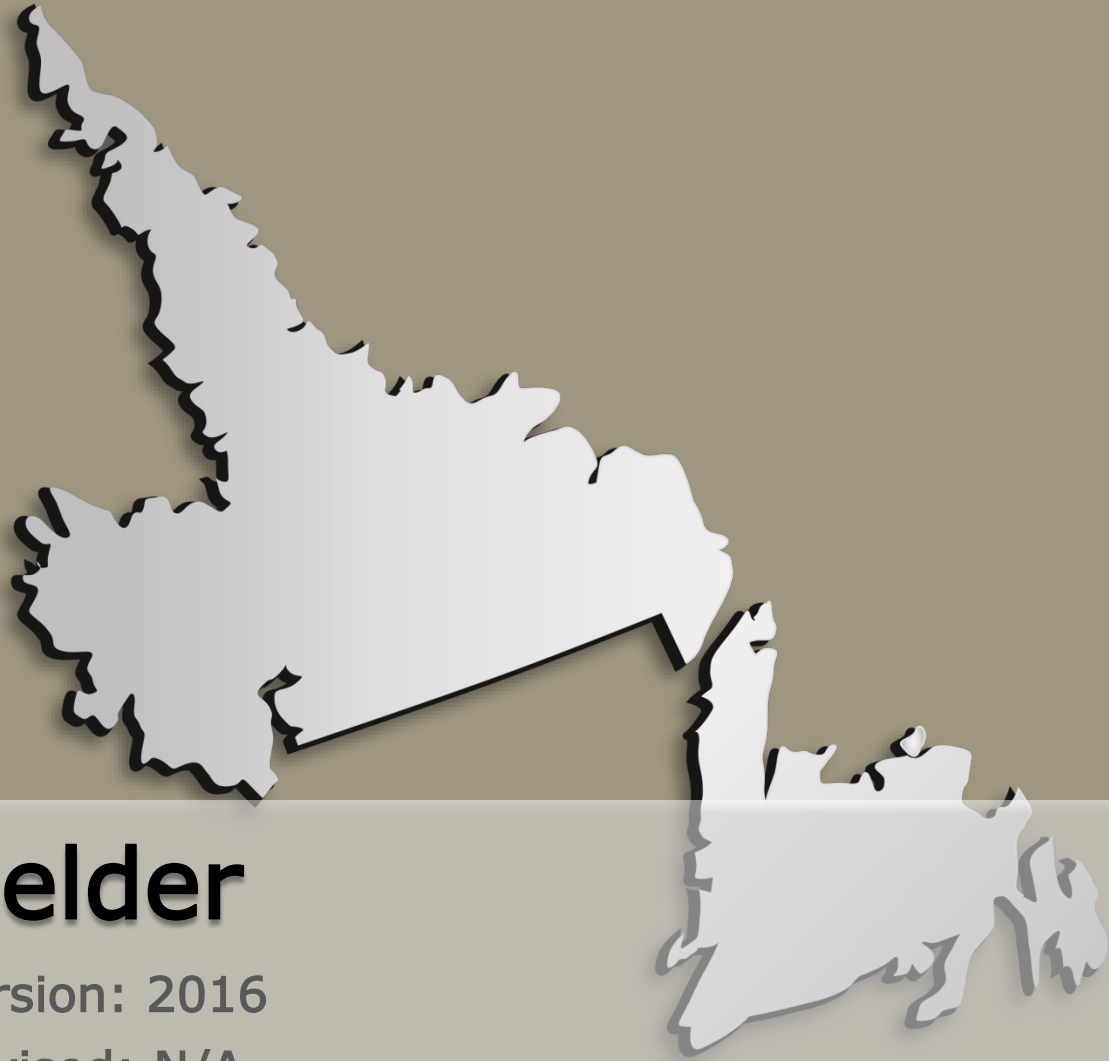


# Atlantic Workforce Partnership

Curriculum Standard



## Welder

Version: 2016

Revised: N/A

Atlantic Apprenticeship



# PLAN OF TRAINING

## Atlantic Apprenticeship Curriculum Standard

### Welder

APRIL 2016



**Government of Newfoundland and Labrador  
Department of Advanced Education and Skills  
Apprenticeship and Trades Certification Division**

Approved by:

A handwritten signature in blue ink, appearing to read "Dave Hill", written over a horizontal line.

Chairperson, Provincial Apprenticeship and Certification Board

Date: June 23, 2016

# Atlantic Apprenticeship Curriculum Standard

## Welder



## Preface

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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 Welder program.

This document contains all the technical training elements required to complete the Welder apprenticeship program and has been developed based on the 2014 National Occupational Analysis (NOA) and the 2011 Interprovincial Program Guide (IPG). The NOA and IPG can be found on the Red Seal website ([www.red-seal.ca](http://www.red-seal.ca)).

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

Level	Implementation Effective
Level 1	2016-2017
Level 2	2017-2018
Level 3	2018-2019

*\*\* The above implementation schedule identifies the training season where implementation is required to be complete in all Atlantic jurisdictions. Please **confirm** with Apprenticeship Staff in your jurisdiction for more specific implementation dates for your jurisdiction prior to commencing training.*

Granting of credit or permission to challenge level examinations for pre-employment or pre-apprenticeship training for the Welder 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

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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 May 2015.

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

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## User Guide

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Atlantic Apprenticeship Curriculum Standards (AACS) are developed based on National Occupational Analyses (NOA), Interprovincial Program Guides (IPG) (if available) and extensive industry consultation. This document represents the minimum content to be delivered as part of the harmonized Atlantic program for the Welder 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)*

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The 2014 National Occupational Analysis References (NOA) to AACS Comparison chart outlines the relation between each NOA sub-task and the AACS units. NOA References have also been detailed in each unit to highlight the direct link between the unit and relevant sub-tasks in the NOA.

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**

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

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

## **Glossary of Terms** (*continued*)

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

## Essential Skills Profiles

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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](http://www.esdc.gc.ca/eng/jobs/les/profiles/index.shtml)

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

## Profile Chart

COMMON OCCUPATIONAL SKILLS			
WDF-005 Safety	WDF-010 Tools and Equipment	WDF-020 Hoisting, Lifting and Rigging	WDF-025 Access Equipment
WDF-030 Communication and Trade Documentation	WDF-075 Drawings	WDF-620 Quality Assurance/Control I	WDF-625 Quality Assurance/Control II
WLD-805 Work Planning	WDF-630 Metallurgy I	WDF-645 Metallurgy II	WDF-650 Metallurgy III
WDF-065 Weld Faults	WLD-815 Program Review		
FABRICATION AND PREPARATION OF COMPONENTS FOR WELDING			
WDF-070 Fabrication Fundamentals	WDF-085 Introduction to Layout and Pattern Development	WLD-300 Jigs and Fixtures	
CUTTING AND GOUGING			
WDF-015 Stationary Machinery	WDF-605 Oxy-fuel	WDF-610 Electric Arc Cutting and Gouging	WDF-615 Plasma Arc Cutting and Gouging
WELDING PROCESSES			
WDF-035 Introduction to Welding Processes	WDF-040 SMAW I - Set up, Strike and Maintain an Arc	WDF-045 SMAW II - Fillet Weld, All Positions	WLD-205 SMAW III - Groove Weld Plate, All Positions
WLD-210 SMAW IV - Fillet and Groove Weld, Medium Carbon Steel	WLD-305 SMAW V - Pipe and Tubing, All Positions	WLD-325 SMAW VI - Alloy Steels	WDF-050 GMAW I - Set up and Maintain an Arc
WDF-600 GMAW II - Fillet Weld, All Positions	WLD-215 GMAW III - Groove Weld, All Positions	WLD-220 GMAW IV - Fillet and Groove Weld, Medium Carbon Steel	WLD-310 GMAW V - Pipe and Tubing, All Positions
WLD-330 GMAW VI - Aluminum Alloys	WLD-335 GMAW VII - Stainless Steel Alloys	WDF-055 FCAW I - Set up and Deposit a Weld	WLD-105 FCAW II - Fillet and Groove Weld Plate, All Positions
WLD-315 FCAW III - Pipe and Tubing, All Positions	WDF-060 MCAW I - Set up and Deposit a Weld	WLD-110 MCAW II - Fillet and Groove Weld, All Positions	WLD-225 GTAW I - Set up and Maintain an Arc

**Profile Chart** *(continued)*

<b>WELDING PROCESSES (CONTINUE)</b>			
WLD-230 GTAW II - Fillet Weld, All Positions	WLD-235 GTAW III - Groove Weld, All Positions	WLD-340 GTAW IV - Fillet and Groove Weld, Medium Carbon Steel	WLD-320 GTAW V - Pipe and Tubing, All Positions
WLD-345 GTAW VI - Ferrous and Non-Ferrous Alloys	WDF-635 Groove Welding I - SMAW, Flat and Horizontal	WDF-640 Groove Welding II - GMAW, Flat and Horizontal	WLD-800 Submerged Arc Welding I
WLD-810 Submerged Arc Welding II	WLD-365 Build up of Metal Parts		

## Level Structure

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### Level 1 – 9 Weeks

Unit Code	Unit Title	Suggested Hours	Page Number
WDF-005	Safety	8	29
WDF-010	Tools and Equipment	4	31
WDF-015	Stationary Machinery	4	33
WDF-020	Hoisting, Lifting and Rigging	12	35
WDF-025	Access Equipment	3	37
WDF-030	Communication and Trade Documentation	3	39
WDF-630	Metallurgy I	6	41
WDF-035	Introduction to Welding Processes	14	42
WDF-040	Shielded Metal Arc Welding I - Set up, Strike and Maintain an Arc	6	45
WDF-045	Shielded Metal Arc Welding II - Fillet Weld, All Positions	18	47
WDF-050	Gas Metal Arc Welding I - Set up and Maintain an Arc	18	49
WDF-600	Gas Metal Arc Welding II - Fillet Weld, All Positions	18	51
WDF-055	Flux Core Arc Welding I - Set up and Deposit a Weld	6	53
WDF-060	Metal Core Arc Welding I - Set up and Deposit a Weld	6	55
WDF-635	Groove Welding I - Shielded Metal Arc Welding, Flat and Horizontal	18	57
WDF-640	Groove Welding II - Gas Metal Arc Welding, Flat and Horizontal	12	59
WDF-605	Oxy-fuel	24	61
WDF-610	Electric Arc Cutting and Gouging	12	64
WDF-615	Plasma Arc Cutting and Gouging	6	66
WDF-075	Drawings	30	68
WDF-070	Fabrication Fundamentals	18	70
WDF-085	Introduction to Layout and Pattern Development	15	72
WDF-065	Weld Faults	9	73

## Level Structure (continued)

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### Level 2 - 7 Weeks

Unit Code	Unit Title	Suggested Hours	Page Number
WDF-620	Quality Assurance/Control I	12	75
WDF-645	Metallurgy II	12	77
WLD-105	Flux Core Arc Welding II - Fillet and Groove Weld Plate, All Positions	24	79
WLD-110	Metal Core Arc Welding II - Fillet and Groove Weld, All Positions	6	81
WLD-205	Shielded Metal Arc Welding III - Groove Weld Plate, All Positions	42	83
WLD-210	Shielded Metal Arc Welding IV - Fillet and Groove Weld, Medium Carbon Steel	6	85
WLD-215	Gas Metal Arc Welding III - Groove Weld, All Positions	18	87
WLD-220	Gas Metal Arc Welding IV - Fillet and Groove Weld, Medium Carbon Steel	3	89
WLD-225	Gas Tungsten Arc Welding I - Set up and Maintain an Arc	12	91
WLD-230	Gas Tungsten Arc Welding II - Fillet Weld, All Positions	30	93
WLD-235	Gas Tungsten Arc Welding III - Groove Weld, All Positions	30	95
WLD-800	Submerged Arc Welding I	3	97
WLD-300	Jigs and Fixtures	6	99
WLD-805	Work Planning	6	100



## Level Structure (continued)

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### Level 3 - 6 Weeks

Unit Code	Unit Title	Suggested Hours	Page Number
WDF-650	Metallurgy III	12	103
WDF-625	Quality Assurance/Control II	6	105
WLD-305	Shielded Metal Arc Welding V - Pipe and Tubing, All Positions	33	107
WLD-310	Gas Metal Arc Welding V - Pipe and Tubing, All Positions	18	109
WLD-315	Flux Core Arc Welding III - Pipe and Tubing, All Positions	15	111
WLD-320	Gas Tungsten Arc Welding V - Pipe and Tubing, All Positions	30	113
WLD-325	Shielded Metal Arc Welding VI - Alloy Steels	6	115
WLD-330	Gas Metal Arc Welding VI - Aluminum Alloys	12	117
WLD-335	Gas Metal Arc Welding VII - Stainless Steel Alloys	6	119
WLD-340	Gas Tungsten Arc Welding IV - Fillet and Groove Weld, Medium Carbon Steel	6	121
WLD-345	Gas Tungsten Arc Welding VI - Ferrous and Non-Ferrous Alloys	30	123
WLD-810	Submerged Arc Welding II	3	125
WLD-365	Build up of Metal Parts	3	127
WLD-815	Program Review	30	129

## 2014 NOA Sub-task to AACS Unit Comparison

NOA Sub-task		AACS Unit	
<b>Task 1 - Maintains tools and equipment.</b>			
1.01	Maintains hand, power, layout and measuring tools.	WDF-010	Tools and Equipment
1.02	Maintains stationary machinery.	WDF-015	Stationary Machinery
1.03	Maintains thermal cutting equipment.	WDF-605	Oxy-fuel
		WDF-610	Electric Arc Cutting and Gouging
		WDF-615	Plasma Arc Cutting and Gouging
1.04	Maintains welding equipment.	WDF-035	Introduction to Welding Processes
		WDF-040	SMAW I - Set up, Strike and Maintain an Arc
		WDF-050	GMAW I - Set up and Maintain an Arc
		WDF-055	FCAW I - Set up and Deposit a Weld
		WDF-060	MCAW I - Set up and Deposit a Weld
		WDF-605	Oxy-fuel
		WLD-225	GTAW I - Set up and Maintain an Arc
		WLD-800	Submerged Arc Welding I
<b>Task 2 - Uses access and material handling equipment.</b>			
2.01	Uses access equipment.	WDF-025	Access Equipment
2.02	Uses rigging, hoisting and lifting equipment.	WDF-020	Hoisting, Lifting and Rigging
<b>Task 3 - Performs safety-related activities.</b>			
3.01	Performs hazard assessments.	WDF-005	Safety
3.02	Maintains safe work environment.	WDF-005	Safety
3.03	Uses personal protective equipment (PPE) and safety equipment.	WDF-005	Safety
<b>Task 4 - Organizes work.</b>			
4.01	Uses documentation and reference material.	WDF-030	Communication and Trade Documentation
		WDF-075	Drawings
		WLD-805	Work Planning
4.02	Plans job tasks.	WLD-805	Work Planning
4.03	Organizes materials.	WLD-805	Work Planning
<b>Task 5 - Performs routine trade activities.</b>			
5.01	Performs quality inspection.	WDF-045	SMAW II - Fillet Weld, All Positions
		WDF-600	GMAW II - Fillet Weld, All Positions
		WDF-635	Groove Welding I - SMAW, Flat and Horizontal
		WDF-640	Groove Welding II - GMAW, Flat and Horizontal

NOA Sub-task		AACS Unit	
		WDF-065	Weld Faults
		WDF-620	Quality Assurance/Control I
		WLD-105	FCAW II - Fillet and Groove Weld Plate, All Positions
		WLD-110	MCAW II - Fillet and Groove Weld, All Positions
		WLD-205	SMAW III - Groove Weld, Plate, All Positions
		WLD-210	SMAW IV - Fillet and Groove Weld, Medium Carbon Steel
		WLD-215	GMAW III - Groove Weld, All Positions
		WLD-220	GMAW IV - Fillet and Groove Weld, Medium Carbon Steel
		WLD-230	GTAW II - Fillet Weld, All Positions
		WLD-235	GTAW III - Groove Weld, All Positions
		WLD-625	Quality Assurance/Control II
		WLD-305	SMAW V - Pipe and Tubing, All Positions
		WLD-310	GMAW V - Pipe and Tubing, All Positions
		WLD-315	FCAW III - Pipe and Tubing, All Positions
		WLD-320	GTAW V - Pipe and Tubing, All Positions
		WLD-325	SMAW VI - Alloy Steels
		WLD-330	GMAW VI - Aluminum Alloys
		WLD-335	GMAW VII - Stainless Steel Alloys
		WLD-340	GTAW IV - Fillet and Groove Weld, Medium Carbon Steel
		WDF-345	GTAW VI - Ferrous and Non-Ferrous Alloys
		WLD-810	Submerged Arc Welding II
5.02	Marks welds, materials and parts.	WLD-625	Quality Assurance/Control II
5.03	Controls temperature of weldments.	WDF-045	SMAW II - Fillet Weld, All Positions
		WDF-600	GMAW II - Fillet Weld, All Positions
		WDF-635	Groove Welding I - SMAW, Flat and Horizontal
		WDF-640	Groove Welding II - GMAW, Flat and Horizontal
		WLD-105	FCAW II - Fillet and Groove Weld Plate, All Positions

NOA Sub-task		AACS Unit	
		WLD-110	MCAW II - Fillet and Groove Weld, All Positions
		WLD-205	SMAW III - Groove Weld, Plate, All Positions
		WLD-210	SMAW IV - Fillet and Groove Weld, Medium Carbon Steel
		WLD-215	GMAW III - Groove Weld, All Positions
		WLD-220	GMAW IV - Fillet and Groove Weld, Medium Carbon Steel
		WLD-230	GTAW II - Fillet Weld, All Positions
		WLD-235	GTAW III - Groove Weld, All Positions
		WLD-305	SMAW V - Pipe and Tubing, All Positions
		WLD-310	GMAW V - Pipe and Tubing, All Positions
		WLD-315	FCAW III - Pipe and Tubing, All Positions
		WLD-320	GTAW V - Pipe and Tubing, All Positions
		WLD-325	SMAW VI - Alloy Steels
		WLD-330	GMAW VI - Aluminum Alloys
		WLD-335	GMAW VII - Stainless Steel Alloys
		WLD-340	GTAW IV - Fillet and Groove Weld, Medium Carbon Steel
		WDF-345	GTAW VI - Ferrous and Non-Ferrous Alloys
WLD-810	Submerged Arc Welding II		
5.04	Stores welding consumables.	WDF-035	Introduction to Welding Processes
		WDF-040	SMAW I - Set up, Strike and Maintain an Arc
		WDF-045	SMAW II - Fillet Weld, All Positions
		WDF-050	GMAW I - Setup and Maintain an Arc
		WDF-600	GMAW II - Fillet Weld, All Positions
		WDF-055	FCAW I - Set up and Deposit a Weld
		WDF-060	MCAW I - Set up and Deposit a Weld
		WDF-635	Groove Welding I - SMAW, Flat and Horizontal
		WDF-640	Groove Welding II - GMAW, Flat and Horizontal
		WDF-605	Oxy-fuel

NOA Sub-task		AACS Unit	
		WLD-105	FCAW II - Fillet and Groove Weld Plate, All Positions
		WLD-110	MCAW II - Fillet and Groove Weld, All Positions
		WLD-205	SMAW III - Groove Weld, Plate, All Positions
		WLD-210	SMAW IV - Fillet and Groove Weld, Medium Carbon Steel
		WLD-215	GMAW III - Groove Weld, All Positions
		WLD-220	GMAW IV - Fillet and Groove Weld, Medium Carbon Steel
		WLD-225	GTAW I - Set up and Maintain an Arc
		WLD-235	GTAW III - Groove Weld, All Positions
		WLD-230	GTAW II - Fillet Weld, All Positions
		WLD-800	Submerged Arc Welding I
		WLD-305	SMAW V - Pipe and Tubing, All Positions
		WLD-310	GMAW V - Pipe and Tubing, All Positions
		WLD-315	FCAW III - Pipe and Tubing, All Positions
		WLD-320	GTAW V - Pipe and Tubing, All Positions
		WLD-325	SMAW VI - Alloy Steels
		WLD-330	GMAW VI - Aluminum Alloys
		WLD-335	GMAW VII - Stainless Steel Alloys
		WLD-340	GTAW IV - Fillet and Groove Weld, Medium Carbon Steel
		WDF-345	GTAW VI - Ferrous and Non-Ferrous Alloys
		WLD-810	Submerged Arc Welding II
5.05	Selects welding processes and power source.	WDF-035	Introduction to Welding Processes
		WDF-045	SMAW II - Fillet Weld, All Positions
		WDF-600	GMAW II - Fillet Weld, All Positions
		WDF-635	Groove Welding I - SMAW, Flat and Horizontal
		WDF-640	Groove Welding II - GMAW, Flat and Horizontal
		WLD-105	FCAW II - Fillet and Groove Weld Plate, All Positions

NOA Sub-task		AACS Unit	
		WLD-110	MCAW II - Fillet and Groove Weld, All Positions
		WLD-205	SMAW III - Groove Weld, Plate, All Positions
		WLD-210	SMAW IV - Fillet and Groove Weld, Medium Carbon Steel
		WLD-215	GMAW III - Groove Weld, All Positions
		WLD-220	GMAW IV - Fillet and Groove Weld, Medium Carbon Steel
		WLD-230	GTAW II - Fillet Weld, All Positions
		WLD-235	GTAW III - Groove Weld, All Positions
		WLD-305	SMAW V - Pipe and Tubing, All Positions
		WLD-310	GMAW V - Pipe and Tubing, All Positions
		WLD-315	FCAW III - Pipe and Tubing, All Positions
		WLD-320	GTAW V - Pipe and Tubing, All Positions
		WLD-325	SMAW VI - Alloy Steels
		WLD-330	GMAW VI - Aluminum Alloys
		WLD-335	GMAW VII - Stainless Steel Alloys
		WLD-340	GTAW IV - Fillet and Groove Weld, Medium Carbon Steel
		WDF-345	GTAW VI - Ferrous and Non-Ferrous Alloys
WLD-810	Submerged Arc Welding II		
5.06	Performs equipment start-up and shut-down.	WDF-040	SMAW I - Set up, Strike and Maintain an Arc
		WDF-050	GMAW I - Setup and Maintain an Arc
		WDF-055	FCAW I - Set up and Deposit a Weld
		WDF-060	MCAW I - Set up and Deposit a Weld
		WDF-605	Oxy-fuel
		WDF-610	Electric Arc Cutting and Gouging
		WDF-615	Plasma Arc Cutting and Gouging
		WLD-225	GTAW I - Set up and Maintain an Arc
WLD-800	Submerged Arc Welding I		
5.07	Finishes final product.	WDF-045	SMAW II - Fillet Weld, All Positions
		WDF-600	GMAW II - Fillet Weld, All Positions
		WDF-635	Groove Welding I - SMAW, Flat and Horizontal

NOA Sub-task		AACS Unit	
		WDF-640	Groove Welding II - GMAW, Flat and Horizontal
		WLD-105	FCAW II - Fillet and Groove Weld Plate, All Positions
		WLD-110	MCAW II - Fillet and Groove Weld, All Positions
		WLD-205	SMAW III - Groove Weld, Plate, All Positions
		WLD-210	SMAW IV - Fillet and Groove Weld, Medium Carbon Steel
		WLD-215	GMAW III - Groove Weld, All Positions
		WLD-220	GMAW IV - Fillet and Groove Weld, Medium Carbon Steel
		WLD-230	GTAW II - Fillet Weld, All Positions
		WLD-235	GTAW III - Groove Weld, All Positions
		WLD-305	SMAW V - Pipe and Tubing, All Positions
		WLD-310	GMAW V - Pipe and Tubing, All Positions
		WLD-315	FCAW III - Pipe and Tubing, All Positions
		WLD-320	GTAW V - Pipe and Tubing, All Positions
		WLD-325	SMAW VI - Alloy Steels
		WLD-330	GMAW VI - Aluminum Alloys
		WLD-335	GMAW VII - Stainless Steel Alloys
		WLD-340	GTAW IV - Fillet and Groove Weld, Medium Carbon Steel
		WDF-345	GTAW VI - Ferrous and Non-Ferrous Alloys
		WLD-810	Submerged Arc Welding II
<b>Task 6 - Performs layout.</b>			
6.01	Develops templates.	WDF-085	Introduction to Layout and Pattern Development
		WLD-300	Jigs and Fixtures
6.02	Transfers dimensions from drawings to materials.	WDF-085	Introduction to Layout and Pattern Development
		WLD-300	Jigs and Fixtures
<b>Task 7 - Fabricates components.</b>			
7.01	Prepares materials.	WDF-045	SMAW II - Fillet Weld, All Positions
		WDF-600	GMAW II - Fillet Weld, All Positions

NOA Sub-task		AACS Unit	
		WDF-635	Groove Welding I - SMAW, Flat and Horizontal
		WDF-640	Groove Welding II - GMAW, Flat and Horizontal
		WDF-070	Fabrication Fundamentals
		WLD-105	FCAW II - Fillet and Groove Weld Plate, All Positions
		WLD-110	MCAW II - Fillet and Groove Weld, All Positions
		WLD-205	SMAW III - Groove Weld, Plate, All Positions
		WLD-210	SMAW IV - Fillet and Groove Weld, Medium Carbon Steel
		WLD-215	GMAW III - Groove Weld, All Positions
		WLD-220	GMAW IV - Fillet and Groove Weld, Medium Carbon Steel
		WLD-230	GTAW II - Fillet Weld, All Positions
		WLD-235	GTAW III - Groove Weld, All Positions
		WLD-300	Jigs and Fixtures
		WLD-305	SMAW V - Pipe and Tubing, All Positions
		WLD-310	GMAW V - Pipe and Tubing, All Positions
		WLD-315	FCAW III - Pipe and Tubing, All Positions
		WLD-320	GTAW V - Pipe and Tubing, All Positions
		WLD-325	SMAW VI - Alloy Steels
		WLD-330	GMAW VI - Aluminum Alloys
		WLD-335	GMAW VII - Stainless Steel Alloys
		WLD-340	GTAW IV - Fillet and Groove Weld, Medium Carbon Steel
		WDF-345	GTAW VI - Ferrous and Non-Ferrous Alloys
		WLD-810	Submerged Arc Welding II
7.02	Fits components for welding.	WDF-070	Fabrication Fundamentals
		WLD-300	Jigs and Fixtures
7.03	Assembles components.	WDF-070	Fabrication Fundamentals
		WLD-300	Jigs and Fixtures
<b>Task 8 - Uses tools and equipment for non-thermal cutting and grinding.</b>			
8.01	Selects cutting and grinding tools.	WDF-015	Stationary Machinery



NOA Sub-task		AACS Unit	
8.02	Cuts using stationary band saws and power hacksaws.	WDF-015	Stationary Machinery
8.03	Cuts using shears and ironworkers.	WDF-015	Stationary Machinery
8.04	Cuts using hand tools.	WDF-010	Tools and Equipment
8.05	Cuts using handheld power tools.	WDF-010	Tools and Equipment
<b>Task 9 - Uses oxy-fuel gas cutting (OFC) process for cutting and gouging.</b>			
9.01	Selects OFC gas and equipment.	WDF-605	Oxy-fuel
9.02	Sets up OFC equipment.	WDF-605	Oxy-fuel
9.03	Sets operating parameters for OFC equipment.	WDF-605	Oxy-fuel
9.04	Performs cut and gouge using OFC equipment.	WDF-605	Oxy-fuel
<b>Task 10 - Uses plasma arc cutting (PAC) process for cutting and gouging.</b>			
10.01	Selects PAC equipment and consumables.	WDF-615	Plasma Arc Cutting and Gouging
10.02	Sets up PAC equipment.	WDF-615	Plasma Arc Cutting and Gouging
10.03	Sets operating parameters for PAC equipment.	WDF-615	Plasma Arc Cutting and Gouging
10.04	Performs cut and gouge using PAC equipment.	WDF-615	Plasma Arc Cutting and Gouging
<b>Task 11 - Uses air carbon arc cutting (CAC-A) process for cutting and gouging.</b>			
11.01	Selects CAC-A equipment and consumables.	WDF-610	Electric Arc Cutting and Gouging
11.02	Sets up CAC-A equipment.	WDF-610	Electric Arc Cutting and Gouging
11.03	Sets operating parameters for CAC-A equipment.	WDF-610	Electric Arc Cutting and Gouging
11.04	Performs cut and gouge using CAC-A equipment.	WDF-610	Electric Arc Cutting and Gouging
<b>Task 12 - Welds using shielded metal arc welding (SMAW) process.</b>			
12.01	Selects SMAW equipment and consumables.	WDF-040	SMAW I - Set up, Strike and Maintain an Arc
		WDF-045	SMAW II - Fillet Weld, All Positions
		WDF-635	Groove Welding I - SMAW, Flat and Horizontal
		WLD-205	SMAW III - Groove Weld, Plate, All Positions
		WLD-210	SMAW IV - Fillet and Groove Weld, Medium Carbon Steel
		WLD-305	SMAW V - Pipe and Tubing, All Positions
		WLD-325	SMAW VI - Alloy Steels

NOA Sub-task		AACS Unit	
12.02	Sets up SMAW equipment.	WDF-040	SMAW I - Set up, Strike and Maintain an Arc
		WDF-045	SMAW II - Fillet Weld, All Positions
		WDF-635	Groove Welding I - SMAW, Flat and Horizontal
		WLD-205	SMAW III - Groove Weld, Plate, All Positions
		WLD-210	SMAW IV - Fillet and Groove Weld, Medium Carbon Steel
		WLD-305	SMAW V - Pipe and Tubing, All Positions
		WLD-325	SMAW VI - Alloy Steels
12.03	Sets operating parameters for SMAW.	WDF-040	SMAW I - Set up, Strike and Maintain an Arc
		WDF-045	SMAW II - Fillet Weld, All Positions
		WDF-635	Groove Welding I - SMAW, Flat and Horizontal
		WLD-205	SMAW III - Groove Weld, Plate, All Positions
		WLD-210	SMAW IV - Fillet and Groove Weld, Medium Carbon Steel
		WLD-305	SMAW V - Pipe and Tubing, All Positions
		WLD-325	SMAW VI - Alloy Steels
12.04	Performs weld with SMAW equipment.	WDF-040	SMAW I - Set up, Strike and Maintain an Arc
		WDF-045	SMAW II - Fillet Weld, All Positions
		WDF-635	Groove Welding I - SMAW, Flat and Horizontal
		WLD-205	SMAW III - Groove Weld, Plate, All Positions
		WLD-210	SMAW IV - Fillet and Groove Weld, Medium Carbon Steel
		WLD-305	SMAW V - Pipe and Tubing, All Positions
		WLD-325	SMAW VI - Alloy Steels
<b>Task 13 - Welds using flux cored arc welding (FCAW), metal cored arc welding (MCAW), and gas metal arc welding (GMAW) processes.</b>			
13.01	Selects FCAW, MCAW and GMAW gas, equipment and consumables.	WDF-600	GMAW II - Fillet Weld, All Positions
		WDF-640	Groove Welding II - GMAW, Flat and Horizontal

NOA Sub-task		AACS Unit	
		WLD-105	FCAW II - Fillet and Groove Weld Plate, All Positions
		WLD-110	MCAW II - Fillet and Groove Weld, All Positions
		WLD-215	GMAW III - Groove Weld, All Positions
		WLD-220	GMAW IV - Fillet and Groove Weld, Medium Carbon Steel
		WLD-310	GMAW V - Pipe and Tubing, All Positions
		WLD-315	FCAW III - Pipe and Tubing, All Positions
		WLD-330	GMAW VI - Aluminum Alloys
		WLD-335	GMAW VII - Stainless Steel Alloys
13.02	Sets up FCAW, MCAW and GMAW equipment.	WDF-600	GMAW II - Fillet Weld, All Positions
		WDF-640	Groove Welding II - GMAW, Flat and Horizontal
		WLD-105	FCAW II - Fillet and Groove Weld Plate, All Positions
		WLD-110	MCAW II - Fillet and Groove Weld, All Positions
		WLD-215	GMAW III - Groove Weld, All Positions
		WLD-220	GMAW IV - Fillet and Groove Weld, Medium Carbon Steel
		WLD-310	GMAW V - Pipe and Tubing, All Positions
		WLD-315	FCAW III - Pipe and Tubing, All Positions
		WLD-330	GMAW VI - Aluminum Alloys
		WLD-335	GMAW VII - Stainless Steel Alloys
13.03	Sets operating parameters for FCAW, MCAW and GMAW.	WDF-600	GMAW II - Fillet Weld, All Positions
		WDF-640	Groove Welding II - GMAW, Flat and Horizontal
		WLD-105	FCAW II - Fillet and Groove Weld Plate, All Positions
		WLD-110	MCAW II - Fillet and Groove Weld, All Positions
		WLD-215	GMAW III - Groove Weld, All Positions

NOA Sub-task		AACS Unit	
		WLD-220	GMAW IV - Fillet and Groove Weld, Medium Carbon Steel
		WLD-310	GMAW V - Pipe and Tubing, All Positions
		WLD-315	FCAW III - Pipe and Tubing, All Positions
		WLD-330	GMAW VI - Aluminum Alloys
		WLD-335	GMAW VII - Stainless Steel Alloys
13.04	Performs weld using FCAW, MCAW and GMAW equipment.	WDF-600	GMAW II - Fillet Weld, All Positions
		WDF-640	Groove Welding II - GMAW, Flat and Horizontal
		WLD-105	FCAW II - Fillet and Groove Weld Plate, All Positions
		WLD-110	MCAW II - Fillet and Groove Weld, All Positions
		WLD-215	GMAW III - Groove Weld, All Positions
		WLD-220	GMAW IV - Fillet and Groove Weld, Medium Carbon Steel
		WLD-310	GMAW V - Pipe and Tubing, All Positions
		WLD-315	FCAW III - Pipe and Tubing, All Positions
		WLD-330	GMAW VI - Aluminum Alloys
		WLD-335	GMAW VII - Stainless Steel Alloys
<b>Task 14 - Welds using gas tungsten arc welding (GTAW) process.</b>			
14.01	Selects GTAW gas, equipment and consumables.	WLD-230	GTAW II - Fillet Weld, All Positions
		WLD-235	GTAW III - Groove Weld, All Positions
		WLD-320	GTAW V - Pipe and Tubing, All Positions
		WLD-340	GTAW IV - Fillet and Groove Weld, Medium Carbon Steel
		WDF-345	GTAW VI - Ferrous and Non-Ferrous Alloys
14.02	Sets up GTAW equipment.	WLD-230	GTAW II - Fillet Weld, All Positions
		WLD-235	GTAW III - Groove Weld, All Positions
		WLD-320	GTAW V - Pipe and Tubing, All Positions
		WLD-340	GTAW IV - Fillet and Groove Weld, Medium Carbon Steel

NOA Sub-task		AACS Unit	
		WDF-345	GTAW VI - Ferrous and Non-Ferrous Alloys
14.03	Sets operating parameters for GTAW.	WLD-230	GTAW II - Fillet Weld, All Positions
		WLD-235	GTAW III - Groove Weld, All Positions
		WLD-320	GTAW V - Pipe and Tubing, All Positions
		WLD-340	GTAW IV - Fillet and Groove Weld, Medium Carbon Steel
		WDF-345	GTAW VI - Ferrous and Non-Ferrous Alloys
14.04	Performs weld using GTAW equipment.	WLD-230	GTAW II - Fillet Weld, All Positions
		WLD-235	GTAW III - Groove Weld, All Positions
		WLD-320	GTAW V - Pipe and Tubing, All Positions
		WLD-340	GTAW IV - Fillet and Groove Weld, Medium Carbon Steel
		WDF-345	GTAW VI - Ferrous and Non-Ferrous Alloys
<b>Task 15 - Welds using submerged arc welding (SAW) process.</b>			
15.01	Selects SAW equipment and consumables.	WLD-800	Submerged Arc Welding I
		WLD-810	Submerged Arc Welding II
15.02	Sets up SAW equipment.	WLD-800	Submerged Arc Welding I
		WLD-810	Submerged Arc Welding II
15.03	Sets operating parameters for SAW.	WLD-800	Submerged Arc Welding I
		WLD-810	Submerged Arc Welding II
15.04	Performs weld using SAW equipment.	WLD-800	Submerged Arc Welding I
		WLD-810	Submerged Arc Welding II



# LEVEL 1

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## **WDF-005            Safety**

### **Learning Outcomes:**

- Demonstrate knowledge of safety equipment, their applications, maintenance and procedures for use.
- Demonstrate knowledge of safe work practices.
- Demonstrate knowledge of regulatory requirements pertaining to safety.

### **2014 National Occupational Analysis Reference:**

- 3.01            Performs hazard assessment.
- 3.02            Maintains safe work environment.
- 3.03            Uses personal protective equipment (PPE) and safety equipment.

### **Suggested Hours:**

8 Hours

### **Objectives and Content:**

#### Theoretical Objectives

1. Identify types of personal protective equipment (PPE) and clothing and describe their applications and limitations.
  - i) respiratory protection
  - ii) hearing protection
  - iii) eye protection
  - iv) fall protection
  - v) head protection
  - vi) foot protection
  - vii) hand protection
2. Describe the procedures used to care for and maintain PPE.
3. Identify hazards and describe safe work practices.
  - i) personal
  - ii) workplace
    - job hazard assessment procedures



- lockout/tag out
  - confined space awareness
  - trenches and excavations
  - explosion and fire (hot work)
  - heights (fall protection and fall arrest)
  - ventilation/fumes
  - iii) environmental contamination (awareness of)
4. Identify and describe workplace safety and health regulations.
- i) federal
    - Workplace Hazardous Material Information System (WHMIS)
  - ii) provincial/territorial
    - occupational health and safety
  - iii) municipal
  - iv) work site specific (awareness of)

Practical Objectives

N/A

## **WDF-010            Tools and Equipment**

### **Learning Outcomes:**

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

### **2014 National Occupational Analysis Reference:**

- 1.01            Maintains hand, power, layout and measuring tools.
- 8.04            Cuts using shears and ironworkers.
- 8.05            Cuts using hand tools.

### **Suggested Hours:**

4 Hours

### **Objectives and Content:**

#### Theoretical Objectives

1.        Interpret regulations pertaining to tools and equipment.
2.        Identify types of hand tools and describe their applications and procedures for use.
3.        Describe the procedures used to inspect, maintain and store hand tools.
4.        Identify types of power tools and describe their applications and procedures for use.
  - i)        electric
  - ii)       hydraulic
  - iii)      pneumatic
5.        Identify power tool attachments and consumables and describe their applications and procedures for use.
6.        Describe the procedures used to inspect, maintain and store power tools.

7. Identify types of layout and measuring tools and equipment and describe their applications and procedures for use.
8. Describe the procedures used to inspect, maintain and store layout and measuring tools and equipment.

Practical Objectives

N/A

## WDF-015            **Stationary Machinery**

### **Learning Outcomes:**

- Demonstrate knowledge of stationary machinery, their applications, maintenance and procedures for use.

### **2014 National Occupational Analysis Reference:**

- 1.02            Maintains stationary machinery.
- 8.01            Selects cutting and grinding tools.
- 8.02            Cuts using stationary band saws and power hacksaws.
- 8.03            Cuts using shears and ironworkers.

### **Suggested Hours:**

4 Hours

### **Objectives and Content:**

#### Theoretical Objectives

1. Define terminology associated with stationary machinery.
2. Identify hazards and describe safe work practices pertaining to stationary machinery.
3. Identify types of stationary machinery and describe their characteristics and applications.
  - i) presses
  - ii) drill presses
  - iii) stationary grinders
  - iv) shears
  - v) saws
  - vi) press brakes
  - vii) ironworkers
4. Describe the procedures used to set up and operate stationary machinery.

5. Describe the procedures used to inspect and maintain stationary machinery.

Practical Objectives

N/A

## **WDF-020            Hoisting, Lifting and Rigging**

### **Learning Outcomes:**

- Demonstrate knowledge of hoisting, lifting and rigging equipment, their applications, limitations and procedures for use.
- Demonstrate knowledge of the procedures used to perform hoisting and lifting operations.
- Demonstrate knowledge of calculations required prior to hoisting and lifting operations.

### **2014 National Occupational Analysis Reference:**

2.02            Uses rigging, hoisting and lifting equipment.

### **Suggested Hours:**

12 Hours

### **Objectives and Content:**

#### Theoretical Objectives

1. Define terminology associated with hoisting, lifting and rigging.
2. Identify hazards and describe safe work practices pertaining to hoisting, lifting and rigging.
3. Identify regulations pertaining to hoisting, lifting and rigging.
4. Identify types of rigging equipment and accessories and describe their limitations, applications and procedures for use.
5. Identify types of hoisting and lifting equipment and accessories and describe their applications and procedures for use.
  - i) jacks
  - ii) hoists
  - iii) cranes
    - overhead travelling cranes (OTC)

- gantry
6. Describe the procedures used to inspect, maintain and store hoisting, lifting and rigging equipment.
  7. Describe the procedures used to rig material/equipment for lifting.
  8. Describe the procedures to attach and use tag lines.
  9. Describe the procedures used to ensure the work area is safe for lifting.
    - i) supervision of lift
    - ii) securing work area
    - iii) communication
  10. Identify and describe the procedures used to communicate during hoisting, lifting and rigging operations.
    - i) hand signals
    - ii) electronic communications
    - iii) audible and visual warnings
  11. Identify the factors to consider when selecting rigging equipment.
    - i) load characteristics
    - ii) sling angle
    - iii) environment
      - chemical hazards
      - grounding requirements
      - weather conditions
    - iv) working load limit
  12. Describe the procedures used to perform a lift.
    - i) pre-lift checks
    - ii) lifting load
    - iii) placement of load
    - iv) post-lift inspection

Practical Objectives

N/A

## **WDF-025            Access Equipment**

### **Learning Outcomes:**

- Demonstrate knowledge of access equipment, their applications, limitations and procedures for use.

### **2014 National Occupational Analysis Reference:**

2.01            Uses access equipment.

### **Suggested Hours:**

3 Hours

### **Objectives and Content:**

#### *Theoretical Objectives*

1.        Define terminology associated with access equipment.
2.        Identify hazards and describe safe work practices pertaining to access equipment.
3.        Identify regulations pertaining to access equipment.
4.        Identify types of access equipment and describe their characteristics and applications.
  - i)        scaffolding
  - ii)       ladders
  - iii)      man lifts
  - iv)      elevated work platforms
5.        Identify types of fall protection and fall arrest equipment and describe their applications and procedures for use.
6.        Describe the procedures used to erect and dismantle access equipment.
7.        Describe the procedures used to inspect and maintain access equipment.



Practical Objectives

N/A

**Learning Outcomes:**

- Demonstrate knowledge of effective communication practices.
- Demonstrate knowledge of trade related documentation and its use.

**2014 National Occupational Analysis Reference:**

4.01 Uses documentation and reference material.

**Suggested Hours:**

3 Hours

**Objectives and Content:***Theoretical Objectives*

1. Describe effective verbal and non-verbal communication.
2. Identify types of communication devices and describe their applications.
3. Identify types of trade related documentation and describe their applications and procedures for use.
  - i) manufacturers' specifications
  - ii) safety/hazard assessment forms
  - iii) mill certificates
  - iv) heat numbers
  - v) customer specifications
  - vi) codes and standards
  - vii) manuals/catalogues
  - viii) work orders
  - ix) requisitions/purchase orders
  - x) permits
  - xi) procedure sheets

Practical Objectives

N/A

## WDF-630 Metallurgy I

### Learning Outcomes:

- Demonstrate knowledge of the properties of steel.
- Demonstrate knowledge of steel and procedures for processing it.

### 2014 National Occupational Analysis Reference:

N/A

### Suggested Hours:

6 Hours

### Objectives and Content:

#### Theoretical Objectives

1. Describe the properties of steel.
  - i) mechanical
  - ii) physical
2. Identify the types of steel and describe their characteristics and applications.
3. Describe the production process for steel.
4. Describe the procedures used to process steel.

#### Practical Objectives

N/A

## **WDF-035            Introduction to Welding Processes**

### **Learning Outcomes:**

- Demonstrate knowledge of welding processes and their applications.
- Demonstrate knowledge of welding equipment and accessories.

### **2014 National Occupational Analysis Reference:**

- 1.04            Maintains welding equipment.
- 5.04            Stores welding consumables.
- 5.05            Selects welding processes and power source.

### **Suggested Hours:**

14 Hours

### **Objectives and Content:**

#### Theoretical Objectives

1. Define terminology associated with welding.
2. Interpret information pertaining to welding found on drawings.
  - i) symbols
  - ii) abbreviations
3. Identify hazards and describe safe work practices pertaining to welding.
  - i) personal
  - ii) shop/facility
  - iii) fire and explosion
  - iv) equipment
  - v) ventilation/fumes
  - vi) storage, handling and transportation
4. Identify codes and standards pertaining to welding.
  - i) Canadian Standards Association (CSA)
  - ii) American Society of Mechanical Engineers (ASME)
  - iii) American Welding Society (AWS)

5. Identify welding processes and describe their characteristics and applications.
  - i) shielded metal arc welding (SMAW)
  - ii) gas metal arc welding (GMAW)
  - iii) metal core arc welding (MCAW)
  - iv) flux core arc welding (FCAW)
  - v) gas tungsten arc welding (GTAW)
  - vi) stud welding
  - vii) resistance welding (RW)
  - viii) submerged arc welding (SAW)
  
6. 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
  
7. Identify the types of beads and describe their characteristics and applications.
  - i) stringer
  - ii) weave
  
8. Identify types of welds and describe their characteristics and applications.
  - i) fillet
  - ii) groove
  - iii) surfacing
  - iv) plug or slot
  
9. Identify welding positions and describe their applications.
  - i) flat (1F or 1G)
  - ii) horizontal (2F or 2 G)
  - iii) vertical (3F or 3G)
  - iv) overhead (4F or 4G)
  - v) pipe fixed – horizontal (5F or 5G)
  - vi) pipe fixed – 45 degree plane (6F or 6G)
  
10. Identify welding test positions and describe their characteristics and restrictions.

Practical Objectives

N/A

## **WDF-040            Shielded Metal Arc Welding I – Set up, Strike and Maintain an Arc**

### **Learning Outcomes:**

- Demonstrate knowledge of shielded metal arc welding (SMAW) welding equipment, consumables and accessories.
- Demonstrate knowledge of the procedures used to set up, adjust, operate, inspect and maintain SMAW welding equipment.
- Demonstrate knowledge of the procedures used to deposit a weld bead using SMAW welding equipment.

### **2014 National Occupational Analysis Reference:**

- |       |  |
|-------|--|
| 1.04  | Maintains welding equipment.               |
| 5.04  | Stores welding consumables.                |
| 5.06  | Performs equipment start-up and shut-down. |
| 12.01 | Selects SMAW equipment and consumables.    |
| 12.02 | Sets up SMAW equipment.                    |
| 12.03 | Sets operating parameters for SMAW.        |
| 12.04 | Performs weld with SMAW equipment.         |

### **Suggested Hours:**

6 Hours

### **Objectives and Content:**

#### Theoretical Objectives

1. Define terminology associated with SMAW welding.
2. Identify hazards and describe safe work practices pertaining to SMAW welding.
  - i) personal
  - ii) shop/facility
  - iii) fire and explosion
  - iv) equipment
  - v) ventilation/fumes
  - vi) storage/handling



3. Identify codes and standards pertaining to SMAW welding.
  - i) Canadian Standards Association (CSA)
  - ii) American Society of Mechanical Engineers (ASME)
  - iii) American Welding Society (AWS)
4. Identify SMAW welding equipment, consumables and accessories and describe their applications.
5. Describe the procedures used to set up and adjust SMAW welding equipment.
6. Describe the procedures used to strike and maintain an arc using SMAW welding equipment.
7. Describe the procedures and techniques used to deposit a weld bead using SMAW welding equipment.
  - i) arc length
  - ii) travel speed
  - iii) work and travel angles
8. Describe the procedures used to inspect, maintain and troubleshoot SMAW welding equipment.

Practical Objectives

1. Strike and maintain an arc.

## **WDF-045            Shielded Metal Arc Welding II – Fillet Weld, All Positions**

### **Learning Outcomes:**

- Demonstrate knowledge of the procedures used to prepare base metals and joints for shielded metal arc welding (SMAW) fillet welds.
- Demonstrate knowledge of the procedures used to perform fillet welds on low carbon steel in all positions using the SMAW process.

### **2014 National Occupational Analysis Reference:**

- 5.01            Performs quality inspection.
- 5.03            Controls temperature of weldments.
- 5.04            Stores welding consumables.
- 5.05            Selects welding processes and power source.
- 5.07            Finishes final product.
- 7.01            Prepares materials.
- 12.01           Selects SMAW equipment and consumables.
- 12.02           Sets up SMAW equipment.
- 12.03           Sets operating parameters for SMAW.
- 12.04           Performs weld with SMAW equipment.

### **Suggested Hours:**

18 Hours

### **Objectives and Content:**

#### Theoretical Objectives

1. Define terminology associated with SMAW fillet welds.
2. Interpret information pertaining to SMAW fillet welds found on drawings and specifications.
3. Identify the considerations when selecting consumables and determining equipment set-up for performing SMAW fillet welds in all positions.
  - i) specification requirements

- ii) base metal
    - composition
    - thickness
  - iii) power source
  - iv) welding position
  - v) joint type and design
4. Identify the requirements and describe the procedures to store consumables used for SMAW fillet welds on low carbon steel.
  5. Describe the procedures used to prepare base metals and joints for SMAW fillet welds.
  6. Describe the procedures used to perform fillet welds on low carbon steel in all positions using the SMAW process.
  7. Describe the procedures used to perform visual quality inspection of welds.
  8. Describe the procedures used to prevent and correct weld faults.

Practical Objectives

1. Perform fillet welds on low carbon steel in all positions.

## WDF-050

## Gas Metal Arc Welding I – Set up and Maintain an Arc

### Learning Outcomes:

- Demonstrate knowledge of gas metal arc welding (GMAW) welding equipment, consumables and accessories.
- Demonstrate knowledge of the procedures used to set up, adjust, operate, inspect and maintain GMAW welding equipment.
- Demonstrate knowledge of the procedures used to deposit a weld bead using GMAW welding equipment.

### 2014 National Occupational Analysis Reference:

- 1.04 Maintains welding equipment.
- 5.04 Stores welding consumables.
- 5.06 Performs equipment start-up and shut-down.

### Suggested Hours:

18 Hours

### Objectives and Content:

#### Theoretical Objectives

1. Define terminology associated with GMAW welding.
2. Identify hazards and describe safe work practices pertaining to GMAW welding.
  - i) personal
  - ii) shop/facility
  - iii) fire and explosion
  - iv) equipment
  - v) ventilation/fumes
  - vi) storage, handling and transportation
3. Identify codes and standards pertaining to GMAW welding.
  - i) Canadian Standards Association (CSA)
  - ii) American Society of Mechanical Engineers (ASME)
  - iii) American Welding Society (AWS)

4. Identify GMAW welding equipment, consumables and accessories and describe their applications.
5. Describe the procedures used to assemble and disassemble GMAW welding equipment.
6. Describe the procedures used to establish and maintain an arc using GMAW welding equipment.
7. Identify the modes of transfer relating to GMAW welding and describe their characteristics and applications.
  - i) short circuiting
  - ii) globular
  - iii) spray
  - iv) pulse
8. Describe the procedures and techniques used to deposit a weld bead using GMAW welding equipment.
  - i) electrode extension
  - ii) travel speed
  - iii) work and travel angles
  - iv) flow rates
9. Describe the procedures used to inspect, maintain and troubleshoot GMAW welding equipment.

Practical Objectives

1. Establish and maintain an arc.
2. Assemble and disassemble GMAW equipment.

## WDF-600

## Gas Metal Arc Welding II – Fillet Weld, All Positions

### Learning Outcomes:

- Demonstrate knowledge of the procedures used to prepare base metals and joints for gas metal arc welding (GMAW) fillet welds.
- Demonstrate knowledge of the procedures used to perform fillet welds on low carbon steel plate in all positions using the GMAW process.

### 2014 National Occupational Analysis Reference:

- 5.01 Performs quality inspection.
- 5.03 Controls temperature of weldments.
- 5.04 Stores welding consumables.
- 5.05 Selects welding processes and power source.
- 5.07 Finishes final product.
- 7.01 Prepares materials.
- 13.01 Selects FCAW, MCAW and GMAW gas equipment and consumables.
- 13.02 Sets up FCAW, MCAW and GMAW equipment.
- 13.03 Sets operating parameters for FCAW, MCAW and GMAW.
- 13.04 Performs weld using FCAW, MCAW and GMAW equipment.

### Suggested Hours:

18 Hours

### Objectives and Content:

#### Theoretical Objectives

1. Define terminology associated with GMAW fillet welds.
2. Interpret information pertaining to GMAW fillet welds found on drawings and specifications.
3. Identify the considerations when selecting consumables and determining equipment set-up for performing GMAW fillet welds on low carbon steel in all positions.
  - i) specification requirements

- ii) base metal
    - composition
    - thickness
  - iii) shielding gas selection
  - iv) power source
  - v) welding position
  - vi) joint type and design
4. Identify the requirements and describe the procedures to store consumables used for GMAW fillet welds on low carbon steel plate.
  5. Describe the procedures used to prepare base metals and joints for GMAW fillet welds.
  6. Describe the procedures used to perform fillet welds on low carbon steel plate in all positions using the GMAW process.
  7. Describe the procedures used to perform visual quality inspection of welds.
  8. Describe the procedures used to prevent and correct weld faults.

Practical Objectives

1. Perform fillet welds on low carbon steel plate in all positions.

## **WDF-055            Flux Core Arc Welding I – Set up and Deposit a Weld**

### **Learning Outcomes:**

- Demonstrate knowledge of flux core arc welding (FCAW) welding equipment, consumables and accessories.
- Demonstrate knowledge of the procedures used to set up, adjust, operate, inspect and maintain FCAW welding equipment.
- Demonstrate knowledge of the procedures used to deposit a weld bead using FCAW welding equipment.

### **2014 National Occupational Analysis Reference:**

- 1.04            Maintains welding equipment.
- 5.04            Stores welding consumables.
- 5.06            Performs equipment start-up and shut-down.

### **Suggested Hours:**

6 Hours

### **Objectives and Content:**

#### Theoretical Objectives

1. Define terminology associated with FCAW welding.
2. Identify hazards and describe safe work practices pertaining to FCAW welding.
  - i) personal
  - ii) shop/facility
  - iii) fire and explosion
  - iv) equipment
  - v) ventilation/fumes
  - vi) storage, handling and transportation
3. Identify codes and standards pertaining to FCAW welding.
  - i) Canadian Standards Association (CSA)
  - ii) American Society of Mechanical Engineers (ASME)
  - iii) American Welding Society (AWS)



4. Identify FCAW welding equipment, consumables and accessories and describe their applications.
5. Describe the procedures used to assemble and disassemble FCAW welding equipment.
6. Describe the procedures and techniques used to deposit a weld bead using FCAW welding equipment.
  - i) electrode extension
  - ii) travel speed
  - iii) work and travel angles
  - iv) flow rates
7. Describe the procedures used to inspect, maintain and troubleshoot FCAW welding equipment.

Practical Objectives

1. Establish and maintain an arc.

## WDF-060

## Metal Core Arc Welding I – Set up and Deposit a Weld

### Learning Outcomes:

- Demonstrate knowledge of metal core arc welding (MCAW) welding equipment, consumables and accessories.
- Demonstrate knowledge of the procedures used to set up, adjust, operate, inspect and maintain MCAW welding equipment.
- Demonstrate knowledge of the procedures used to deposit a weld bead using MCAW welding equipment.

### 2014 National Occupational Analysis Reference:

- 1.04 Maintains welding equipment.
- 5.04 Stores welding consumables.
- 5.06 Performs equipment start-up and shut-down.

### Suggested Hours:

6 Hours

### Objectives and Content:

#### Theoretical Objectives

1. Define terminology associated with MCAW welding.
2. Identify hazards and describe safe work practices pertaining to MCAW welding.
  - i) personal
  - ii) shop/facility
  - iii) fire and explosion
  - iv) equipment
  - v) ventilation/fumes
  - vi) storage, handling and transportation
3. Identify codes and standards pertaining to MCAW welding.
  - i) Canadian Standards Association (CSA)
  - ii) American Society of Mechanical Engineers (ASME)
  - iii) American Welding Society (AWS)

4. Identify MCAW welding equipment, consumables and accessories and describe their applications.
5. Describe the procedures used to assemble and disassemble MCAW welding equipment.
6. Describe the procedures and techniques used to deposit a weld bead using MCAW welding equipment.
  - i) electrode extension
  - ii) travel speed
  - iii) work and travel angles
  - iv) flow rates
7. Describe the procedures used to inspect, maintain and troubleshoot MCAW welding equipment.

Practical Objectives

1. Establish and maintain an arc.

## **WDF-635            Groove Welding I - Shielded Metal Arc Welding, Flat and Horizontal**

### **Learning Outcomes:**

- Demonstrate knowledge of the procedures used to prepare base metals and joints for shielded metal arc welding (SMAW) groove welds.
- Demonstrate knowledge of the procedures used to perform groove welds on low carbon steel plate in flat and horizontal positions using the SMAW process.

### **2014 National Occupational Analysis Reference:**

- 5.01            Performs quality inspection.
- 5.03            Controls temperature of weldments.
- 5.04            Stores welding consumables.
- 5.05            Selects welding processes and power source.
- 5.07            Finishes final product.
- 7.01            Prepares materials.
- 12.01           Selects SMAW equipment and consumables.
- 12.02           Sets up SMAW equipment.
- 12.03           Sets operating parameters for SMAW.
- 12.04           Performs weld with SMAW equipment.

### **Suggested Hours:**

18 Hours

### **Objectives and Content:**

#### Theoretical Objectives

1. Define terminology associated with SMAW groove welds.
2. Interpret information pertaining to SMAW groove welds found on drawings and specifications.
3. Identify the considerations when selecting consumables and determining equipment set-up for performing SMAW groove welds on low carbon steel plate.
  - i) specification requirements

- ii) base metal
    - composition
    - thickness
  - iii) power source
  - iv) welding position
  - v) joint type and design
4. Identify the requirements and describe the procedures to store consumables used for SMAW groove welds on low carbon steel plate.
  5. Describe the procedures used to prepare base metals and joints for SMAW groove welds.
  6. Describe the procedures used to perform groove welds on low carbon steel plate in flat and horizontal positions using SMAW process.
  7. Describe the procedures used to perform visual quality inspection of welds.
  8. Describe the procedures used to prevent and correct weld faults.

Practical Objectives

1. Perform groove welds on low carbon steel plate in flat and horizontal positions.

## **WDF-640            Groove Welding II - Gas Metal Arc Welding, Flat and Horizontal**

### **Learning Outcomes:**

- Demonstrate knowledge of the procedures used to prepare base metals and joints for gas metal arc welding (GMAW) groove welds.
- Demonstrate knowledge of the procedures used to perform groove welds on low carbon steel plate in flat and horizontal positions using the GMAW process.

### **2014 National Occupational Analysis Reference:**

- 5.01            Performs quality inspection.
- 5.03            Controls temperature of weldments.
- 5.04            Stores welding consumables.
- 5.05            Selects welding processes and power source.
- 5.07            Finishes final product.
- 7.01            Prepares materials.
- 13.01           Selects FCAW, MCAW and GMAW gas equipment and consumables.
- 13.02           Sets up FCAW, MCAW and GMAW equipment.
- 13.03           Sets operating parameters for FCAW, MCAW and GMAW.
- 13.04           Performs weld using FCAW, MCAW and GMAW equipment.

### **Suggested Hours:**

12 Hours

### **Objectives and Content:**

#### Theoretical Objectives

1. Define terminology associated with GMAW groove welds.
2. Interpret information pertaining to GMAW groove welds found on drawings and specifications.
3. Identify the considerations when selecting consumables and determining equipment set-up for performing GMAW groove welds on low carbon steel plate.

- i) specification requirements
  - ii) base metal
    - composition
    - thickness
  - iii) power source
  - iv) welding position
  - v) joint type and design
4. Identify the requirements and describe the procedures to store consumables used for GMAW groove welds on low carbon steel plate.
  5. Describe the procedures used to prepare base metals and joints for GMAW groove welds.
  6. Describe the procedures used to perform groove welds on low carbon steel plate in all positions using GMAW process.
  7. Describe the procedures used to perform visual quality inspection of welds.
  8. Describe the procedures used to prevent and correct weld faults.

Practical Objectives

1. Perform groove welds on low carbon steel plate in flat and horizontal positions.

## **WDF-605            Oxy-fuel**

### **Learning Outcomes:**

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

### **2014 National Occupational Analysis Reference:**

- 1.03            Maintains thermal cutting equipment.
- 1.04            Maintains welding equipment.
- 5.04            Stores welding consumables.
- 5.06            Performs equipment start-up and shut-down.
- 9.01            Selects OFC gas and equipment.
- 9.02            Sets up OFC equipment.
- 9.03            Sets operating parameters for OFC equipment.
- 9.04            Performs cut and gouge using OFC equipment.

### **Suggested Hours:**

24 Hours

### **Objectives and Content:**

#### Theoretical Objectives

1. Define terminology associated with oxy-fuel cutting, gouging and welding.
2. Identify hazards and describe safe work practices pertaining to oxy-fuel cutting, gouging and welding.
  - 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 regulations pertaining to oxy-fuel cutting, gouging and welding 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
    - v) heating
  5. Identify types of flames and describe their application and the procedures for flame adjustment.
    - i) oxidizing
    - ii) carburizing
    - iii) neutral
  6. Describe the procedures used to set up, adjust and shut down oxy-fuel equipment.
    - i) manufacturers' recommendations
  7. Describe the procedures used to inspect and maintain oxy-fuel equipment.
  8. Describe the procedures used to cut materials using oxy-fuel equipment.
    - i) free hand
    - ii) guided
      - straight edge
      - pattern
    - iii) automated/semi-automated
  9. Identify common cutting faults and describe the procedures to prevent and correct them.
  10. Describe the procedures used to gouge using oxy-fuel equipment.
  11. Describe the procedures used to weld using oxy-fuel equipment.

12. Describe the procedures used to braze/braze-weld using oxy-fuel equipment.

Practical Objectives

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

## **WDF-610            Electric Arc Cutting and Gouging**

### **Learning Outcomes:**

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

### **2014 National Occupational Analysis Reference:**

- 1.03            Maintains thermal cutting equipment.
- 5.06            Performs equipment start-up and shut-down.
- 11.01           Selects CAC-A equipment and consumables.
- 11.02           Sets up CAC-A equipment.
- 11.03           Sets operating parameters for CAC-A equipment.
- 11.04           Performs cut and gouge using CAC-A equipment.

### **Suggested Hours:**

12 Hours

### **Objectives and Content:**

#### Theoretical Objectives

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

3. Describe the electric arc cutting and gouging processes and their applications.
  - i) air-carbon arc
  - ii) metal arc
  - iii) oxy-arc
4. Identify electric arc cutting and gouging equipment and accessories and describe their applications.
5. Describe the procedures used to set up, adjust and shut down electric arc cutting and gouging equipment.
6. Describe the procedures used to inspect and maintain electric arc cutting and gouging equipment.
7. Describe the procedures used to cut using electric arc cutting equipment.
8. Describe the procedures used to gouge using electric arc gouging equipment.

Practical Objectives

1. Perform air-carbon arc gouging.

## **WDF-615            Plasma Arc Cutting and Gouging**

### **Learning Outcomes:**

- Demonstrate knowledge of plasma arc equipment and accessories.
- Demonstrate knowledge of the procedures used to cut with plasma arc equipment.
- Demonstrate knowledge of the procedures used to gouge with plasma arc equipment.

### **2014 National Occupational Analysis Reference:**

- 1.03            Maintains thermal cutting equipment.
- 5.06            Performs equipment start-up and shut-down.
- 10.01           Selects PAC equipment and consumables.
- 10.02           Sets up PAC equipment.
- 10.03           Sets operating parameters for PAC equipment.
- 10.04           Performs cut or gouge using PAC equipment.

### **Suggested Hours:**

6 Hours

### **Objectives and Content:**

#### Theoretical Objectives

1. Define terminology associated with plasma arc cutting and gouging.
2. Identify hazards and describe safe work practices pertaining to plasma arc cutting and gouging.
  - i) personal
  - ii) shop/facility
  - iii) fire and explosion
  - iv) equipment
  - v) ventilation/fumes
3. Describe the plasma arc cutting and gouging process and its applications.

4. Identify plasma arc equipment and accessories and describe their applications.
  - i) cutting
  - ii) gouging
5. Describe the procedures used to set up, adjust and shut down plasma arc equipment.
6. Describe the procedures used to inspect and maintain plasma arc equipment.
7. Describe the procedures used to cut using plasma arc equipment.
8. Describe the procedures used to gouge using plasma arc equipment.

Practical Objectives

1. Perform plasma arc cutting and gouging operations.

## WDF-075 Drawings

### Learning Outcomes:

- Demonstrate knowledge of drawings and their applications.
- Demonstrate knowledge of interpreting and extracting information from drawings.

### 2014 National Occupational Analysis Reference:

4.01 Uses documentation and reference material.

### Suggested Hours:

30 Hours

### Objectives and Content:

#### Theoretical Objectives

1. Define terminology associated with drawings and sketches.
2. Describe metric and imperial systems of measurement and the procedures used to perform conversions.
3. Identify the types of drawings and describe their applications.
  - i) architectural
  - ii) engineering
  - iii) erection
  - iv) assembly
  - v) shop (detail)
4. Identify drawing projections and views and describe their applications.
  - i) projections
    - orthographic (1<sup>st</sup> and 3<sup>rd</sup> angle)
    - oblique
    - isometric
  - ii) views
    - plan

- section
- detail
- elevation

5. Describe the use of scales.
6. Interpret information on drawings.
  - i) welding symbols
  - ii) lines
  - iii) legend
  - iv) other symbols and abbreviations
  - v) notes and specifications
  - vi) schedules
  - vii) scales
7. Describe basic sketching techniques.
8. Describe dimensioning systems, their purpose and applications.
  - i) datum/baseline
  - ii) elevation
  - iii) conventional
  - iv) running
  - v) aligned
  - vi) unidirectional
  - vii) group
9. Describe the procedures used for the care, handling and storage of drawings.

Practical Objectives

1. Interpret basic shop drawings.



## **WDF-070            Fabrication Fundamentals**

### **Learning Outcomes:**

- Demonstrate knowledge of structural components, their characteristics and applications.
- Demonstrate knowledge of joints, their applications and the procedures used to prepare them for welding operations.

### **2014 National Occupational Analysis Reference:**

- 7.01            Prepares materials.
- 7.02            Fits components for welding.
- 7.03            Assembles components.

### **Suggested Hours:**

18 Hours

### **Objectives and Content:**

#### *Theoretical Objectives*

1. Define terminology associated with structural components.
2. Identify hazards and describe safe work practices pertaining to structural components.
3. Interpret codes, regulations and standards pertaining to structural components.
  - i) industry standards
  - ii) codes of practice
  - iii) government regulations
4. Interpret information pertaining to structural components found on drawings and specifications.
5. Identify types of structures and describe their characteristics.

6. Identify structural steel shapes and describe their designations, characteristics and applications.
  - i) sheet
  - ii) plate
  - iii) pipe
  - iv) flat
  - v) bar
  - vi) angle
  - vii) channel
  - viii) beams
  - ix) hollow structural sections
  
7. Identify types of joints and describe their characteristics and applications.
  - i) corner
  - ii) tee
  - iii) lap
  - iv) edge
  - v) butt
  
8. Describe the procedures used to prepare joints on structural steel shapes.
  
9. Describe the procedures used to fabricate using various structural steel shapes.

Practical Objectives

N/A

## **WDF-085            Introduction to Layout and Pattern Development**

### **Learning Outcomes:**

- Demonstrate knowledge of pattern and template development and its purpose.
- Demonstrate knowledge of the procedures used to develop simple templates.

### **2014 National Occupational Analysis Reference:**

- 6.01            Develops templates.
- 6.02            Transfers dimensions from drawings to materials.

### **Suggested Hours:**

15 Hours

### **Objectives and Content:**

#### Theoretical Objectives

1. Define terminology associated with layout and pattern development.
2. Identify tools and equipment relating to layout and pattern development and describe their applications and procedures for use.
3. Explain the purpose of pattern and template development.
4. Identify materials used in pattern and template development and describe their characteristics and applications.
5. Identify the geometric operations used in performing layout and describe their applications.

#### Practical Objectives

1. Develop simple templates.

## **WDF-065            Weld Faults**

### **Learning Outcomes:**

- Demonstrate knowledge of weld faults, their characteristics and effect on welds.

### **2014 National Occupational Analysis Reference:**

5.01            Performs quality inspection.

### **Suggested Hours:**

9 Hours

### **Objectives and Content:**

#### Theoretical Objectives

1. Define terminology associated with weld faults.
2. Interpret standards and documentation relating to welds and weld faults.
3. Identify tools and equipment used to identify weld faults and describe their applications and procedures for use.
4. Identify the classifications of weld faults and describe their characteristics.
  - i) dimensional defects
  - ii) structural discontinuities
  - iii) defective properties (weld metal and base metal)
5. Identify the causes of weld faults and describe their effect on welds.

#### Practical Objectives

N/A

# LEVEL 2

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WLD-110	Metal Core Arc Welding II - Fillet and Groove Weld, All Positions	6	81
WLD-205	Shielded Metal Arc Welding III - Groove Weld Plate, All Positions	42	83
WLD-210	Shielded Metal Arc Welding IV - Fillet and Groove Weld, Medium Carbon Steel	6	85
WLD-215	Gas Metal Arc Welding III - Groove Weld, All Positions	18	87
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WLD-225	Gas Tungsten Arc Welding I - Set up and Maintain an Arc	12	91
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WLD-800	Submerged Arc Welding I	3	97
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WLD-805	Work Planning	6	100

## WDF-620            Quality Assurance/Control I

### Learning Outcomes:

- Demonstrate knowledge of quality control measures used to verify compliance with design and code specifications.

### 2014 National Occupational Analysis Reference:

5.01            Performs quality inspection.

### Suggested Hours:

12 Hours

### Objectives and Content:

#### Theoretical Objectives

1. Explain quality assurance, its purpose and applications.
2. Define terminology associated with quality control.
3. Interpret codes and standards pertaining to quality control.
4. Interpret information pertaining to quality control found on drawings and specifications.
5. Identify tools and equipment relating to quality control and describe their applications and procedures for use.
6. Explain quality control, its purpose and applications.
7. Explain the methods used to identify and verify materials.
  - i) codes, standards and specifications
  - ii) mill certificates
  - iii) colour coding of materials

Practical Objectives

N/A

## WDF-645 Metallurgy II

### Learning Outcomes:

- Demonstrate knowledge of metals and their characteristics.

### 2014 National Occupational Analysis Reference:

N/A

### Suggested Hours:

12 Hours

### Objectives and Content:

#### Theoretical Objectives

1. Define terminology associated with metallurgy.
2. Identify types of metals and describe their characteristics and applications.
  - i) plain carbon steel
  - ii) low alloy steel
  - iii) heat treated steel
  - iv) stainless steel
  - v) duplex stainless steel
  - vi) non-ferrous
3. 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)
4. Describe the effects of hot and cold working of metals.
  - i) stress
  - ii) contraction
  - iii) expansion
  - iv) distortion



- v) work hardening
5. Describe the procedures used to prevent or correct problems that occur when working with metals.

Practical Objectives

N/A

## **WLD-105            Flux Core Arc Welding II – Fillet and Groove Weld Plate, All Positions**

### **Learning Outcomes:**

- Demonstrate knowledge of the procedures used to prepare plate for flux core arc welding (FCAW).
- Demonstrate knowledge of the procedures used to perform welds on plate in all positions using the FCAW process.

### **2014 National Occupational Analysis Reference:**

- 5.01            Performs quality inspection.
- 5.03            Controls temperature of weldments.
- 5.04            Stores welding consumables.
- 5.05            Selects welding processes and power source.
- 5.07            Finishes final product.
- 7.01            Prepares materials.
- 13.01           Selects FCAW, MCAW and GMAW gas equipment and consumables.
- 13.02           Sets up FCAW, MCAW and GMAW equipment.
- 13.03           Sets operating parameters for FCAW, MCAW and GMAW.
- 13.04           Performs weld using FCAW, MCAW and GMAW equipment.

### **Suggested Hours:**

24 Hours

### **Objectives and Content:**

#### Theoretical Objectives

1. Define terminology associated with FCAW fillet and groove welds.
2. Interpret information pertaining to FCAW fillet and groove welds found on drawings and specifications.
3. Identify the considerations when selecting consumables and determining equipment set-up for performing FCAW fillet and groove welds on plate.
  - i) specification requirements

- ii) base metal
    - composition
    - thickness
  - iii) shielding gas selection
  - iv) power source
  - v) welding position
  - vi) joint type and design
4. Identify the requirements and describe the procedures to store consumables used for FCAW welding of plate.
  5. Describe the procedures used to prepare plate for FCAW fillet and groove welds.
  6. Describe the procedures used to perform fillet and groove welds on plate using the FCAW process.
    - i) temperature measuring devices
    - ii) pre-heating
    - iii) interpass temperature
    - iv) post-heating
    - v) stress relieving
  7. Describe the procedures used to perform visual quality inspection of welds.
  8. Describe the procedures used to prevent and correct weld faults.

Practical Objectives

1. Perform welds on plate using the FCAW process.

## **WLD-110            Metal Core Arc Welding II – Fillet and Groove Weld, All Positions**

### **Learning Outcomes:**

- Demonstrate knowledge of the procedures used to prepare base metals for metal core arc welding (MCAW).
- Demonstrate knowledge of the procedures used to perform welds using the MCAW process.

### **2014 National Occupational Analysis Reference:**

- 5.01            Performs quality inspection.
- 5.03            Controls temperature of weldments.
- 5.04            Stores welding consumables.
- 5.05            Selects welding processes and power source.
- 5.07            Finishes final product.
- 7.01            Prepares materials.
- 13.01          Selects FCAW, MCAW and GMAW gas equipment and consumables.
- 13.02          Sets up FCAW, MCAW and GMAW equipment.
- 13.03          Sets operating parameters for FCAW, MCAW and GMAW.
- 13.04          Performs weld using FCAW, MCAW and GMAW equipment.

### **Suggested Hours:**

6 Hours

### **Objectives and Content:**

#### Theoretical Objectives

1. Define terminology associated with MCAW fillet and groove welds.
2. Interpret information pertaining to MCAW fillet and groove welds found on drawings and specifications.
3. Identify the considerations when selecting consumables and determining equipment set-up for performing MCAW fillet and groove welds.
  - i) specification requirements

- ii) base metal
    - composition
    - thickness
  - iii) shielding gas selection
  - iv) power source
  - v) welding position
  - vi) joint type and design
4. Identify requirements and describe the procedures to store consumables used for MCAW welding.
  5. Describe the procedures used to prepare base metals and joints for MCAW fillet and groove welds.
  6. Describe the procedures used to perform fillet and groove welds using the MCAW process.
  7. Describe the procedures used to perform visual quality inspection of welds.
  8. Describe the procedures used to prevent and correct weld faults.

Practical Objectives

N/A

## **WLD-205            Shielded Metal Arc Welding III – Groove Weld Plate, All Positions**

### **Learning Outcomes:**

- Demonstrate knowledge of the procedures used to prepare base metals and joints for shielded metal arc welding (SMAW) groove welds.
- Demonstrate knowledge of the procedures used to perform groove welds on low carbon steel plate in all positions using the SMAW process.

### **2014 National Occupational Analysis Reference:**

- 5.01            Performs quality inspection.
- 5.03            Controls temperature of weldments.
- 5.04            Stores welding consumables.
- 5.05            Selects welding processes and power source.
- 5.07            Finishes final product.
- 7.01            Prepares materials.
- 12.01           Selects SMAW equipment and consumables.
- 12.02           Sets up SMAW equipment.
- 12.03           Sets operating parameters for SMAW.
- 12.04           Performs weld with SMAW equipment.

### **Suggested Hours:**

42 Hours

### **Objectives and Content:**

#### Theoretical Objectives

1. Define terminology associated with SMAW groove welds.
2. Interpret information pertaining to SMAW groove welds found on drawings and specifications.
3. Identify the considerations when selecting consumables and determining equipment set-up for performing SMAW groove welds on low carbon steel plate.
  - i) specification requirements

- ii) base metal
    - composition
    - thickness
  - iii) power source
  - iv) welding position
  - v) joint type and design
4. Identify the requirements and describe the procedures to store consumables used for SMAW groove welds on low carbon steel plate.
  5. Describe the procedures used to prepare base metals and joints for SMAW groove welds.
  6. Describe the procedures used to perform groove welds on low carbon steel plate in all positions using SMAW process.
  7. Describe the procedures used to perform visual quality inspection of welds.
  8. Describe the procedures used to prevent and correct weld faults.

Practical Objectives

1. Perform groove welds on low carbon steel plate in all positions using the SMAW process.

## **WLD-210            Shielded Metal Arc Welding IV – Fillet and Groove Weld, Medium Carbon Steel**

### **Learning Outcomes:**

- Demonstrate knowledge of the procedures used to prepare medium carbon steel plate and joints for shielded metal arc welding (SMAW) fillet and groove welds.
- Demonstrate knowledge of the procedures used to perform fillet and groove welds on medium carbon steel plate in all positions using the SMAW process.

### **2014 National Occupational Analysis Reference:**

- 5.01            Performs quality inspection.
- 5.03            Controls temperature of weldments.
- 5.04            Stores welding consumables.
- 5.05            Selects welding processes and power source.
- 5.07            Finishes final product.
- 7.01            Prepares materials.
- 12.01           Selects SMAW equipment and consumables.
- 12.02           Sets up SMAW equipment.
- 12.03           Sets operating parameters for SMAW.
- 12.04           Performs weld with SMAW equipment.

### **Suggested Hours:**

6 Hours

### **Objectives and Content:**

#### *Theoretical Objectives*

1. Define terminology associated with SMAW fillet and groove welds on medium carbon steel plate.
2. Interpret information pertaining to SMAW fillet and groove welds on medium carbon steel plate found on drawings and specifications.



3. Identify the considerations when selecting consumables and determining equipment set-up for performing SMAW fillet and groove welds on medium carbon steel plate.
  - i) specification requirements
  - ii) base metals
    - composition
    - thickness
  - iii) power source
  - iv) welding position
  - v) joint type and design
4. Identify the requirements and describe the procedures to store consumables used for SMAW fillet and groove welds on medium carbon steel plate.
5. Describe the procedures used to prepare medium carbon steel plate and joints for SMAW fillet and groove welds.
6. Describe the procedures used to perform fillet and groove welds on medium carbon steel plate using SMAW process.
  - i) temperature measuring devices
  - ii) pre-heating
  - iii) interpass temperature
  - iv) post-heating
  - v) stress relieving
7. Describe the procedures used to perform visual quality inspection of welds.
8. Describe the procedures used to prevent and correct weld faults.

Practical Objectives

N/A

## WLD-215 Gas Metal Arc Welding III – Groove Weld, All Positions

### Learning Outcomes:

- Demonstrate knowledge of the procedures used to prepare base metals and joints for gas metal arc welding (GMAW) groove welds.
- Demonstrate knowledge of the procedures used to perform groove welds on low carbon steel plate in all positions using the GMAW process.

### 2014 National Occupational Analysis Reference:

5.01	Performs quality inspection.
5.03	Controls temperature of weldments.
5.04	Stores welding consumables.
5.05	Selects welding processes and power source.
5.07	Finishes final product.
7.01	Prepares materials.
13.01	Selects FCAW, MCAW and GMAW gas equipment and consumables.
13.02	Sets up FCAW, MCAW and GMAW equipment.
13.03	Sets operating parameters for FCAW, MCAW and GMAW.
13.04	Performs weld using FCAW, MCAW and GMAW equipment.

### Suggested Hours:

18 Hours

### Objectives and Content:

#### Theoretical Objectives

1. Define terminology associated with GMAW groove welds.
2. Interpret information pertaining to GMAW groove welds found on drawings and specifications.
3. Identify the considerations when selecting consumables and determining equipment set-up for performing GMAW groove welds on low carbon steel plate in all positions.
  - i) specification requirements

- ii) base metal
    - composition
    - thickness
  - iii) shielding gas selection
  - iv) power source
  - v) welding position
  - vi) joint type and design
4. Identify the requirements and describe the procedures to store consumables used for GMAW groove welds on low carbon steel plate.
  5. Describe the procedures used to prepare base metal and joints for GMAW groove welds.
  6. Describe the procedures used to perform groove welds on low carbon steel plate in all positions using GMAW process.
  7. Describe the procedures used to perform visual quality inspection of welds.
  8. Describe the procedures used to prevent and correct weld faults.

Practical Objectives

1. Perform groove welds on low carbon steel plate in all positions using the GMAW process.

## **WLD-220            Gas Metal Arc Welding IV – Fillet and Groove Weld, Medium Carbon Steel**

### **Learning Outcomes:**

- Demonstrate knowledge of the procedures used to prepare medium carbon steel base metals and joints for gas metal arc welding (GMAW) fillet and groove welds.
- Demonstrate knowledge of the procedures used to perform fillet and groove welds on medium carbon steel in all positions using the GMAW process.

### **2014 National Occupational Analysis Reference:**

- 5.01            Performs quality inspection.
- 5.03            Controls temperature of weldments.
- 5.04            Stores welding consumables.
- 5.05            Selects welding processes and power source.
- 5.07            Finishes final product.
- 7.01            Prepares materials.
- 13.01          Selects FCAW, MCAW and GMAW gas equipment and consumables.
- 13.02          Sets up FCAW, MCAW and GMAW equipment.
- 13.03          Sets operating parameters for FCAW, MCAW and GMAW.
- 13.04          Performs weld using FCAW, MCAW and GMAW equipment.

### **Suggested Hours:**

3 Hours

### **Objectives and Content:**

#### Theoretical Objectives

1. Define terminology associated with GMAW fillet and groove welds on medium carbon steel.
2. Interpret information pertaining to GMAW fillet and groove welds on medium carbon steel found on drawings and specifications.

3. Identify the considerations when selecting consumables and determining equipment set-up for performing GMAW fillet and groove welds on medium carbon steel.
  - i) specification requirements
    - base metals
      - composition
      - thickness
  - ii) shielding gas selection
  - iii) power source
  - iv) welding position
  - v) joint type and design
4. Identify the requirements and describe the procedures to store consumables used for GMAW fillet and groove welds on medium carbon steel.
5. Describe the procedures used to prepare medium carbon steel base metals and joints for GMAW fillet and groove welds.
6. Describe the procedures used to perform GMAW fillet and groove welds on medium carbon steel.
  - i) temperature measuring devices
  - ii) pre-heating
  - iii) interpass temperature
  - iv) post-heating
  - v) stress relieving
7. Describe the procedures used to perform visual quality inspection of welds.
8. Describe the procedures used to prevent and correct weld faults.

Practical Objectives

N/A

## **WLD-225            Gas Tungsten Arc Welding I – Set up and Maintain an Arc**

### **Learning Outcomes:**

- Demonstrate knowledge of gas tungsten arc welding (GTAW) equipment, consumables and accessories.
- Demonstrate knowledge of the procedures used to set up, adjust, operate, inspect and maintain GTAW welding equipment.
- Demonstrate knowledge of the procedures used to deposit a weld bead using GTAW equipment.

### **2014 National Occupational Analysis Reference:**

- 1.04            Maintains welding equipment.
- 5.04            Stores welding consumables.
- 5.06            Performs equipment start-up and shut-down.

### **Suggested Hours:**

12 Hours

### **Objectives and Content:**

#### Theoretical Objectives

1. Define terminology associated with GTAW welding.
2. Identify hazards and describe safe work practices pertaining to GTAW welding.
  - i) personal
  - ii) shop/facility
  - iii) fire and explosion
  - iv) equipment
  - v) ventilation/fumes
  - vi) storage, handling and transportation
3. Identify codes and standards pertaining to GTAW welding.
  - i) Canadian Standards Association (CSA)
  - ii) American Society of Mechanical Engineers (ASME)

- iii) American Welding Society (AWS)
- 4. Identify GTAW welding equipment, consumables and accessories and describe their applications.
- 5. Describe the procedures used to assemble and disassemble GTAW welding equipment.
- 6. Describe the procedures used to establish and maintain an arc using GTAW welding equipment.
- 7. Describe the procedures and techniques used to deposit a weld bead using GTAW welding equipment.
  - i) with filler metal
  - ii) without filler metal
- 8. Describe the procedures used to inspect, maintain and troubleshoot GTAW welding equipment.

Practical Objectives

- 1. Establish and maintain an arc.

## **WLD-230            Gas Tungsten Arc Welding II – Fillet Weld, All Positions**

### **Learning Outcomes:**

- Demonstrate knowledge of the procedures used to prepare base metals and joints for gas tungsten arc welding (GTAW) fillet welds.
- Demonstrate knowledge of the procedures used to perform fillet welds on low carbon steel sheet and plate in all positions using the GTAW process.

### **2014 National Occupational Analysis Reference:**

- 5.01            Performs quality inspection.
- 5.03            Controls temperature of weldments.
- 5.04            Stores welding consumables.
- 5.05            Selects welding processes and power source.
- 5.07            Finishes final product.
- 7.01            Prepares materials.
- 14.01           Selects GTAW gas, equipment and consumables.
- 14.02           Sets up GTAW equipment.
- 14.03           Sets operating parameters for GTAW.
- 14.04           Performs weld using GTAW equipment.

### **Suggested Hours:**

30 Hours

### **Objectives and Content:**

#### Theoretical Objectives

1. Define terminology associated with GTAW fillet welds.
2. Interpret information pertaining to GTAW fillet welds found on drawings and specifications.
3. Identify the considerations when selecting consumables and determining equipment set-up for performing GTAW fillet welds in all positions.
  - i) specification requirements



- ii) base metals
    - composition
    - thickness
  - iii) shielding gas selection
  - iv) power source
  - v) welding position
  - vi) joint type and design
4. Identify the requirements and describe the procedures to store consumables used for GTAW fillet welds on low carbon steel sheet and plate.
  5. Describe the procedures used to prepare base metals and joints for GTAW fillet welds.
  6. Describe the procedures used to perform fillet welds on low carbon steel sheet and plate in all positions using the GTAW process.
  7. Describe the procedures used to perform visual quality inspection of welds.
  8. Describe the procedures used to prevent and correct weld faults.

Practical Objectives

1. Perform fillet welds on low carbon steel sheet and plate in all positions using the GTAW process.

## **WLD-235            Gas Tungsten Arc Welding III – Groove Weld, All Positions**

### **Learning Outcomes:**

- Demonstrate knowledge of the procedures used to prepare base metals and joints for gas tungsten arc welding (GTAW) groove welds.
- Demonstrate knowledge of the procedures used to perform groove welds on low carbon steel sheet and plate in all positions using the GTAW process.

### **2014 National Occupational Analysis Reference:**

- 5.01            Performs quality inspection.
- 5.03            Controls temperature of weldments.
- 5.04            Stores welding consumables.
- 5.05            Selects welding processes and power source.
- 5.07            Finishes final product.
- 7.01            Prepares materials.
- 14.01           Selects GTAW gas, equipment and consumables.
- 14.02           Sets up GTAW equipment.
- 14.03           Sets operating parameters for GTAW.
- 14.04           Performs weld using GTAW equipment.

### **Suggested Hours:**

30 Hours

### **Objectives and Content:**

#### Theoretical Objectives

1. Define terminology associated with GTAW groove welds.
2. Interpret information pertaining to GTAW groove welds found on drawings and specifications.
3. Identify the considerations when selecting consumables and determining equipment set-up for performing GTAW groove welds in all positions.
  - i) specification requirements

- ii) base metal
    - composition
    - thickness
  - iii) shielding gas selection
  - iv) power source
  - v) welding position
  - vi) joint type and design
4. Identify the requirements and describe the procedures to store consumables used for GTAW groove welds on low carbon steel sheet and plate.
  5. Describe the procedures used to prepare base metals and joints for GTAW groove welds.
  6. Describe the procedures used to perform groove welds on low carbon steel sheet and plate in all positions using GTAW process.
  7. Describe the procedures used to perform visual quality inspection of welds.
  8. Describe the procedures used to prevent and correct weld faults.

Practical Objectives

1. Perform groove welds on low carbon steel sheet and plate in all positions using the GTAW process.

## WLD-800            Submerged Arc Welding I

### Learning Outcomes:

- Demonstrate knowledge of submerged arc welding (SAW) equipment, consumables and accessories.
- Demonstrate knowledge of the procedures used to set up, adjust, operate, inspect and maintain SAW welding equipment.
- Demonstrate knowledge of the procedures used to deposit a weld bead using SAW welding equipment.

### 2014 National Occupational Analysis Reference:

- 1.04            Maintains welding equipment.
- 5.04            Stores welding consumables.
- 5.06            Performs equipment start-up and shut-down.
- 15.01           Selects SAW equipment and consumables.
- 15.02           Sets up SAW equipment.
- 15.03           Sets operating parameters for SAW.
- 15.04           Performs weld using SAW equipment.

### Suggested Hours:

3 Hours

### Objectives and Content:

#### Theoretical Objectives

1. Define terminology associated with SAW welding.
2. Identify hazards and describe safe work practices pertaining to SAW welding.
3. Identify codes and standards pertaining to SAW welding.
  - i) Canadian Standards Association (CSA)
  - ii) American Society of Mechanical Engineers (ASME)
  - iii) American Welding Society (AWS)

4. Identify SAW welding equipment, consumables and accessories and describe their applications.
5. Identify the considerations and describe the procedures to store consumables used for SAW welding equipment.
6. Describe the procedures used to set up and adjust SAW welding equipment.
7. Describe the procedures used to inspect and maintain SAW welding equipment.
8. Describe the procedures and techniques used to deposit a weld bead using SAW welding equipment.
  - i) arc starting methods
  - ii) electrode extension
  - iii) deposition rates
  - iv) travel speeds
  - v) penetration

Practical Objectives

N/A

## WLD-300          Jigs and Fixtures

### Learning Outcomes:

- Demonstrate knowledge of basic jigs and fixtures and their applications.

### 2014 National Occupational Analysis Reference:

6.01	Develops templates.
6.02	Transfers dimensions from drawings to materials.
7.01	Prepares materials.
7.02	Fits components for welding.
7.03	Assembles components.

### Suggested Hours:

6 Hours

### Objectives and Content:

#### Theoretical Objectives

1. Define terminology associated with jigs and fixtures.
2. Identify hazards and describe safe work practices pertaining to jigs and fixtures.
3. Interpret information found on drawings to fabricate basic jigs and fixtures.
4. Explain the purpose, applications and limitations of basic jigs and fixtures.
5. Identify types of basic jigs and fixtures and describe their characteristics and applications.
6. Describe the procedures used to fabricate basic jigs and fixtures.

#### Practical Objectives

N/A

## **WLD-805            Work Planning**

### **Learning Outcomes:**

- Demonstrate knowledge of the procedures used to plan and organize work tasks.

### **2014 National Occupational Analysis Reference:**

- 4.01            Uses documentation and reference material.
- 4.02            Plans job tasks.
- 4.03            Organizes materials.

### **Suggested Hours:**

6 Hours

### **Objectives and Content:**

#### Theoretical Objectives

1.     Identify sources of information relevant to work task planning.
  - i)     supervisor
  - ii)    documentation
  - iii)   drawings
  - iv)    related professionals
  - v)     suppliers
  - vi)    clients
  
2.     Identify the considerations when planning work tasks.
  - i)     scheduling
  - ii)    sequence
  - iii)   material selection and handling
  - iv)    equipment selection
  
3.     Describe the procedures used to organize, move and store tools, equipment, materials and supplies.

Practical Objectives

N/A



## LEVEL 3

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## **WDF-650 Metallurgy III**

### **Learning Outcomes:**

- Demonstrate knowledge of material testing procedures.

### **2014 National Occupational Analysis Reference:**

N/A

### **Suggested Hours:**

12 Hours

### **Objectives and Content:**

#### Theoretical Objectives

1. Define terminology associated with metallurgy.
2. Describe the processes used in the heat treatment of metals.
  - i) stress relieving
  - ii) quenching
  - iii) hardening
  - iv) tempering
  - v) annealing
  - vi) normalizing
3. Describe forging and casting processes.
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
- v) Izod impact

Practical Objectives

N/A

**Learning Outcomes:**

- Demonstrate knowledge of inspection and testing methods and their applications.

**2014 National Occupational Analysis Reference:**

- 5.01 Performs quality inspection.
- 5.02 Marks welds, materials and parts.

**Suggested Hours:**

6 Hours

**Objectives and Content:***Theoretical Objectives*

1. Define terminology associated with quality assurance/control.
2. Interpret codes and standards pertaining to quality control.
3. Interpret information pertaining to quality control found on drawings and specifications.
4. Identify tools and equipment relating to quality control and describe their applications and procedures for use.
5. Identify methods of inspection and testing and describe their characteristics, limitations and applications.
  - i) destructive
  - ii) non-destructive
6. Describe the procedures used to verify compliance with design and code specifications.
  - i) perform visual inspections
  - ii) verify measurements

- iii) perform post welding checks
- iv) mark materials and parts
- v) verify layout

7. Describe the procedures used to document quality control measures.

Practical Objectives

N/A

## **WLD-305            Shielded Metal Arc Welding V – Pipe and Tubing, All Positions**

### **Learning Outcomes:**

- Demonstrate knowledge of the procedures used to prepare pipe and tubing for shielded metal arc welding (SMAW) welds.
- Demonstrate knowledge of the procedures used to weld pipe and tubing in all positions using the SMAW process.

### **2014 National Occupational Analysis Reference:**

- 5.01            Performs quality inspection.
- 5.03            Controls temperature of weldments.
- 5.04            Stores welding consumables.
- 5.05            Selects welding processes and power source.
- 5.07            Finishes final product.
- 7.01            Prepares materials.
- 12.01           Selects SMAW equipment and consumables.
- 12.02           Sets up SMAW equipment.
- 12.03           Sets operating parameters for SMAW.
- 12.04           Performs weld with SMAW equipment.

### **Suggested Hours:**

33 Hours

### **Objectives and Content:**

#### Theoretical Objectives

1. Define terminology associated with SMAW welds on pipe and tubing.
2. Interpret information pertaining to SMAW welds on pipe and tubing found on drawings and specifications.
3. Identify the considerations when selecting consumables and determining equipment set-up for performing SMAW welds on pipe and tubing in all positions.

- i) specification requirements
  - ii) base metal
    - composition
    - thickness
  - iii) power source
  - iv) welding position
  - v) joint type and design
4. Identify the requirements and describe the procedures to store consumables used for SMAW welds on pipe and tubing.
  5. Describe the procedures used to prepare pipe and tubing base metals and joints for SMAW welds.
  6. Describe the procedures used to perform welds on pipe and tubing in all positions using SMAW process.
  7. Describe the procedures used to perform visual quality inspection of welds.
  8. Describe the procedures used to prevent and correct weld faults.

Practical Objectives

1. Perform SMAW welds on pipe and tubing in all positions.

## **WLD-310            Gas Metal Arc Welding V – Pipe and Tubing, All Positions**

### **Learning Outcomes:**

- Demonstrate knowledge of the procedures used to prepare pipe and tubing for gas metal arc welding (GMAW) welds.
- Demonstrate knowledge of the procedures used to weld pipe and tubing in all positions using the GMAW process.

### **2014 National Occupational Analysis Reference:**

- 5.01            Performs quality inspection.
- 5.03            Controls temperature of weldments.
- 5.04            Stores welding consumables.
- 5.05            Selects welding processes and power source.
- 5.07            Finishes final product.
- 7.01            Prepares materials.
- 13.01          Selects FCAW, MCAW and GMAW gas equipment and consumables.
- 13.02          Sets up FCAW, MCAW and GMAW equipment.
- 13.03          Sets operating parameters for FCAW, MCAW and GMAW.
- 13.04          Performs weld using FCAW, MCAW and GMAW equipment.

### **Suggested Hours:**

18 Hours

### **Objectives and Content:**

#### Theoretical Objectives

1. Define terminology associated with GMAW welds on pipe and tubing.
2. Interpret information pertaining to GMAW welds on pipe and tubing found on drawings and specifications.
3. Identify the considerations when selecting consumables and determining equipment set-up for performing GMAW welds on pipe and tubing in all positions.



- i) specification requirements
  - ii) base metals
    - composition
    - thickness
  - iii) shielding gas selection
  - iv) power source
  - v) welding position
  - vi) joint type and design
4. Identify the requirements and describe the procedures to store consumables used for GMAW welds on pipe and tubing.
  5. Describe the procedures used to prepare pipe and tubing base metals and joints for GMAW welds.
  6. Describe the procedures used to perform welds on pipe and tubing in all positions using GMAW process.
  7. Describe the procedures used to perform visual quality inspection of welds.
  8. Describe the procedures used to prevent and correct weld faults.

Practical Objectives

1. Perform GMAW welds on pipe and tubing.

## **WLD-315            Flux Core Arc Welding III – Pipe and Tubing, All Positions**

### **Learning Outcomes:**

- Demonstrate knowledge of the procedures used to prepare pipe and tubing for flux core arc welding (FCAW) welds.
- Demonstrate knowledge of the procedures used to weld pipe and tubing in all positions using the FCAW process.

### **2014 National Occupational Analysis Reference:**

- 5.01            Performs quality inspection.
- 5.03            Controls temperature of weldments.
- 5.04            Stores welding consumables.
- 5.05            Selects welding processes and power source.
- 5.07            Finishes final product.
- 7.01            Prepares materials.
- 13.01           Selects FCAW, MCAW and GMAW gas equipment and consumables.
- 13.02           Sets up FCAW, MCAW and GMAW equipment.
- 13.03           Sets operating parameters for FCAW, MCAW and GMAW.
- 13.04           Performs weld using FCAW, MCAW and GMAW equipment.

### **Suggested Hours:**

15 Hours

### **Objectives and Content:**

#### Theoretical Objectives

1. Define terminology associated with FCAW welds on pipe and tubing.
2. Interpret information pertaining to FCAW welds on pipe and tubing found on drawings and specifications.
3. Identify the considerations when selecting consumables and determining equipment set-up for performing FCAW welds on pipe and tubing in all positions.

- i) specification requirements
  - ii) base metal
    - composition
    - thickness
  - iii) shielding gas selection
  - iv) power source
  - v) welding position
  - vi) joint type and design
4. Identify the requirements and describe the procedures to store consumables used for FCAW welds on pipe and tubing.
  5. Describe the procedures used to prepare pipe and tubing base metals and joints for FCAW welds.
  6. Describe the procedures used to perform welds on pipe and tubing in all positions using the FCAW process.
  7. Describe the procedures used to perform visual quality inspection of welds.
  8. Describe the procedures used to prevent and correct weld faults.

Practical Objectives

1. Perform FCAW welds on pipe and tubing.

## **WLD-320            Gas Tungsten Arc Welding V – Pipe and Tubing, All Positions**

### **Learning Outcomes:**

- Demonstrate knowledge of the procedures used to prepare pipe and tubing for gas tungsten arc welding (GTAW) welds.
- Demonstrate knowledge of the procedures used to perform welds on pipe and tubing in all positions using the GTAW process.

### **2014 National Occupational Analysis Reference:**

- 5.01            Performs quality inspection.
- 5.03            Controls temperature of weldments.
- 5.04            Stores welding consumables.
- 5.05            Selects welding processes and power source.
- 5.07            Finishes final product.
- 7.01            Prepares materials.
- 14.01           Selects GTAW gas, equipment and consumables.
- 14.02           Sets up GTAW equipment.
- 14.03           Sets operating parameters for GTAW.
- 14.04           Performs weld using GTAW equipment.

### **Suggested Hours:**

30 Hours

### **Objectives and Content:**

#### Theoretical Objectives

1. Define terminology associated with GTAW welds on pipe and tubing.
2. Interpret information pertaining to GTAW welds on pipe and tubing found on drawings and specifications.
3. Identify the considerations when selecting consumables and determining equipment set-up for performing GTAW welds on pipe and tubing.
  - i) specification requirements

- ii) base metal
    - composition
    - thickness
  - iii) shielding gas selection
  - iv) insert selection
  - v) power source
  - vi) welding position
  - vii) joint type and design
4. Identify the requirements and describe the procedures to store consumables used for GTAW welds on pipe and tubing.
  5. Describe the procedures used to prepare pipe and tubing base metals and joints for GTAW welds.
  6. Describe the procedures used to perform welds on pipe and tubing in all positions using GTAW process.
  7. Describe the procedures used to perform visual quality inspection of welds.
  8. Describe the procedures used to prevent and correct weld faults.

Practical Objectives

1. Perform GTAW welds on pipe and tubing.

## WLD-325

## Shielded Metal Arc Welding VI – Alloy Steels

### Learning Outcomes:

- Demonstrate knowledge of the procedures used to prepare alloy steel base metals and joints for shielded metal arc welding (SMAW).
- Demonstrate knowledge of the procedures used to weld alloy steels in all positions using the SMAW process.

### 2014 National Occupational Analysis Reference:

5.01	Performs quality inspection.
5.03	Controls temperature of weldments.
5.04	Stores welding consumables.
5.05	Selects welding processes and power source.
5.07	Finishes final product.
7.01	Prepares materials.
12.01	Selects SMAW equipment and consumables.
12.02	Sets up SMAW equipment.
12.03	Sets operating parameters for SMAW.
12.04	Performs weld with SMAW equipment.

### Suggested Hours:

6 Hours

### Objectives and Content:

#### Theoretical Objectives

1. Define terminology associated with SMAW welds on alloy steels.
2. Interpret information pertaining to SMAW welds on alloy steels found on drawings and specifications.
3. Identify types of alloy steels and describe their characteristics and applications.
4. Identify the considerations when selecting consumables and determining equipment set-up for performing SMAW welds on alloy steels in all positions.

- i) specification requirements
  - ii) base metal
    - composition
    - carbon equivalents
    - thickness
  - iii) power source
  - iv) welding position
  - v) joint type and design
5. Identify the requirements and describe the procedures to store consumables used for SMAW welds on alloy steels.
6. Describe the procedures used to prepare alloy steel base metals and joints for SMAW welds.
7. Describe the procedures used to perform welds on alloy steels in all positions using the SMAW process.
8. Describe the procedures used to perform visual quality inspection of welds.
9. Describe the procedures used to prevent and correct weld faults.

Practical Objectives

N/A

**Learning Outcomes:**

- Demonstrate knowledge of the procedures used to prepare aluminum alloy base metals and joints for gas metal arc welding (GMAW) welds.
- Demonstrate knowledge of the procedures used to weld aluminum alloys in all positions using the GMAW process.

**2014 National Occupational Analysis Reference:**

5.01	Performs quality inspection.
5.03	Controls temperature of weldments.
5.04	Stores welding consumables.
5.05	Selects welding processes and power source.
5.07	Finishes final product.
7.01	Prepares materials.
13.01	Selects FCAW, MCAW and GMAW gas equipment and consumables.
13.02	Sets up FCAW, MCAW and GMAW equipment.
13.03	Sets operating parameters for FCAW, MCAW and GMAW.
13.04	Performs weld using FCAW, MCAW and GMAW equipment.

**Suggested Hours:**

12 Hours

**Objectives and Content:***Theoretical Objectives*

1. Define terminology associated with GMAW welds on aluminum alloys.
2. Interpret information pertaining to GMAW welds on aluminum alloys found on drawings and specifications.
3. Identify types of aluminum alloys and describe their characteristics and applications.



4. Identify the considerations when selecting consumables and determining equipment set-up for performing GMAW welds on aluminum alloys in all positions.
  - i) specification requirements
  - ii) base metal
    - composition
    - thickness
  - iii) shielding gas selection
  - iv) power source
    - push/pull
    - spool gun
  - v) welding position
  - vi) joint type and design
5. Identify the requirements and describe the procedures to store consumables used for GMAW welds on aluminum alloys.
6. Describe the procedures used to prepare aluminum base metals and joints for GMAW welds.
7. Describe the procedures used to perform welds on aluminum alloys in all positions using the GMAW process.
8. Describe the procedures used to perform visual quality inspection of welds.
9. Describe the procedures used to prevent and correct weld faults.

Practical Objectives

1. Establish and maintain an arc.

## WLD-335

## Gas Metal Arc Welding VII – Stainless Steel Alloys

### Learning Outcomes:

- Demonstrate knowledge of the procedures used to prepare stainless steel alloys base metals and joints for gas metal arc welding (GMAW) welds.
- Demonstrate knowledge of the procedures used to weld stainless steel alloys in all positions using the GMAW process.

### 2014 National Occupational Analysis Reference:

- 5.01 Performs quality inspection.
- 5.03 Controls temperature of weldments.
- 5.04 Stores welding consumables.
- 5.05 Selects welding processes and power source.
- 5.07 Finishes final product.
- 7.01 Prepares materials.
- 13.01 Selects FCAW, MCAW and GMAW gas equipment and consumables.
- 13.02 Sets up FCAW, MCAW and GMAW equipment.
- 13.03 Sets operating parameters for FCAW, MCAW and GMAW.
- 13.04 Performs weld using FCAW, MCAW and GMAW equipment.

### Suggested Hours:

6 Hours

### Objectives and Content:

#### Theoretical Objectives

1. Define terminology associated with GMAW welds on stainless steel alloys.
2. Interpret information pertaining to GMAW welds on stainless steel alloys found on drawings and specifications.
3. Identify types of stainless steel alloys and describe their characteristics and applications.

- 4 Identify the considerations when selecting consumables and determining equipment set-up for performing GMAW welds on stainless steel alloys in all positions.
  - i) specification requirements
  - ii) base metal
    - composition
    - thickness
  - iii) shielding gas selection
  - iv) power source
  - v) welding position
  - vi) joint type and design
5. Identify the requirements and describe the procedures to store consumables used for GMAW welds on stainless steel alloys.
6. Describe the procedures used to prepare stainless steel base metals and joints for GMAW welds.
7. Describe the procedures used to perform welds on stainless steel alloys in all positions using the GMAW process.
8. Describe the procedures used to perform visual quality inspection of welds.
9. Describe the procedures used to prevent and correct weld faults.

Practical Objectives

N/A

**WLD-340**

**Gas Tungsten Arc Welding IV – Fillet and Groove  
Weld, Medium Carbon Steel**

**Learning Outcomes:**

- Demonstrate knowledge of the procedures used to prepare medium and high carbon steel base metals and joints for gas tungsten arc welding (GTAW) fillet and groove welds.
- Demonstrate knowledge of the procedures used to perform fillet and groove welds on medium carbon steel in all positions using the GTAW process.

**2014 National Occupational Analysis Reference:**

- 5.01 Performs quality inspection.
- 5.03 Controls temperature of weldments.
- 5.04 Stores welding consumables.
- 5.05 Selects welding processes and power source.
- 5.07 Finishes final product.
- 7.01 Prepares materials.
- 14.01 Selects GTAW gas, equipment and consumables.
- 14.02 Sets up GTAW equipment.
- 14.03 Sets operating parameters for GTAW.
- 14.04 Performs weld using GTAW equipment.

**Suggested Hours:**

6 Hours

**Objectives and Content:**

Theoretical Objectives

1. Define terminology associated with GTAW welds on medium carbon steel.
2. Interpret information pertaining to GTAW welds on medium carbon steel found on drawings and specifications.

3. Identify the considerations when selecting consumables and determining equipment set-up for performing GTAW welds on medium carbon steel in all positions.
  - i) specification requirements
  - ii) base metal
    - composition
    - thickness
  - iii) shielding gas selection
  - iv) power source
  - v) welding position
  - vi) joint type and design
4. Identify the requirements and describe the procedures to store consumables used for GTAW welds on medium carbon steel.
5. Describe the procedures used to prepare medium carbon steel base metals and joints for GTAW welds.
6. Describe the procedures used to perform welds on medium carbon steel using GTAW process.
  - i) temperature measuring devices
  - ii) pre-heating
  - iii) interpass temperature
  - iv) post-heating
  - v) stress relieving
7. Describe the procedures used to perform visual quality inspection of welds.
8. Describe the procedures used to prevent and correct weld faults.

Practical Objectives

N/A

## **WLD-345            Gas Tungsten Arc Welding VI – Ferrous and Non-Ferrous Alloys**

### **Learning Outcomes:**

- Demonstrate knowledge of the procedures used to prepare ferrous and non-ferrous alloys and joints for gas tungsten arc welding (GTAW) welds.
- Demonstrate knowledge of the procedures used to perform welds on ferrous and non ferrous alloys in all positions using the GTAW process.

### **2014 National Occupational Analysis Reference:**

- 5.01            Performs quality inspection.
- 5.03            Controls temperature of weldments.
- 5.04            Stores welding consumables.
- 5.05            Selects welding processes and power source.
- 5.07            Finishes final product.
- 7.01            Prepares materials.
- 14.01           Selects GTAW gas, equipment and consumables.
- 14.02           Sets up GTAW equipment.
- 14.03           Sets operating parameters for GTAW.
- 14.04           Performs weld using GTAW equipment.

### **Suggested Hours:**

30 Hours

### **Objectives and Content:**

#### Theoretical Objectives

1. Define terminology associated with GTAW welds on ferrous and non ferrous alloys.
2. Interpret information pertaining to GTAW welds on ferrous and non ferrous alloys found on drawings and specifications.
3. Identify types of ferrous and non ferrous alloys and describe their characteristics and applications.

4. Identify the considerations when selecting consumables and determining equipment set-up for performing GTAW welds on ferrous and non ferrous alloys in all positions.
  - i) specification requirements
  - ii) base metal
    - composition
    - thickness
  - iii) shielding gas selection
    - trailing gas
  - iv) back purging
  - v) power source
  - vi) welding position
  - vii) joint type and design
5. Identify the requirements and describe the procedures to store consumables used for GTAW welds on ferrous and non ferrous alloys.
6. Describe the procedures used to prepare ferrous and non ferrous alloys and joints for GTAW welds.
7. Describe the procedures used to perform welds on ferrous and non ferrous alloys in all positions using the GTAW process.
8. Describe the procedures used to perform visual quality inspection of welds.
9. Describe the procedures used to prevent and correct weld faults.

Practical Objectives

1. Perform fillet welds on stainless and aluminum using the GTAW process.

## WLD-810            Submerged Arc Welding II

### Learning Outcomes:

- Demonstrate knowledge of the procedures used to prepare base metals for submerged arc welding (SAW).
- Demonstrate knowledge of the procedures used to weld using the SAW process.

### 2014 National Occupational Analysis Reference:

- 5.01            Performs quality inspection.
- 5.03            Controls temperature of weldments.
- 5.04            Stores welding consumables.
- 5.05            Selects welding processes and power source.
- 5.07            Finishes final product.
- 7.01            Prepares materials.
- 15.01           Selects SAW equipment and consumables.
- 15.02           Sets up SAW equipment.
- 15.03           Sets operating parameters for SAW.
- 15.04           Performs weld using SAW equipment.

### Suggested Hours:

3 Hours

### Objectives and Content:

#### Theoretical Objectives

1. Define terminology associated with SAW welding.
2. Interpret information pertaining to SAW welding found on drawings and specifications.
3. Identify the considerations when selecting consumables and determining equipment set-up for SAW welding.
  - i) specification requirements
  - ii) base metal
    - properties



- thickness
  - iii) flux types
  - iv) filler metal types
  - v) welding position
  - vi) joint type and design
4. Describe the procedures used to prepare base metals and joints for SAW welding.
  5. Describe the procedures used to weld using the SAW process.
  6. Describe the procedures used to perform visual quality inspection of welds.
  7. Describe the procedures used to prevent and correct weld faults.

Practical Objectives

N/A

## **WLD-365            Build up of Metal Parts**

### **Learning Outcomes:**

- Demonstrate knowledge of the procedures used to build up metal parts.
- Demonstrate knowledge of the procedures used to surface base metals.

### **2014 National Occupational Analysis Reference:**

N/A

### **Suggested Hours:**

3 Hours

### **Objectives and Content:**

#### *Theoretical Objectives*

1. Define terminology associated with build up and surfacing of metal parts.
2. Identify hazards and describe safe work practices pertaining to build up and surfacing metal parts.
3. Interpret codes and standards pertaining to build up and surfacing of metal parts.
  - i) Canadian Standards Association (CSA)
  - ii) American Society of Mechanical Engineers (ASME)
  - iii) American Welding Society (AWS)
4. Interpret information pertaining to build up and surfacing of metal parts found on drawings and specifications.
5. Identify tools and equipment relating to building up and surfacing of metal parts and describe their applications.
6. Explain the purpose and applications of building up and surfacing of metal parts.

7. Identify the processes used to build up and surface metal parts and describe the considerations used to select them.
  - i) shielded metal arc welding (SMAW)
  - ii) gas metal arc welding (GMAW)
  - iii) flux core arc welding (FCAW)
  - iv) metal core arc welding (MCAW)
  - v) gas tungsten arc welding (GTAW)
  - vi) submerged arc welding (SAW)
  - vii) oxy-fuel gas welding (OFW)
  
8. Identify types of wear requiring hard surfacing.
  - i) abrasion
  - ii) impact
  - iii) corrosion
  - iv) erosion
  
9. Describe the procedures used to build up and surface metal parts using welding processes.
  - i) identify base metal
  - ii) identify effects of heating and cooling
  - iii) identify effects of dilution
  - iv) select process
  - v) select filler material
  - vi) determine sequence

Practical Objectives

N/A

**Learning Outcomes:**

- Demonstrate knowledge of the National Occupational Analysis and its relationship to the Interprovincial Examination.
- Demonstrate knowledge of overall comprehension of the trade in preparation for the Interprovincial Examination.

**2014 National Occupational Analysis Reference:**

Entire National Occupational Analysis (NOA)

**Suggested Hours:**

30 Hours

**Objectives and Content:***Theoretical Objectives*

1. Define terminology associated with an NOA.
  - i) blocks
  - ii) tasks
  - iii) sub-tasks
  
2. Explain how an NOA is developed and the link it has with the Interprovincial Red Seal Examination.
  - i) development
  - ii) validation
  - iii) block and task weighting
  - iv) examination breakdown (pie-chart)
  
3. Identify Red Seal products and describe their use for preparing for the Interprovincial Red Seal Examination.
  - i) Red Seal website
  - ii) examination preparation guide
  - iii) sample questions
  - iv) examination counselling sheets

4. Explain the relationship between the NOA and the AACS and IPG.
5. Review Common Occupational Skills for the Welder trade as identified in the NOA.
  - i) tools and equipment
  - ii) access and material handling equipment
  - iii) safety
  - iv) organize work
  - v) routine trade activities
6. Review Fabrication and Preparation of Components for Welding for the Welder trade as identified in the NOA.
  - i) perform layout
  - ii) fabricate components
7. Review Cutting and Gouging for the Welder trade as identified in the NOA.
  - i) non-thermal cutting and grinding
  - ii) oxy-fuel gas (OFC) cutting and gouging
  - iii) plasma arc cutting (PAC) cutting and gouging
  - iv) air carbon arc cutting (CAC-A) cutting and gouging
8. Review Welding Processes for the Welder trade as identified in the NOA.
  - i) shielded metal arc welding (SMAW) process
  - ii) flux core arc welding (FCAW), metal core arc welding (MCAW) and gas metal arc welding (GMAW) processes
  - iii) gas tungsten arc welding (GTAW) process
  - iv) submerged arc welding (SAW) process

Practical Objectives

N/A

## Feedback and Revisions

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

**New Brunswick:**

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

**Newfoundland and Labrador:**

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

**Nova Scotia:**

Nova Scotia Apprenticeship Agency  
 2021 Brunswick St., PO Box 578  
 Halifax, NS B3J 2S9  
 Tel: 902-424-5651  
 Toll Free in NS: 1-800-494-5651  
[www.nsapprenticeship.ca](http://www.nsapprenticeship.ca)

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

**Version Changes**

Revision Date	Affected Section	Description of Change