

# Apprenticeship and Industry Training

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**Glazier**

**Curriculum Guide**

**025 (2022)**

Alberta 



Apprenticeship  
and Industry  
Training

**ALBERTA ADVANCED EDUCATION**

Glazier: apprenticeship education program curriculum guide

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**Glazier  
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**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 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 Glazier apprenticeship program is an individual who will be able to:

- be skilful in cutting, preparing, fabricating or other handling of all glass materials for buildings, fixtures and other uses
- do the glazing, setting, attachment, installation, removal of all types of glass material for buildings, fixtures and other uses
- be capable of doing the installation, fitting fabrication and attachment of architectural metals or related products for all types of buildings
- use efficiently and safely all hand and power operated equipment used by tradespeople
- be able to produce from blueprints and working drawings the type of products made and use by the industry
- relate to the work of other tradesmen in affiliated trades
- carry out damaged light removal procedures, installations and sealing of new parts - understand use of specialised tools, lubricants and sealants
- 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. J. Brady ..... Calgary  
Mr. B. Denholm ..... Calgary  
Mr. R. Neal ..... Calgary  
Mr. R. Walder ..... Calgary  
Mr. M. Huston ..... Chestermere  
Mr. B. Simpson ..... Calgary  
Mr. B. Stadnyk ..... Edmonton

### 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)

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 Glazier trade apprenticeship technical training:

Southern Alberta Institute of Technology (Main Campus)

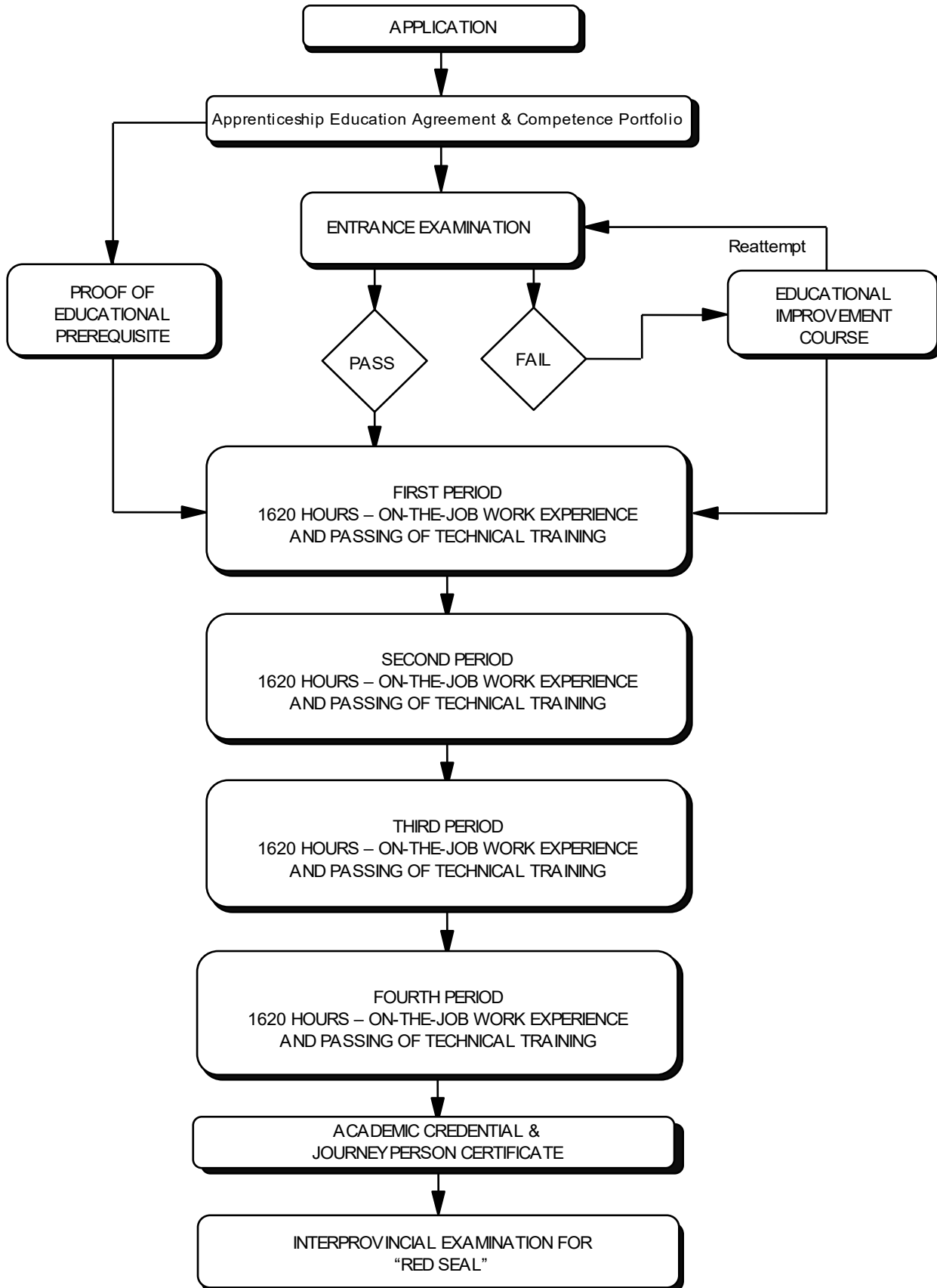
### **Procedures for Recommending Revisions to the Curriculum Guide**

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

Registrar of Apprenticeship 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

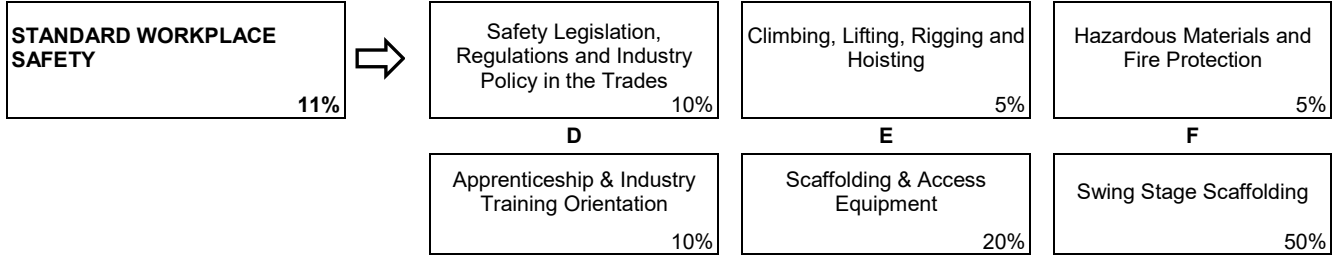
It is requested that recommendations for change refer to specific areas and state references used.

### Apprenticeship Route toward Academic Credential

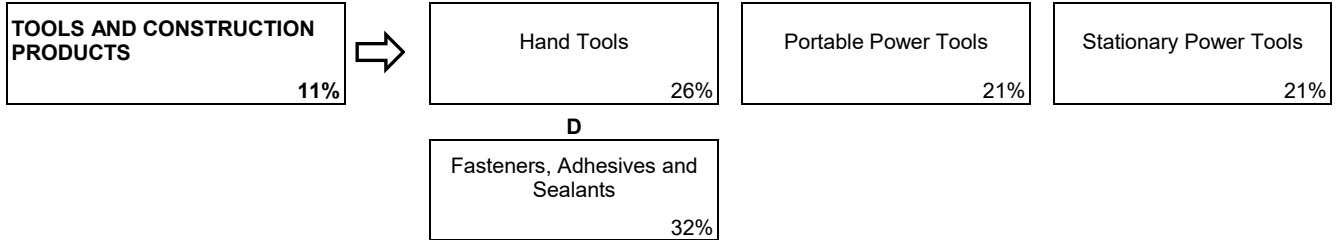


**Glazier Training Profile  
FIRST PERIOD  
(6 Weeks 30 Hours per Week – Total of 180 Hours)**

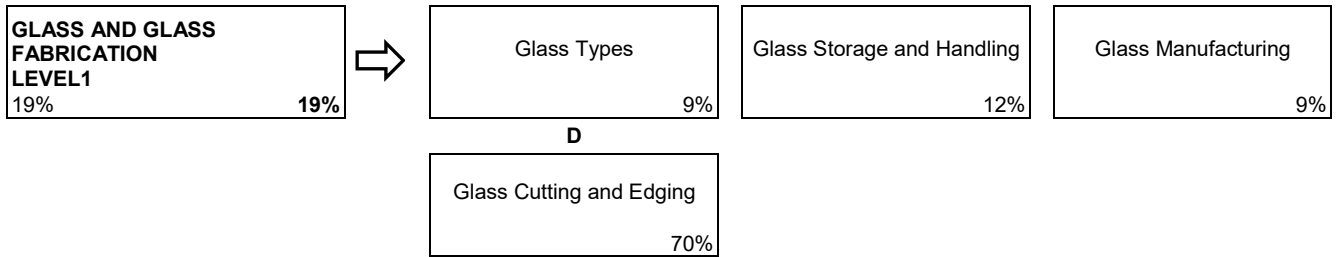
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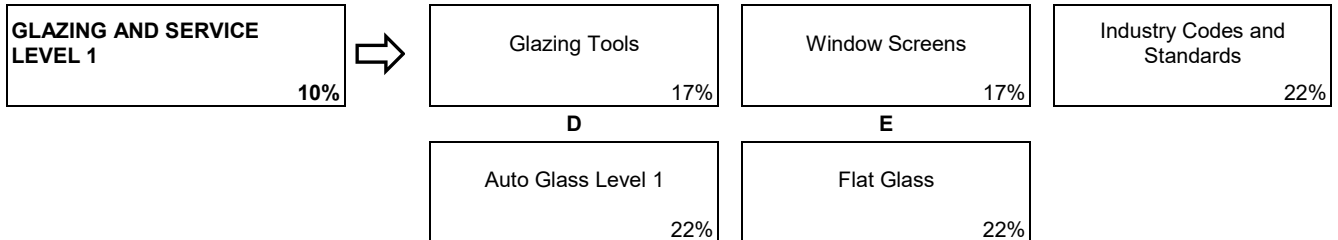
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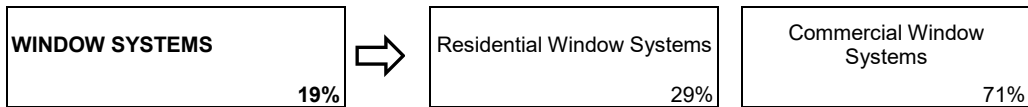
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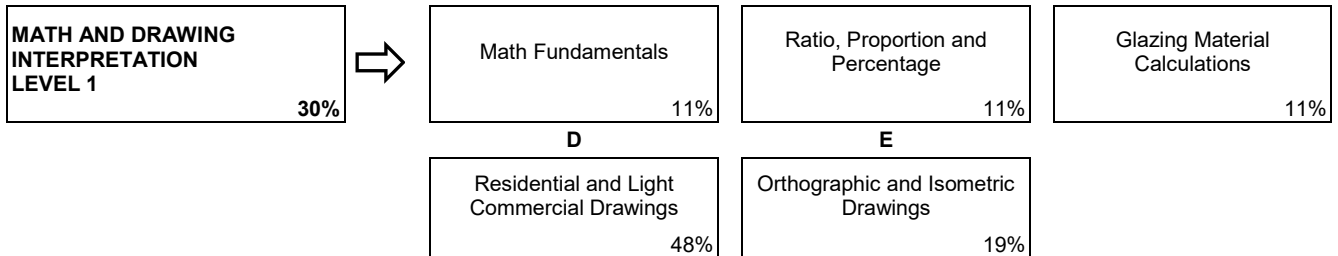
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**SECTION FIVE**

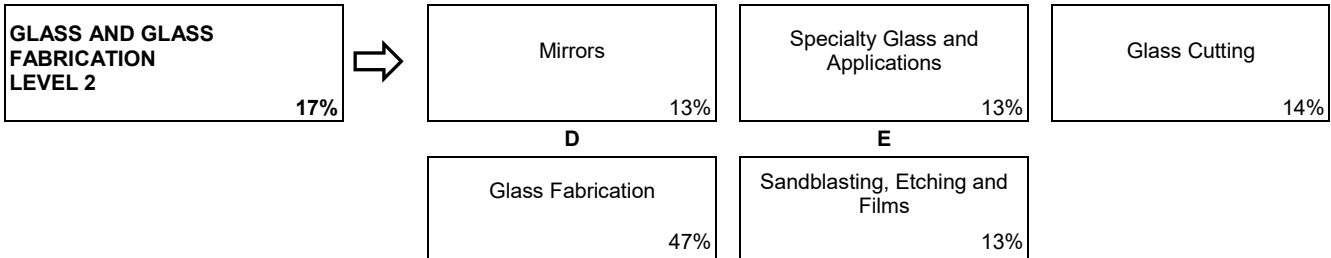


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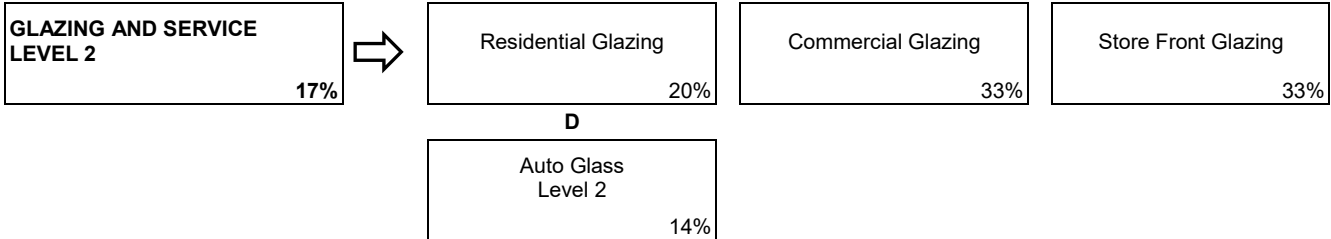


**SECOND PERIOD**  
**(6 Weeks 30 Hours per Week – Total of 180 Hours)**

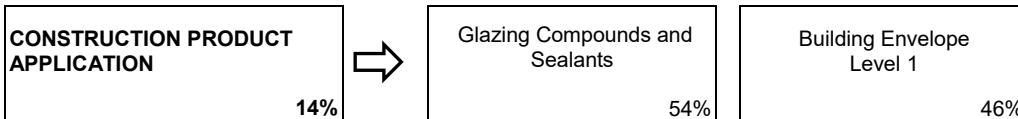
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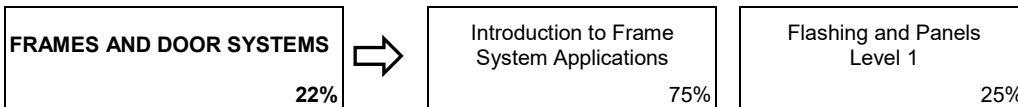
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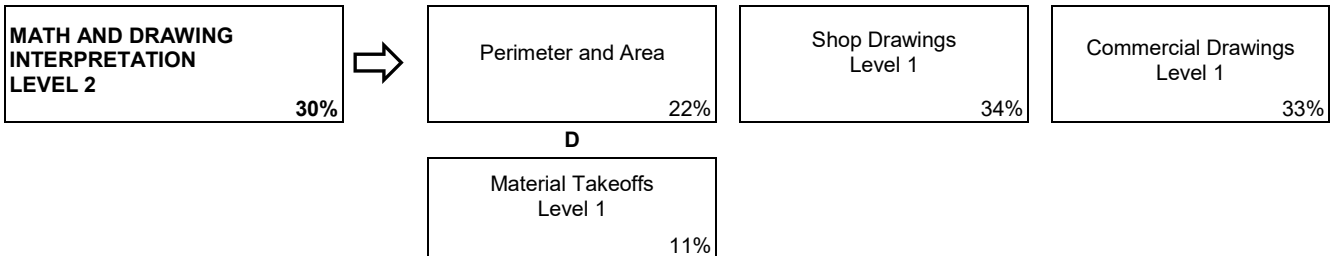
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**SECTION FOUR**



**SECTION FIVE**





**THIRD PERIOD**  
**(6 Weeks 30 Hours per Week – Total of 180 Hours)**

**SECTION ONE**

<b>FRAME SYSTEMS LEVEL 1</b>  29%	⇒	<b>A</b>	<b>B</b>	<b>C</b>
	Aluminum Frames 31%	Curtain Walls Level 1 19%	Frame System Applications Level 1 31%	

<b>D</b>
Flashings and Panels Level 2 19%

**SECTION TWO**

<b>DOOR SYSTEMS LEVEL 1</b>  14%	⇒	<b>A</b>	<b>B</b>	<b>C</b>
	Commercial Door Types Level 1 15%	Door Hardware Level 1 31%	Aluminum Swing Doors 31%	

<b>D</b>
All Glass Entrance Systems 23%

**SECTION THREE**

<b>GLAZING AND SERVICE LEVEL 3</b>  11%	⇒	<b>A</b>	<b>B</b>	<b>C</b>
	Structural Glazing Systems 20%	Structural Glazing Installation 30%	Building Envelope Level 2 50%	

**SECTION FOUR**

<b>SLOPED GLAZING SYSTEMS</b>  16%	⇒	<b>A</b>	<b>B</b>	<b>C</b>
	Sloped Glazing 25%	Skylights 25%	Skylight Shop Project 50%	

**SECTION FIVE**

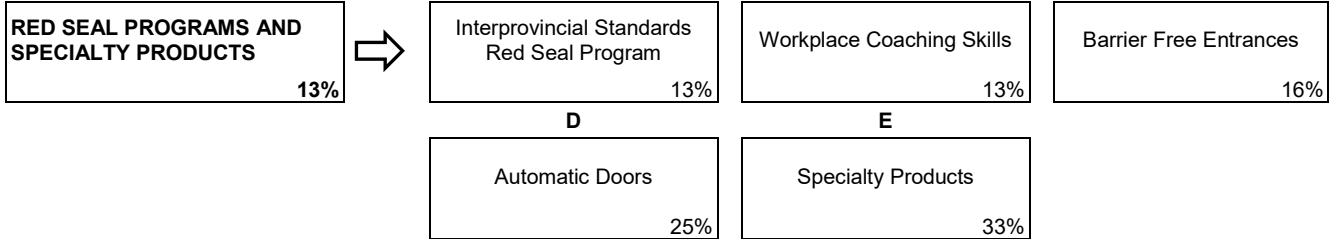
<b>MATH AND DRAWING INTERPRETATION LEVEL 3</b>  30%	⇒	<b>A</b>	<b>B</b>	<b>C</b>
	Design Factors 7%	Commercial Drawings Level 2 30%	Project Specifications Level 1 7%	

<b>D</b>
Shop Drawings Level 2 30%

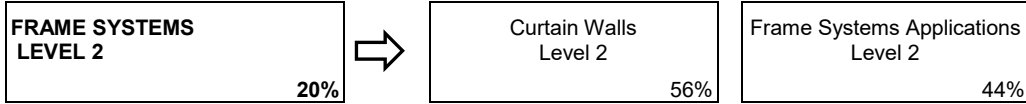
<b>E</b>
Material Takeoffs Level 2 26%

**FOURTH PERIOD**  
**(6 Weeks 30 Hours per Week – Total of 180 Hours)**

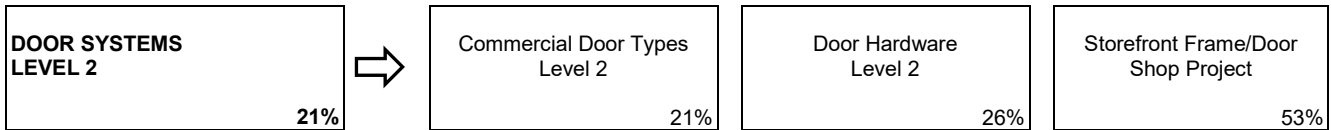
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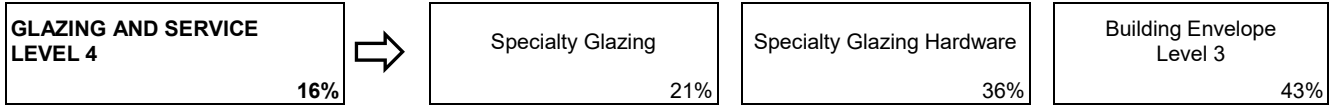
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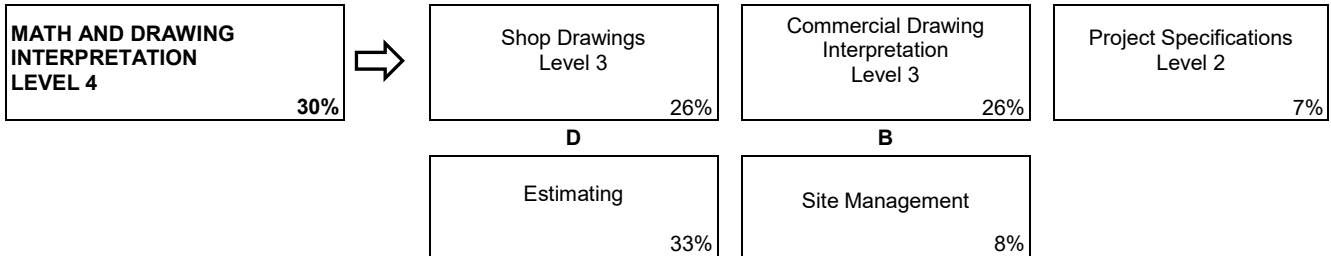
**SECTION THREE**



**SECTION FOUR**



**SECTION FIVE**



**FIRST PERIOD TECHNICAL TRAINING  
GLAZIER 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 ..... 11%**

**A. Safety Legislation, Regulations and 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 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 ..... 5%**

**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 and Fire Protection ..... 5%**

**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 ..... 10%****Outcome: Describe the Alberta Apprenticeship training system.**

1. Identify the training profile of the Glazier Apprenticeship in Alberta.
2. Explain the Glazier program curriculum guide learning outcomes and objectives.
3. Discuss the contents of the apprenticeship training competency portfolio.
4. Describe the responsibilities for the Apprentice Education Agreement by the apprentice, sponsor and Alberta Apprenticeship and Industry Training.
5. Identify industrial, commercial and residential fields that provide opportunities for Glaziers.

**E. Scaffolding and Access Equipment..... 20%****Outcome: Describe the safety procedures of scaffolding and access equipment.**

1. Describe general scaffold terms and components.
2. Identify scaffold systems and structures.
3. Describe tying and bracing scaffolds.
4. Describe base conditions for scaffolds.
5. Describe erection and dismantling of scaffolds.
6. Describe scaffolding and harness safety including maintenance and inspection.
7. Describe powered elevation work platforms.
8. Perform checklist procedures.

**F. Swing Stage Scaffolding..... 50%****Outcome: Operate a swing stage scaffold system.**

1. Identify types of swing stage scaffold systems.
2. Describe the safety features of swing stage systems.
3. Describe types of fall arrest equipment used when operating a swing stage system.
4. Interpret safety codes and regulations related to swing stage systems.
5. Describe the swing stage inspection process.
6. Complete an inspection of a swing stage system.
7. Operate a swing stage scaffold system.

**SECTION TWO:.....TOOLS AND CONSTRUCTION PRODUCTS ..... 11%****A. Hand Tools ..... 26%****Outcome: Use and maintain hand tools.**

1. Identify measurement and layout tools and their applications.
2. Identify squaring and marking tools and their applications.
3. Identify assembly and dismantling tools and their applications.
4. Describe maintenance procedures for hand tools.
5. Use hand tools used in the trade.

**B. Portable Power Tools ..... 21%**

**Outcome: Operate and maintain portable power tools.**

1. Identify portable power saws and their applications.
2. Identify types of drills and their applications.
3. Identify specialty portable power tools and their applications.
4. Describe maintenance procedures for portable power tools.
5. Operate portable power tools used in the trade.

**C. Stationary Power Tools ..... 21%**

**Outcome: Operate and maintain stationary power tools.**

1. Identify stationary saws and their applications.
2. Identify specialty types of stationary power tools and their applications.
3. Identify presses and their applications.
4. Identify edging machines and their applications.
5. Describe maintenance procedures for stationary power tools.
6. Operate stationary power tools used in the trade.

**D. Fasteners, Adhesives and Sealants..... 32%**

**Outcome: Use fasteners, adhesives and sealants.**

1. Identify the different types of fasteners and their applications.
2. Identify the different types of adhesives and their applications.
3. Identify the different types of sealants and their applications.

**SECTION THREE: ..... GLASS AND GLASS FABRICATION LEVEL 1 ..... 19%**

**A. Glass Types ..... 9%**

**Outcome: Recognize common types of glass.**

1. Identify types of glass and their applications.
2. Describe the composition of different types of glass.
3. Identify the different sectors of the glass industry.

**B. Glass Storage and Handling ..... 12%**

**Outcome: Perform methods of glass storage and handling.**

1. Describe glass handling procedures.
2. Describe the requirements of glass storage racks and their applications.
3. Outline the procedures for glass storage.
4. Describe the packaging of glass products.
5. Exercise different storage procedures for glass.

**C. Glass Manufacturing ..... 9%****Outcome: Describe the glass manufacturing process.**

1. List materials used to manufacture glass.
2. Describe methods used to manufacture glass.

**D. Glass Cutting and Edging..... 70%****Outcome: Perform cutting and edging of glass.**

1. Identify tools and products used to cut glass.
2. Describe methods to cut glass.
3. Perform glass cutting techniques using various glass cutting tools.
4. Identify tools and products used to edge glass.
5. Describe methods used to edge glass.
6. Perform edge finishes on glass.

**SECTION FOUR: .....GLAZING AND SERVICE LEVEL 1 ..... 10%****A. Glazing Tools ..... 17%****Outcome: Operate and maintain glazing tools used in the trade.**

1. Identify different types of glazing tools and their applications.
2. Operate glazing tools used in the trade.
3. Maintain glazing tools used in the trade.

**B. Window Screens ..... 17%****Outcome: Fabricate window screening products.**

1. Identify the common types of products of window screen.
2. Describe the use of the types of products for window screens.
3. Fabricate a window screen.

**C. Industry Codes and Standards..... 22%****Outcome: Use codes and standards pertaining to the glazing industry.**

1. Identify the National Building Code (NBC) and Alberta Building Code (ABC) code books used in industry.
2. Describe the relationship between the national code book and the Alberta code book.
3. Identify the sections related to the glazier industry.

**D. Auto Glass Level 1..... 22%****Outcome: Describe automotive glass removal and installation procedures.**

1. List the tools used to remove auto glass.
2. List the tools used to install auto glass.

3. Identify the types of glass used in the auto glass industry.
4. List the bonding agents used to install auto glass.
5. Identify the resource for glass codes related to the auto glass industry.
6. Outline the procedures for installing a front windshield.

**E. Flat Glass..... 22%**

**Outcome: Service flat glass products.**

1. Identify the flat glass products used in the industry.
2. Describe the uses of flat glass products.
3. Remove flat glass products.
4. Fabricate flat glass products.
5. Install flat glass products.

**SECTION FIVE: ..... WINDOW SYSTEMS..... 19%**

**A. Residential Window Systems ..... 29%**

**Outcome: Install residential window systems.**

1. Identify types of residential windows.
2. Identify the different materials used in residential windows.
3. Describe the methods of installation in different residential substrate construction.
4. Outline the procedure for repairing a residential window.

**B. Commercial Window Systems..... 71%**

**Outcome: Fabricate and install a light commercial ribbon window system.**

1. Identify types of commercial windows.
2. Identify the different materials used in commercial windows.
3. Identify the methods of storage and handling of metals.
4. Describe methods of installation in different commercial substrate construction.
5. Outline the procedures for repairing a light commercial window system.
6. Fabricate a light commercial ribbon window system.
7. Install a light commercial ribbon window system.

**SECTION SIX:..... MATH AND DRAWING INTERPRETATION LEVEL 1 ..... 30%**

**A. Math Fundamentals ..... 11%**

**Outcome: Solve basic math problems.**

1. Describe 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. Convert measurements between metric and imperial.

5. Add, subtract, multiply and divide fractions.
6. Convert between fractions and decimals.

**B. Ratio, Proportion and Percentage..... 11%**

**Outcome: Solve ratio, proportion and percentage problems.**

1. Describe percentage calculations and their related trade applications.
2. Convert between decimal and percentage numbers.
3. Calculate the percentage value of a number.
4. Calculate the percentage value of one number relative to another.
5. Calculate the numeric value of a percentage.
6. Describe ratio and proportion and their related trade applications.
7. Solve ratio and proportion problems.

**C. Glazing Material Calculations ..... 11%**

**Outcome: Calculate quantities of glazing materials.**

1. Calculate material quantities as related to the information found on plans and drawings.
2. Calculate edge tolerances to the appropriate system.
3. Determine the maximum yield of a sheet of glass.
4. Determine the yield of an aluminum extrusion.
5. Calculate the weight of a piece of glass.

**D. Residential and Light Commercial Drawings ..... 48%**

**Outcome: Interpret residential and light commercial drawings.**

1. Identify the different components of a drawing.
2. Describe schedules and specifications.
3. Perform scaling and dimensioning tasks.
4. Locate the dimensions of windows and doors in drawings.

**E. Orthographic and Isometric Drawings ..... 19%**

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

1. Identify orthographic drawings.
2. Identify isometric drawings.
3. Draw orthographic drawings.
4. Draw isometric drawings.



**SECOND PERIOD TECHNICAL TRAINING  
GLAZIER TRADE  
CURRICULUM GUIDE**

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

**SECTION ONE:..... GLASS AND GLASS FABRICATION LEVEL 2 ..... 17%**

**A. Mirrors..... 13%**

**Outcome: Perform the layout, fabrication and installation of mirrors.**

1. Identify types of mirrors.
2. Outline the procedure for fabricating mirrors.
3. Fabricate a mirror.
4. Identify the hardware used for installing mirrors.
5. Describe procedures used for installing mirrors.
6. Install a mirror.

**B. Specialty Glass and Applications ..... 13%**

**Outcome: Recognize types of specialty glass and their applications.**

1. Identify types of specialty glass.
2. Describe uses of specialty glass.
3. Identify locations where specialty glass is installed.
4. Identify the products used for installing specialty glass.
5. Discuss the various procedures for the installation of specialty glass.

**C. Glass Cutting ..... 14%**

**Outcome: Cut glass to various shapes.**

1. Identify the different methods of glass cutting.
2. Identify the tools used to cut glass.
3. List procedures for cutting glass.
4. Cut different thicknesses of glass.
5. Cut glass free hand into various shapes.
6. Cut assigned glass projects.
7. Finish assigned glass projects.

**D. Glass Fabrication..... 47%**

**Outcome: Apply techniques for glass fabrication.**

1. Describe uses of various abrasives, coolants and lubricants used to fabricate glass.
2. Describe the effects of speed and heat when drilling glass.
3. Drill holes in glass.

4. Use a glass saw to cut glass.
5. Remove scratches from glass using a scratch polishing machine.

**E. Sandblasting, Etching and Films ..... 13%**

**Outcome: Recognize the procedures for sandblasting, etching and film application on glass.**

1. Identify methods for sand blasting glass.
2. List the procedure for sand blasting glass.
3. Describe methods for etching glass.
4. List the procedure for etching glass.
5. Identify uses of glass film applications.
6. Identify methods for film application.
7. List the procedure for film application.

**SECTION TWO:.....GLAZING AND SERVICE LEVEL 2..... 17%**

**A. Residential Glazing ..... 20%**

**Outcome: Install and service residential glazing products.**

1. Identify sash types.
2. List procedures for sash preparation and glazing.
3. Describe installation techniques for a sash.
4. Prepare a sash and glaze.
5. Install a sash.
6. Identify types of frames.
7. List procedures for frame preparation and glazing.
8. Prepare a frame and glaze.
9. Install a frame.

**B. Commercial Glazing ..... 33%**

**Outcome: Describe service fundamentals for commercial glazing products.**

1. Identify glass types and sizes for servicing commercial glazing products.
2. Describe the theory of energy efficient glazing.
3. Describe methods for replacing glass.
4. Describe methods of securing glass.
5. Describe the purpose and use of spacer shims and setting blocks.

**C. Store Front Glazing ..... 33%**

**Outcome: Troubleshoot and repair store front entrance systems.**

1. Identify basic hardware and glazing used for store front entrance systems.
2. Troubleshoot store front entrance system malfunctions.

3. Develop a repair plan.
4. Resolve store front entrance system deficiencies.

**D. Auto Glass Level 2..... 14%**

**Outcome: Remove and install auxiliary auto glass.**

1. Identify types of auxiliary glass used in the auto glass industry.
2. List the tools used to remove and install auxiliary auto glass.
3. List sealing and bonding agents used to install auxiliary auto glass.
4. Interpret auxiliary glass codes and standards related to the auto glass industry.
5. Outline procedures for installing auxiliary glass.

**SECTION THREE: .....CONSTRUCTION PRODUCT APPLICATION..... 14%**

**A. Glazing Compounds and Sealants..... 54%**

**Outcome: Install glazing compounds and sealants.**

1. Outline types of glazing compounds and sealants.
2. Describe sealant application methods.
3. Install glazing compounds to wood and metal framing.
4. Caulk windows to substrates.

**B. Building Envelope Level 1 ..... 46%**

**Outcome: Describe the concept of building envelope science.**

1. Define building envelope.
2. Describe heat transfer and heat loss through building components.
3. Describe the function of air, vapour and weather barriers.
4. Describe building envelope applications.

**SECTION FOUR: ..... FRAMES AND DOOR SYSTEMS ..... 22%**

**A. Introduction to Frame System Applications ..... 75%**

**Outcome: Fabricate and install a commercial frame and door system.**

1. Identify the components of commercial aluminum frames.
2. Identify entrance systems.
3. Outline the preparation procedure for fabrication of aluminum frames.
4. Fabricate a frame and door system.
5. Outline the procedure for installing entrance door systems.
6. Install entrance doors including hardware and glazing.

**B. Flashings and Panels Level 1 ..... 25%**

**Outcome: Identify flashing and panels.**

1. Identify types of flashings and panels.
2. Describe applications of flashings and panels.
3. Identify the finishes for flashing and panels.

**SECTION FIVE: ..... MATH AND DRAWING INTERPRETATION LEVEL 2 ..... 30%**

**A. Perimeter and Area..... 22%**

**Outcome: Perform perimeter and area calculations related to trade based problems.**

1. Calculate perimeters by applying the applicable formulas.
2. Calculate areas by applying the applicable formulas.
3. Solve surface area problems by applying the applicable formulas.
4. Calculate circumferences by applying the formulas for geometric shapes.

**B. Shop Drawings Level 1 ..... 34%**

**Outcome: Produce basic shop drawings.**

1. Describe line types used in orthographic drawings.
2. Demonstrate dimensioning methods and techniques.
3. Describe page layout and centering techniques.
4. Describe section, details and the use of material symbols.
5. Produce a basic shop drawing.

**C. Commercial Drawings Level 1 ..... 33%**

**Outcome: Perform drawing interpretation tasks relating to basic architectural drawings and specifications.**

1. Identify the different types of views in an architectural drawing.
2. Describe the difference between schedules and specifications.
3. Identify symbols and abbreviations.
4. Locate the dimensions of windows and doors in drawings.
5. Perform scaling and dimensioning tasks.

**D. Material Takeoffs Level 1 ..... 11%**

**Outcome: Determine basic material requirements to complete a job.**

1. Identify all materials required to complete a job.
2. Determine basic material quantities.
3. Generate a basic material list.

**THIRD 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:..... FRAME SYSTEMS LEVEL 1 ..... 29%**

**A. Aluminum Frames..... 31%**

**Outcome: Identify aluminum framing components including finishes, properties and extrusions.**

1. Outline the process of extruding aluminum.
2. Describe types of aluminum frame finishes and their applications.
3. Identify types of corrosion and corrosion prevention.
4. Identify types of aluminum framing components.

**B. Curtain Walls Level 1 ..... 19%**

**Outcome: Fabricate and Install a single level curtain wall.**

1. Describe types of curtain walls, anchors, reinforcing, structural requirements, expansion and sealing.
2. Describe a flush wall panel system and its application.
3. Identify curtain wall layout, survey and alignment.
4. Fabricate a single level curtain wall.
5. Install a single level curtain wall.

**C. Frame System Applications Level 1 ..... 31%**

**Outcome: Fabricate and install a basic frame system.**

1. Identify store front framing components.
2. Prepare store front framing.
3. Fabricate frames including transoms and side lights, using flush line material.
4. Install frames, glass and sealants.

**D. Flashings and Panels Level 2..... 19%**

**Outcome: Design and install flashings and panels.**

1. Interpret flashing and panel detail requirements.
2. Design flashings and panels to suit site conditions.
3. Fabricate flashings and panels.
4. Install flashings and panels.

**SECTION TWO: ..... DOOR SYSTEMS LEVEL 1 ..... 14%**

**A. Commercial Door Types Level 1 ..... 15%**

**Outcome:** *Describe commercial door systems.*

1. List types of commercial door systems.
2. Identify components of commercial door systems.
3. Describe types of commercial door systems and their applications.

**B. Door Hardware Level 1 ..... 31%**

**Outcome:** *Describe associated door hardware.*

1. Describe types of closers and their applications.
2. Describe types of hinging and their applications.
3. Describe types of locking mechanisms and their applications.
4. Describe associated hardware and their applications.

**C. Aluminum Swing Doors ..... 31%**

**Outcome:** *Install an aluminum swing door.*

1. Identify the components of an aluminum swing door.
2. List the procedure for installing an aluminum swing door.
3. Install an aluminum swing door, door lite and hardware.

**D. All Glass Entrance Systems ..... 23%**

**Outcome:** *Install an all glass entrance system.*

1. Identify different types of all glass entrance systems.
2. Describe the components of all glass entrance systems.
3. List the procedure for installing an all glass entrance system.
4. Install an all glass entrance system.

**SECTION THREE: ..... GLAZING AND SERVICE LEVEL 3 ..... 11%**

**A. Structural Glazing Systems ..... 20%**

**Outcome:** *Assess and repair a structural glazing system.*

1. Describe structural glazing, its purpose and installation methods.
2. Identify basic component hardware operations.
3. Troubleshoot structural glazing system malfunctions.
4. Develop a repair plan.
5. Implement a repair plan.

**B. Structural Glazing System Installation ..... 30%**

**Outcome:** *Install a structural glazing system.*

1. List the procedure for installing a total vision structural glazing system.
2. Establish an installation plan.
3. Install a total vision structural glazing system.

**C. Building Envelope Level 2 ..... 50%**

**Outcome:** *Install common types of building envelope components.*

1. Describe types of building envelope components.
2. Describe types of membrane materials.
3. Identify issues related to membrane types.
4. List the procedure for installing membranes.
5. Install a membrane.

**SECTION FOUR: ..... SLOPED GLAZING SYSTEMS ..... 16%**

**A. Sloped Glazing ..... 25%**

**Outcome:** *Install and repair sloped glazing systems.*

1. Identify special considerations concerning slope glazing.
2. Describe project specifications in conjunction with manufacturer’s installation manuals.
3. Describe the anchoring requirements for sloped glazing.
4. Outline the procedure for sloped glazing installation.
5. Outline the procedure for sealing and providing drainage for sloped glazing.
6. Outline a troubleshooting and repair analysis for sloped glazing.

**B. Skylights ..... 25%**

**Outcome:** *Describe the installation and repair of skylights.*

1. Identify different types of skylights.
2. Describe project specifications in conjunction with manufacturer’s installation manuals.
3. Describe the anchoring requirements for skylights.
4. Outline the procedure for layout, glass installation and flashing to perform the function of skylight design.
5. Outline the procedure for sealing to provide drainage.
6. Outline the procedure to provide drainage.
7. Troubleshoot and repair skylights.

**C. Skylight Shop Project..... 50%**

**Outcome: *Install a skylight system.***

1. Identify the components required to install a skylight system.
2. Outline the procedure for installing skylight systems.
3. Install a skylight including framing, glass and flashings.

**SECTION FIVE: ..... MATH AND DRAWING INTERPRETATION LEVEL 3 ..... 30%**

**A. Design Factors ..... 7%**

**Outcome: *Use design factors when designing glazing systems.***

1. Calculate design loads.
2. Define deflection.
3. Identify expansion and contraction factors of aluminum.
4. Define expansion joints as related to glazing systems.
5. Define a sleeve anchor.
6. Determine glass sizes according to design factors.

**B. Commercial Drawings Level 2..... 30%**

**Outcome: *Interpret architectural and structural drawings.***

1. Describe architectural and structural drawings.
2. Collect data from drawings.
3. Determine the conflicts within the data.

**C. Project Specifications Level 1 ..... 7%**

**Outcome: *Interpret project specifications.***

1. Review project specifications.
2. Collect data from specifications.
3. Determine if there are conflicts within the data.

**D. Shop Drawings Level 2 ..... 30%**

**Outcome: *Produce a shop drawing.***

1. Formulate a procedure for creating a shop drawing from collected data.
2. Create the paper layout.
3. Produce elevation and detail drawings.



**E. Material Takeoffs Level 2 ..... 26%**

**Outcome:    *Generate material takeoffs.***

1.     Interpret material requirements from drawings.
2.     List material types.
3.     Determine quantities of each material type.
4.     Apply material costs and calculate.

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**SECTION ONE:..... RED SEAL PROGRAMS AND SPECIALTY PRODUCTS..... 13%**

**A. Interprovincial Standards Red Seal Program ..... 13%**

**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..... 13%**

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

1. Describe the process for coaching an apprentice.

**C. Barrier Free Entrances ..... 16%**

**Outcome: Assess barrier free entrance system operation.**

1. Describe types of barrier free entrance systems.
2. Interpret building codes and standards that pertain to barrier free entrance systems.
3. Describe barrier free entrance system controls.
4. Troubleshoot barrier free entrance system malfunctions.

**D. Automatic Doors ..... 25%**

**Outcome: Assess automatic door operations.**

1. Describe types of automatic doors.
2. Describe automatic door control systems.
3. Troubleshoot automatic door malfunctions.

**E. Specialty Products..... 33%**

**Outcome: Identify specialty products and emerging technologies in the glazing industry.**

1. Describe specialty glass types.
2. Identify specialized framing systems.
3. Describe electronic control systems.
4. Describe environmental control systems.
5. Describe specialty tools and equipment.
6. Describe special safety procedures and equipment.

**SECTION TWO:.....FRAME SYSTEMS LEVEL 2 ..... 20%**

**A. Curtain Walls Level 2..... 56%**

**Outcome: *Install curtain wall systems.***

1. Identify types of curtain wall systems.
2. Demonstrate the considerations for rain screen principle on curtain walls.
3. Layout, fabricate and install a curtain wall frame.
4. Install a pair of doors with adapter.
5. Install a back pan and spandrel panel.

**B. Frame System Applications Level 2 ..... 44%**

**Outcome: *Fabricate and install a multi-level curtain wall.***

1. Describe multi-level curtain wall systems.
2. Identify project planning considerations for multi-level curtain wall systems.
3. Describe anchoring and expansion joint components.
4. Layout, fabricate and install a multi-level curtain wall frame.

**SECTION THREE: .....DOOR SYSTEMS LEVEL 2 ..... 21%**

**A. Commercial Door Types Level 2 ..... 21%**

**Outcome: *Install specialty commercial doors.***

1. Describe interior and exterior commercial door system applications.
2. Describe layout and installation procedures for commercial door systems.
3. Install a commercial door system.

**B. Door Hardware Level 2..... 26%**

**Outcome: *Install and service specialty door hardware.***

1. Describe the installation of intermediate pivot hinges, butt hinges, continuous hinge, latch locks, electric strikes and service panic exit devices.
2. Describe service and repair procedures on door hardware.

**C. Storefront Frame/ Door Shop Project..... 53%**

**Outcome: *Fabricate and install a storefront frame system.***

1. Layout the components of a swing door and frame.
2. Fabricate a door frame.
3. Install a door frame.
4. Install a door and hardware in the frame.

**SECTION FOUR: .....GLAZING AND SERVICE LEVEL 4..... 16%****A. Specialty Glazing ..... 21%****Outcome: Describe specialty glazing systems and their applications.**

1. Outline multi-layered glass systems and their applications.
2. Outline glass balustrades and handrails.
3. Describe electronically altered glazing.
4. Describe point load supported glazing.
5. Describe the purpose of smoke baffles.

**B. Specialty Glazing Hardware..... 36%****Outcome: Install specialty glazing systems.**

1. Describe the installation of point support glazing systems.
2. Describe the installation of balustrade and handrail systems.
3. Describe the installation of suspended floor systems.
4. Describe emerging types of glazing systems and their hardware requirements.

**C. Building Envelope Level 3 ..... 43%****Outcome: Install a building envelope system.**

1. Describe sequential building envelope installation procedures.
2. Interpret a drawing for a building envelope project.
3. Demonstrate the properties of an expansion joint within a building envelope.
4. Install perimeter seals.
5. Install finish flashings around the perimeter.
6. Describe tests used to determine building envelope integrity.

**SECTION FIVE: ..... MATH AND DRAWING INTERPRETATION LEVEL 4 ..... 30%****A. Shop Drawings Level 3 ..... 26%****Outcome: Generate a curtain wall shop drawing.**

1. Design a curtain wall frame.
2. Formulate a procedure for creating a curtain wall shop drawing from collected data.
3. Create the paper layout.
4. Produce elevation and detail drawings.

**B. Commercial Drawing Interpretation Level 3 ..... 26%****Outcome: Interpret a commercial drawing.**

1. Interpret a commercial architectural drawing.
2. Evaluate the data from the drawing.

3. Determine the conflicts within the data.
4. Organize the data into a materials list.

**C. Project Specifications Level 2 ..... 7%**

**Outcome: Interpret project specifications.**

1. Interpret project specifications for a commercial drawing.
2. Evaluate the data from the project specifications.
3. Incorporate the specifications data into the materials list.

**D. Estimating..... 33%**

**Outcome: Estimate labor and material quantities for a given project.**

1. Use the materials list to create an estimate.
2. Calculate materials costs.
3. Calculate fabrication labour costs.
4. Calculate installation labour costs.
5. Calculate designated mark-up costs for the project.
6. Create a quote.

**E. Site Management ..... 8%**

**Outcome: Manage an on-site commercial project.**

1. Review manpower allocation requirements.
2. Develop a project scheduling plan.
3. Identify site logistics requirements.
4. Develop a materials management plan.
5. Implement a safety management program.
6. Coordinate client/trades relationships.
7. Implement a project communications plan.
8. Develop a project cost control.
9. Describe a time management program.



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