Apprenticeship and Industry Training

Boilermaker

Curriculum Guide

0381 (2022)

Alberta

Apprenticeship and Industry Training

ALBERTA ADVANCED EDUCATION

Boilermaker: apprenticeship education program curriculum guide

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Boilermaker
Table of Contents

CURRICULUM GUIDE

Apprenticeship

Apprenticeship is post-secondary education with a difference. Apprenticeship begins with finding a sponsor. Sponsors guide apprentices, and support on-the-job learning through provision of mentorship. Approximately 80 per cent of an apprentice's time is spent on the job under the supervision of a certified journeyperson or qualified tradesperson. The other 20 per cent involves technical training provided at, or through, a post-secondary institution (PSI) – usually a college or technical institute.

To receive their post-secondary credential, apprentices must learn theory and skills, and they must pass examinations. Criteria for the program—including the content and delivery of technical training—are developed and updated by the Registrar.

The graduate of the Boilermaker apprenticeship program is an individual who will be able to:

- understand the principles of drafting; how drawings originate, their purpose and how to correctly interpret the information therein
- understand the use of each type of drawing, part work order sketches, materials lists and specification sheets
- layout from drawings to material; pattern development and template making
- relate to all applicable Codes and Regulations with reference to materials specifications, uses and safety for vessels of all types and the acceptable methods of construction for pressure vessels
- relate to metallurgy, structural shapes, plate, pipe and pipe fittings with respect to vessel components, ropes, wire and fibre types, uses of pipe and its respective fittings and materials used with pressure vessels, both metallic and non-metallic
- use hand tools and powered equipment in a proper and safe manner
- calculate material quantities
- perform an operation with oxyfuel or electric arc welding equipment
- plans lifts to ensure that safe rigging and hoisting practices are followed to avoid personal injury as well as damage to equipment and property
- relate to work of other tradespeople in affiliated trades
- perform assigned tasks in accordance with quality and production standards required by industry

Apprenticeship and Industry Training System

Alberta's apprenticeship education programs are supported by industry stakeholders that ensures a highly skilled, internationally competitive workforce in the province. The Registrar establishes the educational standards and provides direction to the system supported by industry and the PSI's. The Ministry of Advanced Education provides the legislative framework and administrative support for the apprenticeship and industry training system.

Special thanks are offered to the following industry members who contributed to the development of the standard:

Mr. L. Norman	Leduc
Mr. T. Brisson	Morinville
Mr. G. Tardif	Sherwood Park
Mr. K. Thiessen	Edmonton
Mr. E. Velichko	Spruce Grove
Mr. J. Fletcher	Edmonton
Mr. R. Reid	Morinville
Mr. P. Scherba	Edmonton

Alberta Government

Alberta Advanced Education works with industry, sponsor and employee organizations and PSI's to:

- facilitate industry's development and maintenance of training and certification standards
- provide registration and counselling services to apprentices and sponsors
- coordinate technical training in collaboration with training providers
- certify apprentices and others who meet industry standards

Apprenticeship Safety

Safe working procedures and conditions, incident/injury prevention, and the preservation of health are of primary importance in apprenticeship education programs in Alberta. These responsibilities are shared and require the joint efforts of government, sponsors, employees, apprentices and the public. Therefore, it is imperative that all parties are aware of circumstances that may lead to injury or harm.

Safe learning experiences and healthy environments can be created by controlling the variables and behaviours that may contribute to or cause an incident or injury. By practicing a safe and healthy attitude, everyone can enjoy the benefit of an incident and injury free environment.

Occupational Health and Safety

Persons engaged in, or supporting an individual in an experiential learning environment are often exposed to more worksite hazards than in other forms of traditional post-secondary education and therefore should be familiar with and apply the Occupational Health and Safety Act, Regulations and Code when dealing with personal safety and the special safety rules that apply to all daily tasks.

Occupational Health and Safety-OHS (a division of Alberta Labour and Immigration) conducts periodic inspections of workplaces to ensure that safety regulations for industry are being observed.

Additional information is available at www.alberta.ca/occupational-health-safety.aspx

Technical Training

Apprenticeship technical training is delivered by the PSI's throughout Alberta. The PSI's are committed to delivering the technical training component of Alberta apprenticeship programs in a safe, efficient and effective manner. All PSI's place a strong emphasis on safety that complements safe workplace practices towards the development of a culture of safety for all professions.

The PSI's work with industry and Alberta Advanced Education to enhance access and responsiveness to industry needs through the delivery of the technical training component of apprenticeship education programs across the province. They develop curriculum from the curriculum guides established by the Registrar in consultation with the PSI's and industry and provide the technical training to apprentices.

The following PSI's deliver Boilermaker trade apprenticeship technical training:

Northern Alberta Institute of Technology (Souch Campus)

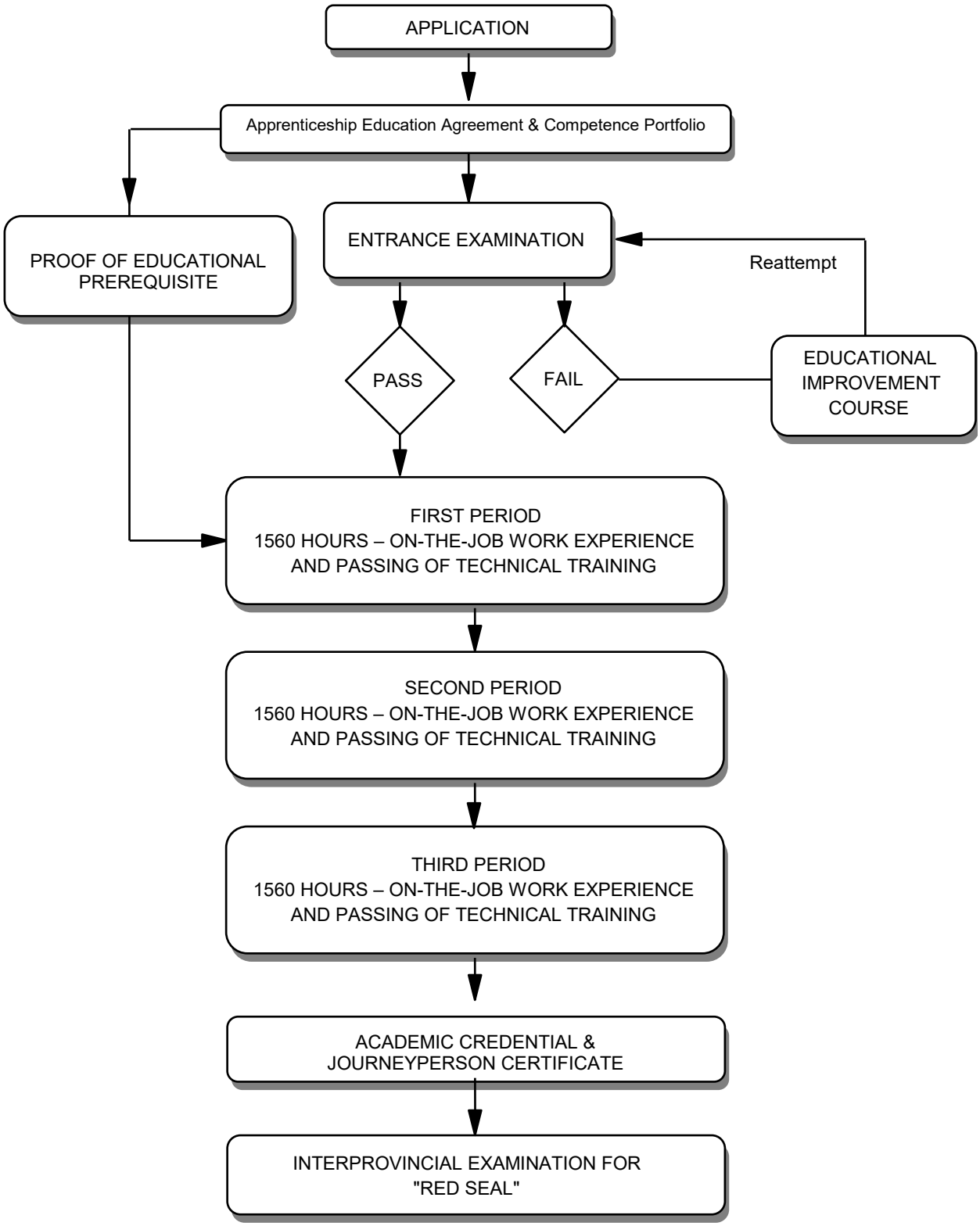
Procedures for Recommending Revisions to the Curriculum Guide

Any concerned individual or group in the province of Alberta may make recommendations for change by writing to:

Registrar of Apprenticeship Programs
c/o Apprenticeship Delivery and Industry Support Services
Apprenticeship Delivery and Industry Support
Advanced Education
19th floor, Commerce Place
10155 102 Street NW
Edmonton AB T5J 4L5

It is requested that recommendations for change refer to specific areas and state references used.

Apprenticeship Route toward Academic Credential

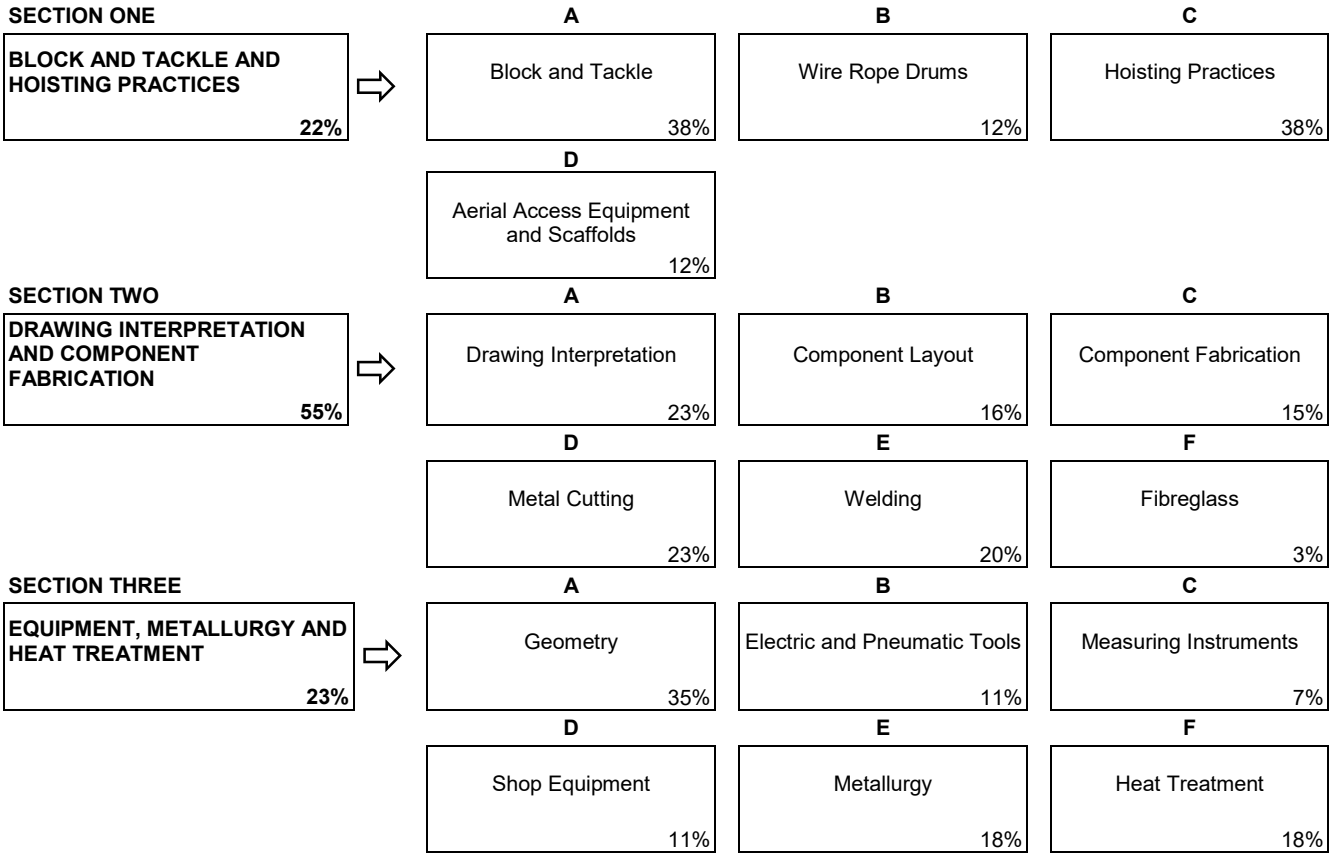


Boilermaker Training Profile

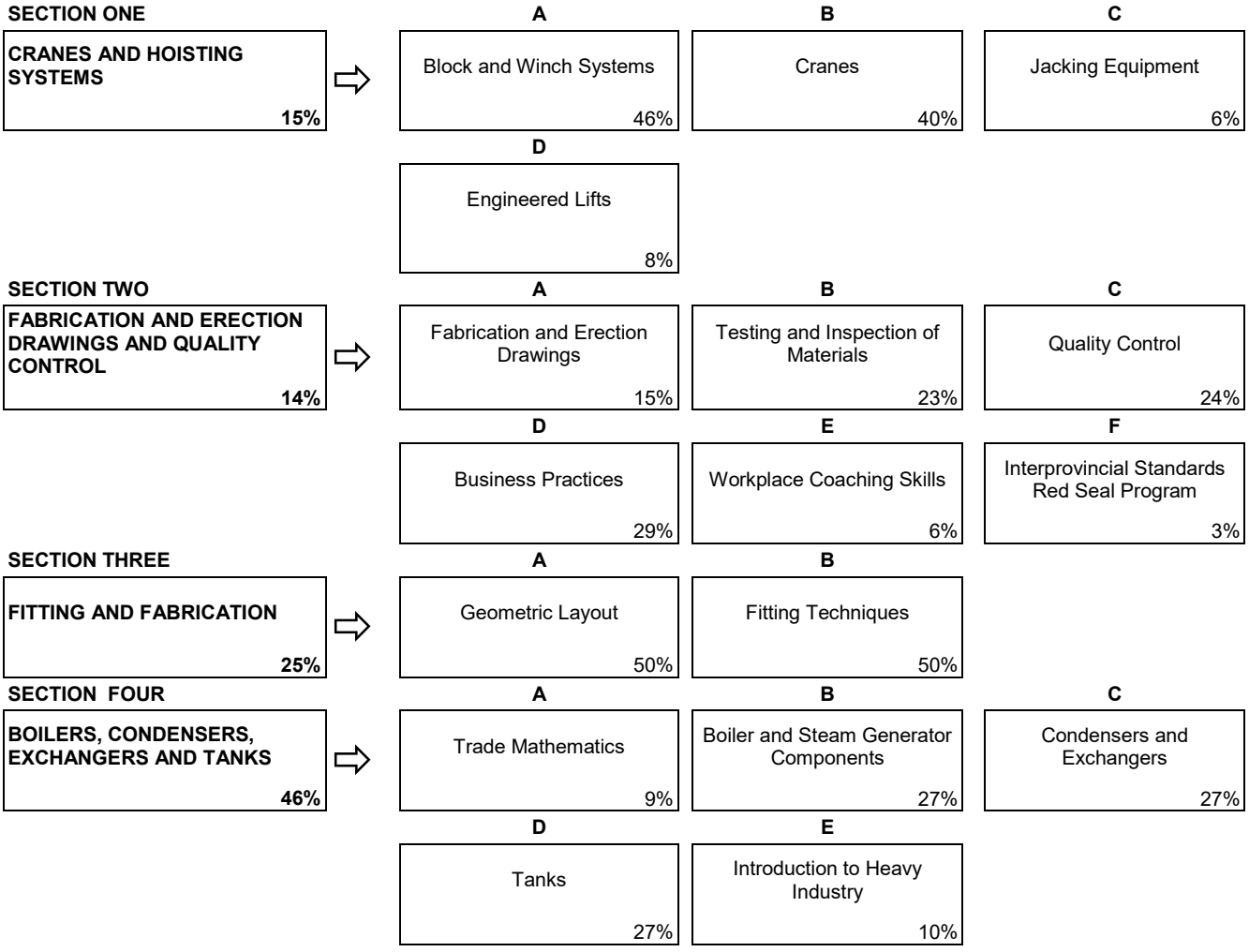
FIRST PERIOD
(8 Weeks 30 Hours per Week – Total of 240 Hours)

SECTION ONE	**A**	**B**	**C**
STANDARD WORKPLACE SAFETY **10%**	Safety Legislation, Regulations & Industry Policy in the Trades 33%	Climbing, Lifting, Rigging and Hoisting 33%	Hazardous Materials and Fire Protection 9%
	D	**E**	**F**
	Apprenticeship Training Program 8%	Confined Space Entry 9%	Communication Skills 8%
SECTION TWO	**A**	**B**	**C**
HOISTING DEVICES AND ROPES **16%**	Ropes 26%	Hoisting Devices and Accessories 26%	Hoisting Communication 22%
	D		
	Wire Rope And Attachments 26%		
SECTION THREE	**A**	**B**	**C**
DRAWINGS, LAYOUT AND TRADE SPECIFIC MATERIALS **24%**	Trade Specific Materials 21%	Materials Preparation and Assembly 14%	Drawing Standards 34%
	D		
	Fundamentals of Layout 31%		
SECTION FOUR	**A**	**B**	**C**
WELDING AND CUTTING **25%**	Electric Arc Welding 42%	Oxy-Fuel Cutting 42%	Steel Production 16%
SECTION FIVE	**A**	**B**	**C**
TOOLS, PRESSURE VESSELS, TANKS AND BOILERS **25%**	Math Concepts 47%	Hand and Power Tools 26%	Pressure Vessels, Tanks and Boilers 27%

SECOND PERIOD
(8 Weeks 30 Hours per Week – Total of 240 Hours)



THIRD PERIOD
(8 Weeks 30 Hours per Week – Total of 240 Hours)



FIRST PERIOD TECHNICAL TRAINING
BOILERMAKER TRADE
CURRICULUM GUIDE

UPON SUCCESSFUL COMPLETION OF THIS PROGRAM THE APPRENTICE SHOULD BE ABLE TO PERFORM THE FOLLOWING OUTCOMES AND OBJECTIVES.

SECTION ONE: ..... STANDARD WORKPLACE SAFETY 10%

A. Safety Legislation, Regulations & Industry Policy in the Trades 33%

Outcome: ***Apply legislation, regulations and practices ensuring safe work in this trade.***

1. Demonstrate the application of the Occupational Health and Safety Act, Regulation and Code.
2. Describe the sponsor's and employee's role with Occupational Health and Safety (OH&S) regulations, Worksite Hazardous Materials Information Systems (WHMIS), fire regulations, Workers Compensation Board regulations and related advisory bodies and agencies.
3. Describe industry practices for hazard assessment and control procedures.
4. Describe the responsibilities of workers and sponsors to apply emergency procedures.
5. Describe tradesperson attitudes with respect to housekeeping, personal protective equipment and emergency procedures.
6. Describe the roles and responsibilities of sponsors and employees with the selection and use of personal protective equipment (PPE).
7. Maintain required PPE for tasks.
8. Use required PPE for tasks.

B. Climbing, Lifting, Rigging and Hoisting 33%

Outcome: ***Use industry standard practices for climbing, lifting, rigging and hoisting in this trade.***

1. Describe manual lifting procedures.
2. Describe rigging hardware and associated safety factors.
3. Select equipment for rigging loads.
4. Describe hoisting and load moving procedures.
5. Maintain personal protective equipment (PPE) for climbing, lifting and load moving equipment.
6. Use PPE for climbing, lifting and load moving equipment.

C. Hazardous Materials & Fire Protection 9%

Outcome: ***Apply industry standard practices for hazardous materials and fire protection in this trade.***

1. Describe roles, responsibilities, features and practices related to the Workplace Hazardous Materials Information System (WHMIS) program.
2. Describe three key elements of WHMIS.
3. Describe handling, storing and transporting procedures for hazardous material.
4. Describe venting procedures when working with hazardous materials.
5. Describe hazards, classes, procedures and equipment related to fire protection.

D. Apprenticeship Training Program 8%

Outcome: Manage an apprenticeship to earn journeyperson certification.

1. Describe the apprentice education agreement responsibilities of the apprentice, sponsor and Alberta Apprenticeship and Industry Training.
2. Describe the purpose of the apprentice competency portfolio.
3. Describe the procedure for changing sponsors during an active apprenticeship.
4. Describe the purpose of the curriculum guide.
5. Describe the procedure for progressing through an apprenticeship.
6. Describe advancement opportunities in this trade.

E. Confined Space Entry..... 9%

Outcome: Apply safe work procedures pertaining to confined space entry.

1. Describe confined space entry procedures.
2. Describe confined space entry legislation.

F. Communication Skills 8%

Outcome: Demonstrate effective communication skills.

1. Demonstrate effective communication skills.

SECTION TWO: .....HOISTING DEVICES AND ROPES 16%

A. Ropes 26%

Outcome: Demonstrate knowledge of the characteristics of ropes used for rigging.

1. Describe the construction of fibre and synthetic ropes.
2. Describe rope maintenance.
3. Describe working load limits formulas, factors and reductions for natural and synthetic ropes.
4. Describe the uses of knots, hitches and splices
5. Describe the strength reductions of knots, hitches and splices.
6. Tie knots and hitches.
7. Splice ropes.

B. Hoisting Devices and Accessories 26%

Outcome: Hoist a load.

1. Describe types of mobile cranes.
2. Interpret manufacturer’s specifications for hoisting equipment.
3. Calculate the centre of gravity for different types of loads.
4. Use tables and charts for sling and attachment selection.
5. Demonstrate sling configurations on loads for hoisting.
6. Demonstrate hitches used for hoisting materials.
7. Use slings, attachments and tag lines.
8. Hoist a load.

C. Hoisting Communication 22%

Outcome: Demonstrate hoisting communication techniques.

1. Demonstrate hand signals used for moving equipment and hoisting.
2. Demonstrate voice communications for moving equipment and hoisting.

D. Wire Rope and Attachments 26%

Outcome: Perform rigging skills using wire rope and attachments.

1. Describe wire ropes.
2. Describe wire rope faults and removal criteria.
3. Describe uses of rigging hardware, hooks and attachments.
4. Calculate working load limits.

SECTION THREE: .....DRAWINGS, LAYOUT AND TRADE SPECIFIC MATERIALS 24%

A. Trade Specific Materials 21%

Outcome: Apply knowledge of basic materials.

1. Describe structural shapes and their designations.
2. Define camber and sweep.
3. Describe the classification of steel plate with reference to thickness and width.
4. Describe the applications of clad steel and other cladding materials.
5. Describe grating and its applications.
6. Describe expanded mesh and its applications.
7. Describe bolts, studs and screws and their applications.
8. Calculate bolt, stud and screw thread lengths.
9. Describe characteristics and applications of tube.
10. Describe characteristics and applications of pipe.
11. Describe pipe fittings and their applications.
12. Describe cutting/threading of pipe using manual and mechanical process.
13. Perform pipe cutting using mechanical processes.

B. Material Preparation and Assembly 14%

Outcome: Describe material preparation and assembly.

1. Describe material markup.
2. Describe the purpose and application of templates.
3. Describe methods used to identify fabricated components and assemblies.

C. Drawing Standards 34%

Outcome: Compose a sketch based on a set of drawings.

1. Describe types of drawings.
2. Describe drawing components.

3. Describe pictorial drawings.
4. Describe drawing conventions.
5. Describe drawing views and their applications.
6. Describe right and left hand views.
7. Interpret symbols and abbreviations.
8. Compose a sketch.

D. Fundamentals of Layout 31%

Outcome: Perform layout skills.

1. Use measuring, checking and layout tools.
2. Perform geometrical constructions.
3. Produce templates using parallel line development.
4. Layout bolt circles, manholes, flanges and ellipses.

SECTION FOUR: ..... WELDING AND CUTTING 25%

A. Electric Arc Welding 42%

Outcome: Use welding equipment.

1. Use PPE and safety equipment specific to welding.
2. Describe types of arc welding machines and their operations.
3. Describe the numerical definitions of electrodes and heat settings.
4. Describe expansion, contraction and distortion resulting from welding.
5. Identify common weld faults.
6. Weld stringer beads.

B. Oxy-fuel Cutting 42%

Outcome: Use oxy-fuel cutting equipment.

1. Use PPE and safety equipment specific to oxy-fuel cutting.
2. Describe the oxy-fuel cutting process.
3. Describe components of oxy-fuel cutting equipment.
4. Describe the purpose of a manifold system.
5. Describe types of flames and their uses.
6. Describe troubleshooting procedures for oxy-fuel equipment and operations.
7. Describe handling, transporting and storing of cylinders.
8. Describe hazardous situations.
9. Describe expansion, contraction and distortion resulting from cutting.
10. Demonstrate fire prevention and controls.
11. Demonstrate the set-up and shutdown of oxy-fuel equipment.
12. Demonstrate the setting of oxy-fuel pressures, balancing and flame adjustments.
13. Demonstrate manual cutting.

C. Steel Production 16%

Outcome: Describe the properties of metal elements.

1. Describe ferrous and non-ferrous metals.
2. Describe the five groups of steel and their properties and applications.
3. Describe elements present in steel and their effects.
4. Describe the types of carbon steel.
5. Describe the physical and mechanical properties of carbon steel.
6. Describe the production of cast iron, carbon steel, alloy steel and stainless steel.
7. Describe the forming of steel products.
8. Describe the American Iron and Steel Institute (AISI) classification system.

SECTION FIVE:..... TOOLS, PRESSURE VESSELS, TANKS AND BOILERS 25%

A. Math Concepts 47%

Outcome: Perform calculations on practical applications using various units of measurement.

1. Describe metric and imperial measurement systems.
2. Convert measurements between the metric and imperial measurement systems.
3. Perform trade-related calculations involving decimals and fractions.
4. Perform trade-related calculations using perimeter, area and volume formulas.

B. Hand and Power Tools 26%

Outcome: Use hand tools, power tools, pneumatic tools and stationary equipment.

1. Use hand tools.
2. Maintain hand tools
3. Use power tools.
4. Maintain power tools.
5. Use pneumatic tools and accessories.
6. Maintain pneumatic tools and accessories.
7. Use stationary equipment.
8. Maintain stationary equipment.

C. Pressure Vessels, Tanks and Boilers 27%

Outcome: Describe pressure vessels, tanks, boilers and their components.

1. Define pressure vessel.
2. Describe types of pressure vessels.
3. Describe pressure vessel components and their functions.
4. Describe pressure and non-pressure components.
5. Describe access openings.
6. Describe watertube boilers and firetube boilers.
7. Describe heat exchangers and their components.
8. Describe distillation towers and their components.
9. Describe storage tanks and their components.
10. Describe the boilermaker's involvement in various heavy industrial sectors.

SECOND PERIOD TECHNICAL TRAINING
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UPON SUCCESSFUL COMPLETION OF THIS PROGRAM, THE APPRENTICE SHOULD BE ABLE TO PERFORM THE FOLLOWING OUTCOMES AND OBJECTIVES.

SECTION ONE: ..... BLOCK AND TACKLE AND HOISTING PRACTICES 22%

A. Block and Tackle 38%

Outcome: Use block and tackle systems.

1. Demonstrate methods of reeving.
2. Calculate mechanical advantage of block and tackle systems.
3. Calculate working load limits for rigging arrangements.

B. Wire Rope Drums 12%

Outcome: Use wire rope drums.

1. Describe fleet angles required for grooved and smooth drums.
2. Describe spooling procedures.
3. Determine drum capacity.

C. Hoisting Practices 38%

Outcome: Apply hoisting techniques.

1. Describe mobile equipment.
2. Describe load stress and precautions in the use of high lines.
3. Define the sling tension formula.
4. Determine working load limits for load and sling configurations.
5. Use rigging tables and charts.
6. Demonstrate hoisting signals.

D. Aerial Access Equipment and Scaffolds 12%

Outcome: Use temporary work platforms.

1. Describe temporary work platform systems.
2. Set up temporary work platforms.

SECTION TWO: ..... DRAWING INTERPRETATION AND COMPONENT FABRICATION 55%

A. Drawing Interpretation 23%

Outcome: Interpret drawings.

1. Interpret drawings.

B. Component Layout 16%

Outcome: Layout components.

1. Describe abbreviations used in layout.
2. Apply geometric concepts for layout and fabrication of components.
3. Utilize material through pre-planning and nesting.
4. Develop templates using geometric construction and parallel and radial line development.
5. Layout components from drawings.

C. Component Fabrication..... 15%

Outcome: Fabricate components.

1. Fabricate components from drawings.
2. Fit and install fabricated components.

D. Metal Cutting 23%

Outcome: Apply metal cutting techniques.

1. Describe material expansion and contraction.
2. Describe cutting processes involved in cutting alloy steels and non-ferrous metals.
3. Describe cutting techniques and cutting faults.
4. Determine if metal conditions require specific cleaning methods.
5. Demonstrate flame-cutting skills.
6. Perform weld joint preparation.

E. Welding 20%

Outcome: Apply welding techniques.

1. Describe the properties, use and care of arc welding electrodes.
2. Describe the functions of slag and shielding gas in the welding process.
3. Explain welding machine selection based on task.
4. Describe other welding processes (GTAW, GMAW, FCAW and SAW).
5. Interpret standardized welding symbols.
6. Demonstrate carbon arc cutting.
7. Demonstrate welding techniques used to control distortion.
8. Demonstrate welding operations.

F. Fibreglass..... 3%

Outcome: Describe fibre-reinforced plastics.

1. Describe the uses of fibreglass in the boilermaker industry.
2. Describe the tools, resins and fibreglass materials required for lay-up and repairs.
3. Describe safe handling and storage of chemicals required for fibreglass operations.
4. Describe mixing ratios and procedures used in fibreglass operations.
5. Describe procedures for fibreglass lay-up and repair.

SECTION THREE: .....EQUIPMENT, METALLURGY AND HEAT TREATMENT..... 23%

A. Geometry 35%

Outcome: Apply math concepts to solve geometry problems.

1. Calculate squares and square roots of numbers.
2. Perform calculations using Pythagorean Theorem.
3. Solve problems involving percentages.
4. Perform calculations on practical applications.

B. Electric and Pneumatic Tools..... 11%

Outcome: Operate power tools.

1. Describe controlled bolting equipment.
2. Demonstrate the use of portable electric and pneumatic tools.

C. Measuring Instruments 7%

Outcome: Use measuring instruments.

1. Describe new technologies.
2. Use transits and levels.
3. Use micrometers and calipers (metric and imperial).

D. Shop Equipment 11%

Outcome: Use shop equipment.

1. Describe drilling equipment.
2. Describe drill bit geometry and sharpening procedures.
3. Describe power-rolling operations.
4. Describe press brake operations.
5. Calculate blank length before forming.
6. Use shearing and punching machines.
7. Use drilling equipment.
8. Use power saws.

E. Metallurgy 18%

Outcome: Describe the properties of metal.

1. Describe metals and alloys.
2. Describe methods of determining the hardness of metals.
3. Describe how heat influences the internal structure of steel.
4. Describe the causes of distortion.
5. Describe methods of controlling and correcting distortion.
6. Describe the effects that carbon has on the cutting and welding of steel.
7. Describe the effects that alloys have on the cutting and welding of steel.
8. Describe the effects of hot and cold working of metals.

F. Heat Treatment 18%

Outcome: ***Describe heat treatment processes.***

1. Describe steel designation systems.
2. Describe the heat-affected zone (HAZ).
3. Describe preheat and postheat treatment processes.
4. Describe heat treatment processes in the manufacturing of steel products.

THIRD PERIOD TECHNICAL TRAINING
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SECTION ONE: ..... CRANES AND HOISTING SYSTEMS 15%

A. Block and Winch Systems 46%

Outcome: Use block and winch systems.

1. Describe the determining factors used when setting up a block and winch system.
2. Perform calculations to determine hoisting system requirements and anchorage points.
3. Set up and use block and winch systems.

B. Cranes 40%

Outcome: Describe the use of cranes.

1. Describe the assembly and disassembly procedures of conventional cranes.
2. Describe the effects of dynamic loading on cranes.
3. Describe factors effecting crane capacities.
4. Describe crane levelling procedures.
5. Describe hoisting operations.
6. Identify high capacity cranes and new technologies.

C. Jacking Equipment 6%

Outcome: Apply jacking techniques.

1. Describe jack and roll equipment.
2. Describe cribbing procedures.
3. Perform jack and roll operations.

D. Engineered Lifts 8%

Outcome: Describe engineered lifts.

1. Describe pre-lift and post-lift meetings.
2. Interpret engineered lift drawings.
3. Identify the requirements and regulations for a critical lift.

SECTION TWO: .... FABRICATION AND ERECTION DRAWINGS AND QUALITY CONTROL 14%

A. Fabrication and Erection Drawings 15%

Outcome: Interpret fabrication and erection drawings.

1. Interpret fabrication and erection drawings.

B. Testing and Inspection of Materials 23%

Outcome: Describe material testing.

1. Describe destructive testing.
2. Describe non-destructive testing.
3. Describe proof testing.

C. Quality Control 24%

Outcome: Describe quality assurance procedures.

1. Describe procedures to ensure products meet specifications.
2. Describe inspections to ensure product compliance.
3. Describe factors contingent to efficient production.
4. Describe the preparation for shipment of a final product.

D. Business Practices 29%

Outcome: Demonstrate industry business practices.

1. Identify general work-related documents.
2. Demonstrate computer skills.
3. Demonstrate effective listening and speaking skills.
4. Define the role and mission of the labour union organization.
5. Demonstrate respect in the workplace.

F. Workplace Coaching Skills 6%

Outcome: Use coaching skills when training an apprentice.

1. Describe the process for coaching an apprentice.

G. Interprovincial Standards Red Seal Program 3%

Outcome: Use Red Seal products to challenge an Interprovincial examination.

1. Identify Red Seal products used to develop Interprovincial examinations.
2. Identify Red Seal products to prepare for an Interprovincial examination.

SECTION THREE: ..... FITTING AND FABRICATION 25%

A. Geometric Layout 50%

Outcome: Perform geometric layout.

1. Interpret drawings to layout and fabricate square, round and elliptical holes.
2. Develop and utilize a template using geometry, parallel lines, radial lines and triangulation.

B. Fitting Techniques 50%

Outcome: Perform fitting techniques.

1. Describe how to install a tangential nozzle.
2. Demonstrate layout and fit-up of vessel and structural components.

3. Demonstrate the fabrication and assembly of davits and hinges.

SECTION FOUR: .....BOILERS, CONDENSERS, EXCHANGERS AND TANKS..... 46%

A. Trade Specific Mathematics 9%

Outcome: Solve mathematical problems associated with practical trade applications using the Imperial and Metric measurement systems.

1. Solve mathematical problems associated with practical trade applications.

B. Boiler and Steam Generator Components 27%

Outcome: Describe boiler and steam generator components.

1. Describe erection and assembly procedures for boiler components.
2. Describe the working operation of water tube boilers.
3. Describe boiler tube installation procedures.
4. Describe steam generator components.
5. Describe the principle of tube expansion.
6. Describe tube-expanding procedures.
7. Define the purpose of tack tubes.
8. Demonstrate tube removal and repair.

C. Condensers and Exchangers 27%

Outcome: Describe condensers and exchangers.

1. Describe types and designs of exchangers.
2. Describe exchanger components, fabrication and assembly.
3. Describe tube installation.
4. Describe tube-expanding procedures and sequences for condensers and exchangers.
5. Describe tube hole arrangement.
6. Describe the reason for grooved seats.
7. Identify the factors affecting the quality of an expanded joint.
8. Perform calculations for tube expansion.
9. Perform tube rolling.
10. Describe alternate tube-expansion methods.
11. Describe the procedures for repairing defects to exchangers.
12. Describe proof-testing procedures.
13. Describe tube bundle removal methods and equipment.
14. Remove a tube bundle, inspect it and replace it.
15. Reassemble heat exchanger components.
16. Describe tube-plugging methods.
17. Describe repair and maintenance procedures of alternate types of heat exchangers.

D. Tanks 27%

Outcome: Describe tanks and tank erection procedures.

1. Describe types of tanks and their components.
2. Describe the standards and different types of materials used to fabricate tanks.
3. Outline the scope of standards API 620, API 650 and API 653.
4. State the general condition of tank foundations and list negative effects encountered during erection due to uneven surfaces.
5. Describe tools and procedures specific to tank fabrication.
6. Describe tank floor designs.
7. Describe the process to layout and fit up a typical tank floor.
8. Describe joint preparation, fitting and welding sequences for tanks and tank components.
9. Describe tank roof designs.
10. Describe tank roof fabrication.
11. Describe how to inspect and test tank bottom, shell and roof using non-destructive methods.
12. Describe inspection requirements for small and large tanks.
13. Describe cathodic protection.
14. Demonstrate tank shell fitting techniques.
15. Demonstrate the ability to layout and erect tank scaffolding.
16. Demonstrate the ability to layout and erect the first shell ring.

E. Introduction to Heavy Industry 10%

Outcome: Describe heavy industries related to the Boilermaker trade.

1. Describe the production of electricity by hydroelectric generation.
2. Describe the components in a hydroelectric generating station.
3. Describe practices used in the erection of penstocks and surge tanks.
4. Describe nuclear generation.
5. Describe the components in a nuclear generating station.
6. Describe special procedures used when working on nuclear plants and components.
7. Describe the production of pulp and paper.
8. Describe the components in a pulp and paper mill.
9. Describe methods of oil extraction and production.
10. Describe the components of oil production.
11. Describe other industries related to the boilermaker trade.

Apprenticeship and Industry Training

Alberta Trades. World Ready.

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