

British Columbia Construction Association

Integrating Newcomers

A comparison of select British Columbian and Irish apprenticeships

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Summary

We conducted a cursory comparison of apprenticeship requirements, contents, and certification processes between British Columbia and the Republic of Ireland (*Poblacht na hÉireann*).

We obtained data from 3 main Irish sources of information, and one main source for British Columbia.

The Irish sources were:

- FÁS¹ (*Foras Áiseanna Saothair*), referred to in English as the Training and Employment Authority, now dissolved (July 2013) and replaced by,
- SOLAS² (established 27 October 2013 - *An tSeirbhís Oideachais Leanúnaigh agus Scileanna*), referred to in English as the Further Education and Training Authority.
- QQI³ (*Dearbhú Cáilíochta agus Cáilíochtaí Éireann*) referred to in English as Quality and Qualifications Ireland.

Both of which were concerned (among other things) with providing access to employment through continuing education and training.

The British Columbian source was:

- ITA⁴ (Industry Training Authority).

On these sites we collected data from the following documents:

- Apprenticeship Listings & Craft Brochures (FÁS)
- SOLA National Skills Database (NSD)
- SOLAS FET 2015 report
- QQI Programme Details
- QQI NFQ details
- ITA Program Profile
- ITA Program Outline

In the document we use the BC trade name, requisites, and content as the reference.

Differences & similarities at a glance

In the table below, we compare key elements of the apprenticeship programs in BC and in Ireland. The most striking difference between the two “systems” is how varied the BC programs are and how standardized the Irish programs are across trades.

Table 1. Comparison of BC and Irish apprenticeship program elements across 9 trades

Program element		British Columbia	Éire / Ireland
Entry requirements	Type	Recommended	Compulsory
	Special requirements	None	Color vision test for some
	Lowest scholastic	Grade 10 (Carpenter, Refrigeration, Security)	Grade D in five subjects in the Department of

¹ <http://www.fas.ie/en/default.htm> - accessed 21 March 2016

² <http://www1.solas.ie/Pages/HomePage.aspx> - accessed 21 March 2016

³ <http://www.qqi.ie/> accessed 25 March 2016

⁴ <http://www.itabc.ca/> accessed 21 March 2016

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Program element		British Columbia	Éire / Ireland
		Alarm)	Education & Skills Junior Certificate Examination
	Preferred scholastic	Grade 12 (Insulator, Sheet Metal, Painter & Decorator, Tilesetter)	
	Highest scholastic	Grade 11 (Plumber) Grade 12 (Electrician)	
	Topics scholastic	English, math, science	English, math, science (+)
In-school training	Total length	Varies (0 - 1200 hours total)	Varies (900 – 1320 hours total)
	Number of periods	Varies (3-4)	Fixed (3)
	Additional studies		Some compulsory self-directed modules
On-the-job training	Total length	Fixed for each trade, but varies by trade (3600 – 7220 hours)	Fixed minima (72 weeks ≈ 2880 hours) same for all trades
	Number of periods	Fixed but varies by trade	Fixed (4)
Assessment	School-based exams	Institution-specific (moving to standardized tests)	Standardized
	On-the-job	Employer hours sign-off	Documented standardized competence tests on site
	Certification	“Paper-and-pencil” single test	Competence tests

Content differences at a glance

Most of the trades compared have similar content for the in-school portion of the apprenticeship and in the Occupational profiles. Details of the differences for each trade are provided below.

Table 2. Major differences between the Irish and BC apprenticeship programs for 9 trades, by trade.

Trade	Major differences
Carpenter	<ul style="list-style-type: none"> The Irish program includes some components of joinery not covered in BC. The BC program includes some rigging and hoisting, excavation, concrete placement, formwork, aerial lift, and site work components not listed in Irish program or Occupational Profile. The BC program has 4 levels of in-school training; the Irish has 3.
Electrician	<ul style="list-style-type: none"> The BC program includes components on alternative power systems, nurse call systems, sound systems, entertainment systems, cable TV and HVAC systems not covered in the Irish program or Occupational Profile. The BC program has 4 levels of in-school training; the Irish has 3.
Insulator	<ul style="list-style-type: none"> The BC program includes components for marine applications, insulation of heat-traced systems and lead and asbestos abatement not listed in the Irish in-school program or the Occupational Profile. The BC program has 4 levels of training; the Irish has 2
Painter	<ul style="list-style-type: none"> The Irish program includes a large sign painting component not covered in BC. The decorative aspects of painting are more emphasized in the Irish program than in the BC program. The BC program includes industrial surface preparation methods, coatings and spray methods not covered in the Irish program or Occupational Profile. Both the BC program and Irish programs have 3 levels of in-school training.

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Trade	Major differences
Plumbing	<ul style="list-style-type: none">• The Irish program includes a large component for the installation and commissioning of oil fired heating systems that is not covered in the BC program.• The Irish program includes a large component of various welding methods not contained in the BC program.• The BC program includes a sprinkler component not listed in the Irish in-school program or the Occupational Profile.• The BC program has 4 levels of in-school training; the Irish has 3.
Refrigeration & Air Conditioning	<ul style="list-style-type: none">• The BC and Irish programs have similar Occupational Profiles and in-school training.• The BC program has 4 levels of in-school training; the Irish has 3.
Security Alarm	<ul style="list-style-type: none">• The Irish program includes a vehicle access control component not covered in BC.• The BC program has no in-school training for apprentices; the Irish has 3.
Sheet Metal Worker	<ul style="list-style-type: none">• The Irish program includes a component of precision sheet metalwork related to aircraft not included in the BC program or Occupational Profile.• The BC program has 4 levels of in-school training; the Irish has 3.
Tilesetter	<ul style="list-style-type: none">• The BC and Irish programs have similar Occupational Profiles and in-school training.• The BC program has 3 levels of in-school training; the Irish program has 2.

Carpenter (details)

Table 3. Carpenter and Carpenter/Joiner duration and prerequisites

British Columbia - Carpenter	Éire – Carpentry and Joinery
Level 1 In-school training: 210 hours	Phases 2 in-school training: 630 hours
Level 2 In-school training: 210 hours	Phases 4 in-school training: 330 hours
Level 3 In-school training: 210 hours	Phases 6 in-school training: 300 hours
Level 4 In-school training: 210 hours	
Total in-school: 840 hours	Total in-school: 1260 hours
Total work based: 6480 accumulated work based hours	Total work base: Minimum 2880 hours (72 weeks in 4 phases)
Recommended entry: Grade 10 English, Math, and Science	The minimum educational requirements are: Grade D in five subjects in the Department of Education & Skills Junior Certificate Examination or an approved equivalent.

Key to color code:

Similar Content in Ireland Content in BC Program, Not in Irish Content in Irish Program, Not in BC



Table 4. Content comparison BC Carpenter - Irish Carpenter/Joiner

Carpenter Program Outline Levels 1 - 4		Carpenter/Joiner Off-the-job Phases 2, 4 and 6
Safety		
WorkSafeBC Regulations/Shop and Site Safety		
Personal Safety Practices		
Personal Protective Equipment		
Fall Protection		
Workplace Hazardous Materials Information System		
Fire safety Procedures		
Safety Committees		
Excavation Shoring and Building Demolition		
<ul style="list-style-type: none"> Blasting signals Safety regulations Sloped trenches Construction of trench shoring 		
Documentation and Organization Skills		
Construction drawings and Specifications		
Views and types of drawings		
Lines, symbols and abbreviations		
Scales in drawings		
Parts of drawings		
Creating architectural drawings: isometric/orthographic views		
Architectural and structural drawings		
Form work details		
Coordinating with other trades		
Temporary supports required during renovations		
Drawings, schedules		
Shop drawings		
Reflected ceiling plans		

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Carpenter Program Outline Levels 1 - 4		Carpenter/Joiner Off-the-job Phases 2, 4 and 6
Elevations and section drawings		
Building Codes and Bylaws		
National, Provincial, Local and Fire Codes		
Types of work requiring inspections		
Manufacturer and Supplier Documentation		
Engineered floor systems		
Truss drawings		
Specifications for suspended slab forming systems		
Organize Work		
Communication skills		
Scheduling work sequence		
Tools and Equipment		
Hand Tools		
Portable Power Tools		
Shop Equipment		
Survey Instruments		
Levelling Instruments		
<ul style="list-style-type: none"> • Optical • Rods and measuring chains and tapes • Recording elevations • Electronic and laser levels 		
Transits and Theodolites		
Electronic Instruments		
Rigging and Hoisting		
Temporary ramps, walkways and stairs		
Ladders		
Scaffolds		
<ul style="list-style-type: none"> • Ground based types • Components • Erection procedures for steel and wooden 		
Suspended platforms		
Aerial work platforms		
Fibre Ropes		
<ul style="list-style-type: none"> • Types • Working load limits • Care and maintenance • Knots, bends and hitches 		
Hoisting equipment		
<ul style="list-style-type: none"> • Lifting with cranes and hoists • Rigging hardware • Hoisting equipment: winches, come-alongs, rollers • Storage and maintenance • Signals 		
Site Layout		
Site Layout Residential		
<ul style="list-style-type: none"> • Survey or plot plans • Survey markers • Excavation and grading procedures 		

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Carpenter Program Outline Levels 1 - 4		Carpenter/Joiner Off-the-job Phases 2, 4 and 6
<ul style="list-style-type: none"> • Installation of batter boards • Squaring corners 		
Site Layout Commercial <ul style="list-style-type: none"> • Survey markers • Batter boards 		
Site Evaluations <ul style="list-style-type: none"> • Hoardings • Soil bearing capacities • Bulk excavations and shoring • Preparing for footings and slabs • Drainage systems • Back filling 		
Concrete Formwork		
Residential Concrete Formwork <ul style="list-style-type: none"> • Footing and wall forms • Anchor bolts and reinforcing steel • Wall forms • Concrete details 		
Commercial Concrete Formwork <ul style="list-style-type: none"> • Footing and wall forms • Gang forms • Manufactured wall form panels • Insulated concrete forms • Column forms • Pre-stressing • Concrete joints: i.e. contraction, control, isolation, cold 		
Suspended slab forms and slab-on-grade forms		
Installation of anchor bolts and metals in concrete		
Build concrete stair forms		
Place, finish and cure concrete		
Pile foundations		
Specialized formwork, pre-cast and pre-stressed		
Frame Residential Housing		
Wood Framing Systems and Materials <ul style="list-style-type: none"> • Roof styles • Framing members • Platform framing • Characteristics of wood for framing • Fasteners and hardware 		
Floors and Support Systems		
<ul style="list-style-type: none"> • Sill plates • Column beams and pony walls • Floor joists • Bridging • Sheathing 		
Walls and Partitions		
<ul style="list-style-type: none"> • Interior and exterior walls 		
Gable roofs with ceiling joists		

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Carpenter Program Outline Levels 1 - 4		Carpenter/Joiner Off-the-job Phases 2, 4 and 6
<ul style="list-style-type: none"> • Components • Layout of roof members • Sheathing requirements • Roof trusses 		
Hip Roofs		
<ul style="list-style-type: none"> • Construction methods • Layout of hip rafters and jack rafters 		
Straight Stairs and Balustrades		
<ul style="list-style-type: none"> • Codes • Calculating stair dimensions 		
Building Finished Staircases		
<ul style="list-style-type: none"> • Winder • Circular • 1/4 turn 		
Intersecting Roofs		
Finished Staircases		
Construct or Alter Building Components		
Unequal Slope Intersecting Roofs		
Architectural Roof Features		
Heavy Timber Construction		
Finishing Materials		
Roof Materials		
Doors and Hardware		
Windows and Hardware		
Exterior Finishes		
Cabinets		
Floor Coverings		
Interior Finishes		
Gypsum Wallboard		
Steel Studs and Moveable Partitions		
Finished Ceiling		
Building Science		
Forces on a Building		
Building structure Building envelope Wood frame seismic applications Seismic hardware		
Control of heat and sound transmission		
Control of Air and moisture movement in buildings		
Math Skills		
Geometry		
Trigonometry		
Area and Perimeter		
Volume		
		Computer Aided Drawing
		CAD
		Kitchen Cabinets
		Surface Planing
		Thickening

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Carpenter Program Outline Levels 1 - 4		Carpenter/Joiner Off-the-job Phases 2, 4 and 6
		Spindle Moulding
		Panel Sawing
		Band resawing
		Narrow band sawing
		Single end tenoning
		Doors
		Windows
		Drawing joinery components
		Doors and screens
		Fire doors
		Ratio and proportioning
		Semi-circular work
		Ramps, knees and easings
		Louvre geometry
		Louvre frames
		Wreathed stair string
		Handrail geometry
		Construction of handrail wreath
		Louvres in Curved Frames

Construction Electrician (details)

Table 5. Construction electrician and Electrical duration and prerequisites

British Columbia – Construction Electrician	Éire – Electrical
Level 1 In-school training: 300 hours	Phases 2 in-school training: 660 hours
Level 2 In-school training: 300 hours	Phases 4 in-school training: 330 hours
Level 3 In-school training: 300 hours	Phases 6 in-school training: 330 hours
Level 4 In-school training: 300 hours	
Approximate in-school: 1200 hours	Total in-school: 1320 hours
Total work based: 6000 accumulated work based hours	Total work base: Minimum 2880 hours (72 weeks in 4 phases)
Recommended but not required: recent Grade 12 graduation (within 5 yrs) with demonstrated mechanical aptitude; Math and Physics 11; English or Communications 12; or successful completion of an electrical industry assessment exam; or recent (with 5 yrs) Electrical Foundation Program graduate.	The minimum educational requirements are: Grade D in five subjects in the Department of Education & Skills Junior Certificate Examination or an approved equivalent. Must pass a colour – vision test approved by SOLAS.

Key to color code:

Similar Content in Ireland Content in BC Program, Not in Irish Content in Irish Program, Not in BC



Table 6. Content comparison BC Construction electrician - Irish Electrical

Construction Electrician Program Outline Levels 1 - 4		Electrical Off-the-job Phases 2, 4 and 6
Essential Skills		
<ul style="list-style-type: none"> • Applied Mathematics <ul style="list-style-type: none"> ○ Geometry ○ Trigonometry ○ Problems involving vectors • Computer Use 		
Safety		
Lockout Procedures		
<ul style="list-style-type: none"> • Sources of energy • Plant requirements • Documentation • Standby worker 		
WorkSafeBC Regulations/Shop and Site Safety		
Personal Safety Practices		
Personal Protective Equipment		
Fall Protection		
Workplace Hazardous Materials Information System		
Fire safety Procedures		
Circuit Concepts		
Electrical Circuit Concepts		
<ul style="list-style-type: none"> • Structure of matter • Electric charge and current flow • Production of electricity • Electrical quantities, units and symbols, 		

Construction Electrician Program Outline Levels 1 - 4		Electrical Off-the-job Phases 2, 4 and 6
drawings <ul style="list-style-type: none"> • Ohm’s and Watt’s Law s • Electrical terms • Conducting and insulating materials • Circuit drawings • Voltage, current, resistance and power in electric circuits 		
DC Circuits <ul style="list-style-type: none"> • Series circuits • Parallel circuits • Bridge circuits 		
Electromagnetism <ul style="list-style-type: none"> • Characteristics • Effects of current carrying conductors and coils • Terminology and units of measure • Applications of magnetic devices • Problem solving 		
Single –phase AC Circuits <ul style="list-style-type: none"> • AC waveforms • Problem solving 		
Three-phase Circuits <ul style="list-style-type: none"> • Characteristics of 3 phase AC • Characteristics of the wye connection • Characteristics of the delta connection • Calculating voltage, current and power • Testing • Connection of capacitors • Calculating ratings of capacitors • Problem solving 		
Electronic Circuits <ul style="list-style-type: none"> • Semiconductor materials • PN junction diode • Zener diode • Light-emitting diodes • Bipolar-junction transistor • Rectifier circuits • Field effect transistors • Junction transistor • Specialty transistors • Filters for circuits • Silicon controlled rectifier (SCR) • Triggering circuits for AC phase control • Features of the triac • Features and application of specialty thyrisotrs • Circuit testing • Rectifier circuits • Number systems in digital electronics • Logic gates 		

Construction Electrician Program Outline Levels 1 - 4		Electrical Off-the-job Phases 2, 4 and 6
<ul style="list-style-type: none"> • Operational amplifiers • Special combination logic circuits • Integrated circuits (IC) • Connecting and testing digital logic circuits 		
Testing Equipment		
Analog Meters <ul style="list-style-type: none"> • Types • Functions • Use and maintenance 		
Digital Meters <ul style="list-style-type: none"> • Functions • Power measurement • Insulation resistance • Use and maintenance • Meter readings 		
Scopes <ul style="list-style-type: none"> • Features of the oscilloscope • Basic controls on a dual-trace oscilloscope • Calibration and safe use 		
Power quality analyzers <ul style="list-style-type: none"> • Power quality problems and causes • Power quality analyzers 		
Structured Cable Testing and Reporting <ul style="list-style-type: none"> • Tests conducted on twisted pair cable • Performing test • Creating and saving test reports • Fibre optic tests • Coaxial cable tests 		
Drawings and Manuals		
Circuit Drawings <ul style="list-style-type: none"> • Symbols • Conventions • Converting between schematic and wiring diagrams 		
Construction drawings <ul style="list-style-type: none"> • Types of drawings • Divisions • Dimensioning • Conventions • Specifications 		
Manuals and Instructions		
Job Planning <ul style="list-style-type: none"> • Materials • Tools and equipment • Labour requirements 		
Electrical Codes and Standards		
<ul style="list-style-type: none"> • National, Provincial and local standards • Permits and inspection 		

Construction Electrician Program Outline Levels 1 - 4		Electrical Off-the-job Phases 2, 4 and 6
<ul style="list-style-type: none"> • Fire codes 		
<p>Low Voltage Distribution Systems Installation</p>		
<p>Service equipment installation</p> <ul style="list-style-type: none"> • Single-phase, three-wire system • Service entrance equipment • Permanent and temporary residential service 		
<p>Grounding and Bonding</p> <ul style="list-style-type: none"> • Objectives • Materials • Grounding and bonding requirements 		
<p>Distribution Centres Installation</p> <ul style="list-style-type: none"> • Single-phase distribution centres • Three-phase, low voltage distribution centres • Components • Distribution requirements 		
<p>Raceway, Box and Fittings Installation</p> <ul style="list-style-type: none"> • Residential and commercial • Cable types • Materials • Raceway requirements • Box and fitting requirements • Creating and sealing openings 		
<p>Conductor and Cable Installation</p> <ul style="list-style-type: none"> • Residential and commercial and industrial circuits • Types • Materials • Requirements 		
<p>Device Installation</p> <ul style="list-style-type: none"> • Residential and commercial and industrial circuits • Switches • Receptacles • Equipment • Installation requirements • Device testing requirements 		
<p>Electrical Equipment Installation</p>		
<p>Lighting and lighting controls</p> <ul style="list-style-type: none"> • Factors affecting vision • Light characteristics and measurements • Lighting design • Construction, features and control of incandescent lamps • Construction, features and control of fluorescent lamps • Construction, features and control of high-intensity discharge lamps • Troubleshooting high-intensity discharge lamps • LED lighting 		

Construction Electrician Program Outline Levels 1 - 4		Electrical Off-the-job Phases 2, 4 and 6
<ul style="list-style-type: none"> • Induction lighting 		
Transformers <ul style="list-style-type: none"> • Types, features and applications • Operating principles • Calculating transformer values • Transformer types and applications • Connecting and maintaining • Polarity and markings • Calculations 		
Protective devices <ul style="list-style-type: none"> • Types • Device requirements • Testing procedures 		
DC motors and generators <ul style="list-style-type: none"> • Types and features of DC motors • Construction features of DC machines • Operating principles and characteristics of generators • Operating principles and characteristics of DC motors • Alternators • Troubleshooting and maintenance 		
AC motors and generators <ul style="list-style-type: none"> • Types and features of AC motors • Construction features • Operating principles • Connections 		
HVAC <ul style="list-style-type: none"> • Types of residential heating and cooling systems • Components of a commercial HVAC system • Connecting and maintaining controls 		
Emergency power systems <ul style="list-style-type: none"> • Types of emergency power systems • Emergency lighting equipment • Standby generators • Uninterruptible power supplies • Power system requirements • Testing 		
Alternative power systems <ul style="list-style-type: none"> • Wind-generated, thermal, solar, and tidal • Advantages and disadvantages • Installation and testing • Testing and commissioning 		
Control Circuit Installation		
Manual Motor Controls <ul style="list-style-type: none"> • Features of manual motor starters • Safe procedures for working around motors and controls 		

Construction Electrician Program Outline Levels 1 - 4		Electrical Off-the-job Phases 2, 4 and 6
<ul style="list-style-type: none"> Connecting and maintaining 		
Magnetic Motor Controls <ul style="list-style-type: none"> Operating principles Types and features Connecting, testing and maintaining Lockout procedures Troubleshooting 		
Electronic Motor Controls <ul style="list-style-type: none"> Types and features Operation of power converters Connecting Soft start controllers 		
Programmable logic controllers (PLCs) <ul style="list-style-type: none"> Features Memory system Input and output types Installation procedures Operating cycle of processor Programming instructions Interaction of hardware and software Connecting and maintaining systems 		
Process Controls <ul style="list-style-type: none"> Operating principles Components Types of sensors and transducers Action of the controller in automatic control systems Connecting and maintaining 		
Signal and Communication Systems		
Fire alarms and suppression systems <ul style="list-style-type: none"> Types and features Installation and testing 		
Structured cabling systems <ul style="list-style-type: none"> Types and features Installation and testing 		
Nurse call systems <ul style="list-style-type: none"> Types and operating principles Installation and testing 		
Installation of Building Automation Systems <ul style="list-style-type: none"> Lighting Fire systems Security systems HVAC Irrigation Sound Load shedding Window coverings Computer interface 		

Construction Electrician Program Outline Levels 1 - 4		Electrical Off-the-job Phases 2, 4 and 6
<ul style="list-style-type: none"> • Communication protocols lighting • Installation, testing and maintenance 		
Sound Systems <ul style="list-style-type: none"> • Operating principles • Installation and testing systems 		
Entertainment Systems <ul style="list-style-type: none"> • Operating principles • Installation and testing systems 		
Cable TV (CATV) systems <ul style="list-style-type: none"> • Operating principles • Components • Installation and testing systems 		
Security Alarm Systems <ul style="list-style-type: none"> • Operating principles • Components • Installation and testing systems 		
HIGH VOLTAGE SYSTEMS		
High Voltage Safety Procedures <ul style="list-style-type: none"> • Terms and concepts • Features of distribution systems and substation equipment • Hazards and safety precautions for high voltage installations 		
High Voltage Cable <ul style="list-style-type: none"> • Features of high voltage cables • Construction of common medium-voltage cables • Practical considerations for high voltage cable installations • Procedures to install a high voltage, single conductor, solid-dielectric cable 		
High Voltage Switch Gear <ul style="list-style-type: none"> • Features of high voltage switch gear features of high voltage fuses • High voltage AC circuit breakers • Types of protective relays used in high voltage systems • Safety precautions when working with protective relay circuits • Procedures to install high voltage switch gear and protective devices 		
High Voltage Test Equipment <ul style="list-style-type: none"> • Characteristics of cable insulation • Use of a megger for insulation testing of high voltage circuits • Use and care of high voltage test equipment 		

Insulator (Heat & Frost) - (details)

Table 7. Insulator (Heat & Frost) and Industrial Insulation duration and prerequisites

British Columbia – Insulator (Heat & Frost)	Éire – Industrial Insulation
Level 1 In-school training: 120 hours	Phases 2 in-school training: 600 hours
Level 2 In-school training: 120 hours	Phases 4 in-school training: 330 hours
Level 3 In-school training: 120 hours	
Level 4 In-school training: 120 hours	
Total in-school: 480 hours	Total in-school: 930 hours
Total work based: 5920 accumulated work based hours	Total work base: Minimum 2880 hours (72 weeks in 4 phases)
Recommended but not required: Grade 10 English, Math and Science (Grade 12 preferred)	The minimum educational requirements are: Grade D in 5 subjects in the Department of Education & Skills Junior Certificate Examination or an approved equivalent. Must pass a colour – vision test approved by SOLAS.

Key to color code:

Similar Content in Ireland Content in BC Program, Not in Irish Content in Irish Program, Not in BC



Table 8. Content comparison BC Insulator (Heat & Frost) - Irish Industrial Insulation

Insulator (Heat & Frost) Program Outline Levels 1 - 4		Industrial Insulation Off-the-job Phases 2 and 4
Tools and Equipment		
Measuring tools		
Cutting tools		
Fastening tools		
Trowels and slicks		
Brushes and rollers		
Portable pin welding machines		
Access and rigging equipment		
Sheet metal tools and equipment		
Layout tools		
Safety		
WorkSafeBC Regulations/Shop and Site Safety		
Causes of accidents		
Power tool safety		
Lockout/tagout		
Personal protective equipment		
Adhesive and solvent hazards		
Insulation Materials		
Installation of Insulation materials		
<ul style="list-style-type: none"> • Forms of flexible and rigid material • Material types and properties • Loose fill materials • Sprayed insulation • Poured insulation 		
Fasteners and reinforcing materials		

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Insulator (Heat & Frost) Program Outline Levels 1 - 4		Industrial Insulation Off-the-job Phases 2 and 4
<ul style="list-style-type: none"> Types of fasteners and purposes Reinforcement materials types and purposes 		
Adhesives, solvents and thinners <ul style="list-style-type: none"> Types, properties and application methods Safety precautions Compatibility between material and adhesives Types of solvent, properties and hazards Preparing surfaces for adhesive application Application of adhesives Manufacturer's recommendations 		
Cements <ul style="list-style-type: none"> Types of cements: finishing, insulating, hydraulic setting, heat transfer, refractory and aggregate Specific job requirements Manufacturer's recommendations 		
Tapes, Vapour Barriers and weather proofing <ul style="list-style-type: none"> Types and purposes of vapour barriers: mastic, roofing felt, plastic and metals Methods of creating vapour barriers Metal jacketing/cladding materials Insulation protectors Manufacturer's recommendations Specific job requirements 		
Application of Insulations		
Insulation to pipes, fittings and valves <ul style="list-style-type: none"> Drawings and specifications Physical properties of insulation material Application to pipes, fittings and valves 		
Insulation to duct work and equipment <ul style="list-style-type: none"> Application of insulation to duct work and auxiliary equipment <ul style="list-style-type: none"> Mechanical equipment Mechanical ducting systems Insulation materials types and physical properties Drawings and specifications Hazards and precautions Application techniques Application of lead impregnated jacketing 		
Interpret drawings <ul style="list-style-type: none"> Location of parts to be insulated Types, size and quantity of material Finish requirements Application procedures 		
Fabricate materials <ul style="list-style-type: none"> Fabricating techniques Application techniques 		
Allowances for expansion or contraction		

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Insulator (Heat & Frost) Program Outline Levels 1 - 4		Industrial Insulation Off-the-job Phases 2 and 4
<ul style="list-style-type: none"> • Drawings and specifications • Material selection • Location of the contraction joint • determining high temperature expansion and contraction joints on pipes and equipment, boilers and breechings • Types and considerations in installing stainless steel expansion joints on piping installation of flange cover expansion joints 		
<p>Low temperature insulation systems</p> <ul style="list-style-type: none"> • Low temperature single layer and multi-layer insulation • Elimination of thermal bridging • Application procedures 		
<p>High temperature insulation systems</p> <ul style="list-style-type: none"> • High temperature single layer and multi-layer insulation • Elimination of thermal bridging 		
<p>Finishing techniques</p> <ul style="list-style-type: none"> • Finishing techniques for fabrics • Specifications for application of mastic finishes • Work environment requirements • Types and functions of membranes and reinforcements with mastic finishes • Tools and application techniques • Application of metal and plastic finishes • Types, purposes and characteristics of finishes 		
<p>Metal and plastic jacketing</p> <ul style="list-style-type: none"> • Selection and application of finishes • Attachment methods • Specifications • Physical hazards 		
<p>Caulking applications</p> <ul style="list-style-type: none"> • Caulking guns • Nozzle selection • Types of seals • Application procedures 		
<p>Underground installation of insulation</p> <ul style="list-style-type: none"> • Site inspection before installation • Specifications • Application procedures • Hazards and precautions 		
<p>Application to heat traced systems</p> <ul style="list-style-type: none"> • Types of heat traced systems • Application methods • Bridging over bolts at joints of insulation • Heat transfer cement • Safety precautions 		
<p>Insulation spray methods</p>		

Insulator (Heat & Frost) Program Outline Levels 1 - 4		Industrial Insulation Off-the-job Phases 2 and 4
<ul style="list-style-type: none"> • Spray equipment • Reinforcing material for spraying • Safety • Characteristics of spray materials • Drawings and specifications • Preparation of surfaces to be sprayed and adjacent areas • Application methods for various materials • Material properties • Set-up, shut down procedures and troubleshooting spray equipment 		
<p>Making insulation pads</p> <ul style="list-style-type: none"> • Material selection • Fabrication methods • Types, purposes and uses of needles • Types, features and characteristics of fabrics and thread • Safety considerations 		
<p>Soundproofing insulation for commercial and industrial applications</p> <ul style="list-style-type: none"> • Basics of sound transmission • Commercial applications: recording studios, theatres, hotels, mechanical rooms • Industrial piping applications: Natural gas, high pressure, process piping • Soundproofing insulation materials • Soundproofing for turbines and equipment 		
<p>Insulation for marine applications</p> <ul style="list-style-type: none"> • Areas requiring insulation • Purposes: fire prevention and thermal and noise suppression • Insulation materials • Application sequence • Pin and clip fastening • Finish materials 		
Fire Stopping and Smoke Sealing Techniques		
<p>Fire Stopping And Smoke Sealing Techniques</p> <ul style="list-style-type: none"> • Materials types and properties • Location and types of penetrations • Safety precautions • Methods for damming installations • Fireproofing structural components • Fireproofing electrical components • Application methods 		
Mathematics and Science		
Math		
Geometry		
Trigonometry		
International system of units (SI units)		

Insulator (Heat & Frost) Program Outline Levels 1 - 4		Industrial Insulation Off-the-job Phases 2 and 4
Fundamentals of Ohm's law		
Heating and cooling of metals		
Trade related heat calculations		
Types of corrosion		
Science Related to Choice Of Insulation Materials <ul style="list-style-type: none"> • Matter and molecules • Internal energy • Effect of heat and cold on matter • Total heat • Expansion and contraction • K-factor • Density 		
Drafting and Layout Techniques		
<ul style="list-style-type: none"> • Layout tools • Lay out of geometric shapes • Line development and symbols • Development of drawings and patterns • Development of patterns for elbows • Pattern lay out of tees and equipment • Patterns layout for seams on metal covers • Pattern layout for seams on metal covers 		
Blueprints and Specifications		
Blueprint lines, abbreviations and symbols		
Sectional and projection views		
Sketch pictorial drawings		
Specifications and blueprints for industrial projects		
Details and addenda		
Asbestos Abatement		
<ul style="list-style-type: none"> • Asbestos products • Control options, advantages and disadvantages <ul style="list-style-type: none"> ○ Removal ○ Encapsulation ○ Enclosure • Regulations and standards • PPE • Removal procedures • Cleanup and inspection 		
Lead Abatement		
<ul style="list-style-type: none"> • Health effects of lead • PPE • Safe work practices • Cleanup and disposal procedures 		

Painter and Decorator (details)

Table 9. Painter and Decorator and Painting and Decorating duration and prerequisites

British Columbia – Painter and Decorator	Éire – Painting and Decorating
Level 1 in-school training: 150 hours	Phases 2 in-school training: 600 hours
Level 2 in-school training: 150 hours	Phases 4 in-school training: 300 hours
Level 3 in-school training: 150 hours	Phases 6 in-school training: 300 hours
Total in-school: 450 hours	Total in-school: 1200 hours
Total work based: 5400 hours	Total work base: Minimum 2880 hours (72 weeks in 4 phases)
Recommended but not required: Grade 10 English, Math and Science (Grade 12 preferred);	The minimum educational requirements are: Grade D in 5 subjects in the Department of Education & Skills Junior Certificate Examination or an approved equivalent. Must pass a colour – vision test approved by SOLAS.

Key to color code:

Similar Content in Ireland Content in BC Program, Not in Irish Content in Irish Program, Not in BC



Table 10. Content comparison BC Painter and Decorator - Irish Painting and Decorating

Painter and Decorator Program Outline Levels 1 - 3	Painting and Decorating Off-the-job Phases 2, 4, and 6
	Sign work
	Art and sign work using new technology and silk screening
	Computer aided design
	Enlarging artwork
	Filling in and shading, Gilding
	Information technology
Safety	
Workplace Hazards	
<ul style="list-style-type: none"> Workplace assessment Worksite safety policies 	
WorkSafeBC Regulations	
Confined Space Awareness	
Fall Protection Systems and Equipment	
Personal Protective Equipment	
Fire Safety Procedures	
First Aid Certification	
Workplace Hazardous Materials Information System	
Tools and Equipment	
Hand Tools	
Abrasive Media	
Power Tools	
Access Equipment	
Hoisting and Lifting Equipment	
Organize Work	
Mathematics	

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Painter and Decorator Program Outline Levels 1 - 3		Painting and Decorating Off-the-job Phases 2, 4, and 6
Drawings and Specifications		
Communication		
Material Handling		
Project Planning		
Surface Preparation		
Drywall and Plaster		
Wood Surfaces		
Concrete and Masonry		
Metal Surfaces		
Hydro Cleaning <ul style="list-style-type: none"> Standards High pressure, ultra high pressure and water-jetting 		
Abrasive Blast <ul style="list-style-type: none"> Corrosion Standards Substrate condition Blasting equipment types, setup and maintenance Air compressors Blasting techniques 		
Wallcovering Application		
Wallcovering Installation <ul style="list-style-type: none"> Wallcovering materials Installation methods Adhesives 		
Paint and Coating Application		
Paint Application		
Industrial Coatings		
Coating Failures		
Air Spray		
Airless Spray		
Thermal Spray <ul style="list-style-type: none"> Gas flame Powder thermal Electric arc Thermoplastic 		
Fibre-reinforced Plastic		
Caulking		
Finish Application		
Wood Finishes		
Decorative Finishes <ul style="list-style-type: none"> Graining and marbling Multi-spec Glazes Stencils Colour theory Graphics 		
Colour Theory		

A Comparison of Select British Columbia and Irish Apprenticeships

Painter and Decorator Program Outline Levels 1 - 3		Painting and Decorating Off-the-job Phases 2, 4, and 6
Colour Theory		
Colour Mixing and Matching		

Plumber (details)

Table 11. Plumber and Plumber duration and prerequisites

British Columbia – Plumber	Éire – Plumber
Level 1 In-school training: 180 hours	Phases 2 in-school training: 630 hours
Level 2 In-school training: 180 hours	Phases 4 in-school training: 330 hours
Level 3 In-school training: 180 hours	Phases 6 in-school training: 330 hours
Level 4 In-school training: 240 hours	
Total in-school: 780 hours	Total in-school: 1290 hours
Total work based: 6420 accumulated work based hours	Total work base: Minimum 2880 hours (72 weeks in 4 phases)
Recommended but not required: Grade 12 English, Grade 11 Algebra or Trade Math 11, Grade 11 Physics or Science and Technology 11	The minimum educational requirements are: Grade D in five subjects in the Department of Education & Skills Junior Certificate Examination or an approved equivalent. Must pass a colour – vision test approved by SOLAS.

Key to color code:

Similar Content in Ireland Content in BC Program, Not in Irish Content in Irish Program, Not in BC



Table 12. Content comparison BC Plumber - Irish Plumber

Plumber Program Outline Levels 1 - 4		Plumber Off-the-job Phases 2, 4, and 6
Safety		
WorkSafeBC Regulations/Shop and Site Safety		
Personal Safety Practices		
Personal Protective Equipment		
Workplace Hazardous Materials Information System		
Fire safety Procedures		
Safety Committees		
Tools and Equipment		
Hand tools		
Portable power tools		
Stationary power tools		
Measuring and levelling tools		
Cutting, brazing and soldering equipment		
<ul style="list-style-type: none"> Oxy-acetylene Brazing and soldering techniques 		
		Thermal Processes
		Oxy-acetylene, Arc, TIG welding
		Heat bending mild steel
		Fabricating mild steel pipes
		Computer aided design
Use ladders and platforms		
Rigging and hoisting equipment		
Organize Work		
Math		
Science		
<ul style="list-style-type: none"> Properties of matter 		

Plumber Program Outline Levels 1 - 4		Plumber Off-the-job Phases 2, 4, and 6
<ul style="list-style-type: none"> • Pascal’s theories • Archimedes principals • Mechanical advantage • Factors affecting fluid flow • Factors affecting gas volumes • Characteristics of hydrocarbon gases 		
Drawings and specifications <ul style="list-style-type: none"> • Drafting tools and materials • Piping and fixture symbols • Drawing projections • Contract documents • Material take-offs • Electrical drawings 		
Codes, regulations and standards		
Manufacturer and supplier documentation		
Preparing & Assembling Plumbing Components		
Pipe installation <ul style="list-style-type: none"> • Pipe and tubing materials • Pipe support • Protection of pipe 		
Valve installation <ul style="list-style-type: none"> • Types • Purposes 		
Fittings installation <ul style="list-style-type: none"> • Types of fittings • Connections 		
Penetrating structures <ul style="list-style-type: none"> • Considerations • Acceptable methods • Codes and specifications • Fire stopping • Sealants 		
Sanitary and Storm Drainage Systems		
Sanitary Drain, Waste and Vent System Installations <ul style="list-style-type: none"> • Terminology • Functions of pipes in an interior drain-waste-vent system • Code requirements • Requirements of a trade-waste system • Placement of interceptors • Testing requirements and methods 		
Storm Drainage Systems <ul style="list-style-type: none"> • Terminology • Functions of pipes in storm drainage system • Code requirements • Placement of sumps and catch basins • Sub-soil drainage systems • Site retention systems • Testing requirements and methods 		

Plumber Program Outline Levels 1 - 4		Plumber Off-the-job Phases 2, 4, and 6
Sanitary Sewer Systems <ul style="list-style-type: none"> • Installation of underground site services for drainage • Code requirements • Testing • Connecting to public system • Protection of pipe • Manholes and catch basin planning and installation • Routine maintenance 		
Private Sewage Systems		
Maintaining and Repairing Sewage Disposal Systems <ul style="list-style-type: none"> • Septic tank processes • Disposal field processes • System components • Codes and regulations • Sewage treatment plants 		
Water Service and Distribution		
Water Services <ul style="list-style-type: none"> • Terminology • System components • Planning and installation 		
Potable Water Distribution Systems <ul style="list-style-type: none"> • Terminology • System components • Testing of cross-connection control assemblies and devices • Planning and layout of systems • Water testing procedures • Code requirements • Maintenance and repair of potable water systems 		
Private Potable Water Supply Systems (Pressure system) <ul style="list-style-type: none"> • Terminology • Purpose • Requirements • Components and accessories • Connections • Heat tracing • Health Act requirements • Planning and laying out systems 		
Water Treatment Systems <ul style="list-style-type: none"> • Softeners, filters, UV sterilizers, de-ionizers, and reverse osmosis • Water compositions • Contaminants • Functions of treatment equipment • Regeneration cycles • Incoming water testing 		

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Plumber Program Outline Levels 1 - 4		Plumber Off-the-job Phases 2, 4, and 6
<ul style="list-style-type: none"> Installation of treatment equipment 		
Fixtures and Appliances		
Fixtures and Trim Installation <ul style="list-style-type: none"> Residential, commercial and institutional Purposes Supports and fastening Manufacturer’s documentation Connections to water distribution systems Connections to power supply Adjustment of settings Coordination of connection of power Testing and commissioning Maintenance and repair 		
Appliances installation <ul style="list-style-type: none"> Residential, commercial and institutional Manufacturers documentation Layout Sealants Connection to water distribution systems and drainage Coordination of connection of power Testing and commissioning Maintenance and repair 		
Oil-fired heating Systems		
		<ul style="list-style-type: none"> Oil tanks storage Oil boilers and burners Pipes and chimneys Commissioning and services
Hydronic Heating and Cooling Systems		
Operation of Hydronic heating and cooling systems <ul style="list-style-type: none"> Principles of electrical controls Purpose and operation of systems Components of systems Heating and cooling generating equipment Controls Transfer units Perimeter radiation 		
<ul style="list-style-type: none"> Installation of Hydronic heating and cooling generating equipment Testing procedures Start-up procedures Water treatment Maintenance and Repair 		
Specialized Systems		
Medical Gas Systems <ul style="list-style-type: none"> Gas types Sources of medical gas Layout requirements Pipe installation 		

A Comparison of Select British Columbia and Irish Apprenticeships

Plumber Program Outline Levels 1 - 4		Plumber Off-the-job Phases 2, 4, and 6
<ul style="list-style-type: none"> • Medical gas equipment • Accessories 		
Irrigation Systems <ul style="list-style-type: none"> • Residential, commercial and agricultural • Equipment types and components • Testing and commissioning systems • Zone sequencing and coverage • Maintenance and repair 		
Compressed Air Systems <ul style="list-style-type: none"> • Codes and regulations • Installation • Piping arrangement • Draining of moisture • System components • Compressors • Testing and commissioning system • Maintenance and repair 		
Fire Protection Systems <ul style="list-style-type: none"> • Types and purposes • Limitation of materials • Pump requirements • Installation, maintenance and repair 		
Natural Gas and Propane Systems		
Installation and servicing of Fuel System <ul style="list-style-type: none"> • Types and characteristics of gases • Fuel delivery system • Parts of a propane system • Residential and commercial installation • Piping, tubing and hoses • Gas meters • Determining input • Installation of propane cylinder systems • Purpose and operation of gas pressure regulators • Installation of pressure regulators • Servicing pressure regulators 		
Installation and servicing of Gas Equipment <ul style="list-style-type: none"> • Gas fire appliance types and characteristics • Installation requirements • Commissioning appliances • Code requirements 		
Installation and servicing of Venting and Air Supply <ul style="list-style-type: none"> • Natural and mechanical draft • Direct venting • Appliance categories • Materials • Draft control devices • Thermally and electrically operated flue dampers 		

A Comparison of Select British Columbia and Irish Apprenticeships

Plumber Program Outline Levels 1 - 4		Plumber Off-the-job Phases 2, 4, and 6
<ul style="list-style-type: none"> • Appliance air supply requirements 		
Installation and servicing of Controls and Safeguards <ul style="list-style-type: none"> • Principles of electricity • Principles of magnetism and magnetic induction • Nonelectric controls and electric control circuits • Electric control components and modules • Wiring controls • Testing and servicing controls 		
Gas Codes, regulations and standards <ul style="list-style-type: none"> • Gas Codes and Regulations 		

Refrigeration and Air Conditioning Mechanic (details)

Table 13. Refrigeration and Air Conditioning Mechanic and Refrigeration and Air Conditioning duration and prerequisites

British Columbia – Refrigeration and Air Conditioning Mechanic	Éire – Refrigeration and Air Conditioning
Level 1 In-school training: 180 hours	Phases 2 in-school training: 600 hours
Level 2 In-school training: 180 hours	Phases 4 in-school training: 300 hours
Level 3 In-school training: 240 hours	Phases 6 in-school training: 300 hours
Level 4 In-school training: 240 hours	
Total in-school: 840 hours	Total in-school: 1200 hours
Total work based: 7220 accumulated work based hours	Total work base: Minimum 2880 hours (72 weeks in 4 phases)
Recommended but not required: Grade 10 English, Math and Science (Grade 12 preferred)	The minimum educational requirements are: Grade D in 5 subjects in the Department of Education & Skills Junior Certificate Examination or an approved equivalent. Must pass a colour – vision test approved by SOLAS.

Key to color code:

Similar Content in Ireland Content in BC Program, Not in Irish Content in Irish Program, Not in BC



Table 14. Content comparison BC Refrigeration and Air Conditioning Mechanic - Irish Refrigeration and Air Conditioning

Refrigeration and Air Conditioning Mechanic Program Outline Levels 1 - 4	Refrigeration and Air Conditioning Off-the-job Phases 2, 4, and 6
Safety	
WorkSafeBC Regulations/Workplace hazard	
Personal Safety Practices	
Workplace Hazardous Materials Information System	
Personal Protective Equipment	
Fire safety Prevention	
Tools and Equipment	
Hand tools	
Power tools	
Measuring and Levelling Tools	
Cutting, Brazing and Soldering equipment	
Rigging, Hoisting and Lifting Equipment	
Charging, Evacuation and Recovery Tools	
Computers	
Organize Work	
Trade mathematics	
Trade science	
<ul style="list-style-type: none"> • Properties of matter • Properties of heat • Gas laws • Properties of materials • Forms of energy 	
Drawings and Specifications	
Codes, Regulations and Standards	

A Comparison of Select British Columbia and Irish Apprenticeships

Refrigeration and Air Conditioning Mechanic Program Outline Levels 1 - 4		Refrigeration and Air Conditioning Off-the-job Phases 2, 4, and 6
Communication Skills		
Planning a project		
Fundamentals of Refrigeration		
Use of refrigerants <ul style="list-style-type: none"> • Properties at saturation • Pressure enthalpy chart • Refrigerant and metal relationships • Performance of refrigerants • Toxicity • Plotting cycle diagrams 		
Use of lubricants <ul style="list-style-type: none"> • Types of lubrication systems and components. • Refrigeration oils <ul style="list-style-type: none"> ○ Properties of oils ○ Oil and refrigerant mixtures • Sources of contamination • Acid testing 		
Compressors <ul style="list-style-type: none"> • Types of compressors • Types of drives • Applications: residential, commercial and industrial • Performance • Operation • Lubrication • Compressor features 		
Evaporators <ul style="list-style-type: none"> • Types, locations and applications • Defrost requirements 		
Condensers <ul style="list-style-type: none"> • Types, locations and applications • Condensing process • Condensing medium 		
Metering devices <ul style="list-style-type: none"> • Fixed orifice • Capillary tubes • Automatic expansion valve • Thermostatic expansion valve • Electronic expansion valve • Sizing metering devices • Servicing metering devices 		

Refrigeration and Air Conditioning Mechanic Program Outline Levels 1 - 4		Refrigeration and Air Conditioning Off-the-job Phases 2, 4, and 6
Accessories <ul style="list-style-type: none"> • Driers • Sight glass/moisture indicators • Refrigerant distributors • Evaporator pressure regulators • Crankcase pressure regulators • Condensing pressure regulators • Receivers • Accumulators • Methods of capacity control • Types of valves • Types and application of heat exchangers 		
Electrical Concepts		
Basic electrical concepts <ul style="list-style-type: none"> • Fundamentals of electricity • Laws and formulas • Single phase power characteristics • Three phase power characteristics • Transformer theory • Proportional control operation • Modulating motor operations • Electrical Code 		
Electrical wiring schematics <ul style="list-style-type: none"> • Troubleshoot complex circuits • Electrical duct heaters • Condensing units • Indoor fan coil units • Damper motor controls 		
Single phase motor theory <ul style="list-style-type: none"> • Types, characteristics and operation of single phase motors • Motor components • Motor protection • Causes of motor failure • Causes of semi and hermetic compressor motor failure • Checking motor starting and protection devices • Checking motor installation and operation 		
Three phase motor theory <ul style="list-style-type: none"> • Types, characteristics and operation of three phase motors • Causes of motor failure • Checking motor installation and operation • Checking motor protection • Three phase motor starters • Variable frequency drives 		

Refrigeration and Air Conditioning Mechanic Program Outline Levels 1 - 4		Refrigeration and Air Conditioning Off-the-job Phases 2, 4, and 6
Electronic concepts <ul style="list-style-type: none"> • Electronic principles • Electronic devices • Rectifier circuits 		
Control technology <ul style="list-style-type: none"> • Control terminology • Advanced logic controls • Building automation systems • Electronic refrigerant monitoring • Gas detection devices <ul style="list-style-type: none"> ○ Combustible gas detection ○ CO₂ 		
Planning and Installation of Refrigeration and Air Conditioning Systems		
Heat pumps and air conditioning systems <ul style="list-style-type: none"> • Analyzing psychrometric processes • Analyzing fan systems • Air filtration and purifications • Air to heat exchangers • Calculating heat gain and heat loss • Types of heat pumps • System configurations • Variable refrigerant flow systems <ul style="list-style-type: none"> ○ Two pipe system ○ Three pipe system 		
Refrigeration systems <ul style="list-style-type: none"> • Open cycle and closed cycle refrigeration systems • Mechanical refrigeration cycles • Operating controls • Defrost systems • Indirect systems • Cascade systems • Absorption systems • Ammonia systems • CO₂ systems 		
Food storage fundamentals <ul style="list-style-type: none"> • Principles of food preservation • Medium temperature storage • Low temperature storage • Insulation requirements • Calculating cooler loads • Calculating freezer loads 		

Refrigeration and Air Conditioning Mechanic Program Outline Levels 1 - 4		Refrigeration and Air Conditioning Off-the-job Phases 2, 4, and 6
Installation of heat pumps and air conditioning systems and accessories <ul style="list-style-type: none"> • Codes and documentation • Types of air conditioners • Types of heat pumps • Types, characteristics and installation of fans, mechanical drives, air filters and their components • Preparing for system installation • Installation of heat pumps • Installation of packages systems • Installation of split systems • Factors when performing system startup 		
Installation of refrigeration systems and accessories <ul style="list-style-type: none"> • Codes and documentation • Types of refrigeration systems • Procedures used for system installation • Preparing for system installation • Types and characteristics of fans, mechanical drives, air filters and their components • Layout, assembly, positioning and securing of refrigeration components • Factors when performing system startup 		
Installation of piping and tubing <ul style="list-style-type: none"> • Piping materials • Pipe support • Protection of piping • Inspecting of piping before installation • Installation of piping and tubing • Calculation of refrigerant pipe sizes • Calculation of fixture drains • Methods of pressure testing 		
Hydronic systems <ul style="list-style-type: none"> • Hydronic principles and systems • Calculation of pipe sizes • Sizing pumps using pump curve tables 		
Installation of controls <ul style="list-style-type: none"> • Code • Sequence of operation • Purpose • Programming • Manufacturer’s specifications 		
Commissioning Refrigeration and Air Conditioning Systems		
Refrigeration and air conditioning systems <ul style="list-style-type: none"> • Pressure test, evacuate, dehydrate and charge refrigeration and air conditioning systems • Conduct performance testing on the refrigeration and air conditioning installation 		

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Refrigeration and Air Conditioning Mechanic Program Outline Levels 1 - 4		Refrigeration and Air Conditioning Off-the-job Phases 2, 4, and 6
Heat pumps and air conditioning systems <ul style="list-style-type: none"> • Factors to consider when starting up heat pumps and air conditioning systems • Start up heat pumps and air conditioning systems, test operation and make adjustments. 		
Refrigeration systems <ul style="list-style-type: none"> • Factors to consider when starting up refrigeration systems • Start up refrigeration systems, test operation and make adjustments 		
Maintaining and Servicing Refrigeration and Air Conditioning Systems		
HVAC and refrigeration systems <ul style="list-style-type: none"> • Routine maintenance on fans, mechanical drives, air filters and air cleaners, and their components. • Service existing HVAC and refrigeration systems • Troubleshoot basic problems encountered in existing HVAC and refrigeration systems. 		

Security Systems Technician (details)

Table 15. Security Systems Technician and Electronic Security Systems duration and prerequisites

British Columbia – Security Systems Technician	Éire – Electronic Security Systems
Foundation Program 840 hours plus work experience of 900 hours	Phase 2 in-school training: 600 hours
Or 3600 hours as registered apprentice	Phase 4 in-school training: 300 hours
	Phase 6 in-school training: 300 hours
	Total in-school: 1200 hours
	Total work base: Minimum 2880 hours (72 weeks in 4 phases)
Recommended but not required: Grade 10 English, Math and Science (Grade 12 preferred)	The minimum educational requirements are: Grade D in 5 subjects in the Department of Education & Skills Junior Certificate Examination or an approved equivalent. Must pass a colour – vision test approved by SOLAS.

Key to color code:

Similar Content in Ireland Content in Canadian Program, Not in Irish Content in Irish Program, Not in Canadian



Table 16. Content comparison BC Security Systems Technician - Irish Electronic Security Systems

Security Systems Technician Program Outline	Electronic Security Systems Off-the-job Phases 2, 4, and 6
	Vehicle Access Control Systems
Safety	
WorkSafeBC Regulations	
Personal Safety Practices	
Personal Protective Equipment	
Safe Electrical Practices	
Fire Safety Procedures	
Workplace Hazardous Materials Information System	
Standard Practices	
Hand Tools: Use and Maintenance	
Power Tools: Use and Maintenance	
Test Instruments: Use and Maintenance	
<ul style="list-style-type: none"> Performing tests of installations and troubleshooting 	
Fasteners, Sealants and Surface Fillers	
<ul style="list-style-type: none"> Types and uses 	
Blueprints, Specifications and Vendor Manuals	
<ul style="list-style-type: none"> Drawings, specifications, operating manuals Installation sketches 	
Communication Skills	
<ul style="list-style-type: none"> Trade terminology Maintaining records Effective communication 	
Codes and Regulations	
Security Services Act	

Security Systems Technician Program Outline		Electronic Security Systems Off-the-job Phases 2, 4, and 6
False Alarm Bylaws		
Electrical Code Requirements		
Provincial Regulations		
Underwriters Laboratories of Canada Standards		
Work Practices		
Elements of Building Construction Design <ul style="list-style-type: none"> • Framing members • Roof members • Steel-and-concrete construction • Types of roofs • Wood frame members • Wall and partition members 		
Electrical Principles <ul style="list-style-type: none"> • Circuits with electrical/electronic digital devices • Electrical theory • Circuit problems • Circuit components • Power supply and batteries 		
Wiring Methods for Cable, System Devices and Control Panels <ul style="list-style-type: none"> • Layout • Installing raceways/conduit for cable • Pulling cable • Security system devices and control panels • Low voltage transformers 		
Computers for Programming, Networking and Documentation <ul style="list-style-type: none"> • Security system applications • Networking principles • Testing 		
Troubleshooting Security Systems <ul style="list-style-type: none"> • Problem solving procedures • Troubleshooting tools 		
Installation		
Intrusion Alarm Systems <ul style="list-style-type: none"> • Cables • System components • Installation and programming of control panel • Computer and software installation • Commissioning system • Documenting installation 		
Access Control system Devices <ul style="list-style-type: none"> • Cables • System components • Installation and programming of control panel • Computer and software installation • Commissioning system • Documenting installation 		

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Security Systems Technician Program Outline		Electronic Security Systems Off-the-job Phases 2, 4, and 6
Closed Circuit Television <ul style="list-style-type: none"> • System cables • CCTV devices • System control devices • Computer and software • Programming devices • Commissioning system • Documenting installation 		
Monitoring System Devices <ul style="list-style-type: none"> • Types • Protocols • Fire system monitoring 		
Intercom System Devices <ul style="list-style-type: none"> • Operation • Master station • System cables • System devices • Master station installation • Programming and commissioning • Documenting installation 		
Designing Security systems <ul style="list-style-type: none"> • Elements of systems • Types • Site Survey 		
Planning and Organizing <ul style="list-style-type: none"> • Project requirements • Scheduling • Documentation 		

Sheet Metal Worker (details)

Table 17. Sheet Metal Worker and Sheet Metalworking duration and prerequisites

British Columbia – Sheet Metal Worker	Éire – Sheet Metalworking
Level 1 In-school training: 180 hours	Phases 2 in-school training: 600 hours
Level 2 In-school training: 180 hours	Phases 4 in-school training: 330 hours
Level 3 In-school training: 180 hours	Phases 6 in-school training: 300 hours
Level 4 In-school training: 180 hours	
Total in-school: 720 hours	Total in-school: 1230 hours
Total work based: 5680 accumulated work based hours	Total work base: Minimum 2880 hours (72 weeks in 4 phases)
Recommended but not required: Grade 11 Math, English 10 and Science 10 or equivalent (Grade 12 preferred)	The minimum educational requirements are: Grade D in 5 subjects in the Department of Education & Skills Junior Certificate Examination or an approved equivalent.

Key to color code:

Similar Content in Ireland Content in BC Program, Not in Irish Content in Irish Program, Not in BC



Table 18. Content comparison BC Sheet Metal Worker - Irish Sheet Metalworking

Sheet Metal Worker Program Outline Levels 1 - 4	Sheet Metalworking Off-the-job Phases 2, 4, and 6
Safety	
WorkSafeBC Regulations/Shop and Site Safety	
Personal Safety Practices	
Personal Protective Equipment	
Workplace Hazardous Materials Information System	
Fire safety Procedures	
Tools and Equipment	
Hand tools	
Portable power tools	
Shop equipment	
Welding equipment	
Soldering and brazing equipment	
Fasteners	
Use ladders and platforms	
Hoisting, lifting and rigging equipment	
Organize Work	
Mathematics <ul style="list-style-type: none"> • Geometry • Formulas for area volumes, metric conversions square roots • Trigonometry • Application of mathematics to sheet metal problems • Air volumes and velocity • Fan laws • Pulley ratios • Heat loss 	

Sheet Metal Worker Program Outline Levels 1 - 4		Sheet Metalworking Off-the-job Phases 2, 4, and 6
<ul style="list-style-type: none"> • British Thermal units 		
Drawings and specifications <ul style="list-style-type: none"> • Shop drawings • Types of drawings • Line types, symbols and abbreviations • Scales • Contract documents • Specifications 		
Codes, regulations, and standards		
Manufacturer and supplier documentation		
Handling materials <ul style="list-style-type: none"> • Procedures for handling architectural materials • Procedures for handling specialty materials 		
Development and Layout of Patterns		
Drafting equipment for development of geometric constructions		
Development of pictorial drawings and orthographic projections <ul style="list-style-type: none"> • 3rd angle projection • Sketching curved surfaces and complex shapes • Pictorial from orthographic • Orthographic from pictorial 		
Development of patterns using parallel line development <ul style="list-style-type: none"> • Views • Line development • Applications <ul style="list-style-type: none"> ○ Architectural mitres ○ Elbows ○ Tee branches on centre complete with main pipe hole patterns ○ Round pipes on slope complete with hole layout ○ Gutter mitres ○ Elbows by the rise method ○ Tee branches off centre • Seam allowances • Pattern labelling and forming instructions 		
Development of patterns using radial line <ul style="list-style-type: none"> • Line development • Geometric construction views • Right cones (chimney cap) • Frustum (storm collar) • Truncated (roof jack on a slope) • Round reducer on centre • Seam allowances • Pattern labelling and forming instructions 		
Development of patterns using triangulation <ul style="list-style-type: none"> • Line development • Geometric construction views 		

Sheet Metal Worker Program Outline Levels 1 - 4		Sheet Metalworking Off-the-job Phases 2, 4, and 6
<ul style="list-style-type: none"> • Applications <ul style="list-style-type: none"> ○ Square to round on centre ○ Square to round off centre ○ Round reducer off centre ○ Square to round on a pitch (Roof jack) ○ Round reducer on a pitch (Roof jack) ○ Square to round elbow ○ “Y” branch ○ Reducing elbow • Seam allowances • Pattern labelling and forming instructions 		
<p>Development of patterns for duct fittings</p> <ul style="list-style-type: none"> • Line development • Geometric construction views • Applications <ul style="list-style-type: none"> ○ Two way transition ○ Change cheek ogee offset ○ Drop cheek elbows ○ Transitional ogee offset ○ Duct “Y” branch fittings ○ Drop cheek change elbow ○ Duct elbows • Seam and joint allowances • Pattern labelling 		
<p>Development of patterns using computer technology</p> <ul style="list-style-type: none"> • Software programs applicable to the sheet metal industry <ul style="list-style-type: none"> ○ CAD (Computer Aided Design) programs ○ SDS (Shop Data Systems) programs ○ Estimation, design, fabrication and project management software • Advantages and disadvantages of using computers to generate patterns and control cutting machines 		
Fabrication of Trade Related Products		
<p>Selection of materials for trade related products</p> <ul style="list-style-type: none"> • Types of metals and their properties • Other materials used in architectural applications: plastic, composites, rubber etc. • Building envelope requirements • Material applications <ul style="list-style-type: none"> ○ Roof drainage systems ○ Roofing/flashings ○ Cladding ○ Composite metal panels ○ Decking ○ Speed wall ○ Cornice/gutters ○ Food service industry 		

Sheet Metal Worker Program Outline Levels 1 - 4		Sheet Metalworking Off-the-job Phases 2, 4, and 6
<ul style="list-style-type: none"> ○ Industrial ○ Laboratories ○ Signage ○ Institutional ○ Commercial ○ Lagging ○ Ornamental 		
<p>Fabrication of components</p> <ul style="list-style-type: none"> ● Sheet metal components ● Tools ● Cutting list ● Types of seams, locks and edges ● Form bending techniques ● Components <ul style="list-style-type: none"> ○ Turning vanes ○ Fire damper sleeves ○ Louver 		
<p>Fabrication of ductwork and assembly fittings with components</p> <ul style="list-style-type: none"> ● Shop layout techniques for duct fittings ● Duct fittings fabrications ● Installation of components <ul style="list-style-type: none"> ○ End caps ○ Spin-in collars ○ Flexible connections ○ Insulation stops ○ Turning vanes ○ Fire damper sleeves ○ Louver ○ Duct “Y” branch fittings ○ Drop cheek change elbow 		
<p>Insulate ductwork, fittings and components</p> <ul style="list-style-type: none"> ● Types and properties of insulation materials ● Fastening methods 		
<p>Fabrication of hanger systems</p> <ul style="list-style-type: none"> ● Types and purposes of hanger systems ● Fabrication of strap hanger systems <ul style="list-style-type: none"> ○ Strap hangers ○ Brackets ○ Saddles ○ Trapeze ● Fabrication of saddle and trapeze hanger systems ● Fabrication of knee bracket hanger systems ● Hanging considerations <ul style="list-style-type: none"> ○ Weight ○ Structure ○ Vibration ○ Fasteners/anchors ○ Environment ○ Manufacturers’ shop drawings 		

A Comparison of Select British Columbia and Irish Apprenticeships

Sheet Metal Worker Program Outline Levels 1 - 4		Sheet Metalworking Off-the-job Phases 2, 4, and 6
<ul style="list-style-type: none"> ○ Seismic requirements 		
Fabrication of equipment supports and bases <ul style="list-style-type: none"> • Types and purposes of equipment bases and supports • Design and fabrication 		
Fabrication of specialty and stainless steel products <ul style="list-style-type: none"> • Types, purposes of stainless steel products • Marine application • Design and fabrication 		
Fabrication of architectural components <ul style="list-style-type: none"> • Louvers • Scuppers • Roof jack • Roofing • Decking • Cladding • Gutter mitre 		
Fabrication of industrial components <ul style="list-style-type: none"> • Companion flanges • Welded duct • Small end big ends • Welded round elbow • Clean outs • Belt guards • Hoppers • Chutes • Grain spouting • Chutes • Conveyors • Blow pipe elbow • Tapers • Transitions • Fans • Wheel • Blow boxes • Hoods 		
		Aircraft Precision Sheet Metal
Installation of Air Handling Systems		
Installation of air handling system equipment <ul style="list-style-type: none"> • Types, purposes and operations of air handlers • Installation of air handlers <ul style="list-style-type: none"> ○ Hoisting ○ Curbs ○ Penetration size ○ Penetration obstructions ○ Sleepers ○ Stands ○ Isolators • Types, purposes and operations of energy recovery ventilators 		

A Comparison of Select British Columbia and Irish Apprenticeships

Sheet Metal Worker Program Outline Levels 1 - 4		Sheet Metalworking Off-the-job Phases 2, 4, and 6
<ul style="list-style-type: none"> • Installation of heat and energy recovery ventilators <ul style="list-style-type: none"> ○ Filter types ○ Hanging hardware ○ Stands 		
Installation of residential heating, ventilating and air conditioning <ul style="list-style-type: none"> • Heat transfer • Furnace types • Controls, equipment and locations • Types, limitations and application of residential duct systems • Installation of residential furnaces 		
Installation of Industrial Systems		
Installation of chimneys, breeching and venting		
Installation of gravity/conveyor material handling systems		
Installation of pneumatic material and dust handling systems <ul style="list-style-type: none"> • Types, purposes, designs and components of venting • Installation of bracing, hangers and supports • Installation of flashing • Connection of venting to appliances • Types, purposes, designs and components of chimneys and breeching 		
Installation of lagging <ul style="list-style-type: none"> • Purpose and installation of cladding and lagging • Materials, insulation types, cladding components • Mechanical equipment: boilers, piping, pressure vessels 		
Installation of Architectural & Specialty Components		

Sheet Metal Worker Program Outline Levels 1 - 4		Sheet Metalworking Off-the-job Phases 2, 4, and 6
Installation of roofing, decking and cladding <ul style="list-style-type: none"> • Layout and installation of roofing systems <ul style="list-style-type: none"> ○ Roof structures ○ Construction features • Types, purposes, materials and installation or decking • Material for roofing and flashing • Forming of flashing and roofing <ul style="list-style-type: none"> ○ Types ○ Joints ○ Seam allowances • Installation of subsurface systems <ul style="list-style-type: none"> ○ Vapour barrier ○ Waterproof membrane ○ Slip sheet ○ Insulation ○ Isolation material • Installation of roofing and cladding components 		
Installation of panel systems <ul style="list-style-type: none"> • Composite and sandwich panels • Installation of subsurface systems • Cutting of panels • Forming of flashings 		
Installation of exterior components <ul style="list-style-type: none"> • Site preparation • Installation of exterior components • Types: Awnings, finials, signage, decorative fascia and canopies • Types of fasteners • Compatibility of materials 		
Servicing Systems		
Test and adjust systems <ul style="list-style-type: none"> • Leak testing and air balancing • Indoor air quality • Testing and balancing procedures 		
Maintenance inspections and service <ul style="list-style-type: none"> • Signs of abnormality • Servicing and repair of components 		

Tilesetter (details)

Table 19. Tilesetter and Floor and Wall Tiling duration and prerequisites

British Columbia – Tilesetter	Éire – Floor and Wall Tiling
Level 1 In-school training: 120 hours	Phase 2 in-school training: 600 hours
Level 2 In-school training: 120 hours	Phase 4 in-school training: 300 hours
Level 3 In-school training: 120 hours	
Total in-school: 360 hours	Total in-school: 900 hours
Total work based: 4500 hours	Total work base: Minimum 2880 hours (72 weeks in 4 phases)
Recommended but not required: Grade 10 or equivalent including Grade 10 English, Math and Science (Grade 12 preferred).	The minimum educational requirements are: Grade D in 5 subjects in the Department of Education & Skills Junior Certificate Examination or an approved equivalent. Must pass a colour – vision test approved by SOLAS.

Key to color code:

Similar Content in Ireland Content in BC Program, Not in Irish Content in Irish Program, Not in BC



Table 20. Content comparison BC Tilesetter - Irish Floor and Wall Tiling

Tilesetter Program Outline Levels 1 - 3		Floor and Wall Tiling Off-the-job Phases 2, 4, and 6
Safety		
WorkSafeBC Regulations/Workplace Hazards		
Personal Safety Practices		
Workplace Hazardous Materials Information System		
Personal Protective Equipment		
Fall Protection		
Fire safety Procedures		
Tools and Equipment		
Hand tools		
Power tools		
Measuring and levelling tools		
Access equipment		
Rigging and hoisting		
Organize Work		
Trade Mathematics		
Blueprint reading		
Preparation of Worksite and Materials		
Substrate preparations		
<ul style="list-style-type: none"> • Removing existing finishes • Determining the suitability of the substrate <ul style="list-style-type: none"> ○ Integrity ○ Slope ○ Drainage ○ Specifications 		
Layout of work area		
<ul style="list-style-type: none"> • Inspection and organization of materials 		

Tilsetter Program Outline Levels 1 - 3		Floor and Wall Tiling Off-the-job Phases 2, 4, and 6
<ul style="list-style-type: none"> • Layout of patterns • Layout techniques 		
<p>Backing and base materials</p> <ul style="list-style-type: none"> • Fastener types • Types of membranes • Metal lathe • Material quantities • Use of lime cement mortar on walls and floors <ul style="list-style-type: none"> ○ Types ○ Mixing ○ Safe handling ○ Proportions/ratios • Preparing mortar base to receive tiles <ul style="list-style-type: none"> ○ Screeding ○ Bond coat ○ Trowel size ○ Combing techniques 		
<p>Special applications</p> <ul style="list-style-type: none"> • Ceiling layouts <ul style="list-style-type: none"> ○ Alignment ○ Control joints • Ceiling installations <ul style="list-style-type: none"> ○ Structural suitability ○ Bonding agents ○ Application techniques • Sealants and caulking for energy conservation • Tiles for energy conservation • Installation methods for marine installations • Installation of in-floor heating systems • Glass blocks installation • Conductive floor installations 		
Installation of Materials		
<p>Tile on vertical</p> <ul style="list-style-type: none"> • Inserts and accessories • Preparation, application and setting tiles to walls • Selection and use of adhesives • Installation techniques and design • Trims 		
<p>Tile on floors and the horizontal</p> <ul style="list-style-type: none"> • Substrate types • Levelling substrates • Mortar bed • Layout and installation methods • Divider strips 		
<p>Tiles on stairways</p> <ul style="list-style-type: none"> • Stairway parts • Layout and screeding for risers and treads • Layout and sequencing • Building codes 		

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Tiler Program Outline Levels 1 - 3		Floor and Wall Tiling Off-the-job Phases 2, 4, and 6
Glass and mosaics <ul style="list-style-type: none"> • Mosaic products and applications • Layout methods • Surface preparations • Handling and application 		
Ceramic veneer <ul style="list-style-type: none"> • Types of veneer • Tile layout • Tools • Application techniques 		
Columns and walls <ul style="list-style-type: none"> • Installation to square, rectangular columns • Installation to round columns • Installation to contour wall assembly 		
Finishing of Installed Products		
Mixing and applying grout <ul style="list-style-type: none"> • Types of grout • Admixtures • Grout application • Environmental considerations • Washing tiles and shaping joints • Removing haze 		
Caulking and sealing <ul style="list-style-type: none"> • Evaluating effects of temperatures and moisture content on the installed product • Techniques for caulking joints • Material selection • Application techniques • Sealing material 		
Finishing terrazzo and stone <ul style="list-style-type: none"> • Grinding procedures • Stone grits • Repairing grinding indentations • Types and application of sealers • Safety hazards 		