) preparing ground
 - ii) reeving a block
 - iii) assembling crane components
 - iv) mounting tuggers

11. Interpret load charts, lift radius and boom length.

12. Describe the procedures used to attach rigging to a load.

13. Describe the procedures used to perform a pre-lift inspection for advanced lifts.

14. Describe the procedures used to ensure the work area is safe for hoisting and lifting.

15. Describe the procedures used to perform an advanced lift.

16. Describe the procedures used to disassemble hoisting equipment and components.

Practical Objectives

N/A

BLM-315 Testing and Inspection

Learning Outcomes

- Demonstrate knowledge of the procedures used to test materials, vessels and components.
- Demonstrate knowledge of quality control, its purpose and applications.

2016 Red Seal Occupational Standard Reference

- 13.01 Inspects vessels and components for defects.
- 13.05 Tests materials, vessels and components.

Suggested Hours

12 Hours

Objectives and Content

Theoretical Objectives

1. Define terminology pertaining to testing and inspection.
2. Identify hazards and describe safe work practices pertaining to testing and inspection procedures.
3. Identify types of destructive testing and describe their applications.
 - i) tensile
 - ii) impact
 - iii) bend
4. Identify types of non-destructive testing and describe their applications.
 - i) visual
 - ii) magnetic particle
 - iii) radiographic
 - iv) ultrasonic
 - v) dye penetrant
 - vi) hydrostatic
 - vii) vacuum box
 - viii) pneumatic

5. Identify types of testing equipment and describe their applications and procedures for use.
 - i) test blinds
 - ii) pumps
 - iii) gauges
 - iv) vent lines
 - v) hydro test assembly
 - vi) vacuum box
 - vii) magnets
 - viii) films
 - ix) liquid penetrant inspection fluid
 - x) radiation source
 - xi) digital equipment

6. Describe advanced testing procedures to confirm the existence and location of defects, and internal weld or structural defects.
 - i) liquid penetrant inspection
 - ii) magnetic particle inspection
 - iii) ultrasonic test
 - iv) radiographic test
 - v) phased array ultrasonic testing
 - vi) pneumatic test
 - vii) hydrostatic test

7. Describe quality control, its purpose and applications.

8. Identify and describe methods used to identify and verify materials.
 - i) codes, standards and specifications
 - ii) mill certificates
 - iii) colour coding of materials

9. Describe the procedures used to ensure products meet specifications.

10. Describe the procedures used to prepare a final product for shipment.

11. Describe responsibilities and requirements to report deficiencies and defects to the supervisor or quality control inspector.

Practical Objectives

1. Perform a guided bend test.

Learning Outcomes

- Demonstrate knowledge of the procedures used to develop a template using parallel lines, radial lines and triangulation.
- Demonstrate knowledge of advanced layout techniques.

2016 Red Seal Occupational Standard Reference

10.01 Lays out components for fabrication.

Suggested Hours

15 Hours

Objectives and Content*Theoretical Objectives*

1. Identify geometric shapes of components developed using the triangulation method.
 - i) oblique pyramid
 - ii) oblique cone
 - iii) square to round transition
 - iv) round to square transition
 - v) square to rotated square transition
 - vi) square to round oblique transition
2. Perform calculations required for layout using the triangulation method.
3. Identify layout and fabrication tools and equipment and describe their applications and procedures for use.
4. Describe the procedures used to develop templates using geometry, parallel lines, radial lines and triangulation.
5. Describe the procedures used to layout a davit and hinges.
6. Describe the procedures used to layout nozzles and manways.

Practical Objectives

1. Layout a tangential nozzle.

BLM-325 Component Fabrication II

Learning Outcomes

- Demonstrate knowledge of advanced fabrication and fitting techniques.

2016 Red Seal Occupational Standard Reference

- 3.01 Handles materials and components.
- 10.02 Cuts components for fabrication.
- 10.03 Forms components for fabrication.
- 10.04 Constructs components.
- 11.01 Aligns vessels and components.
- 11.02 Fits vessels and components.
- 12.01 Bolts components

Suggested Hours

12 Hours

Objectives and Content

Theoretical Objectives

1. Describe advanced fitting techniques and describe their associated procedures.
 - i) circumferential seams
 - ii) longitudinal seams
 - iii) shells of equal thickness
 - iv) shells of unequal thickness
 - v) shells to heads
 - vi) repads for nozzles and manways
 - vii) nozzles, couplings and structural components to the shell and head
 - viii) vessel base ring and skirt openings
 - ix) tower trays and downcomers
2. Describe the procedures used to fabricate and assemble davit parts for vertical and horizontal openings, including hinges.
3. Describe the procedures used to install a tangential nozzle.

Practical Objectives

1. Install a tangential nozzle.

BLM-330 Boilers

Learning Outcomes

- Demonstrate knowledge of boilers, their components and operation.
- Demonstrate knowledge of the procedures used to construct boiler components.
- Demonstrate knowledge of the procedures used to assemble and fit boiler components.
- Demonstrate knowledge of the procedures used to fasten boiler components.
- Demonstrate knowledge of the procedures used to inspect, maintain and repair boilers.

2016 Red Seal Occupational Standard Reference

- 3.01 Organizes project tasks and procedures.
- 3.02 Uses drawings and specifications.
- 3.03 Handles materials and components.
- 10.01 Lays out components for fabrication.
- 10.04 Constructs components.
- 11.01 Aligns vessels and components.
- 11.02 Fits vessels and components.
- 12.01 Bolts components.
- 12.02 Expands tubes.
- 13.03 Repairs vessels and components.
- 14.01 Dismantles vessels and components.
- 14.02 Removes material.

Suggested Hours

30 Hours

Objectives and Content

Theoretical Objectives

1. Define terminology associated with boilers and steam generator components.
2. Identify hazards and describe safe work practices pertaining to boilers and steam generator components.

3. Identify codes and regulations pertaining to boilers and steam generator components.
4. Identify tools and equipment and describe their applications and procedures for use.
 - i) fabrication
 - ii) alignment and fit
 - iii) fastening
 - iv) maintenance and repair
5. Interpret information found on drawings and specifications.
 - i) reference points
6. Identify types of boilers and describe their components and operation.
 - i) coal fired
 - ii) waste
 - iii) biomass
 - iv) recovery
7. Identify pollution control systems and describe their components and operation.
 - i) scrubbers
 - ii) precipitators
 - iii) bag house
 - iv) carbon capture unit
 - v) selective catalytic reduction (SCR)
8. Describe the layout and fit-up of bottom, walls, roof and openings.
9. Describe the preparation, fit-up and alignment of horizontal and vertical seams.
10. Identify orientation, elevation and projection methods and describe their associated procedures.
11. Identify and describe assembly requirements and procedures.
12. Identify fitting methods and describe their associated procedures.
13. Identify methods used to fabricate tubes and describe their associated procedures.
14. Describe the procedures used to install tubes.

15. Describe tube-expanding procedures and sequence for boilers.
16. Describe the purpose of tack tubes.
17. Describe the procedures used to dismantle and remove components and material to facilitate repair.
18. Describe the procedures used to inspect, maintain and repair boilers.

Practical Objectives

N/A

Learning Outcomes

- Demonstrate knowledge of the condensers and exchangers, their components and operation.
- Demonstrate knowledge of the procedures used to construct condensers and exchangers components.
- Demonstrate knowledge of the procedures used to assemble and fit condenser and exchanger components.
- Demonstrate knowledge of the procedures used to fasten condenser and exchanger components.
- Demonstrate knowledge of the procedures used to inspect, maintain and repair condensers and exchangers.

2016 Red Seal Occupational Standard Reference

- 3.01 Organizes project tasks and procedures.
- 3.02 Uses drawings and specifications.
- 3.03 Handles materials and components.
- 10.01 Lays out components for fabrication.
- 10.04 Constructs components.
- 11.01 Aligns vessels and components.
- 11.02 Fits vessels and components.
- 12.01 Bolts components.
- 12.02 Expands tubes.
- 13.03 Repairs vessels and components.

Suggested Hours

36 Hours

Objectives and Content*Theoretical Objectives*

1. Define terminology associated with condensers and exchangers.
2. Identify hazards and describe safe work practices pertaining to condensers and exchangers.

3. Identify codes and regulations pertaining to condensers and exchangers.
4. Identify tools and equipment used and describe their applications and procedures for use.
 - i) fabrication
 - ii) alignment and fit
 - iii) fastening
 - iv) maintenance and repair
5. Interpret information found on drawings and specifications.
6. Identify types and designs of exchangers and describe their components and operation.
7. Describe the procedures used to fabricate and assemble exchangers.
8. Describe the procedures used to install and remove tubes.
9. Describe factors to consider in tube expanding procedures for condensers and exchangers.
 - i) tube sheet layout
 - ii) number of tubes
 - iii) type of metals
 - iv) length of tubes
 - v) diameter of tube
 - vi) material wall thickness, tube sheet or header thickness
 - vii) expansion required
 - viii) lubrication
10. Describe tube-expanding procedures and sequence for condensers and exchangers
11. Identify tube sheet layouts and describe their applications.
12. Identify types of baffles and describe their applications and installation procedures.
13. Describe the purpose of grooved seats.
14. Identify the factors affecting the quality of an expanded joint.
 - i) surface of hole

- ii) roundness of hole
- iii) cleanliness of hole
- iv) expansion past the inner edge of tube sheet
- v) overheating
- vi) roller speed
- vii) mechanical properties of tube and tube sheet
- viii) lubrication or lack of it
- ix) overexpansion

- 15. Describe the process of tube rolling.
- 16. Describe alternate tube-expansion methods.
- 17. Describe tube bundle installation and removal methods and equipment.
- 18. Describe tube-plugging methods.
- 19. Describe the procedures used to inspect, maintain and repair condensers and exchangers.
- 20. Describe testing procedures.
 - i) shell side
 - ii) tube side

Practical Objectives

- 1. Perform tube rolling.

BLM-340 Tanks

Learning Outcomes

- Demonstrate knowledge of drawings, their use and interpretation
- Demonstrate knowledge of tanks, their components and operation.
- Demonstrate knowledge of the procedures used to construct tanks.
- Demonstrate knowledge of the procedures used to assemble and fit tanks.
- Demonstrate knowledge of the procedures used to fasten tanks.
- Demonstrate knowledge of the procedures used to inspect, maintain and repair tanks.

2016 Red Seal Occupational Standard Reference

- 2.05 Uses work platforms and access equipment.
- 3.01 Organizes project tasks and procedures.
- 3.02 Uses drawings and specifications.
- 3.03 Handles materials and components.
- 5.01 Prepares joints for fitting.
- 5.03 Fits joints.
- 5.05 Performs basic welding.
- 10.01 Lays out components for fabrication.
- 10.04 Constructs components.
- 11.01 Aligns vessels and components.
- 11.02 Fits vessels and components.
- 12.01 Bolts components.
- 12.03 Lays up fiberglass.
- 13.03 Repairs vessels and components.

Suggested Hours

30 Hours

Objectives and Content

Theoretical Objectives

1. Define terminology associated with tanks.
2. Identify hazards and describe safe work practices pertaining to tanks.

3. Identify codes and standards pertaining to tanks and spheres.
 - i) American Petroleum Institute (API) 620
 - ii) American Petroleum Institute (API) 650
 - iii) American Society of Mechanical Engineers (ASME)
 - iv) American Water Works Association (AWWA)

4. Identify tools and equipment used and describe their applications and procedures for use.
 - i) fabrication
 - ii) alignment and fit
 - iii) fastening
 - iv) maintenance and repair

5. Interpret information found on drawings and specifications.

6. Identify types of tanks and describe their components and operation.

7. Describe the procedures and materials used to fabricate tanks.

8. Describe tank grades (tank foundations).

9. Describe the process to layout and fit up a typical tank floor.

10. Describe the procedures used to layout and erect the first and succeeding shell rings.

11. Describe tank roof designs and fabrication.
 - i) floating
 - ii) fixed
 - iii) open top

12. Describe joint preparation, fitting and welding sequences for tanks and tank components.

13. Identify non-destructive testing methods to inspect and test tank bottom, shell and roof and describe their associated procedures.

14. Identify and describe inspection requirements for small and large tanks.

15. Identify and describe resins and fibreglass materials required for lay-up and repairs.
16. Describe the procedures used to layout and erect tank scaffolding.
17. Describe the procedures used to inspect, maintain and repair tanks.

Practical Objectives

N/A

BLM-345 Introduction to Heavy Industry

Learning Outcomes

- Demonstrate knowledge of heavy industries related to the boilermaker trade.

2016 Red Seal Occupational Standard Reference

N/A

Suggested Hours

12 Hours

Objectives and Content

Theoretical Objectives

1. Define terminology associated with heavy industry.
2. Identify hazards and describe safe work practices pertaining to heavy industry.
3. Identify regulatory requirements pertaining to heavy industry.
4. Identify types of heavy industry and describe their operation in relation to the boilermaker trade.
 - i) oil sands
 - ii) oil refineries
 - iii) pulp mills
 - iv) nuclear plants
 - v) hydro-electric dams
5. Identify heavy industry components and describe their applications.
 - i) oil sands
 - ii) oil refineries
 - iii) pulp mills
 - iv) nuclear plants
 - v) hydro-electric dams

Practical Objectives

N/A

BLM-350 Program Review

Learning Outcomes

- Demonstrate knowledge of the Red Seal Occupational Standard and its relationship to the Red Seal Examination.
- Demonstrate knowledge of overall comprehension of the trade in preparation for the Red Seal Examination.

Entire Red Seal Occupational Standard (RSOS)

Suggested Hours

30 Hours

Objectives and Content

Theoretical Objectives

1. Define and explain terminology associated with an RSOS.
 - i) levels
 - ii) tasks
 - iii) sub-tasks
2. Explain how an RSOS is developed and the link it has with the Red Seal Examination.
 - i) development
 - ii) validation
 - iii) level and task weighting
 - iv) examination breakdown (pie-chart)
3. Identify Red Seal products and describe their use for preparing for the Red Seal Examination.
 - i) Red Seal website
 - ii) examination preparation guide
 - iii) sample questions
 - iv) examination counselling sheets
4. Explain the relationship between the Red Seal Occupational Standard (RSOS) and the Atlantic Apprenticeship Curriculum Standard (AACCS).

5. Review Common Occupational Skills for the Boilermaker trade as identified in the RSOS.
 - i) safety-related functions
 - ii) tools, equipment and work platforms
 - iii) organizes work
 - iv) communication and mentoring techniques
 - v) cutting and welding activities

6. Review process to perform rigging and hoisting for the Boilermaker trade as identified in the RSOS.
 - i) plans lift
 - ii) rigs load
 - iii) hoists load
 - iv) performs post-lift activities

7. Review process to complete new construction for the Boilermaker trade as identified in the RSOS.
 - i) lays out components and develops templates
 - ii) performs fabrication
 - ii) assembles and fits vessels and components
 - v) fastens components

8. Review process to perform repairs, maintenance, upgrading and testing for the Boilermaker trade as identified in the RSOS.
 - i) services vessels and components
 - ii) repairs vessels and components
 - iii) performs preventative maintenance and upgrades
 - iv) tests and inspects materials, vessels and components
 - v) dismantles and removes vessels and components

Practical Objectives

N/A

Feedback and Revisions

This AACCS will be amended periodically; comments or suggestions for improvements should be directed to.

New Brunswick

Apprenticeship and Occupational
Certification
Post-Secondary Education, Training and
Labour
470 York St., Rm. 110, PO Box 6000
Fredericton, NB E3B 5H1
Tel. 506-453-2260
Toll Free in NB. 1-855-453-2260
www.gnb.ca

Prince Edward Island

Apprenticeship, Training and Certification
Workforce and Advanced Learning
176 Great George St., PO Box 2000
Charlottetown, PE C1A 7N8
Tel. 902-368-4460
www.apprenticeship.pe.ca

Newfoundland and Labrador

Apprenticeship and Trades Certification
Advanced Education, Skills and Labour
Confederation Building, West Block
Prince Philip Dr., PO Box 8700
St. John's, NL A1B 4J6
Toll Free. 877-771-3737
www.gov.nl.ca/aesl/app

Nova Scotia

Nova Scotia Apprenticeship Agency
1256 Barrington Street, 3rd Floor
PO Box 578
Halifax, NS B3J 2S9
Tel. 902-424-5651
Toll Free in NS. 1-800-494-5651
www.nsapprenticeship.ca

Any comments or suggestions received will be reviewed and considered to determine the course of action required. If the changes are deemed to be minor, they will be held for implementation during the next review cycle. If immediate change is deemed appropriate and approved by the Atlantic Trade Advisory Committee, it will result in a revision to this version of the AACCS and will be detailed in the following section.

Version Changes

Revision Date	Affected Section	Description of Change

MENT-1801

Workplace Mentoring I (Nova Scotia Unit of Instruction)

Learning Outcomes:

- Identify and explain strategies for learning workplace skills.
- Demonstrate strategies to assist in learning skills in the workplace.

Objectives and Content:

1. Describe the importance of your own experiences.
2. Identify the partners involved in apprenticeship.
3. Describe the shared responsibilities for workplace learning.
4. Determine your own learning preferences and explain how these relate to learning new skills.
5. Describe the importance of different types of skills in the workplace.
6. Describe the importance of essential skills in the trade.
7. Identify different ways of learning.
8. Identify your learning preferences.
9. Identify different learning needs and strategies to meet learning needs.
10. Identify techniques for effective communication.
11. Identify strategies to assist in learning a skill.

Resource:

- Recommended resource to use in the delivery of this unit:
<https://apprenticeship.nsc.ca/mentoring/>