Boilermaker

Guide to Course Content

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Recognition:
To promote transparency and consistency, portions of this document has been adapted from the 2016 Boilermaker Red Seal Occupational Standard (Employment and Social Development Canada).
A complete version of the Occupational Standard can be found at www.red-seal.ca

STRUCTURE OF THE GUIDE TO COURSE CONTENT

To facilitate understanding of the occupation, this guide to course content contains the following sections:

Description of the Boilermaker trade: an overview of the trade's duties and training requirements.

Essential Skills Summary: an overview of how each of the nine essential skills is applied in this trade.

Elements of harmonization of apprenticeship training: includes adoption of Red Seal trade name, number of levels of apprenticeship, total training hours (on-the-job and in-school) and consistent sequencing of technical training content. Implementation for harmonization will take place progressively. Level one will be implemented in 2016/2017, level two 2017/2018 and level three 2018/2019.

Task Matrix: a chart which outlines graphically the major work activities, tasks and sub-tasks of this standard detailing the essential skills and the level of training where the content is covered.

Major Work Activity (MWA): the largest division within the standard that is comprised of a distinct set of trade activities.

Task: distinct actions that describe the activities within a major work activity.

Sub-task: distinct actions that describe the activities within a task.

Training Profile Chart: a chart which outlines the model for Saskatchewan Apprenticeship and Trade Certification Commission (SATCC) technical training.

Technical Training Course Content for the Boilermaker trade: a chart which outlines the model for SATCC technical training sequencing. For the harmonized level of training, a cross reference to the Harmonized apprenticeship technical training sequencing, at the learning outcome level, is provided.

Appendix A: Post Harmonization Training Profile Chart: a chart which outlines the finalized model for SATCC technical training sequencing with a cross reference to the Harmonized apprenticeship technical training sequencing, at the topic level.

The Red Seal Boilermaker Curriculum Outline, which provides additional detail of the Harmonized technical training, can be found at www.red-seal.ca

DESCRIPTION OF THE BOILERMAKER TRADE

Boilermakers construct, fabricate, weld, assemble, install, erect, alter, maintain, repair, dismantle, demolish and test steam generators, boilers, economizers, air heaters, de-aerators, induction draft (ID) and forced draft (FD) fans, tanks, pollution control devices and systems, duct systems, furnaces, reactors, water towers and reservoirs, penstocks, scroll casing, stacks and other related components and parts, as well as their access structures and assemblies, including all types of structural and plate work on dust, air, gas, steam, oil, water and other liquid-tight containers. Boilermakers work from engineer-approved drawings to fabricate components from steel or other materials. They calculate, select and attach rigging and work with cranes and other hoisting devices to lift components into place. The systems must be tested for leaks and other defects and deficiencies to ensure they are operating safely and efficiently.

Boilermakers require a good understanding of welding methods and procedures. However, while welding is a component of this trade, jurisdictions may or may not permit certain welding processes without further certification.

Boilermakers are employed in industries that are governed by various codes and standards in metal fabricating, construction, shipbuilding, petroleum, mining, smelting and power generation (e.g. hydro, nuclear, thermal, solar, tidal). They may be employed in construction and maintenance in a variety of industrial workplaces such as pulp mills, water treatment plants, steel mills, cement, chemical, fertilizer and potash plants, breweries, ship yards, offshore platforms, mines and power generation and co-generation stations, as well as ethanol, oil and gas extraction facilities, upgraders and refineries where the installation, repair, and maintenance, or demolition of the above equipment is required.

Boilermakers use both hot and cold working methods to shape steel components and other materials to form boilers, tanks and vessels. They must use various metal forming machines such as plate shears, punch presses and bending rolls. Tools such as levels, wedges, grinders and cutting torches are used to lay out, fit and smooth edges so the parts fit together. They also use a variety of test equipment and measuring devices.

Their work is performed indoors or outdoors and may be at extreme heights or underground. The work environment of boilermakers can expose them to hazards and conditions such as vibration, excessive noise, fumes, confined spaces, extreme temperatures, radiation, and asbestos and other toxic environments.

Key attributes for people entering this trade are: good hand-eye coordination, mechanical aptitude and manual dexterity. Boilermakers must possess the full range of knowledge, abilities and skills required of the trade including an understanding of mechanical drawings along with mathematical aptitudes. They also require strength and stamina to work with heavy components and equipment. It is common in this trade to travel for work opportunities; therefore, boilermakers must adapt to frequently changing work environments. It is also common in this trade to work long hours and many consecutive shifts.

This analysis recognizes similarities with the work of metal fabricators, industrial mechanics (millwrights), steamfitters/pipefitters, ironworkers and welders.

With experience, boilermakers may act as mentors and trainers to apprentices in the trade. They may also advance to supervisory positions, quality assurance inspectors and safety personnel.

Training Requirements: To graduate from each level of the apprenticeship program, an apprentice must successfully complete the required technical training and compile enough on-the-job experience to total at least 1800 hours each year. Total trade time required is 5400 hours and at least 3 years in the trade.

The technical training is delivered by Red River Community College in Winnipeg, Manitoba.

Level One: 8 weeks
Level Two: 8 weeks
Level Three: 8 weeks

The information contained in this document serves as a guide for employers and apprentices. The document briefly summarizes the training delivered at each level of apprenticeship training. An apprentice spends approximately 15% of the apprenticeship term in a technical training institute learning the technical and theoretical aspects of the trade. The hours and percentages of technical and practical training may vary according to class needs and progress.

The content of the technical training components is subject to change without notice.

Entrance Requirements for Apprenticeship Training

Your grade twelve transcripts (with no modified classes) or GED 12 is your guarantee that you meet the educational entrance requirements for apprenticeship in Saskatchewan. In fact, employers prefer and recommend apprentices who have completed high school. This ensures the individual has all of the necessary skills required to successfully complete the apprenticeship program, and receive journeyperson certification.

Individuals with “modified” or “general” classes in math or science do not meet our entry requirements. These individuals are required to take an entrance assessment prescribed by the SATCC.

English is the language of instruction in all apprenticeship programs and is the common language for business in Saskatchewan. Before admission, all apprentices and/or “upgraders” must be able to understand and communicate in the English language. Applicants whose first language is not English must have a minimum Canadian Language Benchmark Assessment of six (CLB6).

Note: A CLB assessment is valid for a one-year period from date of issue.

Designated Trade Name	**Math Credit** at the Indicated Grade Level❶	**Science Credit** at Grade Level
Boilermaker	Grade 11	Grade 10

❶ - (One of the following) WA – Workplace and Apprenticeship; or F – Foundations; or P – Pre-calculus, or a Math at the indicated grade level (Modified and General Math credits are not acceptable.).

*Applicants who have graduated in advance of 2015-2016, or who do not have access to the revised Science curricula will require a Science at the minimum grade level indicated by trade.

For information about high school curriculum, including Math and Science course names, please see: http://www.curriculum.gov.sk.ca/#

Individuals not meeting the entrance requirements will be subject to an assessment and any required training

ESSENTIAL SKILLS SUMMARY

(How each of the nine essential skills is applied in this trade)

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

Through extensive research, the Government of Canada and other national and international agencies have identified and validated nine essential skills. These skills are used in nearly every occupation and throughout daily life in different ways.

A series of CCDA-endorsed tools have been developed to support apprentices in their training and to be better prepared for a career in the trades. The tools can be used independently or with the assistance of a tradesperson, trainer, employer, teacher or mentor to:

- understand how essential skills are used in the trades;
- learn about individual essential skills strengths and areas for improvement; and
- improve essential skills and increase success in an apprenticeship program.

The tools are available online or for order at: https://www.canada.ca/en/employment-social-development/programs/essential-skills/profiles.html.

The essential skills profile for the boilermaker trade indicates that the most important essential skills are **document use, numeracy** and **oral communication**.

The application of these skills may be described throughout this document within the competency statements which support each subtask of the trade. The following are summaries of the requirements in each of the essential skills, taken from the essential skills profile. A link to the complete essential skills profile can be found at www.red-seal.ca.

READING

Boilermakers read and interpret summaries of toolbox meetings, short notes from co-workers about work activities and directions on product labels. They also read company policies and procedures, as well as code books, collective agreements and Safety Data Sheets (SDS). Boilermakers also read reference books such as metal trades handbooks, crane and rigging handbooks and training manuals.

DOCUMENT USE

Boilermakers locate information in various tables, bills of lading, work procedures, code books, load charts, SDS and equipment catalogues. They interpret various drawings such as rigging, fabrication (prints) and shop drawings to identify work to be completed. They may also make scale drawings.

WRITING

Boilermakers may write work-related notes to co-workers and keep personal logbooks to record daily activities noting information such as hours worked, tasks completed, problems encountered, observations and concerns. They may also write production plans to sequence and schedule tasks. Boilermakers may complete job safety analysis (JSA) reports, health and safety report forms as well as hazard or near-miss report forms.

NUMERACY

Boilermakers schedule their daily work activities. They determine the total weight of materials to be hoisted and use formulas to calculate the working load limit (safe work load) of various wire and fibre ropes. They also measure tube wall thicknesses and calculate tube expansion using formulas. They measure angles to cut tubing or pipe to specifications. They use geometry such as bisecting angles and constructing circles using chords to lay out materials for vessels. Boilermakers use data analysis math to ensure code requirements are met by cross referencing measurements on drawings with industry specifications. They also estimate tube/pipe lengths to perform rough cuts, materials needed for a job and the weight of a load to be lifted. They may also estimate how many workers and hours are required to complete a job. Boilermakers work with both the imperial and metric measurement systems, and therefore must be able to convert between the two systems.

ORAL COMMUNICATION

Boilermakers discuss safety issues with colleagues and supervisors during daily toolbox meetings. They interact with supervisors to get direction and discuss technical issues, health and safety concerns, timelines and personnel matters. They may consult with draftspersons, quality control officers and engineers to discuss problems with fabrication drawings (prints) such as code violations, technical challenges and design flaws. They may also consult with union representatives.

Boilermakers are often required to use personal protective equipment (PPE) such as ear protection, Self-Contained Breathing Apparatus (SCBA), respirators and full face masks which may impede communication. Boilermakers also work in situations where visibility is restricted. Communication is also challenging because boilermakers often work in confined spaces or in towers, out of hearing range. This necessitates the use of hand signals or two-way radios.

THINKING

Boilermakers use critical thinking skills to perform diagnostics, trouble-shooting and problem solving tasks. They may suggest a more feasible timeframe when dealing with tight timelines and while coordinating with other trades. They also determine and implement actions to address hazardous job conditions. For example, they may choose appropriate safety equipment, isolate an area, or call other trades to facilitate assigned tasks.

WORKING WITH OTHERS

Due to the potentially dangerous nature of their work, working with others is a critical skill. Often a boilermaker-welder is paired with a boilermaker-mechanic to form a skilled team. Boilermakers may also work in larger team situations and with other tradespeople. They should be able to communicate effectively, complete the tasks assigned to them and integrate their work with that of the other trades. They must be self-disciplined, ensuring that work done independently is accurate and completed within prescribed time limits.

DIGITAL TECHNOLOGY

Boilermakers may use digitized programmable equipment such as scientific calculators, digital levels and lasers. They may also use application equipment (robotics) and computer-controlled equipment such as welding overlays and computer numerical controlled (CNC) cutting machines. Boilermakers may use computer-assisted training tools such as on-line programs, simulators, or software packages for health and safety training. They may also use computer-aided design (CAD) software.

CONTINUOUS LEARNING

Technical upgrading is offered by companies when new products, procedures and equipment are introduced. Boilermakers may take courses on the job or at community colleges, or access on-line

programs. However, one of the most practical ways for boilermakers to gain new expertise is to learn on the job from more experienced co-workers, mentors or supervisors. It is common for boilermakers to also have welding certification.

ELEMENTS OF HARMONIZATION FOR APPRENTICESHIP TRAINING

At the request of industry, the Harmonization Initiative was launched in 2013 to *substantively align* apprenticeship systems across Canada by making training requirements more consistent in the Red Seal trades. Harmonization aims to improve the mobility of apprentices, support an increase in their completion rates and enable employers to access a larger pool of apprentices.

As part of this work, the Canadian Council of the Directors of Apprenticeship (CCDA) identified four main harmonization priorities in consultation with industry and training stakeholders:

1. Trade name

The official Red Seal name for this trade is Boilermaker.

2. Number of Levels of Apprenticeship

The number of levels of technical training recommended for the Boilermaker trade is 3.

3. Total Training Hours during Apprenticeship Training

The total hours of training, including both on-the-job and in-school training for the Boilermaker trade is 5400.

4. Consistent sequencing of training content (at each level) using the most recent Occupational Standard

Implementation for harmonization took place progressively. Level one was implemented in 2016/2017, level two 2017/2018 and level three 2018/2019. As of September 2020 all levels of training have been harmonized.

White boxes are “Topics,” grey boxes are “In Context”. In context means learning that has already taken place and is being applied to the applicable task. Learning outcomes for in context topics are accomplished in other topics in that level.

Level One (2016/17 implementation)	Level Two (2017/18 implementation)	Level Three (2018/19 implementation)
Safety-Related Functions	Safety-Related Functions	Safety-Related Functions
	Communication and Mentoring	
Tools, Equipment and Work Platforms	Tools, Equipment and Work Platforms	Tools, Equipment and Work Platforms
Organizes Work	Organizes Work	Organizes Work
Communication and Mentoring Techniques		Communication and Mentoring Techniques
Cutting and Welding Activities	Cutting and Welding Activities	Cutting and Welding Activities

Level One (2016/17 implementation)	Level Two (2017/18 implementation)	Level Three (2018/19 implementation)
Cutting and Welding Activities	Cutting and Welding Activities	Cutting and Welding Activities
Rigging and Hoisting	Rigging and Hoisting	Rigging and Hoisting
Fabrication	Fabrication	Fabrication
Fastens Components	Fastens Components	Fastens Components
Vessels and Components (Introduction)	Vessels and Components (Assemble and Fit)	Vessels and Components (Assemble and Fit)
	Vessels and Components (Service)	Vessels and Components (Service)
	Vessels and Components (Removal)	Vessels and Components (Removal)

PIE CHART OF RED SEAL EXAMINATION WEIGHTINGS

MWA A	Performs Common Occupational Skills	26%
MWA B	Performs Rigging and Hoisting	29%
MWA C	Completes New Construction	23%
MWA D	Performs Repairs, Maintenance, Upgrading and Testing	22%

This pie chart represents a breakdown of the interprovincial Red Seal examination. Percentages are based on the collective input from workers from the trade from across Canada. The Task Matrix on the next pages indicates the breakdown of tasks and sub-tasks within each Major Work Activity and the breakdown of questions assigned to the Tasks. Interprovincial examinations typically have between 100 and 150 questions.

BOILERMAKER TASK MATRIX CHART

This chart outlines the major work activities, tasks and sub-tasks from the 2017 Boilermaker Red Seal Occupational Standard. Each sub-task details the corresponding essential skill and level of training where the content is covered. *

* Sub-tasks with numbers in the boxes is where the content will be delivered in training. The Task Matrix Chart will be updated every year until Harmonization implementation is complete. Currently Level One and Level Two are harmonized. Implementation for harmonization will take place progressively. Level one was implemented in 2016/2017, level two 2017/2018, and level three 2018/2019.

A - PERFORMS COMMON OCCUPATIONAL SKILLS

Task A-1 **Performs safety-related functions**	**A-1.01** **Uses personal protective equipment (PPE) and safety equipment** **1.** **(2 & 3 in context)**	**A-1.02** **Maintains safe work environment** **1.** **(2 & 3 in context)**	**A-1.03** **Monitors confined spaces** **1.** **(2 & 3 in context)**	
Task A-2 **Uses tools, equipment and work platforms**	**A-2.01** **Uses hand tools** **1**	**A-2.02** **Uses power tools** **1, 2, 3**	**A-2.03** **Uses shop equipment** **1, 2, 3**	**A-2.04** **Uses cutting and welding tools and equipment** **1, 2, 3**
	A-2.05 **Uses work platforms and access equipment** **1, 2, 3**	**A-2.06** **Uses aerial work platforms** **1, 2, 3**		
Task A-3 **Organizes work**	**A-3.01** **Organizes project tasks and procedures** **1, 2, 3**	**A-3.02** **Uses drawings and specifications** **1, 2, 3**	**3.03** **Handles materials and components** **1, 2, 3**	**A-3.04** **Demobilizes site** **1, 2**
Task A-4 **Uses communication and mentoring techniques**	**A-4.01** **Uses communication techniques** **1,** **2 in context**	**A-4.02** **Uses mentoring techniques** **2 in context,** **3**		

Task A-5 **Performs cutting and welding activities**	**A-5.01** **Cuts material** **1, 2**	**A-5.02** **Prepares joints for fitting** **1, 2, 3**	**A-5.03** **Fits joints** **1, 2, 3**	**A-5.04** **Performs tack welds** **1**
	A-5.05 **Performs basic welding** **1, 2, 3**	**A-5.06** **Performs advanced welding** **3**		

B – PERFORMS RIGGING AND HOISTING

Task B-6 **Plans lift**	**B-6.01** **Determines load** **1, 2, 3**	**B-6.02** **Performs pre-lift analysis** **3**	**B-6.03** **Selects rigging and hoisting equipment** **1, 2, 3**	**B-6.04** **Secures lift area** **1**
Task B-7 **Rigs load**	**B-7.01** **Inspects rigging equipment** **1, 2**	**B-7.02** **Fabricates rigging equipment** **3**	**B-7.03** **Attaches rigging equipment to load** **1, 2**	
Task B-8 **Hoists load**	**B-8.01** **Inspects hoisting equipment** **1, 2**	**B-8.02** **Assembles hoisting equipment** **2, 3**	**B-8.03** **Performs hoisting operations** **1, 2, 3**	**B-8.04** **Secures load before rigging removal** **2**
Task B-9 **Performs post-lift activities**	**B-9.01** **Conducts post-lift inspection** **1, 2**	**B-9.02** **Disassembles hoisting equipment** **1, 2, 3**	**B-9.03** **Maintains rigging equipment** **1**	

C – COMPLETES NEW CONSTRUCTION

Task C-10 Performs fabrication	**C-10.01** Lays out components for fabrication 1, 2, 3	**C-10.02** Cuts components for fabrication 1, 2	**C-10.03** Forms components for fabrication 2, 3	**C-10.04** Constructs components 1, 2, 3
Task C-11 Assembles and fits vessels and components	**C-11.01** Aligns vessels and components 2, 3	**C-11.02** Fits vessels and components 2, 3		
Task C-12 Fastens components	**C-12.01** Bolts components 1, 2	**C-12.02** Expands tubes 2, 3	**C-12.03** Lays up fiberglass 2	

D - PERFORMS REPAIRS, MAINTENANCE, UPGRADING AND TESTING

Task D-13 Services vessels and components	**D-13.01** Inspects vessels and components for defects 2	**D-13.02** Prepares vessels and components for servicing 1, 2, 3	**D-13.03** Repairs vessels and components 2, 3	**D-13.04** Performs preventative maintenance and upgrades 2, 3
	D-13.05 Tests materials, vessels and components 2, 3			

Task D-14 Removes vessels and components	D-14.01 Dismantles vessels and components 2, 3	D-14.02 Removes materials 3

TRAINING PROFILE CHART

The Harmonization Initiative's goal is to *substantively align* apprenticeship systems across Canada by making apprenticeship training requirements more consistent in Red Seal trades. This Training Profile Chart represents Saskatchewan Apprenticeship and Trade Certification Commission (SATCC) technical training sequencing in relation to the Harmonized apprenticeship technical training sequencing, at the topic level, as published in the 2016 Boilermaker Red Seal Occupational Standard (RSOS). See Appendix A for the finalized curriculum comparisons.

Implementation for harmonization will take place progressively. Level one was implemented in 2016/2017, level two 2017/2018 and level three 2018/2019.

Level One	Unit Title	Hours
General Safety	Trade Safety Awareness	7
	Orientation I: Structure/Scope of Trade	7
	Common Hazards	14
	Safety Equipment, W.C.B. and Interpersonal and Essential Skills	11
	Emergency First Aid and C.P.R.	8
Basic Rigging	Ropes	19
	Hoisting	12
	Wire Rope and Attachments	10
Tools, Cutting and Welding	Hand and Power Tools	15
	Basic Materials	12
	Materials Preparation and Assembly	8
	Basic Drafting	24
	Introduction to Layout	8
Materials Knowledge	Electric Arc Welding	35
	Oxy-fuel Cutting	30
Drawing Interpretation	Trade Mathematics One	25
	Metallurgy One	15
	Trade Related Components	10
	Identification of Pressure Vessels	10
		280

Level Two	Unit Title	Hours
Tools, Cutting and Welding	Cutting, Welding and Related Processes	67
	Power Tools (Electric and Pneumatic)	15
	Instruments and Shop Equipment	25
	Metallurgy Two	7
Layout and Fitting	Drawing Interpretation One	24
	Layout and Fabricating	42
	Fibreglass Fitting	12
	Trade Mathematics Two	25
General Rigging	Block and Tackle	20
	Wire Rope Drums, Aerial Access and Equipment, and Scaffolds	15
	Lifting Practices	20
Materials and Related Knowledge	Heat Treatment	8
		280

Level Three	Unit Title	Hours
Materials and Related Knowledge	Business Practices	10
	Orientation II: Journeywork	7
	Advanced Metallurgy	10
	Inspection / Testing of Materials	20
Advanced Rigging	Hoisting and Jacking Equipment and Engineered Lifts	13
	Advanced Block and Tackle	12
	Advanced Cranes	10
Layout and Fitting	Drawing Interpretation Two	7
	Trade Mathematics	20
	Layout	30
	Fitting	30
Trade Related Components	Boilers	30
	Condensers and Exchangers	30
	Tanks	30
	Introductions to Other Heavy Industries	10
	Pre-IP Review: Examination Review	11
		280

TECHNICAL TRAINING COURSE CONTENT

This chart outlines the model for Saskatchewan Apprenticeship and Trade Certification Commission (SATCC) technical training sequencing. For the harmonized level of training, a cross reference to the Red Seal Occupational Standard (RSOS) apprenticeship technical training sequencing, at the learning outcome level is provided.

Implementation for harmonization took place progressively. Level one was implemented in 2016/2017, level two 2017/2018 and level three 2018/2019.

The Red Seal Boilermaker Curriculum Outline, which provides additional detail of the Harmonized technical training, can be found at www.red-seal.ca

Level One — 8 weeks — 280 hours

General Safety — 47 hours

- trade safety awareness
- common hazards
- proper use of safety equipment
- workers' compensation board
- interpersonal and essential skills
- emergency first aid and CPR

RSOS topics covered in this section of training:

A-1 Performs Safety-related functions

A-1.01 Uses personal protective equipment (PPE) and safety equipment
- PPE and safety equipment, their applications, maintenance, storage and procedures for use
- regulatory requirements pertaining to PPE and safety equipment

A-1.02 Maintains safe work environment
- regulatory requirements pertaining to maintaining a safe work environment
- documentation pertaining to workplace safety
- the Occupational Health and Safety Act, Regulation and Code
- safe handling of hazardous materials
- workplace hazards

A-1.03 Monitors confined spaces
- legislation and regulations pertaining to confined space entry
- confined spaces

A-2 Uses tools, equipment and work platforms

A-2.01 Uses hand tools
- hand tools, their applications and procedures for use
- inspection procedures

A-2.02 Uses power tools
- power tools and components, their applications and procedures for use
- inspection procedures

A-2.03 Uses shop equipment
- shop equipment, their applications and procedures for use
- inspection procedures

A-2.04 Uses cutting and welding tools and equipment
- cutting and welding tools and equipment, their applications and procedures for use
- certification requirements
- inspection procedures

A-2.05 Uses work platforms and access equipment
- work platforms and access equipment, their applications, limitations and procedures for use
- safe work practices pertaining to work platforms and access equipment
- regulatory requirements pertaining to work platforms and access equipment

A-2.06 Uses aerial work platforms
- aerial work platforms, their applications, limitations and procedures for use
- regulatory requirements pertaining to aerial work platforms

A-3 Organizes work

A-3.01 Organizes project tasks and procedures
- elements involved in planning and organizing job tasks and procedures

A-3.02 Uses drawings and specifications
- locate and interpret information on drawings and specifications
- interpret drawings
- create a sketch
- convert between metric and imperial measurements

A-3.03 Handles materials and components
- type, properties and handling requirements of materials and components
- safe handling practices for materials and components

A-3.04 Demobilizes Site
- demobilize a site

Basic Rigging — 41 hours

- ropes
- hoisting
- wire ropes and attachments

RSOS topics covered in this section of training:

B-6 Plans lift

B-6.01 Determines load
- load requirements
- calculations and related factors to determine load weight

B-6.03 Selects rigging and hoisting equipment
- rigging, hoisting/lifting and moving equipment, their applications, limitations and procedures
- regulatory requirements pertaining to rigging, hoisting/lifting and moving equipment
- calculations required to select rigging, hoisting/lifting and moving equipment

B-6.04 Secure lift area
- rigging, hoisting/lifting and moving equipment, their applications, limitations and procedures for use
- safety practices related to rigging, hoisting/lifting and moving operations
- jurisdictional regulations pertaining to rigging, hoisting/lifting and moving equipment

B-7 Rigs load

B-7.01 Inspects rigging equipment
- inspection procedures pertaining to rigging equipment
- jurisdictional regulations pertaining to the inspection of rigging equipment

B-7.03 Attaches rigging equipment to load
- procedures to attach rigging equipment to a load

B-8 Hoists load

B-8.01 Inspects hoisting equipment

- process to inspect hoisting equipment

B-8.03 Performs hoisting operations

- hoisting procedures and their associated equipment, applications, limitations and procedures for use
- use of hoisting communication
- engineered lifts
- safety practices related to rigging, hoisting/lifting and moving operations

B-9 Performs post-lift activities

B-9.01 Conducts post-lift inspection

- ability to conduct post-lift inspections

B-9.02 Disassembles hoisting equipment

- procedure to disassemble hoisting equipment and it associated components

B-9.03 Maintains rigging equipment

- procedures to maintain rigging equipment

Tools, Cutting and Welding — 67 hours

- Hand and Power Tools
- Basic materials
- Materials preparation and assembly
- Basic drafting
- Introduction to layout

RSOS topics covered in this section of training:

A-2 Uses tools, equipment and work platforms

A-2.01 Uses hand tools

- hand tools, their applications and procedures for use
- inspection procedures

A-2.02 Uses power tools

- power tools and components, their applications and procedures for use
- inspection procedures

A-2.03 Uses shop equipment

- shop equipment, their applications and procedures for use
- inspection procedures

A-2.04 Uses cutting and welding tools and equipment

- cutting and welding tools and equipment, their applications and procedures for use
- certification requirements
- inspection procedures

A-2.05 Uses work platforms and access equipment

- work platforms and access equipment, their applications, limitations and procedures for use
- safe work practices pertaining to work platforms and access equipment
- regulatory requirements pertaining to work platforms and access equipment

A-2.06 Uses aerial work platforms

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

A-3 Organizes Work

A-3.01 Organizes project tasks and procedures

- elements involved in planning and organizing job tasks and procedures

A-3.02 Uses drawings and specifications
- locate and interpret information on drawings and specifications
- interpret drawings
- create a sketch
- convert between metric and imperial measurements

A-3.03 Handles materials and components
- type, properties and handling requirements of materials and components
- safe handling practices for materials and components

A-3.04 Demobilizes Site
- demobilize a site

C-10 Performs fabrication

C-10.01 Lays out components for fabrication
- procedure to lay out material and components for fabrication and the associated tools and equipment
- calculations required to lay out components
- drawing interpretation

C-10.02 Cuts components for fabrication
- procedures used to cut components for fabrication and their associated tools and equipment
- procedures used to thread components for fabrication and their associated tools and equipment

C-10.04 Constructs components
- procedures to construct components and their associated tools and equipment

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Materials Knowledge — 65 hours

- Electric Arc Welding
- Oxy-fuel Cutting

RSOS topics covered in this section of training:

A-5 Performs cutting and welding activities

A-5.01 Cuts material
- materials to be cut
- cold-cutting processes, their associated equipment and accessories
- hot-cutting processes, their associated equipment and accessories

A-5.02 Prepares joints for fitting
- processes of preparing joints for fitting
- regulatory requirements pertaining to components

A-5.03 Fits joints
- joint fitting techniques and procedures
- regulatory requirements pertaining to fitting components

A-5.04 Performs tack welds
- process to perform tack welds
- regulatory requirements pertaining to tack welds

A-5.05 Performs basic welding
- basic welding processes, their associated equipment and accessories
- welding codes and symbols
- regulatory requirements pertaining to welding processes

Drawing Interpretation 75 hours

- Trade Mathematics One
- Metallurgy One
- Trade Related Components
- Identification of Pressure Vessels

RSOS topics covered in this section of training:

B-6 Plans lift

B-6.01 Determines load

- load requirements
- calculations and related factors to determine load weight

B-6.03 Selects rigging and hoisting equipment

- rigging, hoisting/lifting and moving equipment, their applications, limitations and procedures
- regulatory requirements pertaining to rigging, hoisting/lifting and moving equipment
- calculations required to select rigging, hoisting/lifting and moving equipment

B-6.04 Secure lift area

- rigging, hoisting/lifting and moving equipment, their applications, limitations and procedures for use
- safety practices related to rigging, hoisting/lifting and moving operations
- jurisdictional regulations pertaining to rigging, hoisting/lifting and moving equipment

B-7 Rigs load

B-7.01 Inspects rigging equipment

- inspection procedures pertaining to rigging equipment
- jurisdictional regulations pertaining to the inspection of rigging equipment

B-7.03 Attaches rigging equipment to load

- procedures to attach rigging equipment to a load

B-8 Hoists load

B-8.01 Inspects hoisting equipment

- process to inspect hoisting equipment

B-8.03 Performs hoisting operations

- hoisting procedures and their associated equipment, applications, limitations and procedures for use
- use of hoisting communication
- engineered lifts
- safety practices related to rigging, hoisting/lifting and moving operations

B-9 Performs post-lift activities

B-9.01 Conducts post-lift inspection

- ability to conduct post-lift inspections

B-9.02 Disassembles hoisting equipment

- procedure to disassemble hoisting equipment and it associated components

B-9.03 Maintains rigging equipment

- procedures to maintain rigging equipment

C-10 Performs fabrication

C-10.01 Lays out components for fabrication

- procedure to lay out material and components for fabrication and the associated tools and equipment
- calculations required to lay out components
- drawing interpretation

C-10.02 Cuts components for fabrication

- procedures used to cut components for fabrication and their associated tools and equipment
- procedures used to thread components for fabrication and their associated tools and equipment
- drawing interpretation

C-10.04 Constructs components

- procedures to construct components and their associated tools and equipment

C-12 Fastens components

C-12.01 Bolts components

- techniques used to bolt components and their associated tools and equipment

D-13 Services vessels and components

D-13.02 Prepares vessels and components for servicing

- procedures used to prepare for service of vessels and components

Level Two — 8 weeks — 280 hours

Tools, Cutting and Welding — 114 hours

- Cutting, Welding and Related Processes
- Power Tools (Electric and Pneumatic)
- Instruments and Shop Equipment
- Metallurgy Two

RSOS topics covered in this section of training:

A-2 Uses tools, equipment and work platforms

A-2.02 Uses power tools
- power tools and components, their applications and procedures for use
- inspection procedures

A-2.03 Uses shop equipment
- shop equipment, their applications and procedures for use
- inspection procedures

A-2.04 Uses cutting and welding tools and equipment
- cutting and welding tools and equipment, their applications and procedures for use
- certification requirements
- inspection procedures

A-2.05 Uses work platforms and access equipment
- work platforms and access equipment, their applications, limitations and procedures for use
- safe work practices pertaining to work platforms and access equipment
- regulatory requirements pertaining to work platforms and access equipment

A-2.06 Uses aerial work platforms
- aerial work platforms, their applications, limitations and procedures for use
- regulatory requirements pertaining to aerial work platforms

A-5 Performs cutting and welding activities

A-5.01 Cuts material
- materials to be cut
- cold-cutting processes, their associated equipment and accessories
- hot-cutting processes, their associated equipment and accessories

A-5.02 Prepares joints for fitting
- processes of preparing joints for fitting
- regulatory requirements pertaining to components

A-5.03 Fits joints
- joint fitting techniques and procedures
- regulatory requirements pertaining to fitting components

A-5.05 Performs basic welding
- basic welding processes, their associated equipment and accessories
- welding codes and symbols
- regulatory requirements pertaining to welding processes

D-13 Services vessels and components

D-13.01 Inspects vessels and components for defects
- inspection procedures to detect defects in vessels and components

D-13.02 Prepares vessels and components for servicing
- procedures used to prepare for service of vessels and components

D-13.03 Repairs vessels and components
- procedures to prepare vessels and components for repair
- procedures to hoist material into place in order to repair vessels and components
- procedures to fit material to vessels and components for repair
- procedures to fasten material to vessels and components for repair

D-13.04 Performs preventative maintenance and upgrades
- preventative maintenance and upgrade procedures

D-13.05 Tests materials, vessels and components
- procedures to test materials, vessels and components

Layout and Fitting — 103 hours

- Drawing Interpretation One
- Layout and Fabricating
- Fibreglass Fitting
- Trade Mathematics Two

RSOS topics covered in this section of training:

A-3 Organizes Work

A-3.01 Organizes project tasks and procedures
- elements involved in planning and organizing job tasks and procedures

A-3.02 Uses drawings and specifications
- locate and interpret information on drawings and specifications
- interpret drawings
- create a sketch
- convert between metric and imperial measurements

A-3.03 Handles materials and components
- type, properties and handling requirements of materials and components
- safe handling practices for materials and components

A-3.04 Demobilizes Site
- demobilize a site

A-5 Performs cutting and welding activities

A-5.01 Cuts material
- materials to be cut
- cold-cutting processes, their associated equipment and accessories
- hot-cutting processes, their associated equipment and accessories

A-5.02 Prepares joints for fitting
- processes of preparing joints for fitting
- regulatory requirements pertaining to components

A-5.03 Fits joints
- joint fitting techniques and procedures
- regulatory requirements pertaining to fitting components

A-5.05 Performs basic welding
- basic welding processes, their associated equipment and accessories
- welding codes and symbols
- regulatory requirements pertaining to welding processes

B-6 Plans lift

B-6.01 Determines load
- load requirements
- calculations and related factors to determine load weight

B-6.03 Selects rigging and hoisting equipment

- rigging, hoisting/lifting and moving equipment, their applications, limitations and procedures
- regulatory requirements pertaining to rigging, hoisting/lifting and moving equipment
- calculations required to select rigging, hoisting/lifting and moving equipment

B-7 Rigs load

B-7.01 Inspects rigging equipment

- inspection procedures pertaining to rigging equipment
- jurisdictional regulations pertaining to the inspection of rigging equipment

B-7.03 Attaches rigging equipment to load

- procedures to attach rigging equipment to a load

B-8 Hoists load

B-8.01 Inspects hoisting equipment

- process to inspect hoisting equipment

B-8.02 Assembles hoisting equipment

- procedures used to assemble hoisting equipment

B-8.03 Performs hoisting operations

- hoisting procedures and their associated equipment, applications, limitations and procedures for use
- use of hoisting communication
- engineered lifts
- safety practices related to rigging, hoisting/lifting and moving operations

B-8.04 Secures load before rigging removal

- procedures to secure a load before rigging removal
- jurisdictional regulations pertaining to rigging

B-9 Performs post-lift activities

B-9.01 Conducts post-lift inspection

- ability to conduct post-lift inspections

B-9.02 Disassembles hoisting equipment

- procedure to disassemble hoisting equipment and it associated components

C-10 Performs fabrication

C-10.01 Lays out components for fabrication

- procedure to lay out material and components for fabrication and the associated tools and equipment
- calculations required to lay out components
- drawing interpretation

C-10.02 Cuts components for fabrication

- procedures used to cut components for fabrication and their associated tools and equipment
- procedures used to thread components for fabrication and their associated tools and equipment

C-10.03 Forms components for fabrication

- procedures to form components and their associated tools and equipment
- drawing interpretation

C-10.04 Constructs components

- procedures to construct components and their associated tools and equipment

General Rigging — 55 hours

- Block and Tackle
- Wire Rope Drums, Aerial Access and Equipment, and Scaffolds
- Lifting Practices

RSOS topics covered in this section of training:

A-2 Uses tools, equipment and work platforms

A-2.01 Uses hand tools
- hand tools, their applications and procedures for use
- inspection procedures

A-2.02 Uses power tools
- power tools and components, their applications and procedures for use
- inspection procedures

A-2.03 Uses shop equipment
- shop equipment, their applications and procedures for use
- inspection procedures

A-2.04 Uses cutting and welding tools and equipment
- cutting and welding tools and equipment, their applications and procedures for use
- certification requirements
- inspection procedures

A-2.05 Uses work platforms and access equipment
- work platforms and access equipment, their applications, limitations and procedures for use
- safe work practices pertaining to work platforms and access equipment
- regulatory requirements pertaining to work platforms and access equipment

A-2.06 Uses aerial work platforms
- aerial work platforms, their applications, limitations and procedures for use
- regulatory requirements pertaining to aerial work platforms

B-6 Plans lift

B-6.01 Determines load
- load requirements
- calculations and related factors to determine load weight

B-6.03 Selects rigging and hoisting equipment
- rigging, hoisting/lifting and moving equipment, their applications, limitations and procedures
- regulatory requirements pertaining to rigging, hoisting/lifting and moving equipment
- calculations required to select rigging, hoisting/lifting and moving equipment

B-7 Rigs load

B-7.01 Inspects rigging equipment
- inspection procedures pertaining to rigging equipment
- jurisdictional regulations pertaining to the inspection of rigging equipment

B-7.03 Attaches rigging equipment to load
- procedures to attach rigging equipment to a load

B-8 Hoists load

B-8.01 Inspects hoisting equipment
- process to inspect hoisting equipment

B-8.02 Assembles hoisting equipment
- procedures used to assemble hoisting equipment

B-8.03 Performs hoisting operations

- hoisting procedures & their associated equipment, applications, limitations & procedures for use
- use of hoisting communication
- engineered lifts
- safety practices related to rigging, hoisting/lifting and moving operations

B-8.04 Secures load before rigging removal
- procedures to secure a load before rigging removal
- jurisdictional regulations pertaining to rigging

B-9 Performs post-lift activities

B-9.01 Conducts post-lift inspection
- ability to conduct post-lift inspections

B-9.02 Disassembles hoisting equipment
- procedure to disassemble hoisting equipment and it associated components

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Materials and Related Knowledge — 8 hours

- Heat Treatment

RSOS topics covered in this section of training:

D-13 Services vessels and components

D-13.01 Inspects vessels and components for defects
- inspection procedures to detect defects in vessels and components

D-13.02 Prepares vessels and components for servicing
- procedures used to prepare for service of vessels and components

D-13.03 Repairs vessels and components
- procedures to prepare vessels and components for repair
- procedures to hoist material into place in order to repair vessels and components
- procedures to fit material to vessels and components for repair
- procedures to fasten material to vessels and components for repair

D-13.04 Performs preventative maintenance and upgrades
- preventative maintenance and upgrade procedures

D-13.05 Tests materials, vessels and components
- procedures to test materials, vessels and components

Level Three — 8 weeks — 280 hours

Materials and Related Knowledge — 47 hours

- Business Practices
- Orientation II: Journeywork
- Advanced Metallurgy
- Inspection / Testing of Materials

RSOS topics covered in this section of training:

D-13 Services vessels and components

D-13.02 Prepares vessels and components for servicing
- procedures used to prepare for service of vessels and components

D-13.03 Repairs vessels and components
- procedures to prepare vessels and components for repair
- procedures to hoist material into place in order to repair vessels and components
- procedures to fit material to vessels and components for repair
- procedures to fasten material to vessels and components for repair

D-13.04 Performs preventative maintenance and upgrades
- preventative maintenance and upgrade procedures

D-13.05 Tests materials, vessels and components
- procedures to test materials, vessels and components

Advanced Rigging — 35 hours

- Hoisting and Jacking Equipment and Engineered Lifts
- Advanced Block and Tackle
- Advanced Cranes

RSOS topics covered in this section of training:

A-2 Uses tools, equipment and work platforms

A-2.02 Uses power tools
- power tools and components, their applications and procedures for use
- inspection procedures

A-2.03 Uses shop equipment
- shop equipment, their applications and procedures for use
- inspection procedures

A-2.04 Uses cutting and welding tools and equipment
- cutting and welding tools and equipment, their applications and procedures for use
- certification requirements
- inspection procedures

A-2.05 Uses work platforms and access equipment
- work platforms and access equipment, their applications, limitations and procedures for use
- safe work practices pertaining to work platforms and access equipment
- regulatory requirements pertaining to work platforms and access equipment

A-2.06 Uses aerial work platforms
- aerial work platforms, their applications, limitations and procedures for use
- regulatory requirements pertaining to aerial work platforms

B-6 Plans lift

B-6.01 Determines load

- load requirements
- calculations and related factors to determine load weight

B-6.02 Performs pre-lift analysis

- pre-lift analysis
- rigging and hoisting
- regulatory requirements pertaining to rigging, hoisting/lifting and moving equipment

B-6.03 Selects rigging and hoisting equipment

- rigging, hoisting/lifting and moving equipment, their applications, limitations and procedures
- regulatory requirements pertaining to rigging, hoisting/lifting and moving equipment
- calculations required to select rigging, hoisting/lifting and moving equipment

B-7 Rigs load

B-7.02 Fabricates rigging equipment

- process to fabricate rigging equipment

B-8 Hoists load

B-8.02 Assembles hoisting equipment

- procedures used to assemble hoisting equipment

B-8.03 Performs hoisting operations

- hoisting procedures and their associated equipment, applications, limitations and procedures for use
- use of hoisting communication
- engineered lifts
- safety practices related to rigging, hoisting/lifting and moving operations

B-9 Performs post-lift activities

B-9.02 Disassembles hoisting equipment

- procedure to disassemble hoisting equipment and it associated components

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Layout and Fitting — 50 hours

- Drawing Interpretation Two
- Trade Mathematics
- Layout
- Fitting

RSOS topics covered in this section of training:

A-3 Organizes Work

A-3.01 Organizes project tasks and procedures

- elements involved in planning and organizing job tasks and procedures

A-3.02 Uses drawings and specifications

- locate and interpret information on drawings and specifications
- interpret drawings
- create a sketch
- convert between metric and imperial measurements

A-3.03 Handles materials and components

- type, properties and handling requirements of materials and components
- safe handling practices for materials and components

C-10 Performs fabrication

C-10.01 Lays out components for fabrication

- procedure to lay out material and components for fabrication and the associated tools and equipment
- calculations required to lay out components
- drawing interpretation

C-10.03 Forms components for fabrication

- procedures to form components and their associated tools and equipment
- drawing interpretation

C-10.04 Constructs components

- procedures to construct components and their associated tools and equipment

C-11 Assembles and fits vessels and components

C-11.01 Aligns vessels and components

- procedures to align vessels and components and their associated tools and equipment
- drawing interpretation

C-11.02 Fits vessels and components

- procedures to fit vessels and components and their associated tools and equipment

Trade Related Components — 50 hours

- Boilers
- Condensers and Exchangers
- Tanks
- Introductions to Other Heavy Industries
- Pre-IP Review: Examination Review

RSOS topics covered in this section of training:

C-12 Fastens components

C-12.02 Expands tubes

- techniques used to expand tubes and their associated tools and equipment
- calculations required when expanding a tube

D-13 Services vessels and components

D-13.02 Prepares vessels and components for servicing

- procedures used to prepare for service of vessels and components

D-13.03 Repairs vessels and components

- procedures to prepare vessels and components for repair
- procedures to hoist material into place in order to repair vessels and components
- procedures to fit material to vessels and components for repair
- procedures to fasten material to vessels and components for repair

D-13.04 Performs preventative maintenance and upgrades

- preventative maintenance and upgrade procedures

D-13.05 Tests materials, vessels and components

- procedures to test materials, vessels and components

D-14 Removes vessels and components

D-14.01 Dismantles vessels and components

- dismantling procedures related to vessels and components
- safe work practices related to the dismantling of vessels and components

D-14.02 Removes materials

- knowledge of procedures related to the removal of materials
- regulatory requirements pertaining to the disposal of waste materials

In Context Topics

In context means learning that has already taken place and is being applied to the applicable task. Learning outcomes for in context topics are accomplished in other topics in that level.

A-1 Performs Safety-related functions

A-1.01 Uses personal protective equipment (PPE) and safety equipment

- PPE and safety equipment, their applications, maintenance, storage and procedures for use
- regulatory requirements pertaining to PPE and safety equipment

A-1.02 Maintains safe work environment

- regulatory requirements pertaining to maintaining a safe work environment
- documentation pertaining to workplace safety
- the Occupational Health and Safety Act, Regulation and Code
- safe handling of hazardous materials
- workplace hazards

A-1.03 Monitors confined spaces

- legislation and regulations pertaining to confined space entry
- confined spaces

A-4 Uses communication and mentoring techniques

A-4.01 Uses communication techniques

- trade terminology
- effective communication practices

A-4.02 Uses mentoring techniques

- strategies for learning skills in the workplace
- strategies for teaching workplace skills

APPENDIX A: POST HARMONIZATION TRAINING PROFILE CHART

This chart which outlines the finalized model for SATCC technical training sequencing with a cross reference to the Harmonized apprenticeship technical training sequencing, at the topic level.

Implementation for harmonization took place progressively. Level one was implemented in 2016/2017, level two 2017/2018 and level three 2018/2019.

SATCC Level One	Unit Title	Hours	Pan-Canadian Harmonized Level One
General Safety	Orientation I: Structure/Scope of Trade	7	Communication and Mentoring Techniques
	Trade Safety Awareness	7	Safety-Related Functions
	Common Hazards	14	
	Safety Equipment, W.C.B. and Interpersonal and Essential Skills	11	
	Emergency First Aid and C.P.R.	8	
Basic Rigging	Ropes	19	Rigging and Hoisting
	Hoisting	12	
	Wire Rope and Attachments	10	
Tools, Cutting and Welding	Basic Materials	12	Organizes Work
	Materials Preparation and Assembly	8	
	Hand and Power Tools	15	Tools, Equipment and Work Platforms
	Basic Drafting	24	Fabrication
	Introduction to Layout	8	
Materials Knowledge	Electric Arc Welding	35	Cutting and Welding Activities
	Oxy-fuel Cutting	30	
Drawing Interpretation	Trade Related Components	10	Fastens Components
	Trade Mathematics One	25	Vessels and Components (Introduction)
	Metallurgy One	15	
	Identification of Pressure Vessels	10	
		280	

Level Two	Unit Title	Hours	Pan-Canadian Harmonized Level Two
Tools, Cutting and Welding	Cutting, Welding and Related Processes	67	Cutting and Welding Activities
	Power Tools (Electric and Pneumatic)	15	Tools, Equipment and Work Platforms
	Instruments and Shop Equipment	25	
	Metallurgy Two	7	Vessels and Components (Service)

Layout and Fitting	Drawing Interpretation One	24	Organizes Work
	Fibreglass Fitting	12	Fastens Components
	Layout and Fabricating	42	Fabrication
	Trade Mathematics Two	25	Vessels and Components (Assemble and Fit)
General Rigging	Block and Tackle	20	Rigging and Hoisting
	Wire Rope Drums, Aerial Access and Equipment, and Scaffolds	15	
	Lifting Practices	20	
Materials and Related Knowledge	Heat Treatment	8	Vessels and Components (Service)
		280	

Level Three	Transcript Code	Hours	Pan-Canadian Harmonized Level Three
Materials and Related Knowledge	Business Practices	10	Vessels and Components (Service)
	Advanced Metallurgy	10	
	Inspection / Testing of Materials	20	
	Orientation II: Journeywork	7	Communication and Mentoring Techniques
Advanced Rigging	Hoisting and Jacking Equipment and Engineered Lifts	13	Tools, Equipment and Work Platforms
	Advanced Block and Tackle	12	Rigging and Hoisting
	Advanced Cranes	10	
Layout and Fitting	Drawing Interpretation Two	7	Organizes Work
	Trade Mathematics	20	
	Layout	30	Vessels and Components (Assemble and Fit)
	Fitting	30	Fabrication
Trade Related Components	Boilers	30	Fastens Components
	Condensers and Exchangers	30	Vessels and Components (Assemble and Fit)
	Tanks	30	Vessels and Components (Removal)
	Introductions to Other Heavy Industries	10	Exceeds
	Pre-IP Review: Examination Review	11	Exceeds
		280	

Exceed Topics

Throughout this guide to course content there are topics, which exceed the scope of work set out by the Boilermaker RSOS. Industry in Saskatchewan has deemed certain topics to fall within the scope of work of the Boilermaker trade and therefore require technical training to also cover these topics.