# Apprenticeship and Industry Training

## Water Well Driller

## Curriculum Guide

**035 (2022)**

Alberta

Apprenticeship and Industry Training

**ALBERTA ADVANCED EDUCATION**

Water well driller : apprenticeship education program curriculum guide

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**Water Well Driller**
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**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 Water Well Driller apprenticeship program is an individual who will be able to:

- through skill and knowledge, is capable of operating the machines used to produce bore holes
- complete a bore hole into a finished productive well
- complete well records and reports as required by the industry
- complete well records and reports as required by Alberta Environment
- disinfect and service completed wells and pumping equipment
- familiar with the work in related trades such a mechanics and plumbers
- perform assigned tasks in accordance with quality and production standards required by industry

## Apprenticeship and Industry Training System

Alberta's apprenticeship 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. C. Quinlan. .....DeWinton
Mr. J. Larson .....Lougheed
Mr. G. Whitesell.....Red Deer
Mr. D. Schmidt.....Ponoka
Mr. S. Kinch.....Cochrane
Mr. B. Sewell .....High River
Mr. E. Miller .....Strathmore
Mr. L. Odegard .....Lougheed

## 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 postsecondary 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 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 Water Well Driller trade apprenticeship technical training:

Red Deer College

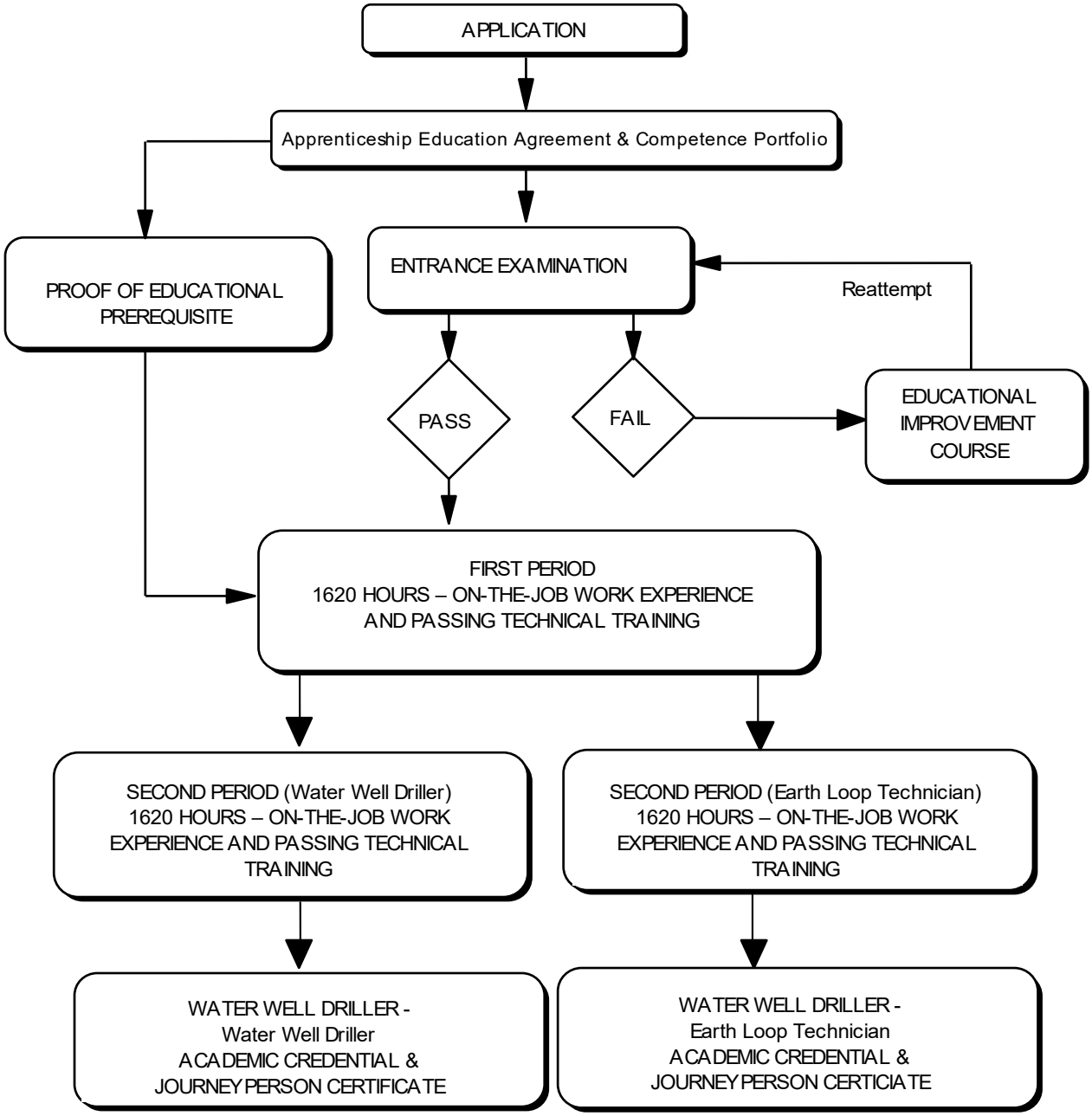
## Procedures for Recommending Revisions to the Curriculum Guide

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

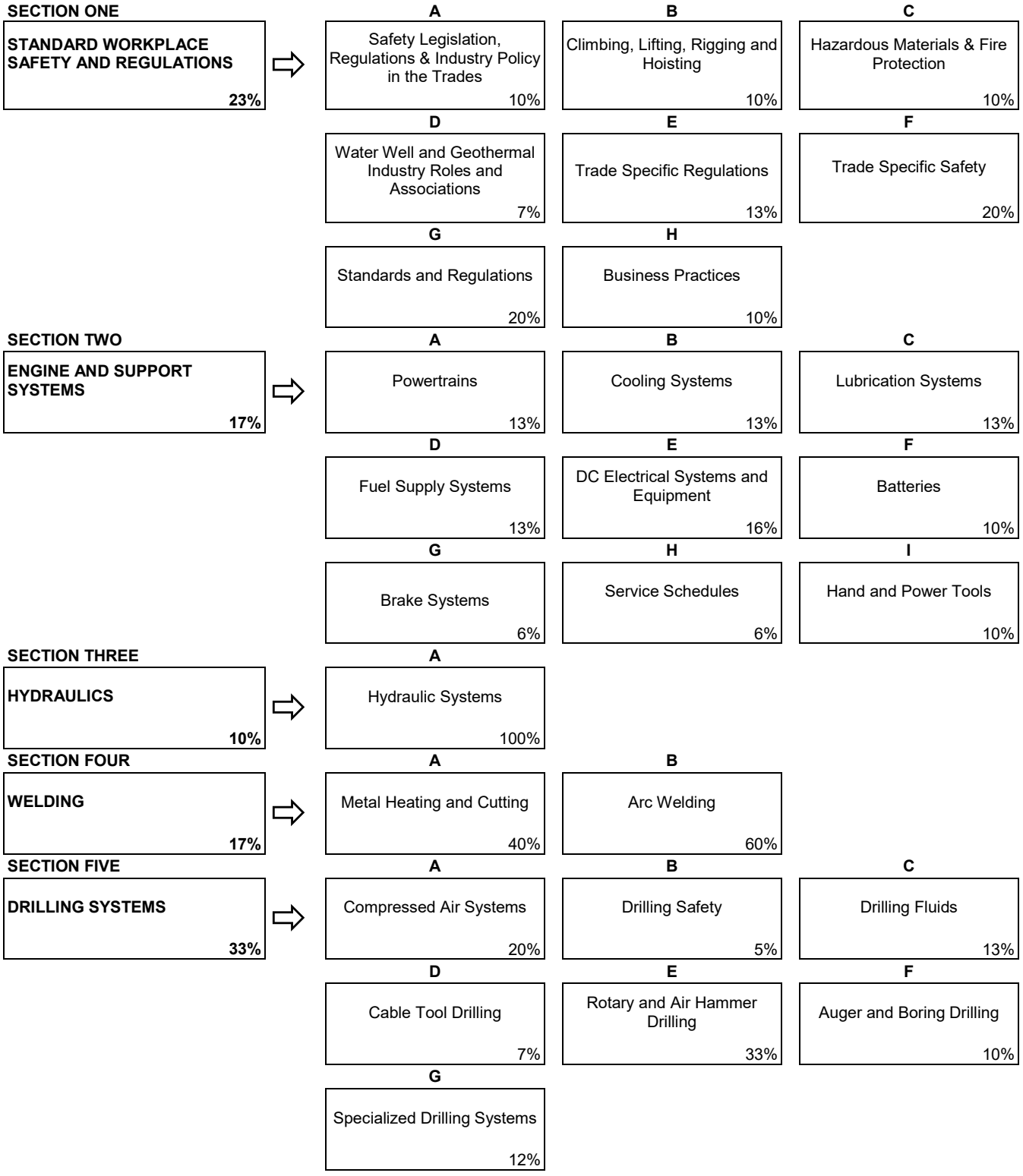
Registrar of Apprenticeship Programs
c/o Apprenticeship Delivery and Industry Support Services
Apprenticeship Delivery and Industry Support
Advanced Education
19th floor, Commerce Place
10155 102 Street NW
Edmonton AB T5J 4L5

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

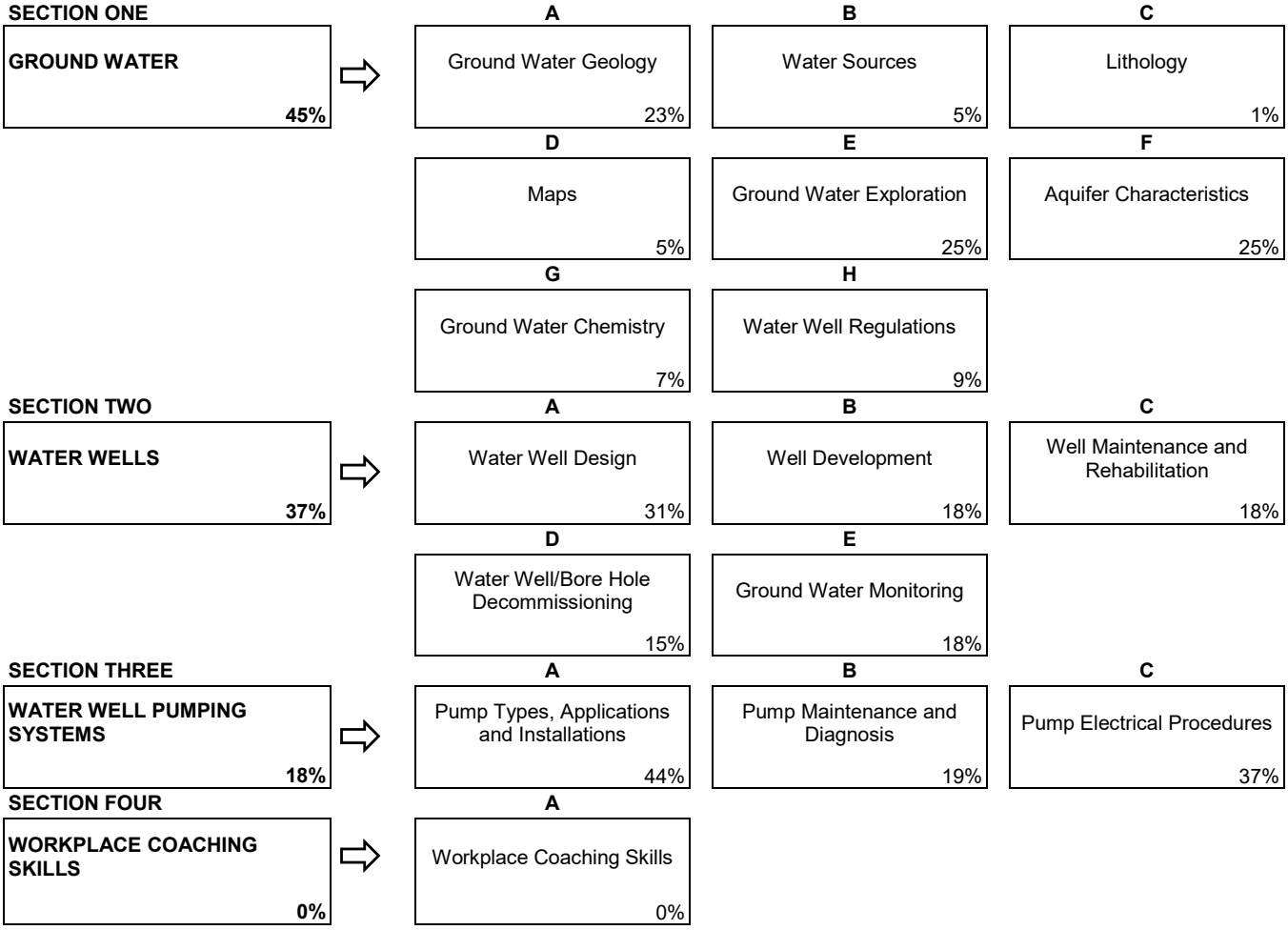
**Apprenticeship Route toward Academic Credential**



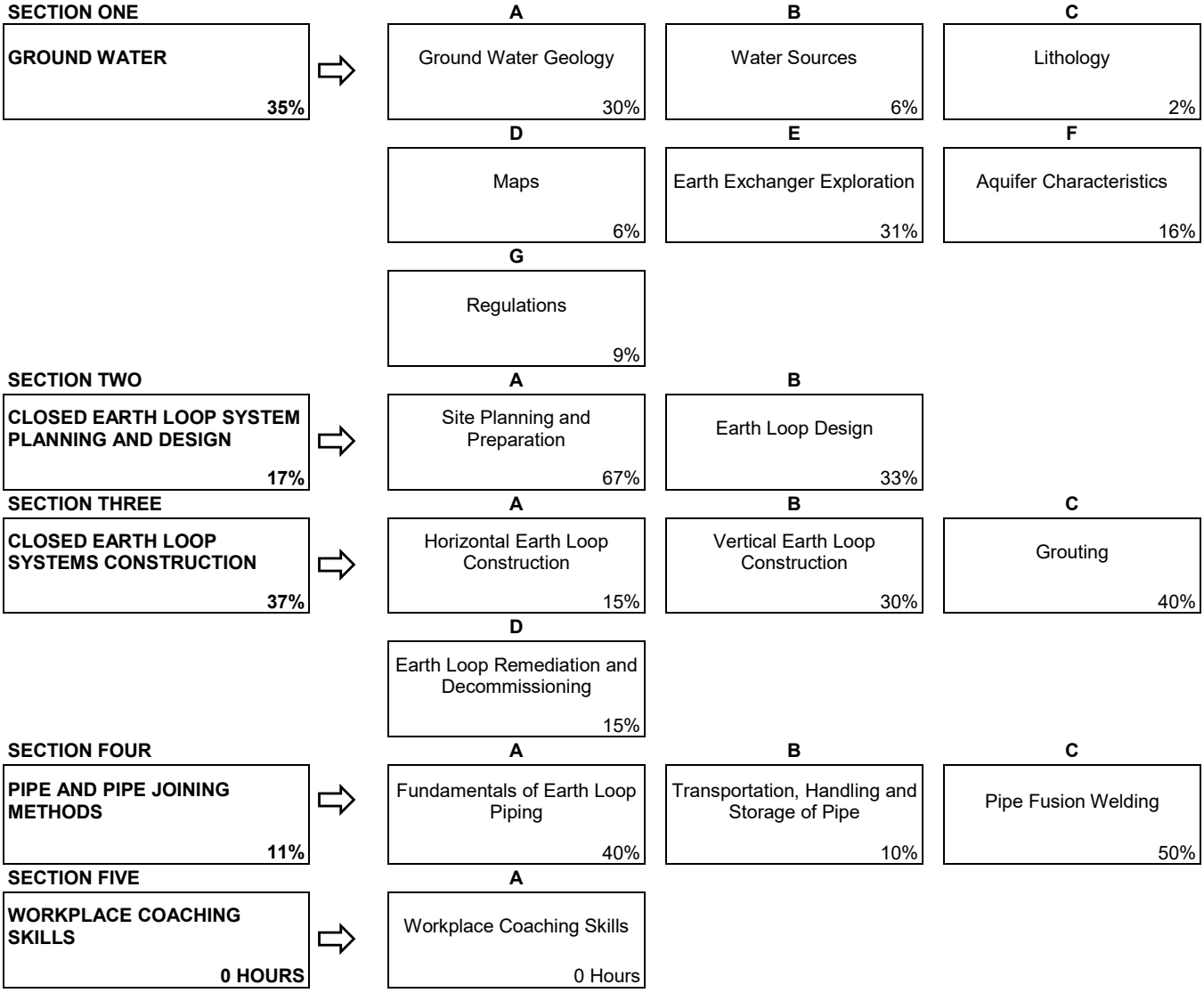
## Water Well Driller Training Profile
## First Period
## (6 Weeks 30 Hours per Week – Total of 180 Hours)



## Second Period – Water Well Driller
## (6 Weeks 30 Hours Per Week – Total of 180 Hours)



## Second Period – Earth Loop Technician
## (6 Weeks 30 Hours Per Week – Total of 180 Hours)



**FIRST PERIOD TECHNICAL TRAINING**
**WATER WELL DRILLER 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 AND REGULATIONS ..... 23%**

**A. Safety Legislation, Regulations & Industry Policy in the Trades ..... 10%**

***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 and Hoisting ..... 10%**

***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. Water Well and Geothermal Industry Roles and Associations ..... 7%**

***Outcome: Explain the role of water well and geothermal industry associations.***

1. Describe the scope of the Alberta water well and geothermal industries.
2. Describe technical training opportunities in the trade.
3. Describe trade specific industry associations.

**E. Trade Specific Regulations ..... 13%**

***Outcome: Apply regulations governing the work of the trade.***

1. Describe regulations pertaining to transporting dangerous goods.
2. Explain the Skilled Trades and Apprenticeship Education Act as it pertains to the work of the trade.
3. Explain the relevant divisions of the Traffic Safety Act.

**F. Trade Specific Safety ..... 20%**

***Outcome: Apply safety procedures associated with work in the trade.***

1. Describe trade-specific work hazards.
2. State the safety considerations when dealing with natural gas encounters.
3. Use safety equipment and procedures associated with the trade.
4. Demonstrate care and control of hazardous products used in the trade.

**G. Standards and Regulations ..... 20%**

***Outcome: Apply regulations, standards and procedures governing the drilling and construction of water wells and geothermal earth loops.***

1. Identify regulations governing the drilling and construction of water wells and geothermal earth loops.
2. Describe processes for drafting and sending documentation to regulatory authorities.
3. Maintain records and reports.
4. Distribute records and reports to stakeholders.

**H. Business Practices ..... 10%**

***Outcome: Apply business, financial and customer service practices.***

1. Identify the elements of a business plan and contracts.
2. Maintain financial records.
3. Describe financial planning, project planning, estimating, bidding and scheduling.
4. Identify customer service practices.
5. Describe employer and employee relations.

**SECTION TWO: ..... ENGINE AND SUPPORT SYSTEMS ..... 17%**

**A. Powertrains ..... 13%**

***Outcome: Service vehicle powertrains.***

1. Identify common types and configurations of engines and powertrains.

2. Describe the operating principles of two and four-stroke engines.
3. Describe service procedures for powertrain components.
4. Identify specialty control devices.

**B. Cooling Systems ..... 13%**

***Outcome: Maintain vehicle cooling systems.***

1. Identify the operating principles of air and liquid cooling systems.
2. Identify the components of air and liquid cooling systems.
3. Describe the procedures for removal, recovery and replacement of coolant.
4. Describe the removal and replacement of cooling system components.
5. Describe routine cooling system servicing.
6. Maintain vehicle cooling systems.

**C. Lubrication Systems ..... 13%**

***Outcome: Maintain vehicle lubrication systems.***

1. Describe types of oils and greases.
2. Describe oil filter system types, operating principles and installation and inspection procedures.
3. Identify lubrication system leaks.
4. Describe the purpose of oil coolers and heat exchangers.
5. Describe procedures for greasing rig and truck components.
6. Analyze engine oil for condition, presence of moisture and foreign substances.
7. Maintain vehicle lubrication systems.

**D. Fuel Supply Systems ..... 13%**

***Outcome: Service vehicle fuel supply systems.***

1. Describe types and grades of fuel.
2. Identify precautions for working with different fuel types.
3. Identify fuel supply system components.
4. Describe fuel supply system operation.
5. Describe the procedures for removal and recovery of fuel.
6. Describe the removal and replacement of components of a fuel supply system.
7. Service vehicle fuel supply systems.

**E. DC Electrical Systems and Equipment ..... 16%**

***Outcome: Service electrical systems and equipment.***

1. Explain electrical theories.
2. Identify electrical terms and symbols.
3. Identify electrical circuit types and their faults.
4. Identify a shorted, open or grounded electrical circuit.
5. Identify electrical systems serviced by drillers.

6. Describe troubleshooting procedures for electrical systems.
7. Describe hazards associated with electrostatic discharge (ESD).
8. Describe removal and replacement procedures for faulty electrical components.
9. Perform wire harness and connector repairs.
10. Service vehicle electrical systems.

**F. Batteries ..... 10%**

***Outcome: Perform servicing of batteries.***

1. Describe the purpose, construction, operation and ratings of batteries.
2. Describe battery hazards and maintenance requirements.
3. Diagnose problems attributed to batteries.
4. Perform servicing of batteries.

**G. Brake Systems ..... 6%**

***Outcome: Operate air brake systems.***

1. Explain the operating principles of hydraulic and air brake systems.
2. Identify the functions of hydraulic and air brake system components.
3. Describe a process for identifying damaged or worn brake system components.
4. Verify brake system operation.
5. Operate air brake systems.

**H. Service Schedules ..... 6%**

***Outcome: Implement an equipment maintenance schedule.***

1. Interpret maintenance schedules according to hour meters and drilling conditions.
2. Identify engine running conditions that could alter maintenance schedules.
3. Implement an equipment maintenance schedule.

**I. Hand and Power Tools ..... 10%**

***Outcome: Use hand and power tools common to the trade.***

1. Verify the serviceable condition of hand and power tools.
2. Identify specialty hand and power tools common to the trade.
3. Use measuring principles and tools.
4. Describe the capacities and limitations of hand and power tools.
5. Use trade specific hand and power tools.

**SECTION THREE: .....HYDRAULICS..... 10%**

**A. Hydraulic Systems..... 100%**

***Outcome: Maintain hydraulic systems on a drilling rig.***

1. Identify the types, layout and principles of operation of hydraulic systems applicable to drilling rigs.
2. Describe the functions and layout of hydraulic system components.
3. Diagnose hydraulic system failures.
4. Perform hydraulic system maintenance according to manufacturer's specifications or prescribed service schedules.

**SECTION FOUR: .....WELDING ..... 17%**

**A. Metal Heating and Cutting..... 40%**

***Outcome: Use oxy-fuel heating and cutting equipment.***

1. Describe the characteristics, composition and handling of oxy-fuel gases.
2. Assemble oxy-fuel heating and cutting equipment.
3. Use oxy-fuel heating and cutting equipment.

**B. Arc Welding ..... 60%**

***Outcome: Produce tack welds using arc welding equipment.***

1. Describe personal protective equipment used for arc welding.
2. Describe the type and use of arc welding power sources.
3. Describe the operation and use of accessories required in arc welding.
4. Describe the types and uses of electrodes.
5. Assemble, adjust and operate arc welding equipment.
6. Perform lap, butt and plug tack welds on steel using various material thicknesses and joint configurations.
7. Demonstrate tack welding in flat, vertical and horizontal positions.
8. Identify weld faults.
9. Maintain arc welding equipment.

**SECTION FIVE: .....DRILLING SYSTEMS..... 33%**

**A. Compressed Air Systems ..... 20%**

***Outcome: Operate compressed air drilling systems.***

1. Identify types of compressors.
2. Describe the operational safety requirements of compressed air drilling systems.
3. Maintain compressed air drilling systems.
4. Operate compressed air drilling systems.

**B. Drilling Safety ..... 5%**

***Outcome: Work safely on a drilling site.***

1. Identify safety hazards on the worksite.
2. Demonstrate safety procedures and regulations on the worksite.

**C. Drilling Fluids ..... 13%**

***Outcome: Select appropriate drilling fluids when drilling.***

1. Describe types and uses of drilling fluids.
2. Describe the difference between drilling fluids and grouts.
3. Select an appropriate drilling fluid for the drilling conditions.
4. Select appropriate grout for the application.

**D. Cable Tool Drilling ..... 7%**

***Outcome: Use cable tool drilling systems.***

1. Use terminology associated with cable tool drilling systems.
2. Explain the operating principles of cable tool drilling.

**E. Rotary and Air Hammer Drilling ..... 33%**

***Outcome: Use rotary and air hammer drilling equipment.***

1. Describe the terminology and equipment used for rotary and air hammer drilling.
2. Explain the principles of operation of rotary and air hammer drilling systems.
3. Describe procedures for aligning and plumbing a drilling rig.
4. Describe the types and uses of drilling bits.
5. Select the appropriate bit for a particular application.
6. Use rotary and air hammer drilling equipment.

**F. Auger and Boring Drilling ..... 10%**

***Outcome: Use auger and boring drilling equipment.***

1. Describe the terminology and equipment associated with auger and boring drilling.
2. Explain the principles of operation of these types of drilling systems.
3. Use auger and boring drilling equipment.

**G. Specialized Drilling Systems ..... 12%**

***Outcome: Use specialized drilling equipment.***

1. Describe the terminology and equipment associated with specialized drilling equipment.
2. Describe new specialized drilling technologies.

**SECOND PERIOD TECHNICAL TRAINING**
**WATER WELL DRILLER TRADE**
**CURRICULUM GUIDE**

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**SECTION ONE: GROUND WATER ..... 45%**

**A. Ground Water Geology ..... 23%**

***Outcome: Identify the geology and hydrogeology encountered when drilling.***

1. Identify rock types and the natural processes that form them.
2. Describe Alberta's geologic column.
3. Describe the Hydrologic Cycle.
4. Identify properties of formations affecting water storage and movement.

**B. Water Sources ..... 5%**

***Outcome: Identify different sources of water using proper terminology.***

1. Define surface water.
2. Describe the effects of surface water on the water table.
3. Define ground water.

**C. Lithology ..... 1%**

***Outcome: Produce a lithology report.***

1. Describe the sequence and format used in lithology reporting.
2. Use appropriate abbreviations in a lithology report.

**D. Maps ..... 5%**

***Outcome: Interpret maps used in the industry.***

1. Interpret maps that pertain to geology, hydrogeology and location.

**E. Ground Water Exploration ..... 25%**

***Outcome: Select appropriate drilling sites.***

1. Describe the site selection process.
2. Describe the process of taking samples and logging them.

**F. Aquifer Characteristics ..... 25%**

***Outcome: Determine aquifer potential.***

1. Describe ground water flow as it pertains to various formations.
2. Identify hydraulic properties of rocks.
3. Perform aquifer tests.
4. Record the readings of aquifer tests.

5. Interpret aquifer test results.
6. Describe new technologies for data collection.

**G. Ground Water Chemistry ..... 7%**

***Outcome: Determine ground water chemistry characteristics.***

1. Perform ground water chemistry tests.
2. Interpret ground water chemistry reports.
3. Describe techniques for water sample collection.

**H. Water Well Regulations ..... 9%**

***Outcome: Apply government legislation, regulations and guidelines relating to work in the trade.***

1. Describe government legislation, regulations and guidelines relating to work in the trade.

**SECTION TWO: ..... WATER WELLS ..... 37%**

**A. Water Well Design ..... 31%**

***Outcome: Design a water well.***

1. Describe the history of well design.
2. Identify the types of wells.
3. Describe the types of formations.
4. List considerations for well design.
5. Describe the types and sizing of casing.
6. Describe the methods of sealing, grouting and cementing casings.
7. Describe the methods of setting and sealing screens.
8. Identify the types of screens, filter packs and pressure tanks.
9. Describe the methods of installing filter packs.
10. Design a water well.

**B. Well Development ..... 18%**

***Outcome: Use development techniques to maximize well efficiency.***

1. Describe the theory of well development.
2. Describe the techniques of well development.
3. Describe the methods of well and piping disinfection.
4. Determine well efficiency.

**C. Well System Maintenance and Rehabilitation ..... 18%**

***Outcome: Perform well system maintenance and rehabilitation procedures.***

1. Describe the causes of well system and equipment failures.
2. Identify the methods of well system inspection, maintenance, rehabilitation and repair.
3. Identify pollution problems and methods of correction.

**D. Water Well and Bore Hole Decommissioning ..... 15%**

***Outcome: Decommission water wells and bore holes.***

1. Identify the equipment required for decommissioning a water well or bore hole.
2. Describe the regulations and methods to decommission a water well or bore hole.

**E. Ground Water Monitoring ..... 18%**

***Outcome: Drill ground water monitoring wells.***

1. Identify ground water contamination sources.
2. Describe containment movement.
3. Describe how to locate monitoring wells.
4. Describe monitor well construction and design.

**SECTION THREE: ..... WATER WELL PUMPING SYSTEMS ..... 18%**

**A. Pump Types, Applications and Installation ..... 44%**

***Outcome: Install a water pumping system at a well site.***

1. Identify types of shallow and deep well pumps.
2. Select pump type according to application and sizing.
3. Describe installation procedures for the different pump types.
4. Describe licensing and equipment requirements.
5. Describe procedures for encountering natural gas.

**B. Pump Maintenance and Diagnosis ..... 19%**

***Outcome: Perform diagnostic and maintenance procedures on pumping systems.***

1. Demonstrate pumping system tests.
2. Troubleshoot pumping systems.
3. Demonstrate pump maintenance and repair procedures.

**C. Pump Electrical Procedures ..... 37%**

***Outcome: Install motor controls on water well pumping system.***

1. Describe electrical code requirements.
2. Identify electrical circuit types.
3. Describe lockout and tag out procedures.
4. Use a voltmeter, amp probe and ohmmeter.
5. Describe the methods used to wire motor controls.
6. Describe procedures for protecting and burying underground cables.
7. Install a waterproof splice on a submersible pump lead.
8. Perform electrical cable connecting and disconnecting at the well head for service.
9. Install a control box.

10. Install a motor ground on a pumping system.
11. Demonstrate electrical tests as required on pumping systems.

**SECTION FOUR: ..... WORKPLACE COACHING SKILLS ..... 0 HOURS**

**A. Workplace Coaching Skills ..... 0 Hours**

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

1. Describe the process for coaching an apprentice.

**SECOND PERIOD TECHNICAL TRAINING**
**EARTH LOOP TECHNICIAN TRADE**
**CURRICULUM GUIDE**

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

**SECTION ONE: GROUND WATER ..... 35%**

**A. Ground Water Geology ..... 30%**

***Outcome: Identify the geology and hydrogeology encountered when drilling.***

1. Identify rock types and the natural processes that form them.
2. Identify the thermal conductivity of rock types.
3. Describe Alberta's geologic column.
4. Identify properties of formations affecting water storage and movement.
5. Identify water zones.

**B. Water Sources ..... 6%**

***Outcome: Identify different sources of water using appropriate terminology.***

1. Define surface water.
2. Describe the effects of surface water on the water table.
3. Define ground water.

**C. Lithology ..... 2%**

***Outcome: Produce a lithology report.***

1. Describe the sequence and format used in lithology reporting.
2. Use appropriate abbreviations in a lithology report.

**D. Maps ..... 6%**

***Outcome: Interpret maps used in the drilling industry.***

1. Interpret maps that pertain to geology, hydrogeology and location.
2. Demonstrate how to access and interpret the ground water information system provided through Alberta Environment.

**E. Earth Exchanger Exploration ..... 31%**

***Outcome: Select appropriate drilling sites.***

1. Describe the site selection process.
2. Determine the location of aquifers when drilling.
3. Calculate thermal conductivity.

**F. Aquifer Characteristics ..... 16%**

***Outcome: Describe hydraulic properties of rocks in various formations.***

1. Describe ground water flow as it pertains to various formations.
2. Identify the hydraulic properties of rocks.

**G. Regulations ..... 9%**

***Outcome: Apply government legislation, regulations and guidelines relating to work in the trade.***

1. Describe government legislation, regulations and guidelines relating to work in the trade.

**SECTION TWO: ..... CLOSED EARTH LOOP SYSTEMS PLANNING AND DESIGN ..... 17%**

**A. Site Planning and Preparation ..... 67%**

***Outcome: Implement a closed earth loop system.***

1. Obtain ground disturbance certification.
2. Create a closed earth loop system site plan.
3. Describe methods of locating utilities and private underground services.
4. Determine site access, material storage and handling and water supply.
5. Describe methods for containing and disposing of cuttings.
6. Describe methods of clearing sites and disposing of overburden.
7. Identify site hazards and safe working distances from utilities.

**B. Earth Loop Design ..... 33%**

***Outcome: Design a closed earth loop system.***

1. Calculate residential design load, energy load and ground load.
2. Calculate the earth loop configuration for a given ground load.
3. Describe differences between residential and commercial loads.
4. Use thermal conductivity values.

**SECTION THREE: ..... CLOSED EARTH LOOP SYSTEMS CONSTRUCTION ..... 37%**

**A. Horizontal Earth Loop Construction ..... 15%**

***Outcome: Construct horizontal earth loop systems.***

1. Describe safety considerations when trenching.
2. Identify trenching methods and procedures.
3. Identify problematic encounters during the drilling and construction of horizontal earth loop systems.
4. Identify equipment types and methods used in the construction of horizontal earth loop systems.
5. Describe requirements and procedures for site restoration.

**B. Vertical Earth Loop Construction ..... 30%**

***Outcome: Construct vertical earth loop systems.***

1. Identify safety considerations for vertical earth loop construction.
2. Identify equipment types and methods used in the construction of vertical earth loop systems.
3. Identify problems during the drilling and construction of vertical earth loop systems.
4. Describe procedures for flushing, purging and pressure testing.
5. Describe the types of heat transfer fluids, viscosities and charging procedures.

**C. Grouting ..... 40%**

***Outcome: Grout earth loop systems.***

1. Describe the purpose of grouting.
2. Describe the properties of grouts and mixes.
3. Calculate volumes for grout mixes.
4. Identify the current industry grouting practices and procedures.
5. Identify equipment types and methods used in the grouting of earth loop systems.
6. Describe remediation procedures for grout loss.

**D. Earth Loop Remediation and Decommissioning ..... 15%**

***Outcome: Apply remediation and decommissioning procedures for earth loop systems.***

1. Describe remediation and decommissioning procedures for earth loop systems.
2. Describe the reporting requirements for heat transfer fluid leakage and loop decommissioning.
3. Describe procedures for flushing, grouting and extracting decommissioned loops.
4. Describe procedures for collecting and disposing of heat transfer fluids.

**SECTION FOUR: .....PIPE AND PIPE JOINING METHODS ..... 11%**

**A. Fundamentals of Earth Loop Piping ..... 40%**

***Outcome: Identify chemical and physical properties of earth loop pipe used in the trade.***

1. Describe resins, polymers, and methods used in the manufacturing of earth loop pipe.
2. Identify standards governing the manufacturing and rating of earth loop pipe.
3. Calculate pressures at various depths of bore hole relative to ratings of earth loop pipe.

**B. Transportation, Handling and Storage of Pipe ..... 10%**

***Outcome: Use appropriate procedures in the transportation, handling and storage of pipe.***

1. Calculate the volume and area required to transport and store earth loop pipe.
2. Describe methods for storing earth loop pipe.
3. Describe methods for temporary capping of earth loop pipes.

**C. Pipe Fusion Welding..... 50%**

***Outcome: Perform fusion welding on pipe and fittings.***

1. Describe regulations governing the fusion welding of earth loop pipe.
2. Describe equipment types and methods used in fusion welding.
3. Prepare pipe for fusion welding.
4. Demonstrate procedures for care, cleaning, and storage of fusion welding equipment.

**SECTION FOUR: ..... WORKPLACE COACHING SKILLS ..... 0 HOURS**

**A. Workplace Coaching Skills..... 0 Hours**

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

1. Describe the process for coaching an apprentice.

# Apprenticeship and Industry Training

Alberta Trades. World Ready.

**035**