Atlantic Workforce Partnership

Curriculum Standard

Boilermaker

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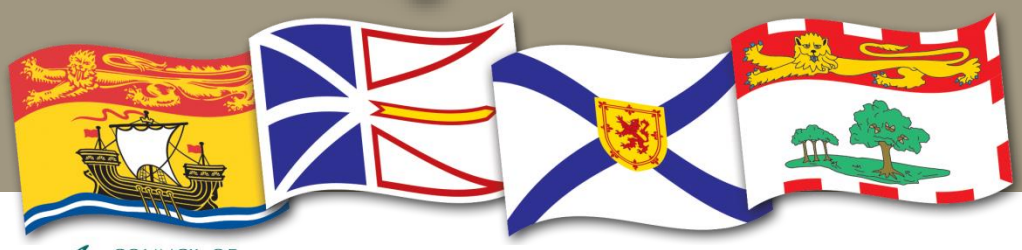
Atlantic Apprenticeship



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.

Mario Leblanc	New Brunswick
Bruno Noel	New Brunswick
Lee Hickey	Newfoundland and Labrador
Alexander Macleod	Nova Scotia
Mitchell DeCoste	Nova Scotia
Brian Mikkelsen	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.

Table of Contents

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	v. To subject to a procedure that ascertains effectiveness, value, proper function or other quality. n. A way of examining something to determine its characteristics or properties, or to determine whether or not it is working correctly.

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 journeyperson 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-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	**MENT-700** Mentoring I
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*
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.
MENT-700	Mentoring I	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*
MENT-701	Mentoring II	6	84	N/A
BLM-305	Advanced Welding	30	85	Perform a v-groove weld.
BLM-310	Hoisting, Lifting and Rigging III	27	87	N/A
BLM-315	Testing and Inspection	12	90	Perform a guided bend test.
BLM-320	Layout and Template Development III	15	92	Layout a tangential nozzle.
BLM-325	Component Fabrication II	12	94	Install a tangential nozzle.
BLM-330	Boilers	30	96	N/A
BLM-335	Condensers and Exchangers	36	99	Perform tube rolling.
BLM-340	Tanks	30	102	N/A
BLM-345	Introduction to Heavy Industry	12	105	N/A
BLM-350	Program Review	30	107	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
		BLM-340	Tanks
3.04	Demobilizes site	BLM-170	Job Task Planning
		BLM-245	Maintenance and Repair

RSOS Sub-task		AACS Unit	
Task 4 - Uses communication and mentoring techniques			
4.01	Uses communication techniques	MENT-700	Mentoring I
		MENT-701	Mentoring II
4.02	Uses mentoring techniques	MENT-700	Mentoring I
		MENT-701	Mentoring II
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

RSOS Sub-task		AACS Unit	
		BLM-215	Hoisting, Lifting and Rigging II
8.02	Assembles hoisting equipment	BLM-215	Hoisting, Lifting and Rigging II
		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

RSOS Sub-task		AACS Unit	
		BLM-335	Condensers and Exchangers
		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

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.

MENT-700 Mentoring I

Learning Outcomes:

- Demonstrate knowledge of effective communication practices as a learner.
- Demonstrate knowledge of strategies for learning skills in the workplace.

Red Seal Occupational Standard Reference:

4.01 Uses communication techniques
4.02 Uses mentoring techniques

Suggested Hours:

6 hours

Learning Objectives:

1. Describe the importance of one's own individual experiences.
2. Identify behaviours that demonstrate positive learning experiences.
3. Identify the benefits of workplace mentoring for the apprentice, mentor, and employer.
4. Identify the partners involved in apprenticeship training.
5. Describe the shared responsibilities for workplace learning in apprenticeship.
6. Identify different learning needs and strategies to address challenges or barriers in the workplace.
   i) learning disabilities
   ii) language
   iii) underrepresentation
7. Identify the components that create a positive and inclusive workplace culture.
   i) workplace characteristics
   ii) individual behaviours

8. Identify various learning styles and determine one's own learning preferences.

9. Explain how learning preferences impact learning new skills.

10. Identify different learning strategies to meet individual learning needs.

11. Describe the importance of adapting to a variety of teaching and learning methods in the workplace.

12. Identify techniques for effective communication as a learner.
    i) verbal and non-verbal
    ii) active listening

13. Identify and describe personal responsibilities and attitudes that contribute to on-the-job success.
    i) self advocating
    ii) asking questions
    iii) accepting constructive feedback
    iv) working safely
    v) employing time management techniques and being punctual

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.

BLM-145 Hoisting, Lifting and Rigging I

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 torqueing procedures.

Practical Objectives

1. Construct basic geometric shapes.

2. Perform bolting and torqueing 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

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

MENT-701 Mentoring II

Learning Outcomes:

- Demonstrate knowledge of effective communication practices as a mentor.
- Demonstrate knowledge of strategies for teaching workplace skills.

Red Seal Occupational Standard Reference:

4.01 Uses communication techniques
4.02 Uses mentoring techniques

Suggested Hours:

6 hours

Learning Objectives:

1. Identify the different roles played by a workplace mentor.

2. Identify strategies to create a supportive learning environment.

3. Identify techniques for effective communication as a mentor.
   i) constructive feedback
   ii) active listening
   iii) leading meetings and one-on-one sessions

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

5. Identify strategies to assist in teaching a skill while meeting individual learning needs.
   i) principles of instruction
   ii) coaching skills

6. Explain how to adjust a lesson for various situations.

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

5.06 Preforms 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

27 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

2. 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.

BLM-320 Layout and Template Development III

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

BLM-335 Condensers and Exchangers

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.
5.02 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 (AACS).

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 AACS 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 AACS and will be detailed in the following section.

Version Changes

Revision Date	Affected Section	Description of Change
May 2024	Levels 1 and 3	Integration of MENT-700 Mentoring I and MENT 701 Mentoring II