

Interprovincial Program Guide

Metal Fabricator (Fitter)

2011

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The CCDA Executive Committee recognizes this Interprovincial Program Guide as the national curriculum for the occupation of Metal Fabricator (Fitter).

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Introduction

Jurisdictions have long recognized the benefit of pooling resources in the development and maintenance of apprenticeship training standards. A successful example of this is the Interprovincial Standards Red Seal Program itself. Essential to the establishment of standards is the development of suitable training systems and programs which enable tradespeople to acquire certification based on these standards. While certification is the responsibility of Apprenticeship administrators throughout Canada, the development and delivery of technical training is the responsibility of jurisdictions.

In 1999, work to develop common training for apprenticeship programs within the Atlantic Provinces began. To date, 22 Curriculum Standards have been developed through the Atlantic Standards Partnership (ASP) project to assist programming staff and instructors in the design and delivery of technical training. Similarly, the Canadian Council of Directors of Apprenticeship (CCDA) embarked on a process for the development of national Interprovincial Program Guides (IPGs) for the Boilermaker, Carpenter and Sprinkler System Installer trades. At its January 2005 strategic planning session, the CCDA identified developing common training standards as one of key activities in moving towards a more cohesive apprenticeship system.

With the support of Human Resources and Skills Development Canada (HRSDC), several provinces and territories have partnered to build on the ASP and the CCDA processes to further develop IPGs to be used across the country. This partnership will create efficiencies in time and resources and promote consistency in training and apprentice mobility.

User Guide

According to the Canadian Apprenticeship Forum, the Interprovincial Program Guide (IPG) is: "a list of validated technical training outcomes, based upon those sub-tasks identified as common core in the National Occupational Analysis (NOA), and validated by industry in the provinces and territories as incorporating the essential tasks, knowledge and skills associated with a given trade."

Learning outcomes contained in the IPG represent the minimum common core content for the development of jurisdictional training standards and outlines. IPGs are developed based on the NOAs and extensive industry consultation. The IPG is intended to assist program development staff in the design of jurisdictional plans of training. Each jurisdiction has the flexibility to add additional content.

The IPG was deliberately constructed for ease of use and flexibility of structure in order to adapt to all delivery requirements. It details units of training, unit outcomes and objectives. It does 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 IPG does not dictate study materials, textbooks or learning activities to be used in delivery.

The IPG document includes a recommended leveling structure to facilitate mobility for apprentices moving from one jurisdiction to another. Because of difference in jurisdictional regulations and program durations, levels are offered as suggestions only.

Structure

The IPG is divided into units. The unit codes are used as a means of identification and are not intended to convey the order of delivery. Prerequisites have not been detailed. Each unit consists of *Learning Outcomes* and *Objectives and Content*.

The *Learning Outcomes* are the specific performances that must be evaluated. Wording of the learning outcomes, "Demonstrate knowledge of...", acknowledges the broad spectrum of ways in which knowledge can be shown. It is at the discretion of each jurisdiction to determine the manner in which learning outcomes are evaluated; theoretically, practically or a combination of both.

User Guide *(continued)*

The *Objectives and Content* for the unit details the information to be covered in order to achieve the performances specified in the *Learning Outcomes*. These objectives can be either theoretical or practical in nature, based on the requirements identified through the industry consultation process. The learning activities used to cover the objectives are at the discretion of the jurisdiction; however, practically worded objective statements have been used where industry indicated a need for the apprentices to receive exposure to performing the task or skill outlined while attending technical training. For example, this exposure could be done through instructor demonstration or individual or group performance of the skill or task. This practical training will help to reinforce the theoretical component of the technical training.

Detailed content for each objective has not been developed. Where detail is required for clarity, content has been provided. The content listed within the IPG document is **not** intended to represent an inclusive list; rather, it is included to illustrate the intended direction for the objective. Content may be added or extended in jurisdictional training plans as required.

Jurisdictions are free to deliver the IPG units one at a time or concurrently, provided that all *Learning Outcomes* are met. The IPG does not indicate the amount of time to be spent on a particular unit as the length of time required to deliver the *Learning Outcomes* successfully will depend upon the learning activities and teaching methods used.

IPG Glossary of Terms

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

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

IPG Glossary of Terms *(continued)*

TECHNIQUE	Within a procedure, the manner in which technical skills are applied.
TEST	v. To subject to a procedure that ascertains effectiveness, value, proper function, or other quality. n. A way of examining something to determine its characteristics or properties, or to determine whether or not it is working correctly.
TROUBLESHOOT	To follow a systematic procedure to identify and locate a problem or malfunction and its cause.

Essential Skills Profiles

Essential Skills are the skills needed for work, learning and life. They provide the foundation for learning all the other skills that enable people to evolve within their jobs and adapt to workplace change.

Over the past several years, the Government of Canada has conducted research examining the skills people use at work. From this research, Essential Skills Profiles have been developed for various occupations.

For more information regarding Essential Skills and to access Essential Skills Profiles for specific occupations, visit Human Resources and Skills Development Canada's Essential Skills website at:

www.hrsdc.gc.ca/eng/workplaceskills/essential_skills/general/home.shtml

Profile Chart

OCCUPATIONAL SKILLS			
WDF-005 Safety	WDF-010 Tools and Equipment	WDF-015 Stationary Machinery	WDF-025 Access Equipment
WDF-030 Communication and Trade Documentation	WDF-080 Work Planning	WDF-020 Hoisting, Lifting and Rigging	WDF-075 Drawings
MTF-200 Drawings II	MTF-300 Drawings III	WDF-090 Metallurgy	MTF-325 Quality Assurance
FABRICATION OF COMPONENTS			
WDF-070 Fabrication Fundamentals	MTF-105 Oxy-fuel	MTF-255 Plasma Arc Cutting	MTF-220 Bending Equipment
MTF-240 Press Brake Equipment	MTF-230 Plate Rolling Equipment	MTF-235 Shape Rolling Equipment	MTF-225 Heat Forming
MTF-305 Automated Shape Cutting Machines	WDF-085 Introduction to Layout and Pattern Development	MTF-205 Layout – Simple Components and Templates	MTF-310 Layout – Complex Components and Templates
ASSEMBLY OF COMPONENTS			
WDF-035 Introduction to Welding Processes	WDF-065 Weld Faults	WDF-040 SMAW I – Set up, Strike and Maintain an Arc	WDF-045 SMAW II – Fillet Weld, All Positions
WDF-050 GMAW I – Set up and Maintain an Arc	MTF-100 GMAW II – Fillet Weld, Flat and Horizontal Positions	WDF-055 FCAW I – Set up and Deposit a Weld	MTF-245 FCAW II – Fillet Weld, Flat and Horizontal Positions
WDF-060 MCAW I – Set up and Deposit a Weld	MTF-250 MCAW II – Fillet Weld, Flat and Horizontal Positions	MTF-210 Fabrication – Simple Components	MTF-315 Fabrication – Complex Components
MTF-215 Fit and Assemble – Simple Components	MTF-320 Fit and Assemble – Complex Components	MTF-330 Finish Preparation	

Recommended Level Structure

WDF = Common Units to Metal Fabricator (Fitter) and Welder IPGs.

MTF = Specific Units to Metal Fabricator (Fitter) IPG.

Level 1			Level 2		
Unit Code	Title	Page	Unit Code	Title	Page
WDF-005	Safety	20	MTF-200	Drawings II	46
WDF-010	Tools and Equipment	22	MTF-205	Layout – Simple Components and Templates	47
WDF-015	Stationary Machinery	23	MTF-210	Fabrication – Simple Components	49
WDF-020	Hoisting, Lifting and Rigging	24	MTF-215	Fit and Assemble – Simple Components	51
WDF-025	Access Equipment	26	MTF-220	Bending Equipment	52
WDF-030	Communication and Trade Documentation	27	MTF-225	Heat Forming	54
WDF-035	Introduction to Welding Processes	28	MTF-230	Plate Rolling Equipment	55
WDF-040	SMAW I – Set up, Strike and Maintain an Arc	30	MTF-235	Shape Rolling Equipment	57
WDF-045	SMAW II – Fillet Weld, All Positions	32	MTF-240	Press Brake Equipment	59
WDF-050	GMAW I – Set up and Maintain an Arc	33	WDF-090	Metallurgy	61
MTF-100	GMAW II – Fillet Weld, Flat and Horizontal	35	WDF-065	Weld Faults	63
WDF-075	Drawings	37	WDF-055	FCAW I – Set up and Deposit a Weld	64
MTF-105	Oxy-fuel	39	MTF-245	FCAW II – Fillet Weld, Flat and Horizontal Positions	66
WDF-085	Introduction to Layout and Pattern Development	41	WDF-060	MCAW I – Set up and Deposit a Weld	68
WDF-070	Fabrication Fundamentals	42	MTF-250	MCAW II – Fillet Weld, Flat and Horizontal Positions	70
			MTF-255	Plasma Arc Cutting	72

Recommended Level Structure (*continued*)

Level 3		
Unit Code	Title	Page
MTF-300	Drawings III	74
MTF-305	Automated Shape Cutting Machines	75
WDF-080	Work Planning	76
MTF-310	Layout – Complex Components and Templates	77
MTF-315	Fabrication – Complex Components	79
MTF-320	Fit and Assemble – Complex Components	81
MTF-325	Quality Assurance	83
MTF-330	Finish Preparation	85

2008 NOA Sub-task to IPG Unit Comparison

NOA Sub-task		IPG Unit	
Task 1 - Maintains and uses tools and equipment.			
1.01	Maintains hand tools.	WDF-010	Tools and Equipment
1.02	Maintains power tools.	WDF-010	Tools and Equipment
1.03	Maintains stationary machinery.	WDF-015	Stationary Machinery
		MTF-240	Press Brake Equipment
		MTF-230	Plate Rolling Equipment
		MTF-235	Shape Rolling Equipment
		MTF-220	Bending Equipment
		MTF-225	Heat Forming
MTF-305	Automated Shape Cutting Machines		
1.04	Maintains layout and measuring tools.	WDF-010	Tools and Equipment
1.05	Maintains cutting and welding equipment.	MTF-105	Oxy-fuel
		MTF-255	Plasma Arc Cutting
		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		
1.06	Uses access equipment.	WDF-025	Access Equipment
1.07	Uses personal protective equipment (PPE) and safety equipment.	WDF-005	Safety
Task 2 - Organizes work.			
2.01	Interprets plans, drawings and specifications.	WDF-030	Communication and Trade Documentation
		WDF-075	Drawings
		MTF-200	Drawings II
		MTF-300	Drawings III
2.02	Uses documentation and reference material.	WDF-030	Communication and Trade Documentation
2.03	Communicates with others.	WDF-030	Communication and Trade Documentation
2.04	Organizes project tasks.	WDF-080	Work Planning

NOA Sub-task		IPG Unit	
2.05	Maintains safe work environment.	WDF-005	Safety
Task 3 - Performs quality assurance.			
3.01	Performs visual inspections.	MTF-325	Quality Assurance
3.02	Verifies measurements.	MTF-325	Quality Assurance
3.03	Performs post-welding checks.	MTF-325	Quality Assurance
3.04	Marks materials and parts.	MTF-325	Quality Assurance
3.05	Verifies layout.	MTF-325	Quality Assurance
Task 4 - Handles materials.			
4.01	Obtains materials.	MTF-325	Quality Assurance
4.02	Verifies piece marks.	MTF-325	Quality Assurance
4.03	Determines weights.	WDF-020	Hoisting, Lifting and Rigging
4.04	Identifies lifting points.	WDF-020	Hoisting, Lifting and Rigging
4.05	Operates material handling equipment.	WDF-020	Hoisting, Lifting and Rigging
Task 5 - Performs layout.			
5.01	Determines layout methods.	WDF-085	Introduction to Layout and Pattern Development
5.02	Performs pattern development.	WDF-085	Introduction to Layout and Pattern Development
5.03	Calculates material allowances for various processes.	WDF-085	Introduction to Layout and Pattern Development
5.04	Determines dimensions.	MTF-205	Layout - Simple Components and Templates
		MTF-310	Layout - Complex Components and Templates
5.05	Transfers dimensions.	MTF-205	Layout - Simple Components and Templates
		MTF-310	Layout - Complex Components and Templates
5.06	Makes templates.	MTF-205	Layout - Simple Components and Templates
		MTF-310	Layout - Complex Components and Templates
5.07	Assembles jigs.	WDF-085	Introduction to Layout and Pattern Development
Task 6 - Cuts materials.			
6.01	Cuts material using plasma arc cutting equipment.	MTF-255	Plasma Arc Cutting
6.02	Cuts material using oxy-fuel cutting equipment.	MTF-105	Oxy-fuel
6.03	Cuts material using shears.	WDF-010	Tools and Equipment
		WDF-015	Stationary Machinery

NOA Sub-task		IPG Unit	
6.04	Cuts material using saws.	WDF-010	Tools and Equipment
		WDF-015	Stationary Machinery
6.05	Cuts material using ironworkers.	WDF-015	Stationary Machinery
6.06	Drills holes.	WDF-015	Stationary Machinery
6.07	Cuts threads.	WDF-015	Stationary Machinery
6.08	Prepares joints.	WDF-035	Introduction to Welding Processes
		WDF-045	SMAW II – Fillet Weld, All Positions
		MTF-100	GMAW II – Fillet Weld, Flat and Horizontal Positions
		MTF-245	FCAW II – Fillet Weld, Flat and Horizontal Positions
		MTF-250	MCAW II – Fillet Weld, Flat and Horizontal Positions
Task 7 - Forms materials.			
7.01	Forms material using plate rollers.	MTF-230	Plate Rolling Equipment
7.02	Forms material using shape rollers.	MTF-235	Shape Rolling Equipment
7.03	Forms material using brake presses.	MTF-240	Press Brake Equipment
7.04	Forms material using benders.	MTF-220	Bending Equipment
7.05	Applies heat for forming.	MTF-105	Oxy-fuel
		WDF-090	Metallurgy
		MTF-225	Heat Forming
Task 8 - Fits and fastens sub-components and components.			
8.01	Determines proper sequence for assembly.	MTF-210	Fabrication – Simple Components
		MTF-315	Fabrication – Complex Components
		MTF-215	Fit and Assemble – Simple Components
		MTF-320	Fit and Assemble – Complex Components
8.02	Assembles sub-components and components.	MTF-210	Fabrication – Simple Components
		MTF-315	Fabrication – Complex Components
		MTF-215	Fit and Assemble – Simple Components
		MTF-320	Fit and Assemble – Complex Components

NOA Sub-task		IPG Unit	
8.03	Sets fabricated component in place.	MTF-215	Fit and Assemble – Simple Components
		MTF-320	Fit and Assemble – Complex Components
8.04	Fastens components on-site.	MTF-210	Fabrication – Simple Components
		MTF-320	Fit and Assemble – Complex Components
Task 9 - Performs welding activities.			
9.01	Applies heat prior to tack welding.	WDF-045	SMAW II – Fillet Weld, All Positions
		MTF-100	GMAW II – Fillet Weld, Flat and Horizontal Positions
		MTF-245	FCAW II – Fillet Weld, Flat and Horizontal Positions
		MTF-250	MCAW II – Fillet Weld, Flat and Horizontal Positions
9.02	Performs tack welding.	WDF-045	SMAW II – Fillet Weld, All Positions
		MTF-100	GMAW II – Fillet Weld, Flat and Horizontal Positions
		MTF-245	FCAW II – Fillet Weld, Flat and Horizontal Positions
		MTF-250	MCAW II – Fillet Weld, Flat and Horizontal Positions
9.03	Minimizes welding distortions.	WDF-065	Weld Faults
		WDF-045	SMAW II – Fillet Weld, All Positions
		MTF-100	GMAW II – Fillet Weld, Flat and Horizontal Positions
		MTF-245	FCAW II – Fillet Weld, Flat and Horizontal Positions
		MTF-250	MCAW II – Fillet Weld, Flat and Horizontal Positions
9.04	Welds using wire-feed processes.	MTF-100	GMAW II – Fillet Weld, Flat and Horizontal Positions
		MTF-245	FCAW II – Fillet Weld, Flat and Horizontal Positions
		MTF-250	MCAW II – Fillet Weld, Flat and Horizontal Positions

NOA Sub-task		IPG Unit	
9.05	Corrects welding distortions.	WDF-065	Weld Faults
		WDF-045	SMAW II – Fillet Weld, All Positions
		MTF-100	GMAW II – Fillet Weld, Flat and Horizontal Positions
		MTF-245	FCAW II – Fillet Weld, Flat and Horizontal Positions
		MTF-250	MCAW II – Fillet Weld, Flat and Horizontal Positions
Task 10 - Prepares products for finishes.			
10.01	Completes project.	MTF-330	Finish Preparation
10.02	Prepares material for finishing.	MTF-330	Finish Preparation

LEVEL 1

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.

Objectives and Content:

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)

WDF-010 Tools and Equipment

Learning Outcomes:

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

Objectives and Content:

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.

WDF-015 Stationary Machinery

Learning Outcomes:

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

Objectives and Content:

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.

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.

Objectives and Content:

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

WDF-025 Access Equipment

Learning Outcomes:

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

Objectives and Content:

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.

Learning Outcomes:

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

Objectives and Content:

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

Learning Outcomes:

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

Objectives and Content:

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.

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.

Objectives and Content:

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 and maintain SMAW welding equipment.
9. 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.

Objectives and Content:

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 prevent and correct weld faults.
8. Perform fillet welds on low carbon steel in all positions.

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.

Objectives and Content:

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.

10. Establish and maintain an arc.

MTF-100

Gas Metal Arc Welding II – Fillet Weld, Flat and Horizontal 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 in the flat and horizontal positions using the GMAW process.

Objectives and Content:

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 in the flat and horizontal 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.
5. Describe the procedures used to prepare base metal and joints for GMAW fillet welds.
6. Describe the procedures used to perform fillet welds on low carbon steel in the flat and horizontal positions using the GMAW process.

7. Describe the procedures used to prevent and correct weld faults.
8. Perform fillet welds on low carbon steel in the flat and horizontal positions.

WDF-075 Drawings

Learning Outcomes:

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

Objectives and Content:

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 (1st and 3rd 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.
10. Interpret basic shop drawings.

MTF-105 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 weld with oxy-fuel equipment.
- Demonstrate knowledge of the procedures used to braze with oxy-fuel equipment.

Objectives and Content:

1. Define terminology associated with oxy-fuel cutting and welding.
2. Identify hazards and describe safe work practices pertaining to oxy-fuel cutting 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 and welding equipment and operations.
4. Identify oxy-fuel equipment and accessories and describe their applications.
 - i) cutting
 - ii) welding
 - iii) brazing/braze-welding
 - iv) heating
5. Identify types of flames and describe their applications 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 weld using oxy-fuel equipment.
11. Describe the procedures used to braze/braze-weld using oxy-fuel equipment.
12. Set up, operate and shut down oxy-fuel equipment.

Learning Outcomes:

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

Objectives and Content:

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.
6. Develop simple templates.

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.

Objectives and Content:

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.

LEVEL 2

MTF-200 Drawings II

Learning Outcomes:

- Demonstrate knowledge of interpreting and extracting information from structural steel, tanks and pressure vessel shop drawings.

Objectives and Content:

1. Define terminology associated with structural steel, tanks and pressure vessel shop drawings.
2. Identify symbols and abbreviations found on structural steel, tanks and pressure vessel shop drawings.
3. Interpret information found on structural steel shop drawings.
4. Interpret information found on tank shop drawings.
5. Interpret information found on pressure vessel shop drawings.

Learning Outcomes:

- Demonstrate knowledge of the procedures used to lay out simple components and templates.

Objectives and Content:

1. Define terminology associated with layout of simple components and templates.
2. Interpret information pertaining to layout of simple components and templates found on drawings and specifications.
3. Describe the procedures used to determine and transfer dimensions from drawings.
4. Identify calculations relating to layout of simple components and templates and describe the procedures used to perform them.
 - i) materials
 - ii) angles
 - iii) tolerances and allowances
5. Identify tools and equipment relating to layout of simple components and templates and describe their applications and procedures for use.
6. Identify the considerations when performing layout of simple components and templates.
 - i) material selection
 - ii) layout method
 - iii) fabrication requirements
 - iv) assembly requirements
 - v) tolerances
 - vi) quantities
7. Identify the methods of template development and describe their characteristics and applications.
 - i) parallel line development

- ii) radial line development
 - iii) triangulation
8. Describe the procedures used to perform layout of simple components and templates from drawings.
 9. Develop simple templates.

MTF-210

Fabrication – Simple Components

Learning Outcomes:

- Demonstrate knowledge of the procedures used to fabricate simple components.

Objectives and Content:

1. Define terminology associated with simple component fabrication.
2. Identify hazards and describe safe work practices pertaining to simple component fabrication.
 - i) personal
 - ii) shop/facility
 - iii) equipment
3. Interpret codes and standards pertaining to simple component fabrication.
4. Interpret information pertaining to simple component fabrication found on drawings and specifications.
5. Identify types of simple components and describe their characteristics and applications.
6. Identify types of materials used in simple component fabrication.
 - i) structural members
 - ii) plate
 - iii) piping
7. Describe simple jigs and fixtures, their purpose and applications.
8. Describe the procedures used to fabricate simple jigs and fixtures.
9. Describe the procedures used to fabricate simple components in the shop.
 - i) layout
 - ii) cut material
 - iii) drill, cut or punch holes
 - iv) cut threads

- v) form material
- vi) prepare joints

10. Fabricate simple components.

MTF-215

Fit and Assemble – Simple Components

Learning Outcomes:

- Demonstrate knowledge of the procedures used to fit and assemble simple components.

Objectives and Content:

1. Define terminology associated with fit and assembly of simple components.
2. Identify hazards and describe safe work practices pertaining to fit and assembly of simple components.
 - i) personal
 - ii) shop/facility
 - iii) equipment
3. Interpret codes and standards pertaining to fit and assembly of simple components.
4. Interpret information pertaining to fit and assembly of simple components found on drawings and specifications.
5. Identify fastening methods for simple component assembly and describe their characteristics and applications.
 - i) mechanical fasteners
 - ii) tack welding
 - iii) welding
6. Identify tools, equipment and accessories used for simple component assembly and describe their applications and procedures for use.
7. Describe the procedures used to lay out and fit simple components for assembly.
 - i) shop
 - ii) field
8. Describe the procedures used to assemble and fasten simple components.
 - i) shop
 - ii) field
9. Fit and assemble simple components.

MTF-220 Bending Equipment

Learning Outcomes:

- Demonstrate knowledge of bending equipment and attachments, their applications and procedures for use.
- Demonstrate knowledge of the procedures used to perform bending operations.

Objectives and Content:

1. Define terminology associated with bending equipment and operations.
2. Explain the effects associated with bending of materials.
 - i) mechanical
 - ii) dimensional
3. Identify hazards and describe safe work practices pertaining to bending equipment and operations.
 - i) personal
 - ii) shop/facility
 - iii) equipment
4. Interpret documentation pertaining to bending operations.
 - i) equipment manufacturers' specifications
5. Interpret information pertaining to bending materials found on drawings and specifications.
6. Identify tools and equipment relating to bending operations and describe their applications and procedures for use.
7. Identify types of bending equipment and describe their characteristics, limitations and applications.
8. Identify bending equipment attachments and describe their characteristics and applications.
9. Describe the procedures used to set up and adjust bending equipment.

10. Identify the considerations and describe the procedures used to lay out materials for bending.
 - i) cut length calculations
 - ii) bend radius minimums
 - iii) minimum radius calculated considering ductility
 - iv) material selection

11. Identify bending methods and describe their associated procedures.
 - i) draw bending
 - ii) compression bending
 - iii) press bending

12. Describe the procedures used to inspect and maintain bending equipment.

MTF-225 Heat Forming

Learning Outcomes:

- Demonstrate knowledge of the procedures used to perform heat forming operations.

Objectives and Content:

1. Define terminology associated with heat forming operations.
2. Explain the effects associated with heat forming on materials.
 - i) mechanical
 - ii) dimensional
3. Identify hazards and describe safe work practices pertaining to heat forming operations.
 - i) personal
 - ii) shop/facility
 - iii) fire and explosion
 - iv) equipment
 - v) ventilation/fumes
 - vi) storage, handling and transportation
4. Interpret information pertaining to heat forming operations found on drawings and specifications.
5. Identify tools and equipment relating to heat forming operations and describe their applications and procedures for use.
6. Identify the considerations and describe the procedures used to lay out materials for heat forming operations.
7. Describe the procedures used to heat form materials.
8. Perform heat forming operations.

MTF-230 Plate Rolling Equipment

Learning Outcomes:

- Demonstrate knowledge of plate rolling equipment and attachments, their applications and procedures for use.
- Demonstrate knowledge of the procedures used to perform plate rolling operations.

Objectives and Content:

1. Define terminology associated with plate rolling equipment and operations.
2. Explain the effects associated with plate rolling.
 - i) mechanical
 - ii) dimensional
3. Identify hazards and describe safe work practices pertaining to plate rolling equipment and operations.
 - i) personal
 - ii) shop/facility
 - iii) equipment
4. Interpret documentation pertaining to plate rolling equipment and operations.
 - i) plate specifications
 - ii) equipment manufacturers' specifications
5. Interpret information pertaining to plate rolling found on drawings and specifications.
6. Identify tools and equipment relating to plate rolling operations and describe their applications and procedures for use.
7. Identify types of plate rolling equipment and describe their characteristics and applications.
8. Describe the procedures used to set up and adjust plate rolling equipment.

9. Identify the considerations and describe the procedures used to lay out materials for plate rolling.
10. Describe the procedures used to operate plate rolling equipment.
 - i) cylinder
 - ii) cone
11. Describe the use of sweeps and templates.
12. Describe the procedures used to inspect and maintain plate rolling equipment.

MTF-235 Shape Rolling Equipment

Learning Outcomes:

- Demonstrate knowledge of shape rolling equipment and attachments, their applications and procedures for use.
- Demonstrate knowledge of the procedures used to perform shape rolling operations.

Objectives and Content:

1. Define terminology associated with shape rolling equipment and operations.
2. Explain the effects associated with shape rolling.
 - i) mechanical
 - ii) dimensional
3. Identify hazards and describe safe work practices pertaining to shape rolling equipment and operations.
 - i) personal
 - ii) shop/facility
 - iii) equipment
4. Interpret documentation pertaining to shape rolling equipment and operations.
 - i) material specifications
 - ii) equipment manufacturers' specifications
5. Interpret information pertaining to shape rolling found on drawings and specifications.
6. Identify tools and equipment relating to shape rolling operations and describe their applications and procedures for use.
7. Identify types of shape rolling equipment and attachments and describe their characteristics and applications.
8. Describe the procedures used to set up and adjust shape rolling equipment.

9. Identify the considerations and describe the procedures used to lay out structural shapes.
10. Describe the procedures used to operate shape rolling equipment.
11. Describe the use of sweeps and templates.
12. Describe the procedures used to inspect and maintain shape rolling equipment.

MTF-240 Press Brake Equipment

Learning Outcomes:

- Demonstrate knowledge of press brake equipment and attachments, their applications and procedures for use.
- Demonstrate knowledge of the procedures used to perform press brake operations.

Objectives and Content:

1. Define terminology associated with press brake equipment and operations.
2. Explain the effects associated with braking.
 - i) mechanical
 - ii) dimensional
3. Identify hazards and describe safe work practices pertaining to press brake equipment and operations.
 - i) personal
 - ii) shop/facility
 - iii) equipment
4. Interpret documentation pertaining to press brake operations.
 - i) equipment manufacturers' specifications
 - ii) bending charts
5. Interpret information pertaining to bending materials found on drawings and specifications.
6. Identify tools and equipment relating to press brake operations and describe their applications and procedures for use.
7. Identify types of press brakes and describe their characteristics and applications.
 - i) hydraulic
 - ii) mechanical
 - iii) computerized numerical controlled (CNC)

8. Identify press brake attachments and describe their characteristics and applications.
9. Describe the procedures used to set up and adjust press brakes.
10. Identify the considerations and describe the procedures used to lay out materials for bending on a press brake.
11. Describe the procedures used to operate press brakes.
12. Describe the procedures used to inspect and maintain press brakes.

WDF-090 Metallurgy

Learning Outcomes:

- Demonstrate knowledge of metals and their characteristics.
- Demonstrate knowledge of metallurgical principles.
- Demonstrate knowledge of material testing procedures.

Objectives and Content:

1. Define terminology associated with metallurgy.
2. Describe the properties of metals.
 - i) mechanical
 - ii) physical
3. 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
4. Describe classification numbering systems for metals.
 - i) Society of Automotive Engineers (SAE)
 - ii) American Iron and Steel Institute (ANSI)
 - iii) American Society of Testing and Materials (ASTM)
 - iv) Canadian Standards Association (CSA)
5. Describe the processes used in the heat treatment of metals.
 - i) stress relieving
 - ii) quenching
 - iii) hardening
 - iv) tempering
 - v) annealing
 - vi) normalizing
6. Identify the methods and processes used in the manufacture of steel and alloys.

7. Describe forging and casting processes.
8. Describe the effects of hot and cold working of metals.
 - i) stress
 - ii) contraction
 - iii) expansion
 - iv) distortion
 - v) work hardening
9. Describe the procedures used to prevent or correct problems that occur when working with metals.
10. Identify the causes of corrosion and describe the methods used to prevent or correct them.
 - i) oxidation
 - ii) galvanic corrosion
 - iii) chemical corrosion
11. Identify common metal testing techniques and describe their associated procedures.
 - i) Rockwell hardness
 - ii) Brinell hardness
 - iii) tensile
 - iv) Charpy impact
 - v) Izod impact

WDF-065 Weld Faults

Learning Outcomes:

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

Objectives and Content:

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.

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.

Objectives and Content:

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.
 8. Establish and maintain an arc.

MTF-245 Flux Core Arc Welding II – Fillet Weld, Flat and Horizontal Positions

Learning Outcomes:

- Demonstrate knowledge of the procedures used to prepare base metals and joints for flux core arc welding (FCAW) fillet welds.
- Demonstrate knowledge of the procedures used to perform fillet welds on low carbon steel in the flat and horizontal positions using the FCAW process.

Objectives and Content:

1. Define terminology associated with fillet welding in the flat and horizontal position using the FCAW process.
2. Interpret information pertaining to FCAW fillet welds found on drawings and specifications.
3. Identify the considerations when selecting consumables and determining equipment set-up for performing FCAW fillet welds in the flat and horizontal position.
 - 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.
5. Describe the procedures used to prepare base metals and joints for FCAW fillet welds.
6. Describe the procedures used to perform fillet welds in the flat and horizontal position using the FCAW process.

7. Describe the procedures used to prevent and correct weld faults.
8. Perform fillet welds on low carbon steel in the flat and horizontal position.

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.

Objectives and Content:

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.
 8. Establish and maintain an arc.

MTF-250 Metal Core Arc Welding II – Fillet Weld, Flat and Horizontal Positions

Learning Outcomes:

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

Objectives and Content:

1. Define terminology associated with MCAW fillet welds.
2. Interpret information pertaining to MCAW fillet welds found on drawings and specifications.
3. Identify the considerations when selecting consumables and determining equipment set-up for performing MCAW fillet welds in the flat and horizontal position.
 - 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 MCAW.
5. Describe the procedures used to prepare base metals and joints for MCAW fillet welds.
6. Describe the procedures used to perform fillet welds in the flat and horizontal position using the MCAW process.

7. Describe the procedures used to prevent and correct weld faults.
8. Perform fillet welds in the flat and horizontal position using the MCAW process.

MTF-255

Plasma Arc Cutting

Learning Outcomes:

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

Objectives and Content:

1. Define terminology associated with plasma arc cutting.
2. Identify hazards and describe safe work practices pertaining to plasma arc cutting.
 - i) personal
 - ii) shop/facility
 - iii) fire and explosion
 - iv) equipment
 - v) ventilation/fumes
3. Describe the plasma arc cutting process and its applications.
4. Identify plasma arc cutting equipment and accessories and describe their applications.
5. Describe the procedures used to set up, adjust and shut down plasma arc cutting equipment.
6. Describe the procedures used to inspect and maintain plasma arc cutting equipment.
7. Describe the procedures used to cut using plasma arc equipment.
8. Perform plasma arc cutting operations.

LEVEL 3

MTF-300 Drawings III

Learning Outcomes:

- Demonstrate knowledge of interpreting and extracting information from advanced structural steel, tank and pressure vessel shop drawings.
- Demonstrate knowledge of interpreting and extracting information from structural steel and tank erection drawings.
- Demonstrate knowledge of interpreting and extracting information from basic piping drawings.

Objectives and Content:

1. Define terminology associated with advanced shop and erection drawings.
2. Identify symbols and abbreviations found on advanced shop and erection drawings.
3. Interpret information found on advanced structural steel shop and erection drawings.
4. Interpret information found on advanced tank shop and erection drawings.
5. Interpret information found on advanced pressure vessel shop drawings.
6. Interpret information found on basic piping drawings.

Learning Outcomes:

- Demonstrate knowledge of automated shape cutting machines and their applications.

Objectives and Content:

1. Define terminology associated with automated shape cutting machines.
2. Identify hazards and describe safe work practices pertaining to automated shape cutting machines.
3. Identify types of automated shape cutting machines and describe their characteristics and applications.
 - i) optical tracer
 - oxy-fuel
 - plasma
 - ii) computerized numerical control (CNC)
 - plasma
 - laser
 - water jet
 - oxy-fuel

WDF-080 Work Planning

Learning Outcomes:

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

Objectives and Content:

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.

Learning Outcomes:

- Demonstrate knowledge of the procedures used to lay out complex components and templates.

Objectives and Content:

1. Define terminology associated with layout of complex components and templates.
2. Interpret information pertaining to layout of complex components and templates found on drawings and specifications.
3. Describe the procedures used to determine and transfer dimensions from drawings.
4. Identify calculations relating to layout of complex components and templates and describe the procedures used to perform them.
 - i) materials
 - ii) angles
 - iii) tolerances and allowances
5. Identify tools and equipment relating to layout of complex components and templates and describe their applications and procedures for use.
6. Identify the considerations when performing layout of complex components and templates.
 - i) material selection
 - ii) layout method
 - iii) fabrication requirements
 - iv) assembly requirements
 - v) tolerances
 - vi) quantities
7. Identify the methods of template development and describe their characteristics and applications.
 - i) parallel line development

- ii) radial line development
 - iii) triangulation
8. Describe the procedures used to perform layout of complex components and templates from drawings.
 9. Develop complex templates.

MTF-315 Fabrication – Complex Components

Learning Outcomes:

- Demonstrate knowledge of the procedures used to fabricate complex components.

Objectives and Content:

1. Define terminology associated with complex component fabrication.
2. Identify hazards and describe safe work practices pertaining to complex component fabrication.
 - i) personal
 - ii) shop/facility
 - iii) equipment
3. Interpret codes and standards pertaining to complex component fabrication.
4. Interpret information pertaining to complex component fabrication found on drawings and specifications.
5. Identify types of complex components and describe their characteristics and applications.
6. Identify types of materials used in complex component fabrication.
 - i) structural members
 - ii) plate
 - iii) piping
7. Describe complex jigs and fixtures, their purpose and applications.
8. Describe the procedures used to fabricate complex jigs and fixtures.
9. Describe the procedures used to fabricate complex components.
 - i) layout
 - ii) cut material
 - iii) drill, cut or punch holes
 - iv) cut threads

- v) form material
- vi) prepare joints

10. Fabricate complex components.

Learning Outcomes:

- Demonstrate knowledge of the procedures used to fit and assemble complex assemblies.

Objectives and Content:

1. Define terminology associated with fit and assembly of complex assemblies.
2. Identify hazards and describe safe work practices pertaining to fit and assembly of complex assemblies.
 - i) personal
 - ii) shop/facility
 - iii) fire and explosion
 - iv) equipment
 - v) ventilation/fumes
 - vi) storage, handling and transportation
 - vii) heights
 - viii) confined spaces
 - ix) excavations
 - x) water
 - xi) weather conditions
3. Interpret codes and standards pertaining to fit and assembly of complex assemblies.
4. Interpret information pertaining to fit and assembly of complex assemblies found on drawings and specifications.
5. Identify fastening methods for component assembly and describe their characteristics and applications.
 - i) mechanical fasteners
 - ii) tack welding
 - iii) welding
6. Identify tools, equipment and accessories used for complex component assembly and describe their applications and procedures for use.

7. Describe the procedures used to lay out and fit complex components for assembly.
 - i) shop
 - ii) field

8. Describe the procedures used to assemble and fasten complex components.
 - i) shop
 - ii) field

9. Fit and assemble complex components.

MTF-325 Quality Assurance

Learning Outcomes:

- Demonstrate knowledge of quality assurance and its use.
- Demonstrate knowledge of quality control measures used to verify compliance with design and code specifications.
- Demonstrate knowledge of inspection and testing methods and their applications.

Objectives and Content:

1. Explain quality assurance, its purpose and applications.
2. Explain quality control, its purpose and applications.
3. Define terminology associated with quality assurance.
4. Interpret codes and standards pertaining to quality control.
 - i) Canadian Standards Association (CSA)
 - ii) American Society of Mechanical Engineers (ASME)
 - iii) American Welding Society (AWS)
5. Interpret information pertaining to quality control found on drawings and specifications.
6. Identify tools and equipment relating to quality control and describe their applications and procedures for use.
7. Explain the methods used to identify and verify materials.
 - i) standards and specifications
 - ii) mill certificates
 - iii) colour coding of materials
8. Identify methods of inspection and testing and describe their characteristics, limitations and applications.
 - i) destructive
 - ii) non-destructive

9. 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

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

MTF-330 Finish Preparation

Learning Outcomes:

- Demonstrate knowledge of the procedures used to prepare products for finish.

Objectives and Content:

1. Define terminology associated with finish preparation.
2. Identify hazards and describe safe work practices pertaining to finish preparation.
 - i) personal
 - ii) shop/facility
 - iii) fire and explosion
 - iv) equipment
 - v) ventilation/fumes
 - vi) storage, handling and transportation
 - vii) heights
 - viii) confined spaces
 - ix) weather conditions
 - x) chemical hazards
3. Interpret codes and standards pertaining to finish preparation.
4. Interpret information pertaining to finish preparation found on drawings and specifications.
5. Identify tools and equipment relating to finish preparation and describe their applications and procedures for use.
6. Identify methods used to prepare surfaces for finishing and describe their characteristics and applications.
 - i) abrasive blasting
 - ii) chemical cleaning
 - iii) mechanical cleaning
 - chipping
 - sanding
 - grinding

- wire wheel buffing
 - iv) polishing
7. Describe the procedures used to prepare products for finish.
8. Describe the procedures used to perform final visual inspection for quality finish.
- i) weld profile
 - ii) surface defects
 - iii) spatter and slag
 - iv) sharp edges
 - v) surface contamination
 - vi) arc strikes
9. Identify types of finishes and describe their characteristics and applications.
- i) primer and paint
 - ii) galvanize
 - iii) electroplate
10. Describe the procedures used to prepare finished materials for shipping.
- i) identification
 - tag
 - stamp
 - engrave
 - etch
 - markers
 - colour code
 - ii) protect and secure
 - covering
 - wrapping
 - tarping