



**TECHNICAL
SAFETY BC**

Safe technical systems. Everywhere.



ELEVATING DEVICES MECHANIC CLASS C

PROGRAM OUTLINE



Safe technical systems. Everywhere.

Technical Safety BC is an independent, self-funded organization that oversees the safe installation and operation of technical systems and equipment. In addition to issuing permits, licences and certificates, we work with industry to reduce safety risks through assessment, education and outreach, enforcement, and research.



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Safety Notice

Disclaimer:

Please note that references to the acts, regulations and codes throughout this document may not reflect the most recent versions available.

Also, the references listed in this outline are by no means an exhaustive list of all the situations that may apply to a particular situation.

Therefore, the user should make sure that references are current and relevant to any situation that they are dealing with.

The latest version of this document is available in PDF format on the Technical Safety BC website.
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Acknowledgements

The Program Outline was prepared with the advice and direction of an industry steering committee convened initially by Technical Safety BC. Members include:

Irvine Jay
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Zoya Jones
SEP Products Group Ltd.

Daniel Royston
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Tony Violette
Tall Crane Equipment Ltd.

Technical Safety BC acknowledges the dedication and hard work of all the industry representatives appointed to identify the training requirements of the Elevating Devices Mechanic (Class C) occupation.

SECTION 1

INTRODUCTION

Foreword

The Elevating Devices Mechanic (Class C) program outline is intended as a guide for instructors, apprentices, and employers of apprentices, as well as for the use of industry organizations, regulatory bodies, and provincial and federal governments. It reflects updated standards based on the British Columbia industry and subject matter experts.

Practical instruction by demonstration and student participation should be integrated with classroom sessions. Safe working practices, even though not always specified in each operation or topic, are an implied part of the program that should be stressed throughout the apprenticeship.

The program outline includes a list of recommended reference textbooks that are available to support the learning objectives and the minimum shop requirements needed to support instruction.

The program outline was prepared with the advice and assistance of the Elevating Devices Mechanic (Class C) Review Committee and will form the basis for further updating of the British Columbia Elevating Devices Mechanic (Class C) Program and learning resources by Technical Safety BC.

Each competency is to be evaluated through the use of written examinations in which the individual must achieve at least 70% in order to receive a passing grade. The types of questions used on the exams must reflect the cognitive level indicated by the learning objectives and the learning tasks listed as part of the related competencies.

Workplace achievement criteria are included for those competencies that require a practical component.

The Elevating Devices Mechanic Personal Skills Passport will be used to verify the successful completion of all required tasks. Some competencies have multiple workplace achievement criteria. Many of the achievement criteria require the passport holder to demonstrate the same competency on multiple setups over a period of time.

A certified elevating devices mechanic is required to initial each of the learning tasks and to sign the bottom of the form for each achievement criterion.

Every certified Elevating Devices Mechanic - Class, A, C, and H, and every Mechanic-in-Training, is issued a personal Skills Passport by Technical Safety BC.

You must keep and update your Skills Passport throughout your career. It provides evidence of your competence to perform work on elevating devices regulated by Technical Safety BC.

How to use this document

This program outline has been developed for the use of individuals from several different audiences.

This table describes how each audience can use the document.

Training providers	Employers and sponsors	Apprentices	Challengers
Program requirements			
To communicate program length and structure and all pathways to completion	To understand the length and structure of the program	To understand the length and structure of the program and pathways to completion	To understand challenger pathway to certificate of qualification
Program assessment			
To communicate program completion requirements and assessment methods	To understand the various assessment requirements for the program	To understand the various assessment requirements for the program	To understand the assessment requirements to challenge the program
Occupational analysis chart			
To communicate the competencies that the industry has defined as representing the scope of the occupation	To understand the competencies that an apprentice is expected to demonstrate in order to achieve certification	To view the competencies they will achieve as a result of completing the program	To understand the competencies they must demonstrate in order to challenge the program

Training providers	Employers and sponsors	Apprentices	Challengers
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Training topics and suggested time allocation

<p>To define the proportionate representation of general areas of competency (GACs) at each program level, the suggested proportion of time spent on each GAC, and the percentage of time spent on theory versus practical application</p>	<p>To understand the scope of competencies covered in the technical training, the suggested proportion of time spent on each GAC, and the percentage of that time spent on theory versus practical application</p>	<p>To understand the scope of competencies covered in the technical training, the suggested proportion of time spent on each GAC, and the percentage of that time spent on theory versus practical application</p>	<p>To understand the relative weightings of various competencies of the occupation on which assessment is based</p>
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Program content

<p>To define the objectives, learning tasks, high-level content that must be covered for each competency, as well as the observable, measurable achievement criteria for objectives that have practical components</p>	<p>To understand the detailed program content and performance expectations for competencies that have practical components, and to use the outline as a checklist before signing a recommendation for certification (RFC) for an apprentice</p>	<p>To view detailed information on program content and performance expectations for demonstrating competency</p>	<p>To check the program content areas against the challenger’s own knowledge and the performance expectations against the challenger’s own skill levels</p>
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Training provider standards

<p>To define the facility requirements, tools and equipment, reference materials (if any) and instructor requirements for the program</p>	<p>To identify the tools and equipment an apprentice is expected to have access to—those the training provider is to provide and those the student is expected to own</p>	<p>To become aware of the training facility requirements, tools and equipment provided by the school and the student, reference materials they may be expected to acquire, and the minimum qualification levels of the program instructors</p>	<p>To know the tools and equipment a tradesperson is expected to be competent in using or operating and that may be used or provided in a practical assessment</p>
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SECTION 2

PROGRAM OVERVIEW

Program requirements

for the Elevating Device Mechanic (Class C) certificate of qualification

Path 1	Path 2	Path 3
Prerequisite safety training		
Yes	Yes	Yes
Technical training		
Industry Training Authority Electrical Level 1 and Level 2 Industry Training Authority Millwright Level 1 and Level 2	Recognized apprenticeship program by other Canadian jurisdictions	Certified Class A Mechanic OR Certified Class A Mechanic in Training ¹
Supplementary courses		
BC Safety Standards Act , BC Elevating Devices Safety Regulation ; and BC Safety Standards General Regulation (4 hrs) CSA Z185-M87: Safety Code for Personnel Hoists, and CSA B311: Safety code for manlifts (4 hrs)	BC Safety Standards Act , BC Elevating Devices Safety Regulation ; and BC Safety Standards General Regulation (4 hrs)	CSA Z185-M87: Safety Code for Personnel Hoists, and CSA B311: Safety code for manlifts (4 hrs)
Documented and verifiable hands-on experience		
4000 hrs	4000 hrs	4000 hrs ²
Technical Safety BC certification exam		
Yes	Yes	Yes

1. Must complete Class A education program
2. 4000 hours of hands-on experience on Z185 equipment must be tracked and recorded separately from work performed on other types of equipment.

Program assessment

Apprentices will be assessed fairly and accurately throughout the program on the various skills required to be a professional Elevator Mechanic (Class C). Assessment activities are designed to provide feedback and to allow for further development of skills that have been identified as essential for on-the-job performance. The forms of assessment used in this program are described below.

Completion requirement	Evidence of achievement	Level of achievement required
Prerequisite technical training	In-school testing and practical assessment	Minimum 70%
Level 1 technical training	In-school testing and practical assessment	Minimum 70%
Level 2 technical training	In-school testing and practical assessment	Minimum 70%
Work-based training hours	Work-based training report completed by sponsor or employer	4000 hours completed
Technical Safety BC certification exam	Written exam	Minimum 70%
Technical Safety BC Certificate of Qualification	Approval or sign off by the Technical Safety BC	Certificate of Qualification

Occupational analysis chart

Occupation description

“Elevating Devices Mechanic (Class C)” means a person who designs, installs, alters, repairs, maintains, or tests personnel hoists as defined in the latest edition of the British Columbia Elevating Devices Safety Act and the Safety Standards Act: Elevating Devices Safety Regulation.

Use safe work practices – A

Control workplace hazards					A1
P					

Comply with the OHS Regulation and WorkSafeBC standards					A2
P					

Use WHIMIS					A3
P					

Use personal protective equipment					A4
P					

Apply fire prevention practices					A5
P					

Use tools and equipment – B

Use hand tools					B1
P					

Use power tools					B2
P					

Use measuring and alignment tools					B3
P					

Use ladders, scaffolding and platforms					B5
P					

Use rigging and hoisting equipment					B6
	1				

Use electrical test equipment					B7
	1				

Use fundamental skills – C

Describe the elevating device industry			
			C1
1			

Use mathematics and science			
			C2
1			

Apply mechanical principles			
			C3
1			

Read drawings and specifications			
			C4
1			

Use acts, regulations and codes			
			C5
1			

Use manufacturer and supplier documentation			
			C6
1			

Plan a project			
			C7
	2		

Apply troubleshooting techniques			
			C8
	2		

Use mentoring techniques			
			C9
1			

Install common components – D

Install wiring raceways, fixtures, and wiring			
			D5
	2		

Install traction elevators – E

Describe the principles of traction systems			
			E1
1			

Apply the principles of electricity and electronics – G

Describe the principles of electricity				G1
1				

Read electrical drawings and specifications				G2
1				

Describe electrical and electronic controls				G4
	2			

Install electrical systems				G5
		2		

Maintain electrical and electronic systems				G6
		2		

Troubleshoot electrical and electronic systems				G7
		2		

Repair elevating systems – K

Describe the principles of escalators and moving walks				K1
		2		

Install and align truss assemblies				K6
		2		

Use fundamental skills – N

Lay out the base and buffer assembly				N1
1				

Install mast, braces, anchors and limit cams				N2
1				

Install hoist car, ldrive assembly and counterweight assembly				N3
1				

Install hoistway door wiring, and inspect hoistway door assembly and hoarding				N3
1				

Install base and car control panel and wiring				N5
		2		

Adjust and commission personnel hoists				N6
		2		

Dismantle a personnel hoist				N7
		2		

Training topics and suggested time allocation summarized by general area of competency (GAC)

Elevating Devices Mechanic (Class C)

Line A	Use safe work practices	Hours	% of Total
A1	Control workplace hazards	4	
A2	Comply with the OHS Regulation and WorkSafeBC standards	4	
A3	Use WHMIS	3	
A4	Use personal protective equipment	4	
A5	Apply fire prevention practices	1	
	Total Line A	16	4%

Line B	Use tools and equipment	Hours	% of Total
B1	Use hand tools	1	
B2	Use power tools	2	
B3	Use measuring and alignment tools	1	
B5	Use ladders, scaffolding and platforms	4	
B6	Use rigging and hoisting equipment	12	
B7	Use electrical test equipment	4	
	Total Line B	24	6%

Line C	Use fundamental skills	Hours	% of total
C1	Describe the elevating industry	2	
C2	Use mathematics and science	12	
C3	Apply mechanical principles	16	
C4	Read drawings and specifications	8	
C5	Use acts, regulations and codes	12	
C6	Use manufacturer and supplier documentation	4	
C7	Plan a project	8	
C8	Apply troubleshooting techniques	8	
C9	Use mentoring techniques	3	
	Total Line C	85	22%

Line D	Install common components	Hours	% of total
D5	Install wiring raceways, fixtures, and wiring	18	
	Total Line D	18	5%

Line E	Install traction elevators	Hours	% of total
E1	Describe the principles of traction systems	16	
	Total Line E	16	4%

Line G	Apply the principles of electricity and electronics	Hours	% of total
G1	Describe the principles of electricity	38	
G2	Read electrical drawings and specifications	16	
G4	Describe electrical and electronic controls	32	
G5	Install electrical systems	16	
G6	Maintain electrical and electronic systems	19	
G7	Troubleshoot electrical and electronic systems	16	
Total Line G		144	37%

Line K	Repair elevating systems	Hours	% Of Total
K2	Service braking systems	16	
K6	Repair machines and motors	8	
Total Line K		24	6%

Line N	Install rack and pinion personnel hoists	Hours	% of Total
N1	Lay out the base and buffer assembly	8	
N2	Install mast, braces, anchors and limit cams	8	
N3	Install hoist car, drive assembly and counterweight assembly	8	
N4	Install hoistway door wiring, and inspect hoistway door assembly and hoarding	8	
N5	Install base and car control panel and wiring	8	
N6	Adjust and commission personnel hoists	8	
N7	Dismantle a personnel hoist	16	
Total Line N		64	16%

Grand total	391	100%
Minus safety prerequisite	24	
Total in-class hours	367	

SECTION 3

PROGRAM CONTENT

Line (GAC): A – Use safe work practices

COMPETENCY: A1 – CONTROL WORKPLACE HAZARDS

Objectives

To be competent in this area, the individual must be able to do the following:

- Describe workplace hazards
- Apply strategies to minimize workplace hazards
- Communicate workplace hazards to co-workers

Learning tasks	Content
1 Describe general strategies to minimize workplace hazards and prevent workplace injuries	<ul style="list-style-type: none"> • Hazards: <ul style="list-style-type: none"> • Identification • Reduction • Elimination • Isolation • Management • Horseplay
2 Describe strategies to help ensure the well-being of the general public	<ul style="list-style-type: none"> • Signage • Barricading access
3 Explain how environmental hazards pose a risk to a worker's health and safety	<ul style="list-style-type: none"> • Chemical materials • Physical materials
4 Describe the issues relating to substance abuse	<ul style="list-style-type: none"> • Substance types • Effects • Contributing factors
5 Describe strategies to minimize the risk of workplace accidents or illness	<ul style="list-style-type: none"> • Training • Communications • Hazard assessment • Hazard control
6 Describe the dangers of exposure to hazardous materials	<ul style="list-style-type: none"> • Materials • Types • Hazards • Toxic effect • Types of exposure
7 Apply strategies to minimize workplace hazards	<ul style="list-style-type: none"> • Site orientation • Safety meetings • Worksite safety plan

Line (GAC): A – Use safe work practices

COMPETENCY: A2 – COMPLY WITH THE OHS REGULATION AND WORKSAFEBC STANDARDS

Objectives

To be competent in this area, the individual must be able to do the following:

- Locate the relevant parts of the Occupational Health and Safety Regulation and WorkSafeBC standards as they apply to an Elevating Devices Mechanic’s workplace
- Integrate the Occupational Health and Safety Regulation and WorkSafeBC standards into their day-to-day work practices

Learning tasks	Content	
1 Describe the general health and safety policies relevant to the elevator trade	<ul style="list-style-type: none"> • Occupational Health and Safety Regulation • Other agencies 	<ul style="list-style-type: none"> • Company policies
2 Describe the rights and responsibilities of employers, managers, supervisors and workers concerning health and safety in the workplace	<ul style="list-style-type: none"> • Due diligence • Code requirements 	
3 Describe the procedures for reporting workplace incidents and accidents	<ul style="list-style-type: none"> • WorkSafeBC requirements • Company requirements • Code requirements 	
4 Describe the core requirements of the Occupational Health and Safety Regulation	<ul style="list-style-type: none"> • Regular inspections • Written instructions • Regular management meetings • Safety committees • Accident and injury investigations 	<ul style="list-style-type: none"> • Records and statistics • Instruction and supervision of workers • Toolbox meetings • Code requirements
5 Describe WorkSafeBC’s role in promoting workplace health and safety	<ul style="list-style-type: none"> • Awareness • Education 	<ul style="list-style-type: none"> • Inspection • Enforcement
6 Apply the general hazard requirements of WorkSafeBC regulations	<ul style="list-style-type: none"> • Chemical and biological substances • Substance-specific requirements • Noise, vibration, radiation and temperature • Personal protective clothing and equipment • Confined spaces • De-energizing, lockout and tagout 	<ul style="list-style-type: none"> • Fall protection • Tools, machinery and equipment • Ladders, scaffolds and temporary work platforms • Cranes and hoists • Rigging • Mobile equipment • Electrical safety • Code requirements
7 Describe how a workplace safety policy is established	<ul style="list-style-type: none"> • Hazard assessment • Conditions • Safety meeting requirements • Reporting hazards and incidents • Accident and incident investigations 	<ul style="list-style-type: none"> • Employee orientation • First aid • Records and statistics • Reporting injuries • Non-compliance procedures

Line (GAC): A – Use safe work practices

COMPETENCY: A3 – USE WHMIS

Objectives

To be competent in this area, the individual must be able to do the following:

- Describe the purpose of the Workplace Hazardous Materials Information System (WHMIS) Regulation
- Explain the contents of Material Safety Data Sheets (MSDS)
- Explain the content of a WHMIS label
- Apply WHMIS regulations in the workplace

Learning tasks	Content
1 Explain the primary goals of WHMIS	<ul style="list-style-type: none"> • Reducing injuries and disease • Communicating information • Reducing exposure to hazardous materials
2 Describe the rights and responsibilities of employers, suppliers and workers under WHMIS legislation	<ul style="list-style-type: none"> • Recognition of rights <ul style="list-style-type: none"> • Employers • Suppliers • Workers • Legislation • Availability and location of information • Updating • Code requirements
3 Describe the six hazard classes of WHMIS.	<ul style="list-style-type: none"> • Hazard classes
4 Describe the three main elements of WHMIS	<ul style="list-style-type: none"> • Labels • Material Safety Data Sheets (MSDS) • Education and training programs
5 Explain the requirements for WHMIS labels	<ul style="list-style-type: none"> • Supplier labels • Workplace labels
6 Describe the primary information found on a Material Safety Data Sheet	<ul style="list-style-type: none"> • Product information • Hazardous ingredients • Physical data • Fire or explosion data • Reactive data • Toxicological properties • Preventative measures • First-aid measures • Preparation information

Line (GAC): A – Use safe work practices

COMPETENCY: A4 – USE PERSONAL PROTECTIVE EQUIPMENT

Objectives

To be competent in this area, the individual must be able to do the following:

- Select appropriate personal protective equipment
- Inspect and maintain personal protective equipment
- Use personal protective equipment

Learning tasks	Content	
1 Select the proper personal protective equipment (PPE) for a specific task	<ul style="list-style-type: none"> • Footwear • Eye protection • Ear protection • Head protection • Respiratory protection • Protective clothing 	<ul style="list-style-type: none"> • Lifting protection • Hair and jewelry • Fall protection • Company policy • Code requirements
2 Use personal protective equipment	<ul style="list-style-type: none"> • Selection • Purpose • Fitting • Operating procedures • Training programs 	<ul style="list-style-type: none"> • Inspection • Maintenance • Storage • Code requirements
3 Use fall protection	<ul style="list-style-type: none"> • Types of equipment • Uses • Purpose • Limitations 	<ul style="list-style-type: none"> • Certification • Code requirements

Line (GAC): A – Use safe work practices

COMPETENCY: A5 – APPLY FIRE PREVENTION PRACTICES

Objectives

To be competent in this area, the individual must be able to do the following:

- Describe the chemical process of a fire
- Select and use appropriate fire suppression equipment
- Apply fire prevention procedures
- Report fire incidents

Learning tasks	Content
1 Describe the components necessary to sustain a fire	<ul style="list-style-type: none"> • Fuel • Heat • Oxygen
2 Describe the five classes of fire extinguishers	<ul style="list-style-type: none"> • Class C • Class B • Class C • Class D • Other
3 Outline strategies to reduce the risk of fire in the workplace	<ul style="list-style-type: none"> • Housekeeping • Inspection and maintenance of fire equipment • Electrical hazards • Storage of materials • Precautions to prevent ignition • Fire and smoke alarms • Hot permit • Code requirements
4 Describe the proper use of a fire extinguisher	<ul style="list-style-type: none"> • Selecting extinguisher • Notifying occupants, co-workers and emergency services • Egress • Procedures

Line (GAC): B – Use tools and equipment

COMPETENCY: B1 – USE HAND TOOLS

Objectives

To be competent in this area, the individual must be able to do the following:

- Select appropriate hand tools
- Use hand tools
- Inspect and maintain hand tools

Learning tasks	Content	
1 Describe the hand tools commonly used in the elevator trade	<ul style="list-style-type: none"> • Cutting tools • Measuring and marking tools • Bracing and clamping tools • Hammering tools • Levelling tools • Wrenches • Sockets • Pliers • Screwdrivers 	<ul style="list-style-type: none"> • Chiselling tools • Squaring tools • Threading tools • EMT benders • Crimping tools • Prying and alignment tools • Brushes • Toolbox • Flashlight
2 Use hand tools	<ul style="list-style-type: none"> • Types • Selection <ul style="list-style-type: none"> • Use • Quality • Parts • Purpose • Use • Procedures 	<ul style="list-style-type: none"> • Safety • Adjustment • Inspection • Maintenance • Cleaning • Storage • Code requirements

Line (GAC): B – Use tools and equipment

COMPETENCY: B2 – USE POWER TOOLS

Objectives

To be competent in this area, the individual must be able to do the following:

- Describe the power tools commonly used in the elevator industry
- Use power tools
- Inspect and maintain power tools

Learning tasks	Content	
1 Describe the power tools commonly used in the elevating industry	<ul style="list-style-type: none"> • Types <ul style="list-style-type: none"> • Electric • Pneumatic • Powder actuated • Certification requirements • Cutting tools • Grinding tools • Drilling and boring tools • Jack hammer • Generators 	<ul style="list-style-type: none"> • Stationary <ul style="list-style-type: none"> • Roll groover • Pipe threader • Tugger • Specialty tools • Accessories • Power cords • Compressors • Air lines • Vacuums, blowers and fans
2 Use power tools in a safe and efficient manner	<ul style="list-style-type: none"> • Types • Selection <ul style="list-style-type: none"> • Use • Quality • Parts • Purpose • Uses • Procedures and operations 	<ul style="list-style-type: none"> • Safety • Adjustment • Inspection • Maintenance • Cleaning • Storage • Code requirements

Line (GAC): B – Use tools and equipment

COMPETENCY: B3 – USE MEASURING AND ALIGNMENT TOOLS

Objectives

To be competent in this area, the individual must be able to do the following:

- Describe the measuring and alignment tools commonly used in the elevating industry
- Use measuring and alignment tools
- Inspect and maintain measuring and alignment tools

Learning tasks	Content	
1 Describe the measuring and alignment tools commonly used in the elevating industry	<ul style="list-style-type: none"> • Measuring tools <ul style="list-style-type: none"> • Tape measure • Scales • Calipers • Rope gauges • Pressure • Rope tension tool • Tachometer • Feeler gauges <ul style="list-style-type: none"> • Step gauges • Skirt gauges • Pin gauges • Dynamometer • Stopwatch 	<ul style="list-style-type: none"> • Alignment tools <ul style="list-style-type: none"> • Plumb bob • Dial gauges • Rail gauges • Lasers • Levels • Squares • Templates
2 Use measuring and alignment tools	<ul style="list-style-type: none"> • Types • Selection <ul style="list-style-type: none"> • Use • Quality • Parts • Purpose • Use • Procedures • Safety 	<ul style="list-style-type: none"> • Adjustment • Inspection • Maintenance • Calibration • Cleaning • Storage • Accuracy • Unit conversion

Line (GAC): B – Use tools and equipment

COMPETENCY: B5 – USE LADDERS, SCAFFOLDING AND PLATFORMS

Objectives

To be competent in this area, the individual must be able to do the following:

- Describe the use of ladders, scaffolding and platforms
- Use ladders, scaffolding and platforms
- Inspect and maintain ladders, scaffolding and platforms

Learning tasks	Content	
1 Describe the use of ladders, scaffolding and platforms	<ul style="list-style-type: none"> • Types • Usage • Selection • Safety 	<ul style="list-style-type: none"> • Maintenance • Storage • Transportation • Inspection
2 Use an extension ladder	<ul style="list-style-type: none"> • Uses • Limitations • Setup • Safety • Inspection • Maintenance 	<ul style="list-style-type: none"> • Storage • CSA certification and duty rating • Company policy • Code requirements
3 Use a step ladder	<ul style="list-style-type: none"> • Uses • Limitations • Setup • Safety • Inspection • Maintenance 	<ul style="list-style-type: none"> • Storage • CSA certification and duty rating • Company policy • Code requirements
4 Use scaffolding	<ul style="list-style-type: none"> • Assembly and disassembly • Personal protective equipment • Hazards and obstructions • Levelling • Bracing and tying off • Guarding the work area • Installing the planking and railings • Load limits 	<ul style="list-style-type: none"> • Engineering requirements • Inspection • Maintenance • Storage of scaffolding and planks • Safety • Signage • Fall protection • Code requirements
5 Use work platforms	<ul style="list-style-type: none"> • Assembly and disassembly • Load limits • Inspection • Maintenance 	<ul style="list-style-type: none"> • Storage • Safety • Code requirements

Line (GAC): B – Use tools and equipment

COMPETENCY: B6 – USE RIGGING AND HOISTING EQUIPMENT

Objectives

To be competent in this area, the individual must be able to do the following:

- Describe rigging and hoisting equipment
- Use rigging and hoisting equipment
- Inspect and maintain rigging and hoisting equipment

Learning tasks		Content	
1	Describe rigging and hoisting equipment and its applications	<ul style="list-style-type: none"> • Types of equipment <ul style="list-style-type: none"> • Chain block • Cranes • Tugger • Slings • Beam clamps • Trolleys • Gantries • Hardware • Jacks • Blocking • Knots • Equipment assembly • Slings and sling arrangements <ul style="list-style-type: none"> • Rating • Wire rope • Nylon rope 	<ul style="list-style-type: none"> • Securing and balancing loads • Pinch points • Equipment weights • Load capacities of lifting equipment • Inspection • Maintenance • Storage • Certification and rating of equipment • Code requirements
2	Use rigging and hoisting equipment	<ul style="list-style-type: none"> • Applications • Test lifts • Manual devices • Electrical devices • Hydraulic devices • Attachment point rating • Communication and hand signals for hoisting 	<ul style="list-style-type: none"> • Slings • Rigging • Safety • Inspection • Maintenance • Storage • Code requirements

Workplace achievement criteria

1. The individual will select and inspect rigging and hoisting equipment, and use proper rigging and hoisting techniques to safely lift and lower a load using three separate setups.

Passport sign off by a certified mechanic is required for each workplace achievement criterion.

Line (GAC): B – Use tools and equipment

COMPETENCY: B7 – USE ELECTRICAL TEST EQUIPMENT

Objectives

To be competent in this area, the individual must be able to do the following:

- Describe the types of electrical test equipment
- Describe the use of electrical test equipment
- Use electrical test equipment

Learning tasks		Content	
1	Describe types of electrical test equipment	<ul style="list-style-type: none"> • Types • Purpose 	<ul style="list-style-type: none"> • Operation • Application
2	Describe the use of electrical test equipment	<ul style="list-style-type: none"> • Handling • Safety • Personal protective equipment • Equipment selection • Static electricity 	<ul style="list-style-type: none"> • Calibration • Inspection • Procedure • Code requirements
3	Use electrical test equipment	<ul style="list-style-type: none"> • Safety • Planning • Procedure 	<ul style="list-style-type: none"> • Personal protective equipment • Environmental considerations • Code requirements

Workplace achievement criteria

1. The individual will use a multimeter to measure voltage, current and resistance.

Passport sign off by a certified mechanic is required for each workplace achievement criterion.

Line (GAC): C – Use fundamental skills

COMPETENCY: C1 – DESCRIBE THE ELEVATING DEVICE INDUSTRY

Objectives

To be competent in this area, the individual must be able to do the following:

- Describe the history and terminology of vertical transportation
- Describe the principles of operation of vertical transportation systems

Learning tasks		Content	
1	Describe the history of vertical transportation	<ul style="list-style-type: none"> • Origin of elevating devices • Early modern elevators 	<ul style="list-style-type: none"> • Modern elevators
2	Describe the types of elevating devices	<ul style="list-style-type: none"> • Traction elevators • Hydraulic elevators • Escalators and moving walks • Lifts for persons with physical disabilities • Specialty lifts 	<ul style="list-style-type: none"> • Dumbwaiters • Material lifts • Incline lifts • Manlifts • Construction hoists

Line (GAC): C – Use fundamental skills

COMPETENCY: C2 – USE MATHEMATICS AND SCIENCE

Objectives

To be competent in this area, the individual must be able to do the following:

- Use mathematics and science to solve problems common to the elevating industry

Learning tasks	Content
1 Add, subtract, multiply and divide whole numbers, fractions, decimals and percentages	<ul style="list-style-type: none"> • Whole numbers • Fractions • Decimals • Percentages
2 Transpose formulas	<ul style="list-style-type: none"> • Introductory algebra
3 Use formulas to calculate area	<ul style="list-style-type: none"> • Circles • Cylinders • Squares • Rectangles • Triangles
4 Use formulas to calculate volume	<ul style="list-style-type: none"> • Cylinders • Square tanks • Rectangular tanks
5 Use formulas to calculate capacity	<ul style="list-style-type: none"> • Imperial measure • Metric measure
6 Convert units of measure	<ul style="list-style-type: none"> • Imperial units • Metric units
7 Use basic right-angle trigonometry	<ul style="list-style-type: none"> • Sine • Cosine • Tangent
8 Describe the properties of matter	<ul style="list-style-type: none"> • Density • Cohesion • Adhesion • Tensile strength • Ductility • Malleability • Elasticity • Conductivity
9 Describe the principles of heat transfer	<ul style="list-style-type: none"> • Convection • Radiation • Conduction

Line (GAC): C – Use fundamental skills

COMPETENCY: C3 – APPLY MECHANICAL PRINCIPLES

Objectives

To be competent in this area, the individual must be able to do the following:

- Describe mechanical principles as they relate to the elevator industry

Learning tasks	Content	
1 Describe the principles of power transmission components	<ul style="list-style-type: none"> • V-belts • Belt sheaves • Taper brushings • Chains and sprockets 	<ul style="list-style-type: none"> • Gear and gear reducers • Couplings, keys, pins and set screws • Belt alignment
2 Describe the principles of bearings and seals	<ul style="list-style-type: none"> • Bearing types • Bearing failures • Replacing bearings • Types of seals 	<ul style="list-style-type: none"> • Lubricating bearings <ul style="list-style-type: none"> • Cleaning • Repacking • Installing and removing seals <ul style="list-style-type: none"> • Pullers • Drivers
3 Describe the properties of materials and fastening technology	<ul style="list-style-type: none"> • Properties and applications <ul style="list-style-type: none"> • Ferrous metals • Non-ferrous metals • Alloys • Non-metallic materials • Mechanical properties of metals and alloys <ul style="list-style-type: none"> • Tensile strength • Yield strength • Hardness • Elongation rate • Conductivity 	<ul style="list-style-type: none"> • Fasteners for specific applications • Thread types • Grades of fasteners <ul style="list-style-type: none"> • Head marking • Strength of materials • Flame spread • Reaction between dissimilar materials • Material profiles • Gauges of material
4 Describe the principles of lubrication	<ul style="list-style-type: none"> • Types and properties • Use of lubricating devices 	<ul style="list-style-type: none"> • Storage • Disposal requirements
5 Describe the principles of mechanical advantage	<ul style="list-style-type: none"> • Levers • Pulleys 	<ul style="list-style-type: none"> • Gear ratios
6 Identify, select and use fasteners and locking devices.	<ul style="list-style-type: none"> • Bolts • Screws • Studs • Retaining rings 	<ul style="list-style-type: none"> • Retaining pins • Rivets • Thread measurement

Learning tasks	Content
<p>7 Describe the service of shafts and shaft attachments</p>	<ul style="list-style-type: none"> • Terminology • Shaft types <ul style="list-style-type: none"> • Drive • Counter • Shaft • Hollow • Shafting <ul style="list-style-type: none"> • Types • Uses • Sizes • Identification • Stresses <ul style="list-style-type: none"> • Types • Source • Reduction • Bearing placement • Maintenance • Shaft repair methods <ul style="list-style-type: none"> • Straightening • Spray welding • Attachments <ul style="list-style-type: none"> • Bearings • Hubs • Couplings • Sprocket • Gears • Compression fittings • Taper lock bushings • Attachment installation <ul style="list-style-type: none"> • Fits and tolerances • Expansion fitting • Shrink fitting • Concentricity • Attachment removal <ul style="list-style-type: none"> • Polars • Hydraulic press • Heat • Cooling • Hydraulic assist

Line (GAC): C – Use fundamental skills

COMPETENCY: C4 – READ DRAWINGS AND SPECIFICATIONS

Objectives

To be competent in this area, the individual must be able to do the following:

- Describe the principles of visualization, projection and views
- Describe the principles of print reading
- Describe information contained on elevating device drawings
- Interpret information contained on drawings

Learning tasks	Content	
1 Describe the principles of visualization, projection and views	<ul style="list-style-type: none"> • Orientation of objects • Third versus first angle of projection • Basic arrangement of views 	<ul style="list-style-type: none"> • Transferring dimensions • Auxiliary and section views • Isometric and exploded views
2 Describe the principles of print reading	<ul style="list-style-type: none"> • Drawing types <ul style="list-style-type: none"> • Information contained • Views <ul style="list-style-type: none"> • Plan • Elevation • Cross-section • Symbols 	<ul style="list-style-type: none"> • Scale • Specifications • Units of measure • Title blocks • Revisions • Dimensioning
3 Describe the information contained on elevating device drawings	<ul style="list-style-type: none"> • Main layout drawings <ul style="list-style-type: none"> • Plan views • Elevation views • Specifications • Position of elevating device to grid lines 	<ul style="list-style-type: none"> • Supplemental drawings <ul style="list-style-type: none"> • Construction details
4 Interpret information with respect to the positioning of components	<ul style="list-style-type: none"> • Position of guide rails • Size and orientation of car frame • Pit equipment 	<ul style="list-style-type: none"> • Machine room/space equipment • Control room/space equipment
5 Interpret information with respect to clearances	<ul style="list-style-type: none"> • Sill-to-sill running clearance • Car-to-car counterweight clearance • Car-to-hoistway wall clearance 	<ul style="list-style-type: none"> • Clearances at top and bottom of hoistway • Run-by, buffer stroke, and clearances • Controller and main disconnect clearances
6 Interpret information with respect to power requirements	<ul style="list-style-type: none"> • Location of main electrical components <ul style="list-style-type: none"> • Main disconnect • Car light disconnect/power supply • Signal switches • Dispatcher disconnect switches 	<ul style="list-style-type: none"> • Elevating device power requirements <ul style="list-style-type: none"> • Voltage • Amperage

Line (GAC): C – Use fundamental skills

COMPETENCY: C5 – USE ACTS, REGULATIONS AND CODES

Objectives

To be competent in this area, the individual must be able to do the following:

- Explain the relationship between acts, regulations and codes
- Describe how the various acts, regulations and codes apply to the elevating industry
- Locate information in the acts, regulations and codes

Learning tasks	Content	
1 Explain the relationship between acts, regulations and codes	<ul style="list-style-type: none"> • Relationship between acts, regulations and codes • Document information 	
2 Describe how the various acts, regulations and codes apply to the elevating industry	<ul style="list-style-type: none"> • Acts • Regulations • Codes • Scope • Reference publications • Definitions • Directives • Safety orders 	<ul style="list-style-type: none"> • Information bulletins • Legal responsibilities <ul style="list-style-type: none"> • Apprentice • Certified elevating devices mechanic • Contractor • Owner • Code requirements
3 Locate information in the acts, regulations and codes	<ul style="list-style-type: none"> • Scope • Parts and sections layout • Numbering system • Terminology • Definitions 	<ul style="list-style-type: none"> • Table of contents • Index • Appendices • Key word search • Code requirements

Line (GAC): C – Use fundamental skills

COMPETENCY: C6 – USE MANUFACTURER AND SUPPLIER DOCUMENTATION

Objectives

To be competent in this area, the individual must be able to do the following:

- Use manufacturer and supplier documentation
- Describe information contained in manufacturer and supplier documentation
- Use the Internet to locate manufacturer’s documentation

Learning tasks		Content	
1	Describe the purpose of documentation encountered in the elevator industry	<ul style="list-style-type: none"> • Handling • Parts • Installation instructions and requirements 	<ul style="list-style-type: none"> • Operation and maintenance manuals • Product specifications • Warranty information
2	Use manufacturer’s instructions	<ul style="list-style-type: none"> • Safety • Warnings • Adjustments • Maintenance • Part identification 	<ul style="list-style-type: none"> • Parts replacement • Parts replacement • Procedures • Storage
3	Describe how to use the Internet to locate manufacturers’ documentation	<ul style="list-style-type: none"> • Manufacturers’ websites • Search engines 	

Line (GAC): C – Use fundamental skills

COMPETENCY: C7 – PLAN A PROJECT

Objectives

To be competent in this area, the individual must be able to do the following:

- Describe how to plan and complete a small project
- Schedule work sequence
- Manage the basic elements of a project (time, resources and scope)
- Plan and complete a project

Learning tasks	Content	
1 Describe the organization of a project	<ul style="list-style-type: none"> • Project specifications • Safety • Sequence of operations • Prioritization • Coordination with other trades 	<ul style="list-style-type: none"> • Estimating materials • Tools and equipment • Inventory requirements <ul style="list-style-type: none"> • Timing of deliveries • Storage • Labelling materials • Consumables
2 Determine the project resources	<ul style="list-style-type: none"> • People • Equipment • Materials 	
3 Create a detailed schedule	<ul style="list-style-type: none"> • Material delivery • Installation • Coordination with sub-trades 	<ul style="list-style-type: none"> • Time estimates • Prioritization • Assigning tasks
4 Describe considerations when planning a project	<ul style="list-style-type: none"> • Coordination of all activities • Project communications 	<ul style="list-style-type: none"> • Housekeeping • Scheduling
5 Secure approval and sign off	<ul style="list-style-type: none"> • Inspections • Documents • Fixing deficiencies 	

Line (GAC): C – Use fundamental skills

COMPETENCY: C8 – APPLY TROUBLESHOOTING TECHNIQUES

Objectives

To be competent in this area, the individual must be able to do the following:

- Describe the process of troubleshooting
- Troubleshoot problems

Learning tasks	Content	
1 Describe the process of troubleshooting	<ul style="list-style-type: none"> • Personal safety • Public safety • Safe work practices <ul style="list-style-type: none"> • Jumper policy • Precautions for multiple units • Investigative techniques • Collecting information <ul style="list-style-type: none"> • Witnesses • Leaving undisturbed • Note taking • History • Comparison to working system • Consulting resources • Consulting others 	<ul style="list-style-type: none"> • Analyzing the information <ul style="list-style-type: none"> • Overall system • Mechanical or electrical • Isolating cause • Repairs • Validating the repair • Startup procedures • Documentation
2 Troubleshoot problems	<ul style="list-style-type: none"> • Reviewing history • Human senses • Diagnostic equipment • Collecting information • Cause and effect • Isolation 	<ul style="list-style-type: none"> • Procedures and flowcharts • Support resources • Validating the repair • Documentation

Workplace achievement criteria

1. The individual will troubleshoot a system fault and document the repair.

Passport sign off by a certified mechanic is required for each workplace achievement criterion.

Line (GAC): D – Install common components

COMPETENCY: D5 – INSTALL WIRING RACEWAYS, FIXTURES, AND WIRING

Objectives

To be competent in this area, the individual must be able to do the following:

- Describe the components of wiring raceways, fixtures and wiring
- Describe the installation of wiring raceways, fixtures and wiring
- Install wiring raceways, fixtures and wiring

Learning tasks	Content
1 Describe the components of wiring raceways, fixtures and wiring	<ul style="list-style-type: none"> • Types • Purpose • Operation • Application
2 Describe the installation of wiring raceways, fixtures and wiring	<ul style="list-style-type: none"> • Field wiring diagrams • Wireways • Conduit layout and fittings • Installation planning • Raceway layout • Raceway installation • Wire • Duct sizes and number of conductors • Grounding and bonding procedures • Strain blocks and fish papers • Fixture types • Tools required • Code requirements
3 Install wiring raceways, fixtures and wiring	<ul style="list-style-type: none"> • Planning • Tool use • Safety • Installation procedures • Interpret installation drawings • Testing • Code requirements
4 Describe procedures to install a structured cable system (coaxial cable only)	<ul style="list-style-type: none"> • Manufacturer's certification • Certification and warranty procedures • Cable layout • Installation techniques • Tools • Colour coding • Support systems and pathways • Placing cable • Termination of cables • Bonding • Fire stopping

Workplace achievement criteria

1. The individual will interpret drawings and specifications to install wiring raceways, fixtures and wiring.

Passport sign off by a certified mechanic is required for each workplace achievement criterion.

Line (GAC): E – Install traction elevators

COMPETENCY: E1 – DESCRIBE THE PRINCIPLES OF TRACTION SYSTEMS

Objectives

To be competent in this area, the individual must be able to do the following:

- Describe the components of a traction system
- Describe the purpose of traction system components
- Describe the principles of a traction system

Learning tasks	Content	
1 Describe the major components of a traction system and their purpose	<ul style="list-style-type: none"> • Machine <ul style="list-style-type: none"> • Motor • Brakes • Gearbox • Hoist ropes • Sheaves <ul style="list-style-type: none"> • Drive • Deflector • Compensating • Safeties <ul style="list-style-type: none"> • Types 	<ul style="list-style-type: none"> • Governor • Buffers <ul style="list-style-type: none"> • Oil • Spring • Compensating chains and ropes • Car • Counterweight • Guide rails • Slipper/roller guide • Controller
2 Describe the interaction between a rope and sheave	<ul style="list-style-type: none"> • Weight of car • Weight of counterweight 	<ul style="list-style-type: none"> • Requirements for traction <ul style="list-style-type: none"> • Balance during construction • Final balance • Rope tension • Sheave types <ul style="list-style-type: none"> • Groove • Diameter • Rope types • Sheave size with respect to rope diameter • Lubrication

Line (GAC): G – Apply the principles of electricity and electronics

COMPETENCY: G1 – DESCRIBE THE PRINCIPLES OF ELECTRICITY

Objectives

To be competent in this area, the individual must be able to do the following:

- Describe the principles of electrical safety
- Describe the structure of matter
- Describe the principles of direct current (DC) circuits
- Describe the principles of alternating current (AC) circuits
- Describe the principles of magnetism and electromagnetism
- Describe the principles of electrical measurement

Learning tasks	Content
1 Describe the principles of electrical safety	<ul style="list-style-type: none"> • Lockout and tagout procedures • Hazards from stored electrical energy and other sources • Testing for presence of electricity • Use of jumpers
2 Describe the principles of electricity in relation to the structure of matter	<ul style="list-style-type: none"> • Atomic structure of matter <ul style="list-style-type: none"> • Free electrons • Sources of electricity • Nature of electricity • Static electricity
3 Describe the principles of DC electrical circuits	<ul style="list-style-type: none"> • Terminology <ul style="list-style-type: none"> • Direct current • Voltage <ul style="list-style-type: none"> • Electromotive force (EMF) • Potential difference (PD) • Current • Resistance • Ohm’s Law • Power • Watt’s Law • Symbols • Electrical circuits <ul style="list-style-type: none"> • Series circuits • Parallel circuits • Series and parallel circuits • Kirchoff’s laws • Power and heat loss • Electrical components <ul style="list-style-type: none"> • Resistors <ul style="list-style-type: none"> • Types • Series parallel • Colour coding • Ratings • Potentiometers • Rheostats • Capacitors <ul style="list-style-type: none"> • Types • Series parallel • Colour coding • Ratings • Timing circuits • Uses • Diodes <ul style="list-style-type: none"> • Types identification • Uses • Capacities • Series and parallel • Measurement

Learning tasks		Content	
4	Describe voltage, current and resistance measurements	<ul style="list-style-type: none"> • Precautions <ul style="list-style-type: none"> • Switching from ohmmeter to voltage and amperage scales • Moisture • Preventing electrical shock • Measuring AC and DC voltage and amperage <ul style="list-style-type: none"> • Analog meters • Digital meters 	<ul style="list-style-type: none"> • Measuring resistance <ul style="list-style-type: none"> • Ohmmeter • Multimeter • Megger
5	Describe the principles of permanent magnetism	<ul style="list-style-type: none"> • Properties of permanent magnets • Action of magnetic poles 	<ul style="list-style-type: none"> • Magnetic fields • Magnetic properties
6	Describe the principles of electromagnetism	<ul style="list-style-type: none"> • Properties of electromagnets • Action of magnetic fields around a conductor • Principles of induced voltage 	<ul style="list-style-type: none"> • Factors that affect induced voltage • Lenz's Law
7	Describe the principles of AC electrical circuits	<ul style="list-style-type: none"> • Terminology • Symbols • Root mean square value of voltage and current • Inductance 	<ul style="list-style-type: none"> • Capacitance • Impedance • AC power • Rectifiers
8	Describe the operation of transformers	<ul style="list-style-type: none"> • Mutual induction • Construction • Turns ratio • Voltage changing 	<ul style="list-style-type: none"> • Ratings • Types <ul style="list-style-type: none"> • Autotransformer • Isolation
9	Describe three-phase systems	<ul style="list-style-type: none"> • Supplies • Transformer connections 	
10	Apply the principles of electricity to elevating device	<ul style="list-style-type: none"> • Installation • Testing • Code requirements 	
11	Identify components of distribution centres	<ul style="list-style-type: none"> • Overcurrent protection • Overload protection • Busbars 	<ul style="list-style-type: none"> • Enclosure type • Enclosure rating

Line (GAC): G – Apply the principles of electricity and electronics

COMPETENCY: G2 – READ ELECTRICAL DRAWINGS AND SPECIFICATIONS

Objectives

To be competent in this area, the individual must be able to do the following:

- Describe the purpose wiring and schematic diagrams
- Use wiring and schematic diagrams
- Convert between wiring and schematic diagrams

Learning tasks		Content	
1	Identify common drawing symbols	<ul style="list-style-type: none"> • Components • Line weights 	<ul style="list-style-type: none"> • Conventions • Labels
2	Describe the conventions used for schematic diagrams	<ul style="list-style-type: none"> • Use of lines • Arrangement of components 	<ul style="list-style-type: none"> • Labels and identifications • Road map
3	Describe the conventions used for field wiring diagrams	<ul style="list-style-type: none"> • Use of lines • Arrangement of components • Labels and identifications 	
4	Describe the conventions used for single-line (block) diagrams	<ul style="list-style-type: none"> • Use of lines • Arrangement of components • Labels and identifications 	
5	Use diagrams to convey information	<ul style="list-style-type: none"> • Schematic • Wiring 	<ul style="list-style-type: none"> • Care and handling • As built drawings
6	Convert between schematic and field wiring diagrams	<ul style="list-style-type: none"> • Diagram layout • Wiring diagrams 	
7	Interpret information with respect to power requirements	<ul style="list-style-type: none"> • Elevating device power requirements <ul style="list-style-type: none"> • Voltage • Amperage • Disconnect 	

Line (GAC): G – Apply the principles of electricity and electronics

COMPETENCY: G4 – DESCRIBE ELECTRICAL AND ELECTRONIC CONTROLS

Objectives

To be competent in this area, the individual must be able to do the following:

- Describe electrical control devices
- Describe semiconductor power devices
- Describe the operation of rectifiers and power supplies
- Describe operational amplifiers and their applications
- Describe digital logic devices and applications
- Describe the operation of programmable relays and PLCs
- Describe the operation of motor controls

Learning tasks	Content
1 Describe electrical control devices	<ul style="list-style-type: none"> • Types <ul style="list-style-type: none"> • Switches • Relays • Contactors • Solenoids • Timers • Circuit protection devices • Symbols • Operation • Characteristics • Ratings • Handling precautions • Testing • Applications
2 Describe semiconductor power devices	<ul style="list-style-type: none"> • Types <ul style="list-style-type: none"> • Diodes • Zener diodes • Photo diodes • Light-emitting diodes • Varistors • Transistors <ul style="list-style-type: none"> • Bipolar junction transistors (BJTs) • Field-effect transistors (FETs) • Insulated-gate bipolar transistors (IGBTs) • Thyristors <ul style="list-style-type: none"> • Silicon controlled rectifiers (SCRs) • Triodes for alternating current (Triacs) • Symbols • Operation • Characteristics • Ratings • Packaging • Handling precautions • Testing • Applications

Learning tasks	Content	
3 Describe the operation of rectifiers and power supplies	<ul style="list-style-type: none"> • Purpose • Types <ul style="list-style-type: none"> • Half-wave • Full wave • Three-phase • Filters • Regulators 	<ul style="list-style-type: none"> • Operation • Characteristics • Ratings • Packaging • Handling precautions • Testing • Applications
4 Describe operational amplifiers and their applications	<ul style="list-style-type: none"> • Purpose • Operation • Characteristics and ratings • Packaging 	<ul style="list-style-type: none"> • Handling precautions • Testing • Applications
5 Describe digital logic devices and their applications	<ul style="list-style-type: none"> • Operation • Characteristics and ratings • Packaging 	<ul style="list-style-type: none"> • Handling precautions • Testing • Applications
6 Describe the operation and programming of programmable relays and programmable logic controllers (PLCs)	<ul style="list-style-type: none"> • Features • Operation • Characteristics and ratings 	<ul style="list-style-type: none"> • Packaging • Handling precautions • Testing
7 Describe motor drives	<ul style="list-style-type: none"> • DC drives <ul style="list-style-type: none"> • Ward-Leonard • Pulse-width modulation • SCR drives • IGBT drives • AC drives <ul style="list-style-type: none"> • Single-speed AC motors • Two speed AC motors • Variable voltage-variable frequency (VVVF) drives • Inverter drives (open loop and closed loop) • Regenerative drives • Soft starts 	<ul style="list-style-type: none"> • Encoders • Tachometers • Features • Operation • Characteristics • Ratings • Packaging • Handling precautions • Testing • Maintenance

Line (GAC): G – Apply the principles of electricity and electronics

COMPETENCY: G5 – INSTALL ELECTRICAL SYSTEMS

Objectives

To be competent in this area, the individual must be able to do the following:

- Describe the installation of conductors
- Describe the installation of raceways
- Describe the installation of travelling cables
- Describe the installation of elevator-related circuits
- Install raceways, conductors and components

Learning tasks		Content	
1	Describe the installation of conductors	<ul style="list-style-type: none"> • Types • Materials • Gauge • Insulation (thermal rating) 	<ul style="list-style-type: none"> • Ampacity • Termination • Marking
2	Describe the installation of raceways	<ul style="list-style-type: none"> • Types • Sizes • Support • Bending 	<ul style="list-style-type: none"> • Planning runs • Raceway fill • Installation of conductors
3	Describe the installation of travelling cables	<ul style="list-style-type: none"> • Construction • Handling • Preparation 	<ul style="list-style-type: none"> • Installation • Replacement • Protection
4	Describe elevator-related circuits	<ul style="list-style-type: none"> • Electrical protective devices <ul style="list-style-type: none"> • Operation systems • Door operation • Direction selection • Acceleration • Deceleration • Final stop 	<ul style="list-style-type: none"> • Safety circuit components • Interlocks • Normal terminal slow downs • Emergency terminal slow downs • Redundancy • Fire service and emergency power
5	Install raceways, conductors and components	<ul style="list-style-type: none"> • Raceway runs • Placement of boxes, fittings and supports • Number of conductors in runs • Raceway size 	<ul style="list-style-type: none"> • Conductor insulation rating and size • Box and fitting sizes • Devices and switches • Code requirements

Learning tasks		Content	
6	Determine distribution centre requirements	<ul style="list-style-type: none"> • Mounting requirements • Clearance requirements • Lug rating • Environment 	<ul style="list-style-type: none"> • Torque requirements • Means of egress • Ventilation
7	Determine device installation requirements	<ul style="list-style-type: none"> • Wiring methods • Environment • Polarity • Location • Finishes 	<ul style="list-style-type: none"> • Bonding • Support • Construction specification requirements • Manufacturer’s specifications

Workplace achievement criteria

1. The individual will interpret drawings and specifications to install a wiring raceway.
2. The individual will interpret drawings and specifications to install a fixture.
3. The individual will extract information from a wiring diagram to install wiring.

Passport sign off by a certified mechanic is required for each workplace achievement criterion.

Line (GAC): G – Apply the principles of electricity and electronics

COMPETENCY: G6 – MAINTAIN ELECTRICAL AND ELECTRONIC SYSTEMS

Objectives

To be competent in this area, the individual must be able to do the following:

- Perform maintenance checks
- Describe the maintenance of motors and generators
- Maintain motors and generators

Learning tasks	Content	
1 Perform maintenance checks	<ul style="list-style-type: none"> • Checks <ul style="list-style-type: none"> • Insulation condition • Termination tightness • Contacts • Heat • Interlocks • Verification of correct components • Brushes and commutator • Verification of voltage levels • Grounding • Verification of inspection controls 	<ul style="list-style-type: none"> • Verification of safety circuits • Emergency lights • Communication equipment • Verification of fire service and emergency power • Battery replacements • Cleaning <ul style="list-style-type: none"> • Filters • Fans • Lubrication • Maintaining logs • Code requirements
2 Describe the maintenance of motors and generators	<ul style="list-style-type: none"> • Brushes • Commutator • Lubrication • Bearings • Compounding 	<ul style="list-style-type: none"> • Replacement • Testing for grounds • Cleaning • Safety practices
3 Maintain motors and generators	<ul style="list-style-type: none"> • Equipment • Procedures • Safety 	<ul style="list-style-type: none"> • Environmental considerations • Manufacturer's specifications
4 Describe the removal of unused conductors, cables, raceways, boxes and fittings	<ul style="list-style-type: none"> • Scope of work • Limits of removal • Maintaining system integrity 	<ul style="list-style-type: none"> • Safety <ul style="list-style-type: none"> • Electrical lockout • Health hazards • Disposal
5 Describe maintenance procedures for conductors and cables	<ul style="list-style-type: none"> • Torque specs 	
6 Describe maintenance procedures for motor starters and motor controls	<ul style="list-style-type: none"> • Preventative maintenance • Infrared testing 	

Workplace achievement criteria

1. The individual will use maintenance procedures and check sheets to maintain an electrical system.

Passport sign off by a certified mechanic is required for each workplace achievement criterion.

Line (GAC): G – Apply the principles of electricity and electronics

COMPETENCY: G7 – TROUBLESHOOT ELECTRICAL AND ELECTRONIC SYSTEMS

Objectives

To be competent in this area, the individual must be able to do the following:

- Describe troubleshooting of electrical and electronic systems
- Troubleshoot electrical and electronic systems
- Describe troubleshooting techniques for DC machines
- Describe troubleshooting techniques for AC machines
- Troubleshoot motors and generators

Learning tasks	Content
1 Describe troubleshooting of electrical and electronic systems	<ul style="list-style-type: none"> • Use of drawings and other resources • Use of test equipment • Tracing techniques • Analyzing information • Narrowing the focus
2 Troubleshoot electrical and electronic systems	<ul style="list-style-type: none"> • Isolating the cause • Flowcharts • Use of senses • History • Repair • Validate the repair
3 Describe troubleshooting techniques for DC machines	<ul style="list-style-type: none"> • Procedure • Resources • Commutation problems • Shorted windings • Grounded windings • Wiring and connections • Contactors • Repair • Test
4 Describe troubleshooting techniques for AC machines	<ul style="list-style-type: none"> • Overloads • Over current devices • Field circuit faults • Loop circuit faults • Loss of phase • Shorted windings • Grounded windings • Open rotor bars • Wiring and connections • Contactors • Overloads • Over current devices
5 Troubleshoot motors	<ul style="list-style-type: none"> • Procedures • Equipment • Safety
6 Describe troubleshooting procedures for motor starters and motor controls	<ul style="list-style-type: none"> • Visual inspection • Analyzing diagrams • Meter measurements • Infrared testing • Common faults

Workplace achievement criteria

1. The individual will troubleshoot an electrical or electronic fault and test for proper operation.

Passport sign off by a certified mechanic is required for each workplace achievement criterion.

Line (GAC): K – Repair elevating systems

COMPETENCY: K2 – SERVICE BRAKING SYSTEMS

Objectives

To be competent in this area, the individual must be able to do the following:

- Describe how to service braking systems
- Service braking systems

Learning tasks	Content	
1 Describe how to service braking systems	<ul style="list-style-type: none"> • Personal safety • Public safety • Material • Shutdown procedures • Work procedures • Manufacturer’s documentation • Main brake procedures • Emergency brake procedures 	<ul style="list-style-type: none"> • Testing requirements • Clean-up • Verifying operation • Environmental considerations • Start-up procedures • Documentation • Code requirements
2 Service braking systems	<ul style="list-style-type: none"> • Procedures • Safety 	<ul style="list-style-type: none"> • Code requirements

Workplace achievement criteria

1. The individual will service the brakes—including servicing drum brakes and disc brakes—test and verify operation on a minimum of three different elevators, and complete the required documentation.

Passport sign off by a certified mechanic is required for each workplace achievement criterion.

Line (GAC): K – Repair elevating systems

COMPETENCY: K6 – REPAIR MACHINES AND MOTORS

Objectives

To be competent in this area, the individual must be able to do the following:

- Describe the repair of machines and motors
- Repair machines and motors

Learning tasks	Content
1 Describe the repair of machines and motors	<ul style="list-style-type: none"> • Personal safety • Materials • Shutdown procedures • Work procedures • Rigging and hoisting • Machines <ul style="list-style-type: none"> • Thrust bearing replacement • Worm removal and replacement • Ring gear removal and replacement • Ring gear bearing replacement • Main motor <ul style="list-style-type: none"> • Removal • Bearing replacement • Re-installation and alignment • Manufacturer’s documentation • Clean-up • Verify operation • Environmental considerations • Start-up procedures • Documentation
2 Repair machines and motors	<ul style="list-style-type: none"> • Procedures • Safety

Workplace achievement criteria

1. The individual will replace a bearing on a machine, motor or generator and complete the required documentation.

Passport sign off by a certified mechanic is required for each workplace achievement criterion.

Line (GAC): N – Install rack and pinion personnel hoists

COMPETENCY: N1 – LAY OUT THE BASE AND BUFFER ASSEMBLY

Objectives

To be competent in this area, the individual must be able to do the following:

- Describe how to lay out a base and buffer assembly
- Lay out a base and buffer assembly

Learning tasks	Content
1 Describe how to lay out a base and buffer assembly	<ul style="list-style-type: none"> • Survey of base location • Confirmation of travel, pit, and overhead dimensions • Suitability of base slab and shoring • Buffer locations
2 Lay out a base and buffer assembly	<ul style="list-style-type: none"> • Planning • Tool use • Safety • Lay out procedures <ul style="list-style-type: none"> • Base suitability • Buffer assembly • Problem solving • Code requirements

Workplace achievement criteria

1. The individual will lay out a base and buffer assembly on a minimum of three separate setups.

Passport sign off by a certified mechanic is required for each workplace achievement criterion.

Line (GAC): N – Install rack and pinion personnel hoists

COMPETENCY: N2 – INSTALL MASTS, BRACES, ANCHORS AND LIMIT CAMS

Objectives

To be competent in this area, the individual must be able to do the following:

- Describe the components of masts, braces and anchors
- Describe the installation of masts, braces and anchors
- Install masts, braces and anchors

Learning tasks	Content
1 Describe the components of masts, braces and anchors	<ul style="list-style-type: none"> • Mast types • Rack types • Braces <ul style="list-style-type: none"> • Types • Sizes • Hardware • Anchors <ul style="list-style-type: none"> • Types • Suitability
2 Describe the installation of masts, braces and anchors	<ul style="list-style-type: none"> • Mast • Braces <ul style="list-style-type: none"> • Location • Type • Anchors
3 Install masts, braces, anchors and limit cams	<ul style="list-style-type: none"> • Installation procedures <ul style="list-style-type: none"> • Mast • Braces • Anchors • Limit cams • Cathead • Cable trolley • Tool use • Safety • Tower and rack alignment • Alignment procedures • Code requirements

Workplace achievement criteria

1. The individual will install mast sections, braces, anchors and limit cams on a single unit, using proper rigging and hoisting techniques, a minimum of three times.
2. The individual will install mast sections, braces, anchors and limit cams on a twin unit, using proper rigging and hoisting techniques, a minimum of three times.
3. The individual will raise a cathead, adjust a cable trolley and adjust a limit cam on a single unit, using proper rigging and hoisting techniques, a minimum of three times.
4. The individual will raise a cathead, adjust a cable trolley and adjust a limit cam on a twin unit, using proper rigging and hoisting techniques, a minimum of three times.

Passport sign off by a certified mechanic is required for each workplace achievement criterion.

Line (GAC): N – Install rack and pinion personnel hoists

COMPETENCY: N3 – INSTALL HOIST CAR, DRIVE ASSEMBLY AND COUNTERWEIGHT ASSEMBLY

Objectives

To be competent in this area, the individual must be able to do the following:

- Describe the components of a hoist car, drive assembly and counterweight assembly
- Describe the installation of a hoist car, drive assembly and counterweight assembly
- Install a hoist car, drive assembly and counterweight assembly

Learning tasks	Content	
1 Describe the components of a hoist car, drive assembly and counterweight assembly	<ul style="list-style-type: none"> • Hoist car <ul style="list-style-type: none"> • Over speed device • Limit switches • Drive assembly • Travelling cable <ul style="list-style-type: none"> • Storage 	<ul style="list-style-type: none"> • Counterweight assembly <ul style="list-style-type: none"> • Cathead • Leveller • Counterweight wire ropes • Counterweight
2 Describe the installation of a hoist car, drive assembly, and counterweight assembly	<ul style="list-style-type: none"> • Planning • Installation procedures <ul style="list-style-type: none"> • Hoist car <ul style="list-style-type: none"> • Over speed device • Limit switches • Drive assembly • Counterweight assembly <ul style="list-style-type: none"> • Cathead • Leveller • Counterweight wire ropes • Counterweight 	<ul style="list-style-type: none"> • Travelling cable • Roller guides adjustment • Code requirements
3 Install a hoist car, a drive assembly, and a counterweight assembly	<ul style="list-style-type: none"> • Tool use • Safety • Installation Procedures <ul style="list-style-type: none"> • Hoist car <ul style="list-style-type: none"> • Over speed device • Limit switches • Drive assembly • Counterweight assembly <ul style="list-style-type: none"> • Cathead • Leveller • Counterweight wire ropes 	<ul style="list-style-type: none"> • Counterweight • Travelling cable • Roller guides adjustment alignment procedures • Code requirements

Workplace achievement criteria

1. The individual will install a hoist car, a drive assembly and a counterweight assembly, using proper rigging and hoisting techniques, on a minimum of five separate setups.

Passport sign off by a certified mechanic is required for each workplace achievement criterion.

Line (GAC): N – Install rack and pinion personnel hoists

COMPETENCY: N4 – INSTALL HOISTWAY DOOR WIRING, AND INSPECT HOISTWAY DOOR ASSEMBLY AND HOARDING

Objectives

To be competent in this area, the individual must be able to do the following:

- Describe the components of hoistway doors assembly and hoistway hoarding
- Describe the installation of a hoistway door assembly and hoistway hoarding
- Verify the correct installation of a hoistway door assembly and hoistway hoarding

Learning tasks	Content
1 Describe the components of a hoistway door assembly	<ul style="list-style-type: none"> • Types • Purpose • Operation • Application
2 Describe the installation of a hoistway door assembly and hoistway hoarding	<ul style="list-style-type: none"> • Components <ul style="list-style-type: none"> • Interlock • Car door mechanical lock • Code requirements
3 Verify the correct installation of a hoistway door assembly and hoistway hoarding	<ul style="list-style-type: none"> • Door assembly <ul style="list-style-type: none"> • Interlock alignment • Car door mechanical lock assembly <ul style="list-style-type: none"> • Hoarding requirements • Fastening requirements
	<ul style="list-style-type: none"> • Hoarding requirements • Fastening requirements • Clearances • Code requirements
	<ul style="list-style-type: none"> • Confirmation of <ul style="list-style-type: none"> • Door assembly <ul style="list-style-type: none"> • Interlock alignment • Car door mechanical lock assembly <ul style="list-style-type: none"> • Hoarding requirements • Fastening requirements
	<ul style="list-style-type: none"> • Testing • Code requirements

Workplace achievement criteria

1. The individual will inspect the installation of a hoistway door assembly and associated hoarding using code references, and install the wiring of a hoistway door.

Passport sign off by a certified mechanic is required for each workplace achievement criterion.

Line (GAC): N – Install rack and pinion personnel hoists

COMPETENCY: N5 – INSTALL BASE AND CAR CONTROL PANEL AND WIRING

Objectives

To be competent in this area, the individual must be able to do the following:

- Describe the components of a base and car control panel
- Describe how to set and test a final terminal stop-motion switch
- Describe the installation of a base and car control panel and wiring
- Wire a base and car control panel
- Wire and set a final terminal stop-motion switch

Learning tasks	Content
1 Describe the components of a base and car control panel	<ul style="list-style-type: none"> • Purpose • Operation
2 Describe how to set and test a final terminal stop-motion switch	<ul style="list-style-type: none"> • Purpose • Operation • Safety
3 Describe the installation of a base and car control panel and wiring	<ul style="list-style-type: none"> • Field wiring diagrams • Wire • Installation planning <ul style="list-style-type: none"> • Grounding and bonding procedures • Testing
4 Wire a base and car control panel	<ul style="list-style-type: none"> • Installation procedures • Safety • Interpret wiring drawings <ul style="list-style-type: none"> • Testing • Code requirements
5 Wire and set a final terminal stop-motion switch	<ul style="list-style-type: none"> • Installation procedures • Adjusting <ul style="list-style-type: none"> • Testing • Code requirements

Workplace achievement criteria

1. The individual will install a base and car control panel and a final terminal stopping device.

Passport sign off by a certified mechanic is required for each workplace achievement criterion.

Line (GAC): N – Install rack and pinion personnel hoists

COMPETENCY: N6 – ADJUST AND COMMISSION PERSONNEL HOISTS

Objectives

To be competent in this area, the individual must be able to do the following:

- Describe adjustments made to rack and pinion personnel hoists
- Adjust a rack and pinion personnel hoist
- Describe testing and commissioning procedures

Learning tasks	Content	
1 Describe adjustments made to rack and pinion personnel hoists	<ul style="list-style-type: none"> • Assembled mechanical system <ul style="list-style-type: none"> • Car and counterweight • Mast • Braces 	<ul style="list-style-type: none"> • Electrical <ul style="list-style-type: none"> • Car • Hoistway doors • Controllers • Hoarding
2 Adjust a rack and pinion personnel hoist	<ul style="list-style-type: none"> • Processes • Tools 	<ul style="list-style-type: none"> • Tolerances <ul style="list-style-type: none"> • Alignment • Cam followers • Tooth alignment • Safeties • Guide rollers • Code requirements
3 Adjust and commission a rack and pinion personnel hoist	<ul style="list-style-type: none"> • Purpose of commissioning <ul style="list-style-type: none"> • Process • Pre-inspection checklist • Tests run • Verification of all code-required functions 	<ul style="list-style-type: none"> • Documentation • Code requirements

Workplace achievement criteria

1. The individual will adjust and commission a rack and pinion personnel hoist on a minimum of three separate setups.

Passport sign off by a certified mechanic is required for each workplace achievement criterion.

Line (GAC): N – Install rack and pinion personnel hoists

COMPETENCY: N7 – DISMANTLE PERSONNEL HOISTS

Objectives

To be competent in this area, the individual must be able to do the following:

- Safely dismantle a hoist without a counterweight
- Safely dismantle a personnel hoist with a counterweight

Learning tasks		Content	
1	De-rig the counterweight and counterweight cables	<ul style="list-style-type: none"> • Safety procedures • Lowering the counterweight to ground • Coiling the cables on the roof of the car 	<ul style="list-style-type: none"> • Removing the cathead • Removing the counterweight
2	Dismantle the mast and braces	<ul style="list-style-type: none"> • Safety procedures • Using a mobile or tower crane • Using a cartop jib crane 	
3	Dismantle the cable trolley	<ul style="list-style-type: none"> • Safety procedures • Removing the support arm and supply cable • Removing the cable trolley 	
4	Remove the drive and car	<ul style="list-style-type: none"> • Safety procedures • Supporting the car and drive 	<ul style="list-style-type: none"> • Permanently disconnecting the main power • Disconnecting the wiring

Workplace achievement criteria

1. The individual will develop a site-specific plan and dismantle a personnel hoist without a counterweight, following safety procedures, a minimum of three times.
2. The individual will develop a site-specific plan and dismantle a personal hoist with a cable, following safety procedures, a minimum of three times.

Passport sign off by a certified mechanic is required for each workplace achievement criterion.

SECTION 4

TRAINING PROVIDER

STANDARDS

This section defines the facility requirements, tools and equipment, reference materials and instructor requirements for the Elevating Devices Mechanic (Class C) program.

Facility requirements

Classroom area

The classroom area where the program is delivered must provide the following:

- At least 22 square feet per student
- Comfortable seating and tables that are conducive for learning
- Compliance with the local and national fire codes and occupational safety requirements
- Compliance with applicable municipal zoning bylaws for technical instruction and education facilities
- Overhead and multimedia projectors with a projection screen
- A whiteboard with marking pens and erasers
- Lighting controls to allow easy visibility of the projection screen while allowing students to take notes
- Shades or blinds on the windows that can be adjusted for sunlight
- Heating and air conditioning, as necessary, for year-round comfort
- Room acoustics that allow the instructor to be heard

Student facilities

The facilities for students taking the program must provide the following:

- Adequate eating area, as per WorkSafeBC requirements (OHS Regulation, Section 4.84, and WorkSafe BC guidelines)
- Adequate washroom facilities, as per WorkSafeBC requirements (OHS Regulation, Section 4.85, and WorkSafe BC guidelines)
- Personal storage lockers

Workshop areas

The workshop and laboratory areas where the program is delivered must provide the following:

- At least 3000 square feet of shop area, including a tool crib and workstations
- A 10-foot-high (minimum) ceiling in workshop areas
- An 8-foot-high (minimum) ceiling in lab areas
- Adequate heating, lighting and ventilation
- Refuse and recycling bins for used shop materials
- First-aid equipment
- Ability to support practical requirements, as outlined in the program outline

Instructor's office space

The office space for the instructor teaching the program must provide the following:

- Adequate office space for student consultation
- Desk and filing space
- Computer
- Internet access
- Printer
- Adequate storage facilities for material and training aids
- Access to a photocopier
- Telephone

Tools and equipment

Hand tools

- Alignment bar
- Bench vice
- Breaker bar
- Broom and dustpan
- Burrs
- Calculator
- C-clamp
- Chisels
- Dollies
- EMT benders
- Files
- Flashlight
- Gear pullers
- Hammers:
 - Ball peen
 - Claw
 - Mallet
 - Sledge
 - Soft-faced mallet
- Handcart
- Helicoil
- Hex keys (set)
- Knife
- Knock out set
- Levels
- Lubrication tools
- Lunar key (unlocking key)
- Pliers:
 - Crimpers
 - Linesman
 - Locking
 - Needle nose
 - Side cutters
 - Wire strippers
 - Snap ring
 - Water pump (slip joint)
- Plumb bob
- Pry bars
- Punch
- Riveting tools
- Roller
- Saws:
 - Hacksaw
 - Hand saw (wood)
- Scrapers
- Screwdrivers (complete set)
- Security screwdrivers
- Snips
- Suction cups for lifting
- Square
- Tap and die set
- Thread chaser
- Thread files
- Torque wrenches
- Wrenches:
 - Adjustable
 - Allen
 - Box end
 - Combination
 - Crows foot
 - Hook spanner
 - Open end
 - Pipe
 - Socket set
- Strap

Power hand tools

- Angle drill
- Angle grinder
- Blower
- Concrete drill
- Drills:
 - Electric
 - Cordless
- Drill bits
- Electric impact driver
- Extension cords
- Grinder
- Hole saw
- Hydraulic jacks
- Hydraulic press
- Lighting equipment
- Piping and threading equipment
- Reciprocating saw
- Soldering iron
- Vacuum cleaner

Lifting equipment

- A-Frames
- Beam clamps
- Beam trolley
- Block and tackle
- Bridles
- Chain hoists
- Chain slings
- Come-alongs
- Engine hoists
- Eye bolts
- Fibre rope
- Fibre slings
- Hand winches
- Hoist rings
- Hooks
- Hydraulic jack
- Jacks
- Ladders
- Nylon lifting straps
- Pinch bar
- Scaffolding
- Shackles (varying sizes)
- Spreader bar
- Tirfors
- Tripods
- Wire rope
- Wire slings

Personal protective equipment

- Coveralls
- Earmuffs
- Ear plugs
- Electrical gloves
- Eye wash kit
- Face shield
- Fire blanket
- Fire extinguisher
- First-aid kit
- Glasses
- Goggles
- Gloves
- Hard hat
- Lockout and tagout equipment
- Reflective vest
- Respirators
- Safety boots
- Safety harness, lanyard and lifeline
- Welding gloves
- Welding mask

Cutting and joining equipment

- Copper tube cutter
- Crimpers
- Flaring tools
- Gas cylinders
- Mechanical crimper
- Oxy-acetylene cutting equipment
- Tube bender
- Tube cutter

Measuring and layout tools

- Adjustable square
- Angle gauge
- Bevel protractor
- Clamp-on meter
- Combination set
- DC ammeter
- Dividers
- Door force gauge
- Feeler gauges
- Hydraulic pressure gauge
- Laser level
- Measuring tape (metric/Imperial)
- Megger
- Micrometer
- Multimeter
- Oscilloscope
- Plumb bob
- Rail gauge
- Rope tension gauge
- Rope thickness gauge
- Scale ruler
- Scribes
- Tachometer
- Temperature gauge
- Vernier caliper
- Vibration gauge
- Weigh scale

Reference materials

This section contains a summary of the important acts, regulations and codes that apply to the competencies in the program outline.

CSA Group
CAN/CSA–Z185-M87: Safety Code for Personnel Hoists. Toronto, Ontario: CSA Group.

CSA Group
AA.7- 2007/CSA B44.7-07 Performance-based safety code for elevators and Escalators. Toronto, Ontario: CSA Group.

CSA Group
CAN/CSA–B355-09: Lifts for Persons with Physical Disabilities. Toronto, Ontario: CSA Group.

CSA Group
ASME A17.1-2016/CSA B44 16: Safety Code for Elevators and escalators. Toronto, Ontario: CSA Group.

CSA Group
C22.1-18: Canadian Electrical Code, Part 1 (24th Edition) Safety standard for electrical installations. Mississauga, Ontario: CSA Group. Elevator World Inc. 2020. Elevator Industry Field Employees’ Handbook. Elevator World Inc.: Mobile, Alabama.

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Hazardous Products Act. [R.S.C., 1985, c. H-3]. Ottawa, Ontario: Department of Justice. Retrieved 2 February 2022 from laws-lois.justice.gc.ca/eng/acts/h-3/.

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Safety Standards Act. [SBC 2003]. Victoria, B.C.: Queen’s Printer. Retrieved 2 February 2022 from www.bclaws.gov.bc.ca/civix/document/id/complete/statreg/00_03039_01.

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Workers Compensation Act. [RSBC 2019]. Victoria, B.C.: Queen’s Printer. Retrieved 2 February 2022 from www.bclaws.gov.bc.ca/civix/document/id/complete/statreg/19001_00. Also viewable at www.worksafebc.com/en/law-policy/occupational-health-safety/searchable-ohs-regulation/workers-compensation-act [accessed 2 February 2022].

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Occupational Health and Safety (OHS) Regulation 2021. Richmond, British Columbia: WorkSafe BC. Available from www.worksafebc.com/en/law-policy/occupational-health-safety/searchable-ohs-regulation/ohs-regulation [accessed 2 February 2022].

Abbreviations used in reference citations

CSA	CSA Group (formerly Canadian Standards Association)
FE	Field Employees
OHS	Occupational Health and Safety
WCA	Workers Compensation Act
WSBC	WorkSafeBC

LINE A: USE SAFE WORK PRACTICES

A1: Control workplace hazards

- WCA, Part 2, Division 4: General Duties of Employers, Workers and Others
- OHS Regulation, Part 5, Section 5.2: General information requirement
- OHS Regulation, Part 6, Section 6.6: Assessment and Classification
- OHS Regulation, Part 6, Section 6.8: Procedures
- FE Safety Handbook, Section 4.2–4.4: Fall Arrest
- FE Safety Handbook, Section 7: Lockout and Tagout

A2: Comply with the OHS Regulation and WorkSafeBC standards

- WCA, Part 2, Division 4: General Duties of Employers, Workers and Others
- WCA Part 4, Division 3, Section 149: Worker obligation to give notice of injury or disease to employer

A3: Use WHMIS

- Hazardous Products Act (Canada)
- WSBC Guideline G5.3-1: WHMIS application

A4: Use personal protective equipment

- OHS Regulation, Part 8: Personal Protective Equipment and Clothing
- FE Safety Handbook, Section 3: Personal Protective Equipment

A5: Apply fire prevention practices

- OHS Regulation Part 4, Section 4.32: Access to work areas
- OHS Regulation, Part 5, Section 5.97: Emergency plan
- WSBC Guideline G5.97: Emergency procedures – emergency plan
- OHS Regulation, Part 5, Section 5.99: Risk assessment
- WSBC Guideline G5.99: Risk assessment

LINE B: USE TOOLS AND EQUIPMENT

B1: Use hand tools

- FE Safety Handbook, Section 9.1: Hand Tools

B2: Use power tools

- FE Safety Handbook, Section 9.2: Portable Electrical Tools and

B3: Use measuring and alignment tools

- None

B5: Use ladders, scaffolding and platforms

- FE Safety Handbook, Section 10: Portable Ladders/Scaffolds/Stationary Work Platforms

- OHS Regulation, Part 13, Division 2: Ladders

- OHS Regulation, Part 13, Division 3: Work Platforms

- OHS Regulation, Part 13, Division 4: Scaffolds

- OHS Regulation, Part 13, Division 5: Movable Work Platforms

B6: Use rigging and hoisting equipment

- FE Safety Handbook, Section 12: Material Handling

- OHS Regulation, Part 15: Rigging

B7: Use electrical test equipment

- FE Safety Handbook, Section 5: Electrical Safety

LINE C: USE FUNDAMENTAL SKILLS

C1: Describe the elevating device industry

- None

C2: Use mathematics and science

- None

C3: Apply mechanical principles

- None

C4: Read drawings and specifications

- None

C5: Use acts, regulations and codes

- BC Safety Standards Act: Safety Standards General Regulation

- BC Safety Standards Act: Elevating Devices Safety Regulation

- Applicable codes

C6: Use manufacturer and supplier documentation

- None

C7: Plan a project

- None

C8: Apply troubleshooting techniques

- None

C9: Use mentoring techniques

- None

LINE D: INSTALL COMMON COMPONENTS

D5: Install wiring raceways, fixtures, and wiring

- CSA C22.1: Electrical Equipment and Wiring

LINE E: INSTALL TRACTION ELEVATORS

E1: Describe the principles of traction systems

- None

LINE G: APPLY THE PRINCIPLES OF ELECTRICITY AND ELECTRONICS

G1: Describe the principles of electricity

- FE Safety Handbook, Section 5: Electrical Safety

G2: Read electrical drawings and specifications

- None

G4: Describe electrical and electronic controls

- None

G5: Install electrical systems

- CSA C22.2-18: Canadian Electrical Code, Part 1, Section 38

G6: Maintain electrical and electronic Systems (level 2)

- None

G7: Troubleshoot electrical and electronic systems (Level 2)

- None

LINE K: REPAIR ELEVATING SYSTEMS

K2: Service braking systems

- None

K6: Repair machines and motors

- None

LINE N: INSTALL RACK AND PINION PERSONNEL HOISTS

N1: Lay out the base and buffer assembly

- CSA Z185-M87, Section 5: Mast, Foundation and Guying
- CSA Z185-M87, Section 6: Hoistway Enclosure and Protection Around Hoist

N2: Install masts, braces, anchors and limit cams

- CSA Z185-M87, Section 4: General Requirements

N3: Install hoist car, drive assembly and counterweight assembly and hoarding

- CSA Z185-M87, Section 8: Cars
- CSA Z185-M87, Section 11: Counterweights

N4: Install hoistway wiring, and inspect hoistway door assembly

- CSA Z185-M87, Section 7: Hoistway Landings and Doors

N5: Install base and car control panel and wiring

- CSA Z185-M87, Section 4.3: Electrical Wiring and Devices

N6: Adjust and commission personnel hoists

- CSA Z185-M87, Section 24: Acceptance Inspections and Tests for New Installation and Alterations

N7: Dismantle personnel hoists

- TBD

APPENDIX

Appendix A

TRAINING TOPICS AND SUGGESTED TIME ALLOCATION BY LEVEL AND YEAR

ELEVATING DEVICES MECHANIC (CLASS C)

Prerequisites

Line A	Use safe work practices	Hours	% of Total
A1	Control workplace hazards	4	
A2	Comply with the OHS Regulation and WorkSafeBC standards	4	
A3	Use WHMIS	3	
A4	Use personal protective equipment	4	
A5	Apply fire prevention practices	1	
	Total Line A	16	4%
Line B	Use tools and equipment	Hours	% of Total
B1	Use hand tools	1	
B2	Use power tools	2	
B3	Use measuring and alignment tools	1	
B5	Use ladders, scaffolding and platforms	4	
	Total Line B	8	2%
Total for Prerequisites		24	6%

ELEVATING DEVICES MECHANIC (CLASS C)

Level 1

Line B	Use tools and equipment	Hours	% of Total
B6	Use rigging and hoisting equipment	12	
B7	Use electrical test equipment	4	
Total Line B		16	4%
Line C	Use fundamental skills	Hours	% of total
C1	Describe the elevating industry	2	
C2	Use mathematics and science	10	
C3	Apply mechanical principles	30	
C4	Read drawings and specifications	8	
C5	Use acts, regulations and codes	12	
C6	User manufacturer and supplier documentation	4	
C9	Use mentoring techniques	3	
Total Line C		69	18%
Line E	Install traction elevators	Hours	% of total
E1	Describe the principles of traction systems	16	
Total Line E		16	4%
Line G	Apply the principles of electricity and electronics	Hours	% of total
G1	Describe the principles of electricity	36	
G2	Read electrical drawings and specifications	16	
Total Line G		52	13%
Line N	Install rack and pinion personnel hoists	Hours	% of total
N1	Lay out the base and buffer assembly	8	
N2	Install mast, braces, anchors and limit cams	8	
N3	Install hoist car, drive assembly and counterweight assembly	8	
N4	Install hoistway door wiring, and inspect hoistway door assembly and hoarding	8	
Total Line N		32	8%
Total for Level 1		185	47%

ELEVATING DEVICES MECHANIC (CLASS C)

Level 2

Line C	Use fundamental skills	Hours	% of total
C7	Plan a project	8	
C8	Apply troubleshooting techniques	8	
	Total Line C	16	4%
Line D	Install common components	Hours	% of total
D5	Install wiring raceways, fixtures and wiring	18	
	Total Line D	18	5%
Line G	Apply the principles of electricity and electronics	Hours	% of total
G4	Describe electrical and electronic controls	32	
G5	Install electrical systems	20	
G6	Maintain electrical and electronic systems	21	
G7	Troubleshoot electrical and electronic systems	19	
	Total Line G	92	24%
Line K	Repair elevating systems	Hours	% of total
K2	Service braking systems	16	
K6	Repair machines and motors	8	
	Total Line K	24	6%
Line N	Install rack and pinion personnel hoists	Hours	% of total
N5	Install base and car control panel and wiring	8	
N6	Adjust and commission personnel hoists	8	
N7	Dismantle a personnel hoist	16	
	Total Line N	32	8%
Total for Level 2		182	47%
Grand total		391	100%
Minus safety prerequisite		24	
Total in-class hours		367	

Appendix B

DESCRIBE THE PRINCIPLES OF HYDRAULIC SYSTEMS

This section outlines the basic educational requirements for an individual seeking an endorsement to an existing Elevating Devices Mechanic (Class C) licence to perform regulated work on hydraulic personnel hoists in British Columbia.

Technical Safety BC will provide additional details on the training requirements for this certification at a later date.

LINE (GAC): F – Describe the principles of hydraulic systems

COMPETENCY: F1 – DESCRIBE THE PRINCIPLES OF HYDRAULIC SYSTEMS

Objectives

To be competent in this area, the individual must be able to do the following:

- Describe the components of a hydraulic system
- Describe the purpose of hydraulic system components
- Describe the principles of hydraulic systems

Learning tasks		Content	
1	Describe the components of hydraulic systems	<ul style="list-style-type: none"> • Purpose • Pumps • Positive displacement screw pump • Jack assemblies 	<ul style="list-style-type: none"> • Tank • Pipes and flexible hose • Control valves • Safety devices
2	Describe the principles of operation of hydraulic systems	<ul style="list-style-type: none"> • Advantages of using hydraulics • Types of hydraulic systems 	<ul style="list-style-type: none"> • Properties of hydraulic fluids

Technical Safety BC is an independent, self-funded organization mandated to oversee the safe installation and operation of technical systems and equipment.

In addition to issuing permits, licences and certificates, we work with industry to reduce safety risks through assessment, education and outreach, enforcement, and research.

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