

Apprenticeship and Industry Training

Elevator Constructor

Apprenticeship Course Outline

097 (2017)



Apprenticeship
and Industry
Training

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Elevator Constructor: apprenticeship course outline

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Course Outline

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Apprenticeship

Apprenticeship is post-secondary education with a difference. Apprenticeship begins with finding an employer. Employers hire apprentices, pay their wages and provide on-the-job training and work experience. Approximately 80 per cent of an apprentice's time is spent on the job under the supervision of a certified journeyman or qualified tradesperson. The other 20 per cent involves technical training provided at, or through, a post-secondary institution – usually a college or technical institute.

To become certified journeymen, apprentices must learn theory and skills, and they must pass examinations. Requirements for certification—including the content and delivery of technical training—are developed and updated by the Alberta Apprenticeship and Industry Training Board on the recommendation of the Elevator Constructor Provincial Apprenticeship Committee.

The graduate of the Elevator Constructor apprenticeship program is a certified journeyman who will be able to:

- read and interpret prints to determine the layout of cylinders, electrical connections and other system components
- do preparatory construction work including steel work, wiring and piping
- install doors and frames, guide rails, counterweights, and elevator, escalator and walkway chassis
- connect car frames to counterweights with cables and assemble elevator cars
- wire electronic control system equipment
- test and adjust equipment
- trouble-shoot when mechanical or electrical systems fail and make the necessary repairs
- carry out preventative maintenance programs to ensure public safety.

Apprenticeship and Industry Training System

Industry-Driven

Alberta's apprenticeship and industry training system is an industry-driven system that ensures a highly skilled, internationally competitive workforce in more than 50 designated trades and occupations. This workforce supports the economic progress of Alberta and its competitive role in the global market. Industry (employers and employees) establishes training and certification standards and provides direction to the system through an industry committee network and the Alberta Apprenticeship and Industry Training Board. The Alberta government provides the legislative framework and administrative support for the apprenticeship and industry training system.

Alberta Apprenticeship and Industry Training Board

The Alberta Apprenticeship and Industry Training Board provides a leadership role in developing Alberta's highly skilled and trained workforce. The board's primary responsibility is to establish the standards and requirements for training and certification in programs under the Apprenticeship and Industry Training Act. The board also provides advice to the Minister of Advanced Education on the needs of Alberta's labour market for skilled and trained workers, and the designation of trades and occupations.

The thirteen-member board consists of a chair, eight members representing trades and four members representing other industries. There are equal numbers of employer and employee representatives.

Industry Committee Network

Alberta's apprenticeship and industry training system relies on a network of industry committees, including local and provincial apprenticeship committees in the designated trades, and occupational committees in the designated occupations. The network also includes other committees such as provisional committees that are established before the designation of a new trade or occupation comes into effect. All trade committees are composed of equal numbers of employer and employee representatives. The industry committee network is the foundation of Alberta's apprenticeship and industry training system.

Local Apprenticeship Committees (LAC)

Wherever there is activity in a trade, the board can set up a local apprenticeship committee. The board appoints equal numbers of employee and employer representatives for terms of up to three years. The committee appoints a member as presiding officer. Local apprenticeship committees:

- monitor apprenticeship programs and the progress of apprentices in their trade, at the local level
- make recommendations to their trade's provincial apprenticeship committee (PAC) about apprenticeship and certification in their trade
- promote apprenticeship programs and training and the pursuit of careers in their trade
- make recommendations to the board about the appointment of members to their trade's PAC
- help settle certain kinds of disagreements between apprentices and their employers
- carry out functions assigned by their trade's PAC or the board

Provincial Apprenticeship Committees (PAC)

The board establishes a provincial apprenticeship committee for each trade. It appoints an equal number of employer and employee representatives, and, on the PAC's recommendation, a presiding officer - each for a maximum of two terms of up to three years. Most PACs have nine members but can have as many as twenty-one. Provincial apprenticeship committees:

- make recommendations to the board about:
 - standards and requirements for training and certification in their trade
 - courses and examinations in their trade
 - apprenticeship and certification
 - designation of trades and occupations
 - regulations and orders under the Apprenticeship and Industry Training Act
- monitor the activities of local apprenticeship committees in their trade
- determine whether training of various kinds is equivalent to training provided in an apprenticeship program in their trade
- promote apprenticeship programs and training and the pursuit of careers in their trade
- consult with other committees under the Apprenticeship and Industry Training Act about apprenticeship programs, training and certification and facilitate cooperation between different trades and occupations
- consult with organizations, associations and people who have an interest in their trade and with employers and employees in their trade
- may participate in resolving certain disagreements between employers and employees
- carry out functions assigned by the board

Elevator Constructor PAC Members at the Time of Publication

Mr. R. Logee.....	Calgary	Presiding Officer
Mr. C. Koczula.....	Calgary	Employer
Ms. S. MacArthur	Edmonton	Employer
Mr. C. Austrom	Edmonton	Employer
Mr. A. Mroczek	Edmonton	Employer
Mr. C. Mercer	Calgary	Employee
Mr. B. Halfyard	Edmonton	Employee
Mr. J. Mitchell	Edmonton	Employee
Mr. K. James	Calgary	Employee

Alberta Government

Alberta Advanced Education works with industry, employer and employee organizations and technical training providers to:

- facilitate industry's development and maintenance of training and certification standards
- provide registration and counselling services to apprentices and employers
- coordinate technical training in collaboration with training providers
- certify apprentices and others who meet industry standards

Apprenticeship Safety

Safe working procedures and conditions, incident/injury prevention, and the preservation of health are of primary importance in apprenticeship programs in Alberta. These responsibilities are shared and require the joint efforts of government, employers, employees, apprentices and the public. Therefore, it is imperative that all parties are aware of circumstances that may lead to injury or harm.

Safe learning experiences and healthy environments can be created by controlling the variables and behaviours that may contribute to or cause an incident or injury. By practicing a safe and healthy attitude, everyone can enjoy the benefit of an incident and injury free environment.

Alberta Apprenticeship and Industry Training Board Safety Policy

The Alberta Apprenticeship and Industry Training Board (board) fully supports safe learning and working environments and emphasizes the importance of safety awareness and education throughout apprenticeship training- in both on-the- job training and technical training. The board also recognizes that safety awareness and education begins on the first day of on-the-job training and thereby is the initial and ongoing responsibility of the employer and the apprentice as required under workplace health and safety training. However the board encourages that safe workplace behaviour is modeled not only during on-the-job training but also during all aspects of technical training, in particular, shop or lab instruction. Therefore the board recognizes that safety awareness and training in apprenticeship technical training reinforces, but does not replace, employer safety training that is required under workplace health and safety legislation.

The board has established a policy with respect to safety awareness and training:

The board promotes and supports safe workplaces, which embody a culture of safety for all apprentices, employers and employees. Employer required safety training is the responsibility of the employer and the apprentice, as required under legislation other than the *Apprenticeship and Industry Training Act*.

The board's complete document on its 'Apprenticeship Safety Training Policy' is available at www.tradesecrets.alberta.ca; access the website and conduct a search for 'safety training policy'.

Implementation of the policy includes three common safety learning outcomes and objectives for all trade course outlines. These common learning outcomes ensure that each course outline utilizes common language consistent with workplace health and safety terminology. Under the title of 'Standard Workplace Safety', this first section of each trade course outline enables the delivery of generic safety training; technical training providers will provide trade specific examples related to the content delivery of course outline safety training.

Occupational Health and Safety

A tradesperson is often exposed to more hazards than any other person in the work force and therefore should be familiar with and apply the Occupational Health and Safety Act, Regulations and Code when dealing with personal safety and the special safety rules that apply to all daily tasks.

Occupational Health and Safety (a division of Alberta Human Services) conducts periodic inspections of workplaces to ensure that safety regulations for industry are being observed.

Additional information is available at www.humanservices.alberta.ca

Technical Training

Apprenticeship technical training is delivered by the technical institutes and colleges in the public post-secondary system throughout Alberta. The colleges and institutes are committed to delivering the technical training component of Alberta apprenticeship programs in a safe, efficient and effective manner. All training providers place a strong emphasis on safety that complements safe workplace practices towards the development of a culture of safety for all trades.

The technical institutes and colleges work with Alberta's Apprenticeship and Industry Training Board, industry committees and Alberta Advanced Education to enhance access and responsiveness to industry needs through the delivery of the technical training component of apprenticeship programs across the Province. They develop curriculum from the course outlines established by industry and provide technical training to apprentices.

Procedures for Recommending Revisions to the Course Outline

Advanced Education has prepared this course outline in partnership with the Elevator Constructor Provincial Apprenticeship Committee.

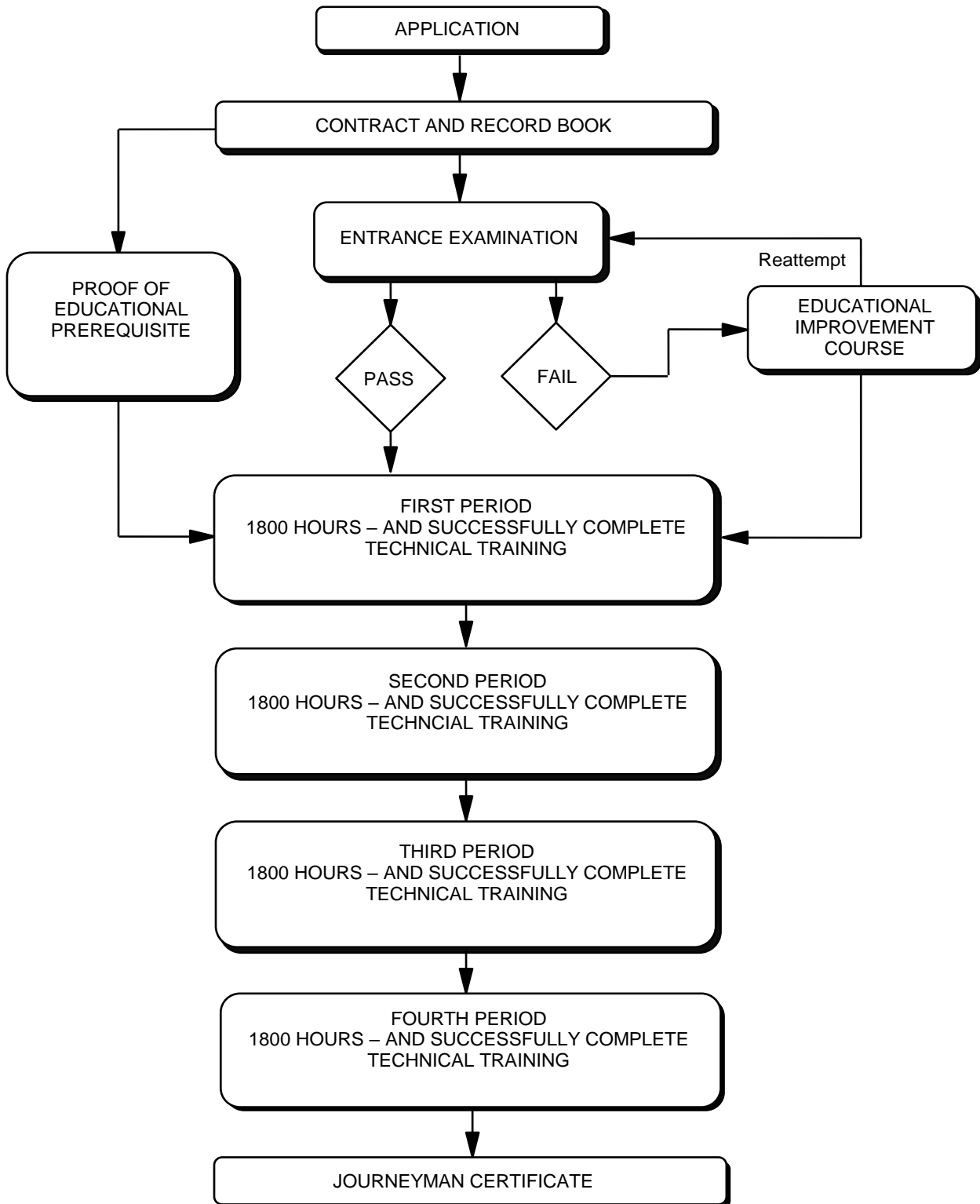
This course outline was approved on June 23, 2017 by the Alberta Apprenticeship and Industry Training Board on a recommendation from the Provincial Apprenticeship Committee. The valuable input provided by representatives of industry and the institutions that provide the technical training is acknowledged.

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

Elevator Constructor Provincial Apprenticeship Committee
c/o Industry Programs and Standards
Apprenticeship and Industry Training
Advanced Education
10th floor, Commerce Place
10155 102 Street NW
Edmonton AB T5J 4L5

It is requested that recommendations for change refer to specific areas and state references used. Recommendations for change will be placed on the agenda for regular meetings of the Elevator Constructor Provincial Apprenticeship Committee.

Apprenticeship Route toward Certification



**Elevator Constructor Training Profile
First Period
200 Hours**

SECTION ONE

ELEVATOR SAFETY ⇒
20 HOURS

A
Safety Legislation,
Regulation and Industry
Policy in the Trades
5 Hours

B
Climbing, Lifting, Rigging
and Hoisting
5 Hours

C
Hazardous Materials and
Fire Protection
4 Hours

D
Apprenticeship Training
Program
1 Hour

E
Tools, Oxy-Fuel and
Equipment Safety and
Babbiting
5 Hours

SECTION TWO

**DRAWINGS, SPECIFICATIONS
AND CODES** ⇒
20 HOURS

A
Mechanical Drawings
10 Hours

B
Mathematics
5 Hours

C
Canadian Standards
Association Codes (CSA)
5 Hours

SECTION THREE

TRACTION ELEVATORS ⇒
70 HOURS

A
Site Planning
5 Hours

B
Hoistway Compliance
5 Hours

C
False Cars and Guide Rails
5 Hours

D
Machine Room Equipment
and Wiring
10 Hours

E
Pit Structures
5 Hours

F
Elevator Mechanical
Systems
5 Hours

G
Hoistway Entrance Systems
5 Hours

H
Hoistway Wiring Systems
5 Hours

I
Car Cab Systems
5 Hours

J
Car Door Systems
5 Hours

K
Machine Roomless Elevators
10 Hours

L
Inspection of Elevating
Devices and Commissioning
5 Hours

SECTION FOUR

**ELEVATOR HYDRAULIC
SYSTEMS** ⇒
50 HOURS

A
Hydraulic Systems
15 Hours

B
Hydraulic Jacking Systems
10 Hours

C
Maintenance of Hydraulics
5 Hours

D
Hydraulic System
Adjustment
15 Hours

E
Work Platforms
5 Hours

SECTION FIVE

**HYDRAULIC ELEVATOR
INSTALLATION** ⇒
40 HOURS

A
Hydraulic Elevators
15 Hours

B
Hydraulic Distribution
Systems
10 Hours

C
Hydraulic Control Systems
10 Hours

D
Hydraulic Field Inspections,
Tests and Data Reports
5 Hours

**Elevator Constructor Training Profile
Second Period
200 Hours**

SECTION ONE

MECHANICAL SYSTEMS
30 HOURS

A	B	C
Mechanical Transmission Components 10 Hours	Bearings and Seals 5 Hours	Precision Measurements 5 Hours
D	E	
Materials and Fastening Technology 5 Hours	Lubrication 5 Hours	

SECTION TWO

ESCALATORS, CARTVEYOR AND MOVING WALK MAINTENANCE
40 HOURS

A	B	C
Escalator, Cartveyor and Moving Walk Conveyances 15 Hours	Maintenance Inspections 10 Hours	Preparation and Installation 10 Hours
D		
Commissioning 5 Hours		

SECTION THREE

MODERNIZATION AND ALTERATIONS
30 HOURS

A	B
Preparation for Modernization or Alteration 10 Hours	Performing Modernization and Alterations 20 Hours

SECTION FOUR

ELECTRICITY
100 HOURS

A	B	C
Electrical Safety 20 Hours	Principles of Electricity and Magnetism 30 Hours	Direct Current Circuits 20 Hours
D	E	
Alternating Current Circuits 20 Hours	Electrical Testing 10 Hours	

**Elevator Constructor Training Profile
Third Period
200 Hours**

SECTION ONE

ELECTRICAL SYSTEMS
40 HOURS

A
Electrical Control Systems
10 Hours

B
Transformers
5 Hours

C
Distribution and Control
Devices
5 Hours

D
Control Systems
10 Hours

E
Electrical Diagrams
5 Hours

F
Electrical Conductors
5 Hours

SECTION TWO

**GENERATORS AND MOTORS
CONTROL SYSTEMS**
60 HOURS

A
Generators
10 Hours

B
Electric Motors
15 Hours

C
DC Motor Control Systems
15 Hours

D
AC Motor Control Systems
20 Hours

SECTION THREE

ELECTRONICS
40 HOURS

A
Solid State Electronic
Components
5 Hours

B
Diodes
5 Hours

C
Transistors
5 Hours

D
Thyristors
5 Hours

E
Digital and Analog Integrated
Circuits
5 Hours

F
Solid State Power
5 Hours

G
Solid State Electronics
5 Hours

H
Programmable Logic Control
Systems
5 Hours

SECTION FOUR

**CIRCUIT TRACING AND
TESTING**
60 HOURS

A
Circuit Tracing
40 Hours

B
Diagnostic Test Equipment
10 Hours

C
Troubleshooting Procedures
10 Hours

**Elevator Constructor Training Profile
Fourth Period
200 Hours**

SECTION ONE

**SPECIAL APPLICATION LIFTING
DEVICES AND GOVERNANCE**
40 HOURS



A	B	C
Inclined Travel Elevators 5 Hours	Lifts for Persons with Physical Disabilities (LPPD) 13 Hours	Silent Butlers 5 Hours
D	E	F
Material Lifts 5 Hours	Manlifts 5 Hours	Construction Hoists 5 Hours
G	H	
Alberta's Industry Network 1 Hour	Workplace Coaching Skills 1 Hour	

SECTION TWO

PREVENTIVE MAINTENANCE
40 HOURS

A	B	C
Public Safety 5 Hours	Site Visits 10 Hours	Lock-Out-Tag-Out and Reinstatement Procedures 10 Hours
D	E	
Remote Monitoring 10 Hours	Log Books 5 Hours	

SECTION THREE

**ELEVATOR MAINTENANCE
ROOM EQUIPMENT**
50 HOURS



A	B	C
Machine Room Safety 5 Hours	Motors and Generators 5 Hours	Drive Machines 5 Hours
D	E	F
Sheaves and Drums 5 Hours	Machine Brakes 5 Hours	Elevator Safety Devices 5 Hours
G	H	I
Control Equipment 5 Hours	Suspension Means 10 Hours	Hydraulic System Devices 5 Hours

SECTION FOUR

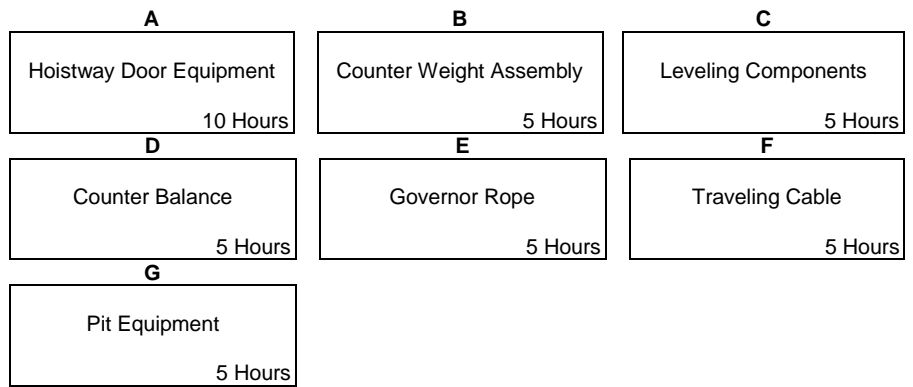
**ELEVATOR CAR EQUIPMENT
MAINTENANCE**
30 HOURS



A	B	C
Car Doors and Gates 5 Hours	Elevator Enclosures 5 Hours	Car Tops 5 Hours
D	E	
Car Bottoms 5 Hours	Car Safety Components 10 Hours	

SECTION FIVE

**HOISTWAY AND PIT
EQUIPMENT MAINTENANCE**
40 HOURS



NOTE: The hours stated are for guidance and should be adhered to as closely as possible. However, adjustments must be made for rate of apprentice learning, statutory holidays, registration and examinations for the training establishment and Apprenticeship and Industry Training.

**FIRST PERIOD TECHNICAL TRAINING
ELEVATOR CONSTRUCTOR TRADE
COURSE OUTLINE**

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

NOTE: The safety and precautionary methods and procedures are to be reinforced throughout all of the training, when, and as, the subject matter is being practiced or demonstrated.

SECTION ONE:.....ELEVATOR SAFETY 20 HOURS

A. Safety Legislation, Regulation & Industry Policy in the Trades 5 Hours

Outcome: ***Apply legislation, regulations and practices intended ensuring safe work in this trade.***

1. Demonstrate the application of the Occupational Health and Safety Act, Regulation and Code.
2. Describe the employer's and employee's role with Occupational Health and Safety (OH&S) regulations, Worksite Hazardous Materials Information Systems (WHMIS), fire regulations, Workers Compensation Board regulations and related advisory bodies and agencies.
3. Describe industry practices for hazard assessment and control procedures.
4. Describe the responsibilities of worker and employers to apply emergency procedures.
5. Describe tradesperson attitudes with respect to housekeeping, personal protective equipment and emergency procedures.
6. Describe the roles and responsibilities of employers and employees with the selection and use of personal protective equipment (PPE).
7. Maintain required PPE for tasks.
8. Use required PPE for tasks.

B. Climbing, Lifting, Rigging and Hoisting 5 Hours

Outcome: ***Use industry standard practices for climbing, lifting, rigging and hoisting in this trade.***

1. Describe manual lifting procedures.
2. Describe rigging hardware and associated safety factors.
3. Select equipment for rigging loads.
4. Describe hoisting and load moving procedures.
5. Maintain personal protective equipment (PPE) for climbing, lifting and load moving equipment.
6. Use PPE for climbing, lifting and load moving equipment.

C. Hazardous Materials & Fire Protection 4 Hours

Outcome: ***Apply industry standard practices for hazardous materials and fire protection in this trade.***

1. Describe roles, responsibilities, features and practices related to the Workplace Hazardous Materials Information System (WHMIS) program.
2. Describe three key elements of WHMIS.
3. Describe handling, storing and transporting procedures for hazardous material.

4. Describe venting procedures when working with hazardous materials.
5. Describe hazards, classes, procedures and equipment related to fire protection.

D. Apprenticeship Training Program 1 Hour

Outcome: ***Manage an apprenticeship to earn journeyman certification.***

1. Describe the contractual responsibilities of the apprentice, employer and Alberta Apprenticeship and Industry Training.
2. Describe the purpose of the apprentice record book.
3. Describe the procedure for changing employers during an active apprenticeship.
4. Describe the purpose of the course outline.
5. Describe the procedure for advancing through apprenticeship.
6. Describe advancement opportunities in this trade.

E. Tools, Oxy-Fuel and Equipment Safety and Babbitting 5 Hours

Outcome: ***Use tools and equipment.***

1. Describe type and function of trade specific tools and equipment.
2. Describe tools and equipment maintenance.
3. Describe heating and cutting processes.
4. Describe operating principles of oxy-fuel equipment.
5. Describe oxy-fuel equipment maintenance.
6. Describe operating principles of babbitt.
7. Describe the hazards when heating babbitt.
8. Perform oxy-fuel heating and cutting.
9. Describe babbitting tools and equipment.
10. Use tools and equipment.

SECTION TWO:.....DRAWINGS, SPECIFICATIONS AND CODES 20 HOURS

A. Mechanical Drawings 10 Hours

Outcome: ***Interpret drawings and specifications.***

1. Describe types of drawings.
2. Describe drawing symbols.
3. Describe characteristics of materials, including strength and heat transfer methods.
4. Interpret dimensions of a drawing.
5. Interpret technical terms and abbreviations.
6. Interpret multiple views and elevations.

B. Mathematics 5 Hours

Outcome: ***Perform trade related calculations.***

1. Ratio and proportion.
2. Inclined planes.

- 3. Formulas.
- 4. Solve trade related problems.

C. Canadian Standards Association Codes (CSA) 5 Hours

Outcome: Apply CSA/ASME codes.

- 1. Describe the purpose of code and standards.
- 2. Describe the structure of CSA policies.
- 3. Categorize trade specific codes.
- 4. Interpret codes and regulations regarding maintenance, procedures, and examinations and testing.
- 5. Apply specific codes.

SECTION THREE: TRACTION ELEVATORS..... 70 HOURS

A. Site Planning 5 Hours

Outcome: Coordinate site plan.

- 1. Verify site preparation is complete.
- 2. Identify equipment features and application procedures.

B. Hoistway Compliance 5 Hours

Outcome: Verify hoistways tolerances.

- 1. Describe procedures for surveying the hoistway.

C. False Cars and Guide Rails 5 Hours

Outcome: Install false cars and guide rails.

- 1. Describe procedures and safety factors for installing false cars and guide rails.

D. Machine Room Equipment and Wiring..... 10 Hours

Outcome: Install machine room equipment and wiring.

- 1. Describe positioning and installation of machine room equipment.
- 2. Describe tools and materials for wiring machine room equipment.
- 3. Interpret wiring diagrams.

E. Pit Structures 5 Hours

Outcome: Install pit structures.

- 1. Describe installation procedures for pit structures.
- 2. Install pit structures.

F. Elevator Mechanical Systems 5 Hours

Outcome: Install elevator mechanical systems.

- 1. Describe installation procedure for cars and components.

2. Describe positioning and static balancing procedures for car assemblies.
3. Describe dynamic balancing procedures.
4. Describe installation of freight cars.
5. Describe types and characteristics of suspension means.
6. Describe care and handling of suspension means.
7. Describe types of sheaves.

G. Hoistway Entrance Systems 5 Hours

Outcome: *Install hoistway entrance systems.*

1. Determine elevation of finished floors.
2. Describe types of entrances.
3. Describe installation procedures for door frames, lobby panels and elevator fixtures.
4. Describe components of hoistway doors and lock assemblies.
5. Describe procedures for installing hoistway doors and lock assemblies.

H. Hoistway Wiring Systems 5 Hours

Outcome: *Install hoistway wiring systems.*

1. Describe installation of duct risers and conduit.
2. Describe conduit layout and fittings.
3. Describe planning procedures and raceway layout.
4. Describe procedures for installing wiring and hoistway switches.
5. Interpret wiring diagrams.
6. Install hoistway wiring systems.

I. Car Cab Systems 5 Hours

Outcome: *Install car cab systems.*

1. Describe types of traveling cables.
2. Describe cable handling techniques.
3. Describe cable installation procedures.
4. Describe parts of a cab assembly.
5. Describe cab assembly installation.
6. Install car cab systems.

J. Car Door Systems 5 Hours

Outcome: *Install car door systems.*

1. Describe types and components of car door systems.
2. Describe car door system installation.
3. Describe car door opening devices.
4. Install car door systems.

K. Machine Roomless Elevators 10 Hours

Outcome: *Install drive machine and controllers.*

1. Describe types and components of machine installation.
2. Describe types and components of controller installation.
3. Describe types of suspension means.
4. Describe hazards associated working on remote machinery.
5. Describe testing procedures on remote machinery.

L. Inspection of Elevating Devices and Commissioning 5 Hours

Outcome: *Perform inspection, testing and commissioning of traction elevators.*

1. Describe procedure for preparing an elevating device for inspection.
2. Describe procedure to test safety and door lock circuits.
3. Describe procedure for removing temporary jumpers.
4. Describe procedures for setting up communication links.
5. Describe procedure for setting door operation.
6. Describe setting contract, levelling, and inspection speeds.
7. Describe final completion procedure for field tests and data reports.
8. Describe elevating devices branch inspection procedure.
9. Describe local authority inspection list.
10. Describe procedure for brake hold adjustment.
11. Describe electrical schematic wiring diagrams, fuse protection, and safety circuits.
12. Describe procedure for counterweight balancing.
13. Describe Special Emergency Services (S.E.S.).
14. Describe sequence of operation when on emergency power.
15. Describe special hospital service requirements.
16. Describe auxiliary operations.
17. Calibrate elevator safety components.

SECTION FOUR: ELEVATOR HYDRAULIC SYSTEMS 50 HOURS

A. Hydraulic Systems 15 Hours

Outcome: *Use hydraulic principles.*

1. Describe types and applications of hydraulic systems.
2. Describe properties of hydraulic fluids.
3. Describe hydraulic fluid contamination.
4. Describe hydraulic principles.
5. Describe construction, features and applications of hydraulic systems and components.
6. Describe operating principles of hydraulic systems and components.
7. Calculate hydraulic system parameters.

B. Hydraulic Jacking Systems 10 Hours

Outcome: Prepare elevator jacking systems.

1. Describe types of jack units.
2. Install elevator jacking systems.

C. Maintenance of Hydraulics 5 Hours

Outcome: Troubleshoot hydraulic elevator systems.

1. Inspect elevator hydraulic systems.
2. Test elevator hydraulic systems.
3. Troubleshoot elevator hydraulic systems.

D. Hydraulic System Adjustment..... 15 Hours

Outcome: Perform hydraulic valve adjustments.

1. Describe control valve set-up procedures.
2. Adjust valve solenoids.
3. Perform hydraulic valve(s) set-up.

E. Work Platforms 5 Hours

Outcome: Install work platforms.

1. Describe work platforms or false car applications.
2. Describe load capacities of work platforms and false cars.
3. Describe inspection of work platform and false cars.
4. Describe maintenance of work platforms and false cars.
5. Describe code requirements for working from work platforms and false cars.
6. Install work platforms.

SECTION FIVE:HYDRAULIC ELEVATOR INSTALLATION..... 40 HOURS

A. Hydraulic Elevators 15 Hours

Outcome: Install hydraulic elevators.

1. Describe site planning.
2. Describe installation sequences.
3. Describe above ground, and in ground cylinder plumbing.
4. Describe procedures for surveying hoistway.
5. Describe installation of jack units.
6. Install drive components.
7. Install oil lines.
8. Install pumping units.

B. Hydraulic Distribution System 10 Hours

Outcome: ***Install hydraulic distribution systems.***

1. Describe types of pump units.
2. Describe installation procedures for hydraulic distribution systems.
3. Describe safety issues regarding the hydraulic distribution systems and work area.
4. Install hydraulic distribution systems.

C. Hydraulic Control Systems..... 10 Hours

Outcome: ***Install hydraulic control systems.***

1. Describe working pressure.
2. Describe relief valve tests.
3. Describe control valve adjustment procedures.
4. Describe process of co-ordination with the electrical controls.
5. Adjust and test control valves.

D. Hydraulic Field Inspections, Tests and Data Reports 5 Hours

Outcome: ***Complete inspections, testing and data reports.***

1. Describe field testing for elevator components.
2. Describe inspection check-lists.
3. Complete inspections, testing and data reports.

**SECOND PERIOD TECHNICAL TRAINING
ELEVATOR CONSTRUCTOR TRADE
COURSE OUTLINE**

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

NOTE: The safety and precautionary methods and procedures are to be reinforced throughout all of the training, when, and as, the subject matter is being practiced or demonstrated.

SECTION ONE:..... MECHANICAL SYSTEMS 30 HOURS

A. Mechanical Transmission Components..... 10 Hours

Outcome: ***Install power transmission components.***

1. Describe components of the power transmission system.
2. Describe belt alignment procedures.
3. Install power transmission components.

B. Bearings and Seals 5 Hours

Outcome: ***Install bearings and seals.***

1. Describe types of bearings and seals.
2. Describe causes of bearing breakdown and failure.
3. Describe procedure for removing bearings and seals.
4. Remove and install bearings and seals.
5. Perform lubrication of bearings

C. Precision Instruments 5 Hours

Outcome: ***Use precision measurement instruments.***

1. Describe the types and use of precision measuring tools.
2. Describe maintenance and storage of precision measuring tools.
3. Perform unit conversion.
4. Use precision measuring instruments.

D. Materials and Fastening Technology 5 Hours

Outcome: ***Use materials and fasteners.***

1. Describe properties and applications of metallic and non-metallic materials.
2. Describe mechanical properties of alloys and metals.
3. Categorize grade and thread type of fasteners
4. Select fasteners for specific applications.

E. Lubrication 5 Hours

Outcome: ***Use lubrication products.***

1. Describe types and properties of lubricants.

2. Describe lubrication devices.
3. Describe procedures for storing and disposing of lubricant.

SECTION TWO:.....ESCALATORS, CARTVEYOR AND MOVING WALK MAINTENANCE 40 HOURS

A. Escalator Cartveyors and Moving Walk Conveyances..... 15 Hours

Outcome: ***Apply operating principles of moving conveyances.***

1. Describe applications of escalators, cartveyors and moving walks.
2. Describe operating principles of escalators, cartveyors and moving walks.
3. Describe components and drive mechanisms.
4. Describe service requirements for each major component.
5. Describe power requirements and operational function of drive mechanisms.
6. Describe other code protective devices.

B. Maintenance Inspections 10 Hours

Outcome: ***Perform inspections during maintenance.***

1. Describe method of visual inspections of escalators, cartveyors and moving walks.
2. Describe procedures for inspecting the performance of escalators, cartveyors and moving walks.
3. Describe the importance of inspection control.
4. Describe devices and equipment used for safety.
5. Describe procedures for public safety.

C. Preparation and Installation 10 Hours

Outcome: ***Install moving conveyances.***

1. Describe procedure for setting a truss.
2. Describe procedure for setting tracks and brackets.
3. Describe procedure to set the machine, bull gear and tension carriage.
4. Describe procedure to install and wire the electrical components.
5. Describe procedure to install chains and belts.
6. Describe procedure to install skirting and decking.
7. Describe procedure to install newels and tracks.
8. Describe procedure to install handrails and guide assemblies.
9. Install moving conveyances.

D. Commissioning 5 Hours

Outcome: ***Commission moving conveyances.***

1. Describe procedure to make the specified adjustments for setting and testing all safety switches.
2. Describe procedure to make the specified adjustments for the brake control.
3. Commission a moving conveyance.

SECTION THREE:MODERNIZATION AND ALTERATIONS 30 HOURS

A. Preparation for Modernization or Alteration 10 Hours

Outcome: *Apply codes and regulations for modernization and alterations.*

1. Describe code requirements for minor and major alteration.
2. Apply codes and regulations for modernization and alterations.
3. Calculate counterbalance ratios.

B. Performing Modernization and Alterations..... 20 Hours

Outcome: *Perform modernization and alterations.*

1. Describe procedures for working in an occupied building.
2. Describe workplace hazards associated with modernization and alterations.
3. Describe interfacing with new equipment.
4. Describe dangers of overbalancing of the counterweight during cab removal.
5. Describe building power requirements and control wiring requirements.
6. Perform modernization and alterations.

SECTION FOUR: ELECTRICITY 100 HOURS

A. Electrical Safety 20 Hours

Outcome: *Demonstrate electrical safe work practices.*

1. Describe lock-out tag-out procedures.
2. Describe hazards of stored electrical energy.
3. Describe use of electrical jumpers.
4. Describe use of electrical meters and instruments.
5. Demonstrate electrical safe work practices.

B. Principles of Electricity and Magnetism 30 Hours

Outcome: *Apply principles of electricity.*

1. Describe sources of electricity.
2. Describe static electricity.
3. Describe free electrons.
4. Describe characteristics of magnetism.
5. Describe properties of permanent magnetism.
6. Describe characteristics of electromagnetism.
7. Describe action of magnetic fields around a conductor.
8. Describe principles of induced voltage.
9. Describe electrical terms and symbols.
10. Use mathematical formulas to solve electrical related problems.
11. Design electrical circuits.
12. Apply principles of electricity.

C. Direct Current Circuits 20 Hours

Outcome: *Use direct (dc) circuits.*

1. Describe direct current.
2. Describe dc power sources.
3. Assemble dc circuits.
4. Operate and test dc circuits.

D. Alternating Current Circuits 20 Hours

Outcome: *Use alternate (ac) circuits.*

1. Describe alternating current.
2. Describe ac power sources.
3. Describe RMS value of voltage and current.
4. Assemble ac circuits.
5. Operate and test ac circuits.

E. Electrical Testing 10 Hours

Outcome: *Diagnose electrical systems.*

1. Describe electrical measuring devices.
2. Measure voltage, amperage, and resistance.

**THIRD PERIOD TECHNICAL TRAINING
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SECTION ONE:.....ELECTRICAL SYSTEMS..... 40 HOURS

A. Electrical Control Systems 10 Hours

Outcome: *Install electrical components.*

1. Describe switches.
2. Describe relays.
3. Describe solenoids.
4. Describe timers.
5. Describe contactors.
6. Describe rectifiers.
7. Describe main line disconnect switches.
8. Describe circuit protection devices.
9. Assemble electrical components in circuits.
10. Install electrical components.

B. Transformers..... 5 Hours

Outcome: *Install electrical transformers.*

1. Describe transformer voltage, current, and power ratings.
2. Describe transformer operation.
3. Describe transformer application for electrical isolation and spike control.
4. Assemble transformers in electrical circuits.

C. Distribution and Control Devices 5 Hours

Outcome: *Install distribution systems.*

1. Describe power distribution systems.
2. Describe single phase systems.
3. Describe three phase systems.
4. Describe three phase star and delta connections.
5. Describe neutral and ground connections.
6. Describe bonding.
7. Describe grounded and ungrounded control systems.
8. Describe motor start, and power circuits.
9. Perform single phase and three phase calculations.

D. Control Systems 10 Hours

Outcome: *Install control systems.*

1. Describe types of control systems.
2. Describe brake controls and brake cooling through resistance.
3. Assemble control systems.

E. Electrical Diagrams 5 Hours

Outcome: *Assemble electrical circuits from schematic diagrams.*

1. Interpret electrical symbols.
2. Interpret electrical schematic diagrams.
3. Locate power and control functions in schematic diagrams.
4. Draw schematic diagrams.
5. Assemble electrical circuit from a schematic diagram.

F. Electrical Conductors 5 Hours

Outcome: *Install circuit conductors.*

1. Identify electrical conductors.
2. Describe the American Wire Gauge system (AWG).
3. Describe current carrying capacity, thermal ratings, and designations of conductors.
4. Describe requirements of hoistway machine room and raceway wiring.
5. Perform current carrying capacity calculations.
6. Assemble electrical raceway wiring.

SECTION TWO GENERATORS AND MOTOR CONTROL SYSTEMS..... 60 HOURS

A. Generators.....10 Hours

Outcome: *Service generators for elevating devices.*

1. Describe electromagnetism pertaining to motor generator action.
2. Describe induction.
3. Describe factors that determine induced EMF strength.
4. Describe effects of motion on direction of current.
5. Describe components of a generator.
6. Describe generating operation.
7. Operate and test electrical motor generator circuits.

B. Electric Motors..... 15 Hours

Outcome: *Install electric motors.*

1. Describe characteristics of electric motors:
2. Describe types of motors.
3. Describe speed and torque in a compound motor.

4. Operate and test electrical motor circuits.

C. DC Motor Control Systems 15 Hours

Outcome: *Install dc motor control systems.*

1. Describe the Ward-Leonard System.
2. Describe control system types.
3. Describe speed control.
4. Describe SCR/Transistor drives
5. Describe speed sensing devices.
6. Describe electronic drive safety features.
7. Assemble dc motor control systems.
8. Operate and test dc motor systems.

D. AC Motor Control Systems 20 Hours

Outcome: *Install ac motor control systems.*

1. Describe motor action (ac).
2. Describe the rotating field.
3. Describe armature rotation.
4. Describe motor performance characteristics.
5. Assemble ac motor circuits.
6. Operate and test ac motor circuits.

SECTION THREE: ELECTRONICS..... 40 HOURS

A. Solid State Electronic Components.....5 Hours

Outcome: *Install electronic components.*

1. Describe functions of diodes, transistors and thyristors.
2. Describe solid state devices and their applications.
3. Describe conduction in intrinsic, doped germanium and silicon.
4. Describe care and handling of solid state devices.
5. Install electronic components.

B. Diodes..... 5 Hours

Outcome: *Diagnose electrical components.*

1. Describe function of diodes.
2. Describe diode forward and reverse biasing.
3. Describe characteristics of germanium and silicon diodes.
4. Describe diode applications.
5. Describe rectifiers.
6. Describe zener diodes and their applications.
7. Describe voltage regulation with zener diodes.

8. Describe varistors.
9. Describe light emitting diodes (LED).
10. Describe photodiodes.
11. Assemble and test diodes in electrical circuits.

C. Transistors 5 Hours

Outcome: Test transistors.

1. Describe application of transistors.
2. Describe characteristics of transistors.
3. Describe configuration of transistors.
4. Describe transistor circuit arrangements.
5. Perform transistor testing.

D. Thyristors 5 Hours

Outcome: Test thyristors.

1. Describe types of thyristors.
2. Describe function of thyristors.
3. Describe configurations of thyristors.
4. Perform thyristor testing.

E. Digital and Analog Integrated Circuits 5 Hours

Outcome: Test integrated circuits.

1. Describe function of digital and analog integrated circuits.
2. Describe development of digital integrated circuits.
3. Describe digital integrated circuit packaging.
4. Perform digital integrated circuit testing.

F. Solid State Power 5 Hours

Outcome: Test solid state devices.

1. Describe function of power supply systems.
2. Describe features of power supply devices.
3. Describe application of power supply systems.
4. Describe testing equipment and procedures.
5. Describe construction features of operational amplifiers.
6. Describe function and application of operational amplifiers.
7. Describe power supplies for operational amplifiers.
8. Define the term “gain” as applied to operational amplifiers.
9. Perform operational amplifier calculations.

G. Solid State Electronics 5 Hours

Outcome: ***Install solid state electronic devices.***

1. Describe the number systems used in solid state devices.
2. Define memory terms.
3. Describe the function of microprocessors.
4. Describe microprocessor terms.
5. Describe testing procedures for integrated circuits.
6. Describe troubleshooting procedures for microprocessors.
7. Install solid state electronic devices.

H. Programmable Logic Control Systems 5 Hours

Outcome: ***Install programmable logic control systems.***

1. Describe Programmable Logic Control System (PLC).
2. Describe features of a programmable logic control system.
3. Describe applications for programmable logic control.
4. Perform programming of a PLC.
5. Install programmable logic control system.

SECTION FOUR:CIRCUIT TRACING AND TESTING..... 60 HOURS

A. Circuit Tracing 40 Hours

Outcome: ***Perform circuit testing on elevating devices.***

1. Identify main system components and symbols.
2. Describe circuit tracing of elevator operating systems.
3. Describe circuit tracing of safety systems.
4. Describe circuit tracing of emergency service.
5. Describe logic control systems.
6. Interpret schematic wiring diagrams for elevating device.
7. Perform circuit testing on elevating devices.

B. Diagnostic Test Equipment 10 Hours

Outcome: ***Use diagnostic test equipment.***

1. Describe types of diagnostic testing equipment.
2. Perform inspection and testing procedures for test equipment.
3. Test circuits using diagnostic testing equipment.

C. Troubleshooting Procedures 10 Hours

Outcome: ***Troubleshoot electrical circuits.***

1. Describe troubleshooting processes.
2. Describe troubleshooting the Ward-Leonard system.

3. Perform troubleshooting on safety controls.
4. Perform troubleshooting procedures on relay, PLC and microprocessor based control circuits.
5. Perform troubleshooting procedures on single automatic push button systems.
6. Perform troubleshooting on collective relay systems.

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SECTION ONE:.....SPECIAL APPLICATION LIFTING DEVICES AND GOVERNANCE 40 HOURS

A. Inclined Travel Elevators 5 Hours

Outcome: ***Install inclined travel and sidewalk elevators.***

1. Describe types and components of inclined travel elevators.
2. Describe construction and operation of inclined travel elevators.
3. Apply codes for inclined travel elevators.
4. Describe types and components of sidewalk elevators.
5. Describe construction and operation of sidewalk elevators.
6. Apply codes for sidewalk elevators.

B. Lifts for Persons with Physical Disabilities (LPPD)..... 13 Hours

Outcome: ***Install lifts for persons with physical disabilities (LPPD's).***

1. Describe types and components of LPPD's.
2. Describe construction and operation of LPPD's.
3. Describe application and components of stair chair lifts.
4. Describe application and components of vertical platform lifts.
5. Describe main components and drive mechanisms.
6. Describe lift control methods for lift devices.
7. Describe lift operating procedures.
8. Describe types of drives and components.
9. Describe installation methods and procedures.
10. Describe test procedures.
11. Perform visual inspections.
12. Apply codes for LPPD's.
13. Install and maintain LPPD's.

C. Silent Butlers..... 5 Hours

Outcome: ***Install silent butlers.***

1. Describe types and components of silent butlers.
2. Describe construction and operation of silent butlers.
3. Apply codes for silent butlers.
4. Install silent butlers.

D. Material Lifts..... 5 Hours

Outcome: *Install material lifts.*

1. Describe types and components of material lifts.
2. Describe construction and operation of material lifts.
3. Apply codes for material lifts
4. Install material lifts.

E. Manlifts 5 Hours

Outcome: *Install manlifts.*

1. Describe types and components of manlifts.
2. Describe construction and operation of manlifts.
3. Apply codes for manlifts.
4. Install manlifts.

F. Construction Hoists 5 Hours

Outcome: *Install construction hoists.*

1. Describe types and components of construction hoists.
2. Describe construction and operation of construction hoists.
3. Apply codes for construction hoists.
4. Install construction hoists.

G. Alberta’s Industry Network..... 1 Hour

Outcome: *Describe the role of the Alberta Apprenticeship and Industry Training Board and the network of industry committees that represent the trades and occupations in Alberta.*

1. Describe Alberta’s Apprenticeship and Industry Training system.
2. Describe roles and responsibilities of the Alberta Apprenticeship and Industry Training Board, the Government of Alberta and post-secondary institutions
3. Describe roles and responsibilities of the Provincial Apprenticeship Committees (PACs), Local Apprenticeship Committees (LACs) and Occupational Committees (OCs).

H. Workplace Coaching Skills..... 1 Hour

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

1. Describe the process for coaching an apprentice.

SECTION TWO:..... PREVENTIVE MAINTENANCE 40 HOURS

A. Public Safety.....5 Hours

Outcome: *Perform public safety procedures.*

1. Describe public impact during maintenance.
2. Describe circumstance and location of maintenance signage.
3. Describe procedures and equipment for barricading entrances for maintenance.

B. Site Visits..... 10 Hours**Outcome: *Perform preventative maintenance.***

1. Describe customer communication.
2. Identify abnormal operating conditions.
3. Inspect safety circuits and devices.
4. Inspect mechanical and electrical operating components.
5. Inspect the condition of the components.
6. Inspect operation and condition of the fixtures.
7. Inspect appearance and cosmetic details
8. Observe operation of components and system.
9. Perform preventative maintenance checks.

C. Lock-Out Tag-Out and Reinstatement Procedures 10 Hours**Outcome: *Perform lock-out tag-out procedures.***

1. Describe how to use the controller maintenance operation.
2. Describe the method of ensuring the device is unoccupied.
3. Describe the method of ensuring the electrical device is isolated.
4. Describe the method of ensuring the device is mechanically secured.
5. Describe procedures to ensure the electrical protective devices are operating.
6. Describe procedure to test and verify the correct operation prior to returning to service.
7. Apply lock-out and tag-out procedures.

D. Remote Monitoring 10 Hours**Outcome: *Install remote monitoring systems.***

1. Describe operation of remote monitoring systems.
2. Describe hazards of remote monitoring systems.
3. Interpret information provided by remote monitoring systems.

E. Log Books 5 Hours**Outcome: *Use log books.***

1. Describe the purpose of log books.
2. Describe the information recorded in a log book.
3. Describe the maintenance control program.
4. Describe applicable codes used for log book applications.
5. Complete log book requirements.

SECTION THREE:ELEVATOR MAINTENANCE ROOM EQUIPMENT 50 HOURS**A. Machine Room Safety 5 Hours****Outcome: *Perform live equipment assessment.***

1. Describe machine room equipment.
2. Describe machine room hazards.
3. Perform machine room assessment.

B. Motors and Generators 5 Hours**Outcome: *Service motors and generators.***

1. Describe maintenance of motors and generators.
2. Service motors and generators.

C. Drive Machines 5 Hours**Outcome: *Service drive machines.***

1. Describe geared, gearless, and drum machine types.
2. Describe drive machine maintenance.
3. Determine the condition of machine parts.
4. Determine sources of oil loss.
5. Service drive machines.

D. Sheaves and Drums 5 Hours**Outcome: *Service sheaves and drums.***

1. Describe types of roping arrangements.
2. Describe traction sheave groove types.
3. Describe inspection of sheaves and drums.
4. Determine the condition of sheave grooves.
5. Determine the use of sheave liners.
6. Determine the integrity of torque transmitting elements to drive sheaves.
7. Determine the reliability of wire rope fastenings on drums.
8. Service sheaves and drums.

E. Machine Brakes 5 Hours**Outcome: *Service machine brakes.***

1. Describe types of brake systems.
2. Describe types and applications of brake release systems.
3. Describe brake system cleaning and lubrication procedures.
4. Describe brake relining and alignment procedures.
5. Service machine brake.

F. Elevator Safety Devices 5 Hours

Outcome: Service machine safety devices.

1. Describe types of governors and their applications.
2. Describe operating and testing procedures for governors and related components.
3. Describe cleaning and lubrication procedures for governors.
4. Describe types of elevator safeties and their applications.
5. Describe types of emergency braking devices and their applications.
6. Describe maintenance and operation of emergency braking devices.
7. Determine causes of uncontrolled motion.
8. Perform governor maintenance and testing.
9. Perform emergency braking device maintenance and testing.

G. Control Equipment 5 Hours

Outcome: Service control equipment.

1. Describe operating conditions of control equipment.
2. Describe the method of cleaning control equipment.
3. Describe maintenance requirements for control equipment.
4. Service control equipment.

H. Suspension Means..... 10 Hours

Outcome: Service suspension means.

1. Describe types of suspension means.
2. Describe cleaning and lubricating requirements for suspension means.
3. Describe inspection procedure for suspension means.
4. Describe method for checking and adjusting tension for suspension means.
5. Describe methods to prevent suspension means corrosion.
6. Describe methods of suspension means terminations.
7. Service suspension means.

I. Hydraulic System Devices 5 Hours

Outcome: Service hydraulic systems.

1. Describe hydraulic system testing.
2. Perform a visual inspection for fluid leaks.
3. Perform pressure tests.
4. Perform oil loss test procedures.
5. Service hydraulic systems.

SECTION FOUR: ELEVATOR CAR EQUIPMENT MAINTENANCE 30 HOURS**A. Car Doors and Gates 5 Hours****Outcome: *Service elevator car doors and gates.***

1. Describe inspection checks for door operation and re-opening devices.
2. Describe inspection checks for gib wear, upthrust adjustments and retainers.
3. Describe inspection checks for skates, vanes, and clutches.
4. Describe inspection checks for gates switches and operating rollers.
5. Describe inspection checks for linkage arms and assemblies.
6. Describe inspection checks for re-opening device cabling.
7. Describe inspection tests for door restrictors.
8. Describe inspection tests for relating system devices.
9. Service elevator car door and gates.

B. Elevator Enclosures 5 Hours**Outcome: *Service elevator enclosures.***

1. Describe inspection checks for elevator enclosures.
2. Describe inspection checks for call buttons and alarm buttons.
3. Describe inspection checks for key switches.
4. Describe inspection checks for fixtures and bulbs.
5. Describe inspection checks for communication system and audible devices.
6. Describe inspection checks for emergency lighting.
7. Perform elevator enclosure inspections.

C. Car Tops 5 Hours**Outcome: *Service car top equipment.***

1. Describe car top hazards.
2. Describe car top cleaning.
3. Describe inspection checks for load weighing devices.
4. Describe inspection checks for guides, guide shoes, slippers and rollers.
5. Describe method to clean, adjust, and lubricate guides.
6. Describe maintenance for the retiring cams and motors.
7. Describe maintenance for suspension means shackles, hitches, and springs.
8. Describe maintenance for door operators, cam assemblies and resistors.
9. Describe maintenance for car top sheaves, guards, and shafts.
10. Describe maintenance for electrical switches and switch assemblies.
11. Describe maintenance for the governor rope hitch, release carriers, levers, arms and return springs.
12. Service car top equipment.

D. Car Bottoms 5 Hours

Outcome: Service car bottom equipment.

1. Describe inspection checks for load weighing devices.
2. Describe inspection checks for guide shoes, slippers and rollers.
3. Describe inspection checks for isolation devices and travelling cable attachments.
4. Describe inspection checks for compensating chains or ropes and their attachments.
5. Describe inspection checks for buffer and striker plates.
6. Describe inspection checks for platen and plunger attachments.
7. Service car bottom equipment.

E. Car Safety Components 10 Hours

Outcome: Service elevator car safety components.

1. Describe types, operation, and applications of safety components.
2. Describe methods of disassembling, cleaning, lubricating, reassembling, and adjusting safety components.
3. Describe tests needed to ensure a safeties are operating correctly.
4. Service elevator car safety equipment.

SECTION FIVE:HOISTWAY AND PIT EQUIPMENT MAINTENANCE 40 HOURS

A. Hoistway Door Equipment 10 Hours

Outcome: Service hoistway door equipment.

1. Describe hoistway door equipment components
2. Describe door component cleaning, and lubricating procedures.
3. Describe inspection checks for gib wear, upthrust adjustments and retainers.
4. Describe inspection checks for door unlocking assemblies.
5. Describe inspection checks for door unlocking mechanical and electrical components.
6. Describe inspection checks for door closing assemblies.
7. Describe inspection tests for door restrictors.
8. Describe inspection tests for relating system devices.
9. Describe hoistway door adjustment procedures.
10. Perform hoistway door maintenance.

B. Counter Weight Assembly 5 Hours

Outcome: Service hoistway counter weight assembly.

1. Describe types of counter weight assemblies.
2. Describe inspections and checks for the counter weight assemblies.
3. Describe inspection checks for guides, guide shoes, slippers and rollers.
4. Describe methods to clean, adjust and lubricate guides.
5. Describe inspection checks for sheaves, guards and shafts.

6. Describe inspection checks for suspension means, shackles, hitches and springs.
7. Describe counter weight maintenance.
8. Service hoistway counter weight systems.

C. Leveling Components 5 Hours

Outcome: Service leveling components.

1. Describe leveling component systems.
2. Describe operation of leveling components.
3. Describe inspection checks for leveling components.
4. Describe clearance required for leveling components.
5. Maintain and inspect leveling components.

D. Counter Balance 5 Hours

Outcome: Adjust counter balance.

1. Describe maintenance procedures for hoistway counter balance ratio after cab renovations.
2. Describe maintenance procedures for hoistway counter balance ratio after replacement of traveling cables.
3. Adjust counter balances.

E. Governor Rope..... 5 Hours

Outcome: Service governor rope.

1. Describe inspection checks for governor ropes.
2. Describe maintenance procedure for governor rope.
3. Describe inspection checks for governor idler sheave.
4. Maintain and inspect governor ropes.

F. Traveling Cable 5 Hours

Outcome: Service traveling cable.

1. Describe inspection checks for travelling cable.
2. Describe inspection checks for travelling cable hitches.
3. Describe inspection checks for travelling cable protection devices.
4. Service traveling cables.

G. Pit Equipment..... 5 Hours

Outcome: Service pit equipment.

1. Describe pit hazards.
2. Describe pit cleaning.
3. Describe inspection and checks for pit components.
4. Describe cleaning, lubricating and adjusting procedures.
5. Describe inspection and checks for car and counter weight run-by.
6. Describe inspection and checks for car and counter weight buffers.

7. Describe inspection and checks for compensation systems.
8. Describe inspection and checks for hydraulic system equipment.
9. Perform inspection checks for hydraulic system equipment.



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