

# Apprenticeship and Industry Training

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## Insulator (Heat and Frost) Curriculum Guide

033 (2022)



Apprenticeship  
and Industry  
Training

**ALBERTA ADVANCED EDUCATION**

Insulator (Heat and Frost): apprenticeship education program curriculum guide

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## 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 journeyman 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 Insulator (Heat and Frost) apprenticeship education program is an individual who will be able:

- responsibly do all work tasks expected of a journeyman
- supervise, train and coach apprentices
- demonstrate the installation, fitting, fabrication and attachment of insulation, finishing and weatherproofing materials to a high standard of workmanship
- use efficiently and safely all hand and power operated equipment used by the insulation industry
- read and correctly interpret blueprints, specifications and building codes
- thoroughly describe insulation materials and their uses
- describe all systems requiring insulation
- co-ordinate insulation work with other trades on the job site
- comply with all safety regulations of the construction industry
- 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. D. Paul .....Red Deer  
Mr. J. Weber .....Calgary  
Mr. W. Boys .....Calgary  
Mr. J. Archer .....Calgary  
Mr. B. Aquila .....Edmonton  
Ms. C. Smith .....Edmonton  
Mr. R. Milich .....Edmonton  
Mr. L. Reid .....Edmonton  
Mr. R. Robertson ....Calgary

### Alberta Government

Alberta Advanced Education works with industry, sponsor and employee organizations and technical training providers 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 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](http://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 education 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 Insulator (Heat and Frost) trade apprenticeship technical training:

Northern Alberta Institute of Technology  
Southern Alberta Institute of Technology

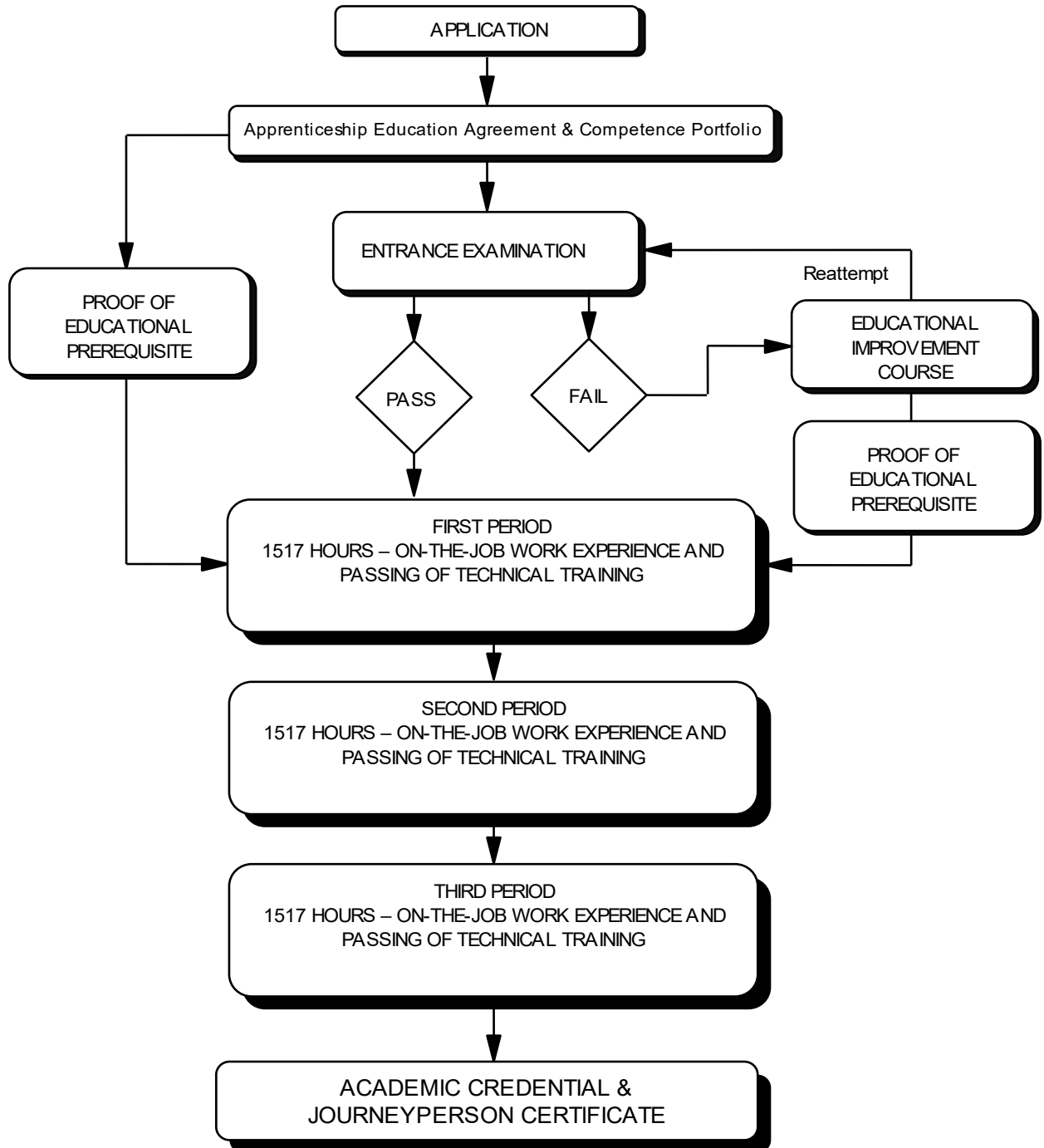
### **Procedures for Recommending Revisions to the Curriculum Guide**

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

Registrar of Apprenticeship Education 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



**Insulator (Heat and Frost) Training Profile  
FIRST PERIOD  
(7 Weeks 30 Hours per Week – Total of 210 Hours)**

**SECTION ONE**

<b>STANDARD &amp; SPECIFIC WORKPLACE SAFETY</b>  20%	<b>A</b>	<b>B</b>	<b>C</b>
	Safety Legislation, Regulations & Industry Policy in the Trades 14%	Climbing, Lifting, Rigging & Hoisting 9%	Hazardous Materials & Fire Protection 10%
	<b>D</b>	<b>E</b>	<b>F</b>
	Apprenticeship & Industry Training Orientation 5%	Safety and Noise Control 19%	Asbestos Awareness 43%

**SECTION TWO**

<b>ACCESSORIES, TOOLS &amp; EQUIPMENT</b>  27%	<b>A</b>	<b>B</b>	<b>C</b>
	Adhesives, Mastics and Cements 21%	Insulation Fittings 25%	Insulation Fasteners 7%
	<b>D</b>	<b>E</b>	<b>F</b>
	Insulation Finishes 13%	Trade Tools and Shop Equipment 15%	Material Handling 5%
	<b>G</b>		
	Stud Welders 14%		

**SECTION THREE**

<b>HOT &amp; COLD APPLICATIONS</b>  15%	<b>A</b>	<b>B</b>	<b>C</b>
	Ceramic Fibers 6%	Extruded Foam Plastic 31%	Polystyrenes 31%
	<b>D</b>		
Calcium Silicate 32%			

**SECTION FOUR**

<b>DUAL TEMPERATURE APPLICATIONS</b>  18%	<b>A</b>	<b>B</b>	<b>C</b>
	Mineral Wool 21%	Fiberglass 39%	Cellular Glass 24%
	<b>D</b>	<b>E</b>	
	Polyurethane 8%	Nano Fiber 8%	

**SECTION FIVE**

<b>MATH &amp; BLUEPRINT LEVEL ONE</b>  20%	<b>A</b>	<b>B</b>	<b>C</b>
	Applied Mathematics 19%	Perimeters and Areas 31%	Blueprint Fundamentals 19%
	<b>D</b>	<b>E</b>	
	Types of Drawings 19%	Division of Blueprints 12%	

**SECOND PERIOD**  
**(7 Weeks 30 Hours per Week – Total of 210 Hours)**

**SECTION ONE**

**CANVAS ON INSULATED  
 PIPING, DUCTS AND  
 EQUIPMENT**  
 26%



**A**

Canvas-Surface Preparation  
 31%

**B**

Canvas Applications  
 69%

**SECTION TWO**

**PATTERN LAYOUT LEVEL ONE  
 & COVERINGS**  
 28%



**A**

Pattern Development  
 49%

**B**

PVC Surface Preparation  
 7%

**C**

PVC Applications  
 34%

**D**

Metal Application  
 10%

**SECTION THREE**

**SPECIALIZED APPLICATIONS  
 LEVEL ONE**  
 18%



**A**

Lag Applications  
 39%

**B**

Extruded Foam Elbows  
 18%

**C**

Extruded Foam Reducers  
 18%

**D**

Underground Systems  
 5%

**E**

Heat Loss Detection  
 5%

**F**

Soundproofing  
 10%

**G**

Building Insulation & Air  
 Barriers  
 5%

**SECTION FOUR**

**MATH & BLUEPRINT LEVEL  
 TWO**  
 28%



**A**

Insulating Material Quantities  
 12%

**B**

Finish Material Quantities  
 12%

**C**

Lags  
 24%

**D**

Orthographic & Isometric  
 Drawings  
 26%

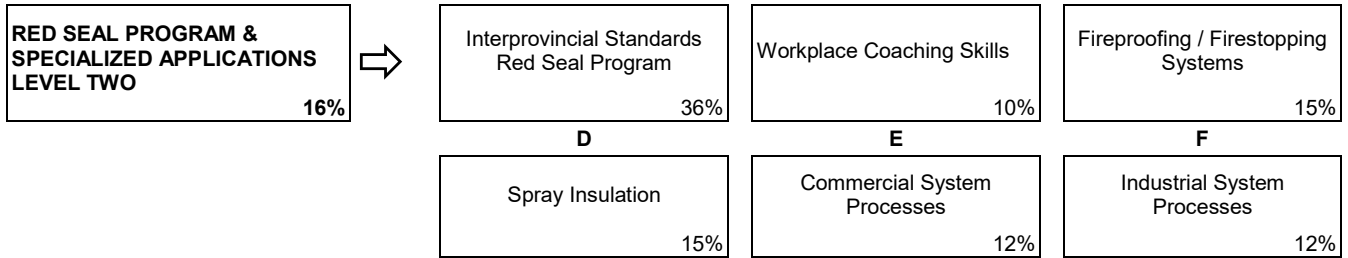
**E**

Commercial Systems  
 26%

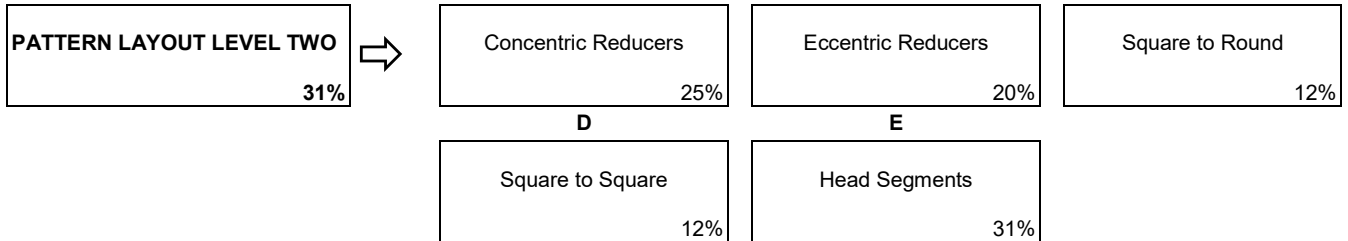


**THIRD PERIOD**  
**(7 Weeks 30 Hours per Week – Total of 210 Hours)**

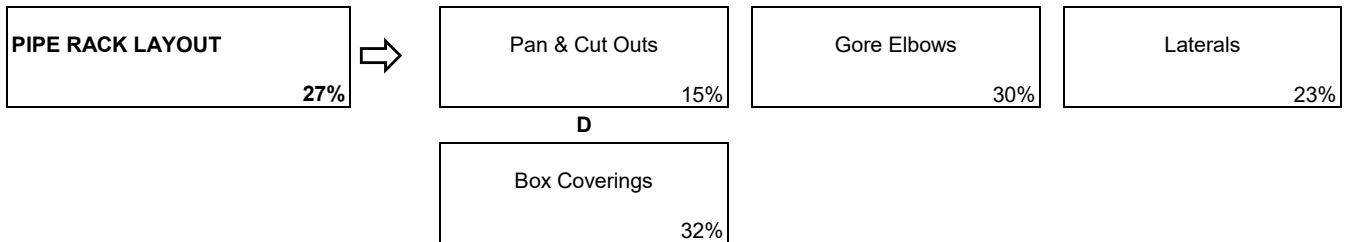
**SECTION ONE**



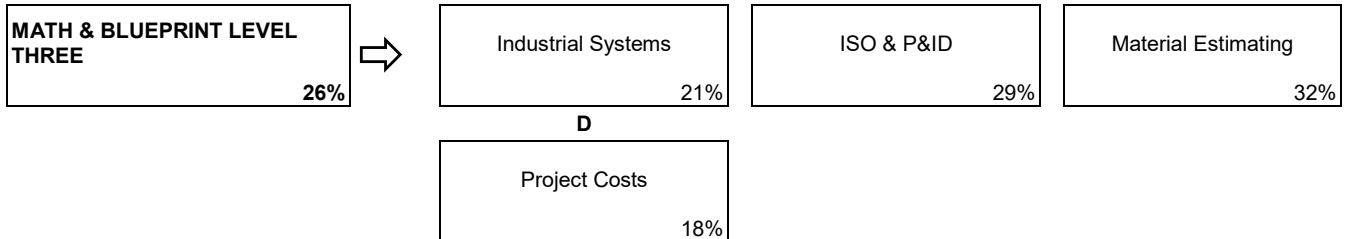
**SECTION TWO**



**SECTION THREE**



**SECTION FOUR**



**FIRST PERIOD TECHNICAL TRAINING  
INSULATOR (HEAT AND FROST) TRADE  
CURRICULUM GUIDE**

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

**SECTION ONE: ..... STANDARD & SPECIFIC WORKPLACE SAFETY ..... 20%**

**A. Safety Legislation, Regulations & Industry Policy in the Trades .....14%**

**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 worker 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 & Hoisting .....9%**

**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 .....10%**

**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 and Industry Training Orientation.....5%**

**Outcome: Describe the Alberta Apprenticeship system.**

1. Identify the training profile of the Insulator (Heat and Frost) Apprenticeship in Alberta.
2. Explain the Insulator (Heat and Frost) program curriculum guide learning outcomes and objectives.
3. Discuss the contents of the apprenticeship training competency portfolio.
4. Describe the responsibilities for the Contract of Apprenticeship by the apprentice, sponsor and Alberta Apprenticeship and Industry Training.
5. Identify industrial, commercial and residential fields that provide opportunities for insulators.

**E. Safety and Noise Control .....19%**

**Outcome: Perform safe work procedures pertaining to noise control.**

1. Identify the physical hazards that are common to the Industry.
2. Outline OH&S regulations relevant to noise control.
3. Recognize the different types and applications of hearing protection.
4. Recognize the procedures and applications during hot and cold exposure.
5. Describe the safety practises taken during hot and cold exposure.

**F. Asbestos Awareness ..... 43%**

**Outcome: Perform industry practiced abatement procedural methods of control.**

1. Identify the certification requirements for asbestos workers.
2. Identify the different types of asbestos.
3. Describe the health effects associated to exposure to asbestos.
4. Outline OH&S regulations relevant to asbestos removal.
5. Describe methods of asbestos abatement in the industry:
6. List equipment, materials, and safety accessories.
7. List worksite planning procedures and safety.
8. List clean-up procedures and final inspection practices.
9. Make use of asbestos removal tools & equipment.

**SECTION TWO: .....ACCESSORIES, TOOLS AND EQUIPMENT ..... 27%**

**A. Adhesives, Mastics and Cements ..... 21%**

**Outcome: Prepare surfaces to allow the application of adhesives, cements and mastics.**

1. Identify the different types of adhesives, cements and mastics.
2. Identify the different types of reinforcing materials.
3. Describe the surface preparation for adhesives, cements and mastics.
4. Describe the application methods of adhesives, cements and mastics.
5. Prepare a surface for an adhesive, cement or mastic.
6. Apply an adhesive, cement or mastic to a surface.

**B. Insulation Fittings .....25%****Outcome: Install miters, elbows, tees and lateral type fittings.**

1. Identify the common types of insulation fittings.
2. Identify long and short radius elbow fittings.
3. Describe the fabrication methods of insulation fittings.
4. Fabricate common types of insulation fittings.
5. Install common types of insulation fittings on a shop project.

**C. Insulation Fasteners .....7%****Outcome: Install common types of insulation fasteners.**

1. Identify the general types of insulation fasteners.
2. Outline preparation and application procedures for insulation fasteners.
3. Install insulation fasteners on a shop project.

**D. Insulation Finishes .....13%****Outcome: Recognize PVC, canvas, and metal type finishes.**

1. Identify the applications of common types of finishes.
2. Describe the types of finishes.
3. Recognize the health risks associated when working with insulation finishes.
4. Identify the applications of pre-formed type fittings.
5. Identify the applications of vapour barrier type materials.
6. Apply general types of finishes.

**E. Trade Tools and Shop Equipment .....15%****Outcome: Operate and maintain tools and shop equipment used in the trade.**

1. Identify the different types of hand & power tools and shop equipment used in the trade.
2. Describe the different types of hand & power tools and shop equipment used in the trade.
3. Operate hand & power tools and shop equipment used in the trade.

**F. Material Handling .....5%****Outcome: Perform the methods of material handling.**

1. Identify the different methods of material handling.
2. Outline the proper storage procedures of material.
3. Perform the different methods of handling insulating material.

**G. Stud Welders .....14%****Outcome: Operate a stud welder.**

1. Identify frequent types of fasteners used with stud welders.
2. List the set-up procedures for a stud welder.

3. Perform the set-up procedures for a stud welder.
4. Operate a stud welder.

**SECTION THREE: .....HOT & COLD APPLICATIONS..... 15%**

**A. Ceramic Fibers .....6%**

**Outcome: *Install ceramic fiber insulation.***

1. Identify the applications of ceramic fibers.
2. Recognize the health risks associated when exposed to ceramic fibers.

**B. Extruded Foam Plastic .....31%**

**Outcome: *Install extruded foam plastic insulation.***

1. Identify the applications of extruded foam plastic.
2. Recognize the health risks associated when exposed to extruded foam plastic.
3. Apply extruded foam plastic on a shop project.

**C. Polystyrenes .....31%**

**Outcome: *Install polystyrene insulation.***

1. Identify the applications of polystyrenes.
2. Recognize health risks associated when exposed to polystyrenes.
3. Apply polystyrene on a shop project.

**D. Calcium Silicate .....32%**

**Outcome: *Install calcium silicate.***

1. Identify the applications of calcium silicate.
2. Recognize health risks associated when exposed to calcium silicate.
3. Apply calcium silicate on a shop project.

**SECTION FOUR: .....DUAL TEMPERATURE APPLICATIONS..... 18%**

**A. Mineral Wool .....21%**

**Outcome: *Install mineral wool insulation.***

1. Identify the applications of mineral wool.
2. Recognize the health risks associated when exposed to mineral wool.
3. Apply mineral wool to a shop project.

**B. Fiberglass .....39%**

**Outcome: *Install fiberglass insulation.***

1. Identify the applications of fibreglass.
2. Recognize the health risks associated when exposed to fiberglass.
3. Apply fiberglass insulation on a shop project.

**C. Cellular Glass .....24%**

**Outcome: Install cellular glass insulation.**

1. Identify the applications of cellular glass.
2. Recognize health risks associated when exposed to cellular glass.
3. Apply cellular glass on a shop project.

**D. Polyurethane .....8%**

**Outcome: Install polyurethane insulation.**

1. Identify the applications of polyurethanes.
2. Recognize the health risks associated when exposed to polyurethanes.
3. Apply polyurethane on a shop project.

**E. Nano Fibers .....8%**

**Outcome: Install Nano fiber type insulation.**

1. Identify the applications of nano fibers.
2. Recognize the health risks associated when exposed to nano fibers.
3. Outline the recommended handling procedures of nano fibers.

**SECTION FIVE:..... MATH & BLUEPRINT LEVEL 1 ..... 20%**

**A. Applied Mathematics .....19%**

**Outcome: Solve basic mathematical problems.**

1. Describe the basic calculator functions and operations.
2. Perform basic math calculations using whole numbers, fractions and decimals.
3. Perform number and measurement conversions using whole numbers, fractions and decimals.
4. Perform the order of operations known as BEDMAS.
5. Convert measurements between metric and imperial.
6. Calculate right angle problems using the Pythagorean Theorem.

**B. Perimeters and Areas .....31%**

**Outcome: Calculate geometric perimeter and areas using applicable formulas.**

1. Identify the general geometric formulas to calculate perimeter.
2. Identify the general geometric formulas to calculate area.
3. Solve geometric surface areas by combining the applicable formulas.

**C. Blueprint Fundamentals .....19%**

**Outcome: Apply the skills in practicing the use of measurement scales, lines, symbols and pipe sizes.**

1. Identify the different types of pipe sizes.
2. Explain the different architectural symbols and lines.

3. Identify the different types of scale rulers.
4. Perform measuring type exercises using scale rulers.

**D. Types of Drawings .....19%**

**Outcome: Prepare basic orthographic drawings.**

1. Define the term pictorial drawing.
2. Define the term orthographic drawing.
3. Draw basic orthographic drawings.

**E. Divisions of Blueprints .....12%**

**Outcome: Recognize the divisions of a blueprint.**

1. Identify the use of divisions in blueprints.
2. Describe the divisions in blueprints.
3. Apply the divisions in blueprints corresponding to shop drawings.

**SECOND PERIOD TECHNICAL TRAINING  
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**SECTION ONE:..... CANVAS ON INSULATED PIPING, DUCTS AND EQUIPMENT ..... 26%**

**A. Canvas Surface Preparation..... 31%**

**Outcome: Prepare canvas surface on piping, ducts and equipment.**

1. Identify the applications of canvas surface preparation.
2. Recognize the health risks associated when preparing surfaces for canvas.
3. Outline the preparation procedures for canvas.
4. Prepare the surface for a canvas shop project(s).

**B. Canvas Applications ..... 69%**

**Outcome: Install canvas on piping, ducting and equipment.**

1. Identify the purposes of canvas application.
2. Recognize the health risks associated when applying canvas.
3. Outline the application procedures when applying canvas.
4. Apply canvas on shop project(s).

**SECTION TWO:..... PATTERN LAYOUT LEVEL ONE & COVERINGS ..... 28%**

**A. Pattern Development..... 49%**

**Outcome: Install end caps, tees and bevels.**

1. Identify the types of finish fittings.
2. Describe the setup of drafting layout tools.
3. Describe the methods of line and circle division.
4. Perform the layout procedure to produce common finish fittings.
5. Fabricate common types of finish fittings.

**B. PVC Surface Preparation ..... 7%**

**Outcome: Prepare a surface for installing PVC on insulated pipe.**

1. Identify the applications of PVC surface preparation.
2. Recognize the health risks when preparing surfaces for PVC.
3. Outline the preparation procedures for PVC.
4. Prepare the surface for PVC on a shop project(s).



**C. PVC Application..... 34%**

**Outcome: Install PVC on insulated pipe.**

1. Identify the purposes of PVC application.
2. Recognize the health risks when applying PVC.
3. Outline the application procedures when applying PVC.
4. Apply PVC on a shop project(s).

**D. Metal Application..... 10%**

**Outcome: Install metal on insulated pipe.**

1. Identify the fundamental purposes of metal application.
2. Outline the application procedures when applying metal.
3. Install metal finish fittings on a shop project(s).

**SECTION THREE: .....SPECIALIZED APPLICATIONS LEVEL ONE..... 18%**

**A. Lag Applications..... 29%**

**Outcome: Install lags on pre-insulated equipment.**

1. Identify the types of materials used for fabricating lags.
2. Refer to a working drawing to develop a lag layout.
3. Determine inside/outside lag sizes to verify the number of lags.
4. Perform the procedure in fabricating lags.
5. Perform the procedure when installing lags.

**B. Extruded Foam Elbows..... 18%**

**Outcome: Install extruded foam elbows.**

1. Identify the applications that use extruded foam elbows.
2. Outline the layout process for extruded foam elbows.
3. Describe how to fabricate an extruded foam elbow.
4. Install an extruded foam elbow on a shop project.

**C. Extruded Foam Reducers ..... 18%**

**Outcome: Install extruded foam reducers.**

1. Identify applications that utilize extruded foam reducers.
2. Outline the layout process for extruded foam reducers.
3. Fabricate an extruded foam reducer.
4. Install an extruded foam reducer on a shop project.

**D. Underground Systems ..... 5%**

**Outcome: Install insulation on underground systems.**

1. Identify the different types of systems used in underground insulation.
2. Recognize the health risks associated when working with underground systems.

**E. Heat Loss Detection ..... 5%**

**Outcome:** *Recognize the methods of heat loss detection.*

1. Identify the principles of heat loss detection.
2. Describe the concepts of thermography.

**F. Soundproofing ..... 10%**

**Outcome:** *Install soundproofing systems.*

1. Identify the different types of soundproofing systems.
2. Outline the installation methods for soundproof systems.
3. Install a soundproof system on a shop project.

**G. Building Insulation and Air Barriers ..... 5%**

**Outcome:** *Recognize insulation and air barrier systems, materials and their application.*

1. Identify the different types of insulation and their characteristics.
2. Describe insulation techniques for foundations.
3. Describe the assembly methods for different types of air barrier systems.

**SECTION FOUR: .....MATH & BLUEPRINT LEVEL 2 ..... 28%**

**A. Insulating Material Quantities ..... 12%**

**Outcome:** *Calculate the amount of insulating material required.*

1. Calculate insulation material quantities for rectangular ducts.
2. Calculate insulation material quantities for round ducts.
3. Calculate insulation material quantities for equipment.

**B. Finish Material Quantities ..... 12%**

**Outcome:** *Calculate the amount of finish material required.*

1. Calculate finish material quantities for rectangular ducts.
2. Calculate finish material quantities for round ducts.
3. Calculate finish material quantities for equipment.

**C. Lags ..... 24%**

**Outcome:** *Calculate lag sizes and quantities to determine the required amount of rigid board insulation.*

1. Perform calculation to determine lag sizes.
2. Perform calculation to determine lag quantities.
3. Calculate the required board feet of rigid insulation.

D. Orthographic and Isometric Drawings ..... 26%

**Outcome:** *Prepare orthographic and isometric drawings.*

1. Identify orthographic and isometric type of drawings.
2. Interpret orthographic and isometric type of drawings.
3. Draw an orthographic drawing.
4. Draw an isometric drawing.
5. Convert between isometric and orthographic pipe/ duct drawings.

E. Commercial Systems ..... 26%

**Outcome:** *Interpret mechanical drawings and symbols in a commercial system.*

1. Identify the symbols within mechanical drawings for a commercial system.
2. Describe the processes of a commercial system.
3. Identify the divisions of blueprints and how they relate to specifications and addendums in a commercial system.

**THIRD PERIOD TECHNICAL TRAINING  
INSULATOR (HEAT AND FROST) TRADE  
CURRICULUM GUIDE**

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**SECTION ONE:.....RED SEAL PROGRAM & SPECIALIZED APPLICATIONS LEVEL TWO ..... 16%**

**A. Interprovincial Red Seal Standards Program ..... 36%**

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

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

**B. Workplace Coaching Skills..... 10%**

**Outcome:** *Use coaching skills when training an apprentice.*

1. Describe the process for coaching an apprentice.

**C. Fireproofing/ Firestopping Systems ..... 15%**

**Outcome:** *Recognize the importance of fireproofing and firestopping systems.*

1. Define the terms fireproofing and firestopping systems.
2. Describe the materials that are used in fireproofing and firestopping.
3. Identify areas where fireproofing and firestopping are required in a building system.
4. Recognize the codes and regulations that pertain to fireproofing and firestopping.

**D. Spray Insulation..... 15%**

**Outcome:** *Recognize the various applications of various spray applications.*

1. Define the term spray insulation.
2. Identify the material, equipment and substrate for spray insulation.
3. Recognize the codes and regulations that pertain to spray insulation.

**E. Commercial System Processes ..... 12%**

**Outcome:** *Understand commercial process systems.*

1. Identify the components of a commercial process system.
2. Describe the components of a commercial process system.
3. Describe the materials used in a commercial process system.

**F. Industrial System Processes..... 12%**

**Outcome:** *Understand industrial process systems.*

1. Identify the components of an industrial process system.
2. Describe the components of an industrial process system.

3. Describe the materials used in an industrial process system.
4. Describe the purpose and application of expansion joints.

**SECTION TWO:..... PATTERN LAYOUT LEVEL TWO ..... 31%**

**A. Concentric Reducers ..... 25%**

**Outcome: *Install a concentric reducer.***

1. Define the term concentric reducer.
2. Describe how patterns are developed for a concentric reducer.
3. Outline the layout process for concentric reducers.
4. Fabricate a concentric reducer.
5. Install a concentric reducer on a shop project.

**B. Eccentric Reducers ..... 20%**

**Outcome: *Install an eccentric reducer.***

1. Define the term eccentric reducer.
2. Describe how patterns are developed for an eccentric reducer.
3. Outline the layout process for eccentric reducers.
4. Fabricate an eccentric reducer.
5. Install an eccentric reducer on a shop project.

**C. Square to Round..... 12%**

**Outcome: *Install a square to round transition.***

1. Define the term square-to-round transition.
2. Describe how patterns are developed for square-to-round transition.
3. Outline the layout process for a square-to-round transition.
4. Fabricate a square-to-round transition.
5. Install a square-to-round transition on a shop project.

**D. Square to Square ..... 12%**

**Outcome: *Install square to square transition.***

1. Define the term square-to-square transition.
2. Describe how patterns are developed for a square-to-square transition.
3. Outline the layout process for a square-to-square transition.
4. Fabricate a pattern for a square-to-square transition.
5. Install a square-to-square transition on a shop project.

**E. Head Segments..... 31%**

**Outcome: *Install finish on head segments.***

1. Define the term spherical head.

2. Define the term elliptical head.
3. Describe how patterns are developed by using the chalkline method.
4. Describe how patterns are developed by using the geometric method.
5. Outline the layout process to develop patterns using the geometric method.
6. Fabricate a finish pattern for a head segment.
7. Install a finish on a head segment.

**SECTION THREE: .....PIPE RACK LAYOUT ..... 27%**

**A. Pan & Cut Outs ..... 15%**

**Outcome: Perform a pan out and cut out for obstructions.**

1. Define the terms cut out and pan out.
2. Identify the different applications for pan outs and cut outs.
3. Outline the layout process to complete a cut out.
4. Fabricate a pan out and install on a shop project.

**B. Gore Elbows ..... 30%**

**Outcome: Install common types of elbows.**

1. Define the term gore elbow.
2. Define the term butterfly elbow.
3. Outline the layout process in developing patterns for a gore elbow.
4. Outline the layout process in developing patterns for a butterfly elbow.
5. Layout and install common types of elbows on a shop project.

**C. Laterals ..... 23%**

**Outcome: Install a lateral.**

1. Define the terms equal lateral and unequal lateral.
2. Outline the layout process in developing patterns for an equal lateral.
3. Outline the layout process in developing patterns for an unequal lateral.
4. Fabricate and install a lateral(s) on a shop project.

**D. Box Coverings ..... 32%**

**Outcome: Install box coverings.**

1. Identify the terms permanent and removable box coverings.
2. Identify applications for pre-insulated panels.
3. Identify applications for soft cover (blankets).
4. Outline the layout process in developing patterns for removable box coverings.
5. Fabricate and install removable box coverings on a shop project.

**SECTION FOUR: .....MATH & BLUEPRINT LEVEL 3..... 26%**

**A. Industrial Systems..... 21%**

**Outcome:** *Interpret mechanical drawings and symbols in an industrial system.*

1. Identify symbols on mechanical drawings for an industrial system.
2. Describe the processes of an industrial system.
3. Identify the divisions and their components relating to specifications and addendums relating to an industrial system.

**B. Isometric (ISO) and Piping & Instrumentation Diagram (P&ID) ..... 29%**

**Outcome:** *Interpret ISO and P&ID drawings for the application of insulating materials.*

1. Identify an ISO and P& ID type drawing.
2. Define the abbreviated terms ISO and P& ID.
3. Apply the information found on an ISO drawing.
4. Apply the information found on a P& ID drawing.

**C. Material Estimating..... 32%**

**Outcome:** *Determine quantities of materials by doing a takeoff.*

1. Identify the documents required to complete a material takeoff.
2. Demonstrate the ability to interpret specifications and addendums.
3. Demonstrate the ability to interpret various types of drawings.
4. Calculate the total amount, including the wastage factor, of materials ordered.

**D. Project Costs..... 18%**

**Outcome:** *Estimate the project costs to complete a job.*

1. Estimate total costs for a given project.
2. Determine the cost at a given price per unit.
3. Estimate the man-hours based on material quantity.
4. Calculate manpower costs.



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