Elevating Devices Mechanic

EDM - D

Cab Renovation

In-School Curriculum Standard

July 2012

PREFACE

This Elevating Devices Mechanic Curriculum Training Standard has been developed in keeping with the Common Format Guidelines prescribed by the Technical Standards and Safety Authority (TSSA) in conjunction with the Elevating Devices Training and Certification Advisory Board (TCAB). The Curriculum Standard reflects the content necessary for appropriate progression through each level of the Elevating Devices Mechanic in-school program.

For easy reference, a time allocation has been included for each respective reportable subject and units, along with a breakdown of theory and application in the delivery of the performance objectives.

The continual introduction of innovative techniques and more complex equipment is resulting in increasing demands for Elevating Devices Mechanics who are not only skilled in the practical aspects of the trade, but who also have a sound theoretical knowledge of the testing, diagnosing and servicing requirements. The Curriculum Standard has been developed to provide this theoretical knowledge and to offer some practical applications to complement the on-the-job work experience of the Elevating Devices Mechanic. The Curriculum Standard will be revised accordingly based on recommendations of the TCAB and industry partners.

The Curriculum Standard has been designed to give the instructor every opportunity for flexibility and innovation without significant departures from content. Since the scope of the prescribed Curriculum Standard is quite extensive, the Mechanic-In-Training will be expected to reinforce the acquired knowledge through regular independent out-of-classroom assignments.

The Curriculum Standard includes specific references to on-the-job training. While on-the-job training has been linked to the respective in-school learning outcomes and learning content objectives, employers should not assume complete coverage in all aspects of the modules. The in-school delivery focuses primarily on the knowledge required and fundamental skills that support the respective objectives outlined in the workplace training. Employers are expected to complete the delivery of these objectives by ensuring the prescribed in-school knowledge is applied to the practical learning experiences in the work setting.

Regular evaluations of a Mechanic-In-Training's learning achievements must be performed in both theory and practical applications throughout the program.

Participation by Stakeholders

TSSA, working in collaboration with the Elevating Devices TCAB and industry members participated in the development of this curriculum guideline.

Table of Contents

Summary of Total Program In-School Training Hours

Reportable Subjects	Total	Theory	Application
1. Safety	24	24	0
2. Introduction to Elevating Devices	21	21	0
3. Mechanical Print Reading	15	6	9
4. Ladders	1	0.5	0.5
5. Rigging and Hoisting	2	1.5	0.5
6. Introduction to Applicable Codes and Standards	6	2	4
7. Mechanical Practices	6	6	0
8. Traction Elevator Installation	28.5	22.5	6
12. Basic Electricity	6	5	1
25. Elevator Modernization/Alterations	24	21	3
Total	**133.5**	**109.5**	**24**

Number: 1

Title: Safety

Duration: 24 Total Hours

Theory: 24 Hours Application: 0 Hours

Evaluation & Testing:

- Assignments related to theory and appropriate application skills.
- Minimum of one mid-term test during the term.
- Final exam at end of term.
- Periodic quizzes.

General Learning Outcome:

Upon successful completion of this reportable subject, the EDM-T is able to practice workplace safety in accordance with government safety regulations, manufacturer's recommendations and specifications and approved industry standards.

1.1 – Define the fundamentals of personal protective equipment.

1.2 – Describe the dangers of asbestos, synthetic mineral fibres and silica.

1.3 – Define the fundamentals of hand and power tool safety.

1.4 – Define the fundamentals of hazards in the hoistway, machine room and Pit.

1.5 – Define the fundamentals of electrical safety.

1.6 – Define the fundamentals of safety when babbitting.

1.7 – Define the fundamentals of safety when using oxy-acetylene equipment for heating and flame cutting.

1.8 – Define the fundamentals of environmental hazards.

1.9 – Define the fundamentals of Material Handling.

1.10 – Describe the safety issues relating to substance abuse.

1.11 – Describe the role of the Workplace Safety & Insurance Board (W.S.I.B.)
1.12 – Describe the workplace fire safety and prevention requirements.

1.13 – Define the essential workplace housekeeping procedures.

1.14 – Describe the types and applications of effective communication techniques.

1.15 – Identify the required Ministry of Labour and TSSA procedures for accidents and unsafe working conditions.

1.16 - Describe the public safety requirements for the workplace.

Learning Content:

1.1 – Define the fundamentals of personal protective equipment.

[1.5/0]

- personal protective equipment
  - head guarding
  - problems for hair and jewellery
  - guarding eyes, ears, hands and feet
  - use of respirators
  - protective clothing
  - use of fall arrest devices and travel restraint as per the requirements of the Occupational Health and Safety Act
  - use of back belts
  - code reference: applicable codes, standards and regulations

1.2 – Describe the dangers of asbestos, synthetic mineral fibres and silica.
[1/0]

- dangers of asbestos, synthetic products and Silica
  - recognize the toxic effects
  - define the types of potential exposure
  - use of P.P.E. to minimize effects of exposure
  - responsibilities and action procedures

1.3 – Define the fundamentals of hand and power tool safety.
[2/0]

- hand tool safety
  - safe use and application of hand tools
  - maintenance of hand tools
  - safe storage of hand tools
- power tool safety
  - inspection
  - operation
  - maintenance
  - storage
  - electrical safety
  - code reference: applicable codes, standards and regulations

1.4 – Define the fundamentals of hazards in the hoistway, machine room and pit.
[5/0]

- identify hazards when removing elevating device from service and positioning in hoistway.
- identify hazards of placing the elevating device back into normal service.
- Identify hazards of stored mechanical energy
- Identify hazards of stored pneumatic energy
- identify hazards of using hoistway access switches and unlocking. devices
- identify hazards of Gaining Access to and Egress from the elevating device car pit.

- identify hazards from overhead deflector sheaves, traction sheaves and deflector sheaves on car.
- identify hazards associated with moving counterweights when on car top and in the pit.
- identify hazards associated with vanes and other devices that present a shear hazard in the hoistway.
- code reference: applicable codes, standards and regulations
- identify hazards caused from falling objects
- identify hazards of falling and exposure to electric shock
- identify hazards of moving on uneven or unstable surfaces
- identify slippery conditions
  - dirt
  - oil grease
  - ice and water
- identify hazards of working around rotating or moving equipment
- code reference: applicable codes, standards and regulations

1.5 – Define the fundamentals of electrical safety.
[3/0]

- define “tag and lockout procedures”
  - verify NO POWER
- describe the use of electrical meters and instruments
  - testing for presence of electricity
- define the hazards from stored electrical energy and other sources
  - capacitors
  - inductors
  - interconnections
- directors ruling 106/93 & 01/82
- define the safe use of jumpers
  - appropriate use
  - potential hazards
- code reference: applicable codes, standards and regulations

1.6 – Define the fundamentals of safety when babbitting.
[1/0]

- identify the requirements for Personal Protective Equipment P.P.E.
- identify the requirements for clean clothing
- define the specified Babbitt composition
- identify the required babbitting equipment
- identify the hazards associated with heating babbitt
  - use of heating equipment
  - handling molten Babbitt
- identify the dangers of moisture in babbitting
- identify the dangers of fumes in babbiting

1.7 – Define the fundamentals of safety when using oxy-acetylene equipment for heating and flame cutting.
[1/0]

- define the requirements of wearing Personal Protective Equipment (P.P.E.).
- identify the safe handling methods and storage requirements of oxy-acetylene equipment.
  - turning on and off equipment
  - hazards of using oxygen around lubricating oil or grease

- explosion hazards
- equipment storage and transportation
- regulator adjustment

1.8 – Define the fundamentals of environmental hazards.
[1/0]

- chemical hazards
- physical hazards
- biological hazards
- toxic substances

1.9 – Define the fundamentals of material handling.
[1/0]

- planning storage
- specified PPE
- warm up
- adequate lighting
- communication
- use of dollies
- lifting techniques

1.10 – Describe the safety issues relating to substance abuse.
[1/0]

- describe alcohol, prescription and non-prescription drug abuse
- recognize symptoms
- awareness of programs and counseling

1.11 – Describe the role of the Workplace Safety and Insurance Board (W.S.I.B.)
[1/0]

- define the role of the W.S.I.B
- define the role and responsibilities of the employer and employee

1.12 – Describe the workplace fire safety and prevention requirements.
[1/0]

- interpret the Occupational Health and Safety Act (O.H.S.A.)
- identify potential fire hazards
- identify the class of fires and the application of the appropriate fire extinguisher
- develop an emergency action plan including evacuation procedures
- describe the use of extinguishers, respirators, stretchers and fire blankets
- describe the factors that determine when a fire should not be fought

1.13 – Define the essential workplace housekeeping procedures.
[1/0]

- Identify hazardous areas in the workplace
  - wet floors and liquid spills
  - poor illumination

- debris in walking area
- loose carpet and uneven surfaces
- storage of tools and equipment

1.14 – Describe the types and applications of effective communication techniques.
[0.5/0]

- identify the four types of communication and situational applications
  - Verbal
  - Written
  - Visual
  - Body language

1.15 – Identify the required Ministry of Labour and TSSA procedures for accidents and unsafe working conditions.
[2/0]

- define the procedures for identifying and reporting unsafe conditions
- describe how to attend to injured workers
- practice writing an accident and incident report that complies with the Ministry of Labour and TSSA Accident Reporting Procedures
- review the TSSA "Emergency Evacuation Training and Certification Policy"

1.16 - Describe the public safety requirements for the workplace.
[1/0]

- define the method of notifying building personnel of elevating device shut-down or reinstatement to service.
- define the reasons for notifying building personnel that the elevating device has been shut down or returned to service
- define the requirement for and location of "maintenance in progress" signs
- define the equipment requirements and procedure for barricading entrances.
- define the requirements for barricading
- minimizing hazards associated with public contact with tools or materials in the work area

<u>Reference material for this section includes the following:</u>

The Act:
Occupational Health and Safety Act, R.S.O. 1990

4 Sector Regulations:
Regulations for Construction Projects, O. Reg. 213/91
Industrial Establishments Regulations, O. Reg. 851
Health Care and Residential Facilities Regulation, O. Reg. 67/93
Mines and Mining Plants Regulation, O. Reg. 854

Elevator Industry Safety Handbook

Number: 2

Title: Introduction to Elevating Devices

Duration: 21 Total Hours

Theory: 21 Hours Application: 0 Hours

Evaluation & Testing:

- Assignments related to theory and appropriate application skills.
- Minimum of one mid-term test during the term.
- Final exam at end of term.
- Periodic quizzes.

General Learning Outcome:

Upon successful completion of this reportable subject, the EDM-TEDM-T is able to describe the introductory information of the elevating devices industry in accordance with historical and current elevating systems.

2.1 – History and Terminology of Vertical Transportation

2.2 – Other Elevating Devices

2.3 – Acts, Regulations, Standards and Codes

2.1– History and Terminology of Vertical Transportation

Duration: Total Hours 3 Theory: 3 hours Application: 0 hours

General Learning Outcome:

Upon successful completion of this reportable subject, the EDM-T is able to describe the history and terminology of vertical transportation and the evolution to the modern elevating devices in accordance with government safety regulations, manufacturers' recommendations and approved industry standards.

Learning Outcomes:

Upon successful completion, the EDM-T is able to:

2.1.1- Describe the need for elevators and how this need caused the evolution in elevating devices from the simplest to the most technologically advanced.

2.1.2- Describe terminology concerning elevators, escalators and other elevating devices.

Learning Content:

2.1.1- Describe the need for elevators and how this need caused the evolution in elevating devices from the simplest to the most technologically advanced.
[1/0]

- the origin of elevating devices
- early modern elevators
- modern elevators

2.1.2- Describe terminology concerning elevators, escalators and other elevating devices.
[2/0]

- identify a glossary of elevating devices terms:
  - machine room equipment
  - hoistway equipment
  - car assembly equipment
  - pit equipment

2.2 –Other Elevating Devices

Duration: Total Hours: 9 Theory: 9 hours Application: 0 hours

General Learning Outcome:

Upon successful completion of this reportable subject, the EDM-T is able to describe other elevating devices covered under the Elevating Devices Regulations in accordance with manufacturer's design features.

Learning Outcomes:

Upon successful completion, the EDM-T is able to:

2.2.1- Define the fundamentals of dumbwaiters.

2.2.2- Define the fundamentals of material lifts.

2.2.3- Define the fundamentals of sidewalk elevators.

2.2.4- Define the fundamentals of incline lifts.

2.2.5- Define the fundamentals of lifts for persons with physical disabilities.

2.2.6- Define the fundamentals of manlifts.

2.2.7- Define the fundamentals of construction hoists.

2.2.8- Define the fundamentals of passenger ropeways.

2.2.9- Define the fundamentals of stage lifts.

2.2.10- Define the fundamentals of special application elevators.

2.2.11- Define the fundamentals of elevators with other types of driving machines.

Learning Content:

2.2.1- Define the fundamentals of dumbwaiters.
[1.5/0]

- code reference: applicable codes, standards and regulations
- Types and applications
- Basic construction features and operation

2.2.2- Define the fundamentals of material lifts. (Freight Platform Lifts).
[1.5/0]

- Ontario Regulation, Section 1. and Section 2.3.(see freight platform lifts).
- Code Adoption Document Part 3
- B44 Code, Section 7.4, 7.5, 7.6, 7.7, 7.9, 7.10, 7.11
- Outline the essential differences from elevators.
  - lifting mechanism
  - controls

2.2.3- Define the fundamentals of sidewalk elevators.
[.5/0]

- Ontario Regulation, Section 1
- B44 Code, Section 5.5

2.2.4- Define the fundamentals of incline lifts.
[1/0]

- Ontario Regulation, Section 1
- B44 Code, Section 5.1, 5.4

2.2.5- Define the fundamentals of lifts for persons with physical disabilities.
[1.5/0]

- Ontario Regulation, Section 1. and Section 2
- Code Adoption Document Part 7
- CSA B355
- CSA B613

2.2.6- Define the fundamentals of manlifts.
[0.5/0]

- Ontario Regulation, Section 1. and Section 2
- Code Adoption Document Part 4
- B311 Code

2.2.7- Define the fundamentals of construction hoists.
[0.5/0]

- Ontario Regulation, Section 1 and Section 2
- Code Adoption Document Part 6
- Z185 (Workers hoists) and Z256 Codes (Material Hoists)

2.2.8- Define the fundamentals of passenger ropeways. (Note that the Elevating Device Mechanic is not certified to work on a Passenger Ropeway as identified in the Ontario Regulation 186/03 for Ski Lift machine Requirements).
[0.5/0]

- Ontario Regulation, Section 1. and Section 2
- Code Adoption Document Part 5
- Z98 Code (Passenger Ropeways)

2.2.9- Define the fundamentals of stage lifts.
[0.5/0]

- Ontario Regulation, Section 1. and Section 2
- B44 Code (Stage lifts) General rules applicable to elevators

2.2.10- Define the fundamentals of Special Application Elevators.
[0.5/0]

- CSA B44 Code Part 5
- Ontario Acts / Regulations

2.2.11- Define the fundamentals of elevators with other types of driving machines.
[0.5/0]

- CSA B44 Part 4
- Ontario Acts / Regulations

2.3– Acts, Regulations, Standards and Codes

Duration: Total Hours: 9 Theory: 9 hours Application: 0 hours

General Learning Outcome:

Upon successful completion of this reportable subject, the EDM-T is able to describe acts, regulations, standards and codes in accordance with government safety regulations, manufacturer's recommendations and specifications and approved industry standards.

Learning Outcomes:

Upon successful completion, the EDM-T is able to:

2.3.1- Identify the basic differences between acts, regulations, standards and codes.

2.3.2- Describe the essentials of the Technical Standards and Safety Act, Regulations, Code Adoption Document, Policies and Procedures.

2.3.3 - Interpret the essentials of the Ontario Building Code Act and Regulations.

2.3.4 - Define the essentials of the Ontario Health and Safety Act (Construction/ Industrial) as it applies to this trade.

2.3.5 - Describe the essentials of W.H.M.I.S. as it applies to this trade and industry.

2.3.6 - Define the essentials of the various Codes and Standards as they apply to elevating devices.

2.3.7 - Identify the legal responsibilities as they apply in the various acts, regulations, standards and codes and how they affect this trade.

2.3.8- Identify the fundamentals of the TSSA Directors rulings.

Learning Content:

2.3.1 - Identify the basic differences between acts, regulations, standards and codes.
[1/0]

- basic information concerning the differences between the topics covered in acts, those covered in regulations and those in standards.
- explanation of the relationship between acts, regulations and standards.
- review Code adoption documents.

2.3.2 - Describe the essentials of the Technical Standards and Safety Act, Regulations and Code Adoption Document Policies and Procedures.
[2/0]

- Basic information (overview) concerning topics in the Technical Standards and Safety Act and Regulations and Training and Certification of Mechanics.

2.3.3 - Interpret the essentials of the Ontario Building Code Act and Regulations.
[1/0]

- Overview of the topics which are directly relevant to elevating devices.

2.3.4 - Define the essentials of the Ontario Health and Safety Act (Construction/ Industrial) as it applies to this trade.
[1/0]

2.3.5 - Describe the essentials of W.H.M.I.S. as it applies to this trade and industry.
[1/0]

2.3.6 - Define the essentials of the various Codes and Standards as they apply to elevating devices.
[1.5/0]

- CSA B44, Safety Code for Elevators
- CSA C22.1 Part I, Canadian Electrical Code (Section 38)
- Overview only of the following standards:
  - CSA B311, Safety Code for Manlifts
  - CSA Z185, Safety Code for Personnel Hoists
  - CSA Z256, Safety Code for Material Hoists
  - CSA B613 Lifts for persons with physical disabilities in private residences
  - ASME A17.4 Guide for Emergency personnel

2.3.7 - Identify the legal responsibilities as they apply in the various acts, regulations, standards and codes and how they affect this trade.
[0.5/0]

- Identify the legal responsibilities:
  - Elevating Device Mechanic-In-Training (EDM-T)

- Journeyperson
- Elevating devices mechanic

2.3.8- Identify the fundamentals of the TSSA Directors rulings. [1/0]

- refer to the TSSA web site (www.tssa.org)
- identify the legal responsibilities
- explain the reasons for directors rulings

Number: 3

Title: Mechanical Print Reading

Duration: 15 Total Hours

Theory: 6 Hours Application: 9 Hours

Evaluation & Testing:

- Assignments related to theory and appropriate application skills.
- Minimum of one mid-term test during the term.
- Final exam at end of term.
- Periodic quizzes.

General Learning Outcome:

Upon successful completion of this reportable subject, the EDM-T is able interpret mechanical print reading in accordance with manufacturer's recommendations and specifications and approved industry standards.

3.1 – Architectural/Structural Prints

3.2 – Elevating Device Layout Prints

3.3 – Elevating Devices Mechanical Print Reading

3.1– Architectural/Structural Prints

Duration: 3 Total Hours Theory: 3 hours Application: 0 hours

General Learning Outcome:

Upon successful completion of this reportable subject, the EDM-T is able to interpret architectural/structural prints in accordance with manufacturer's recommendations and specifications and approved industry standards.

Learning Outcomes:

Upon successful completion, the EDM-T is able to:

3.1.1- Identify the fundamentals of architectural/structural prints.

3.1.2- Describe the construction features of architectural/structural prints.

3.1.3- Locate and identify key elements on an architectural/structural print relating to the construction/installation of an elevating device.

Learning Content:

3.1.1- Identify the fundamentals of architectural/structural prints.
[0.5/0]

- identify the type and application of architectural/structural drawings
  - drawing type
  - location of identifying information
    - building address
    - drawing number
    - plan views
    - elevation views
    - drawing scale
    - specifications

3.1.2- Describe the construction features of architectural/structural prints.
[0.5/0]

- nomenclature relating to sectional views
- number of landings and floor elevations
- symbols relating to:
  - doors
  - windows
  - structural beams
  - beam connections
  - fasteners
  - poured concrete
  - concrete blocks
  - masonry
  - timber
  - drywall
  - footings reinforcing rods
  - anchors
  - concrete inserts
  - through bolts
  - heating cooling and ventilation ducts
  - exhaust fans
  - plumbing
  - sanitary drains
  - sump holes
  - cored holes

3.1.3- Locate and identify key elements on an architectural/structural print relating to the construction/installation of an elevating device.
[2/0]

- location of elevating device in the plan views
- location of elevation views and determine floor heights and number of landings
- determine the travel, pit depth and overhead
- locate the system of grid lines on the drawings and relate position of elevating device to the grid lines
- determine the thickness and type of finished walls for the hoistway
- determine the location of fixtures forming part of the elevating device control equipment and other ancillary fixtures.
  - Central Alarm and Control Facility (CACF)

    - lobby dispatch panel
    - recall switches
    - smoke and heat sensors
    - sprinkler heads
    - display systems
- locate the elevating device entrances
- locate the elevating device machine room
    - machine room configuration
    - secondary level configuration
    - special trenches or tunnels for:
        - oil lines
        - electrical conduit

3.2– Elevating Device Layout Prints

Duration: Total Hours: 8 Theory: 0 hours Application: 8 hours

General Learning Outcome:

Upon successful completion of this reportable subject, the EDM-T is able to describe elevating device layout prints in accordance with manufacturer's recommendations and specifications and approved industry standards.

Learning Outcomes:

Upon successful completion, the EDM-T is able to:

3.2.1- Interpret the information on an elevating device print

3.2.2- Identify the key aspects of elevating device print reading

3.2.3- Locate and identify positioning of components

3.2.4- Locate and identify clearances

3.2.5- Locate and identify power requirements

Learning Content:

3.2.1- Interpret the information on an elevating device print.
[0/2]

- location of identifying information
    - building address
    - drawing number
    - plan and elevation views
    - drawing scale

3.2.2- Identify the key aspects of elevating device print reading.
[0/1]

- location and depth of pit
- identify the normal travel of the elevating device

- locate and identify the overhead and related dimensions
- locate the width and depth of the hoistway in the plan view

3.2.3- Locate and identify positioning of components
[0/2]

- locate and identify position of guide rails
- identify the size and orientation of the car frame
- locate and identify pit equipment:
  - buffers
  - rail foot brackets
  - pit channels
  - compensating sheave
  - pit ladder
  - pit stop switch
  - pit light and light switch

3.2.4- Locate and identify clearances
[0/1]

- locate and identify clearances:
  - sill to sill running clearance
  - car to car counterweight clearance
  - car to hoistway wall clearance
  - clearances at top and bottom of hoistway
  - run-by, buffer stroke and clearances
  - controller and main disconnect clearances

3.2.5- Locate and identify power requirements
[0/2]

- identify the correct location of main electrical components
  - main disconnect switches
  - car light disconnect / power supply
  - signal switches
  - dispatcher disconnect switches
- confirm the elevating device power requirements
  - voltage
  - amperage

3.3– Elevating Devices Mechanical Print Reading

Duration: Total Hours: 4 Theory: 3 hours Application: 1 hour

General Learning Outcome:

Upon successful completion of this reportable subject, the EDM-T is able to explain elevating device mechanical print reading procedures in accordance with manufacturer's recommendations and specifications and approved industry standards.

Learning Outcomes:

Upon successful completion, the EDM-T is able to:

3.3.1- Describe the fundamentals of drawing title blocks, notes and abbreviations.

3.3.2- Describe the fundamentals of visualization, projection and views.

3.3.3- Explain the fundamentals of dimensioning.

3.3.4- Identify typical machine elements associated with elevating devices.

Learning Content:

3.3.1- Describe the fundamentals of drawing title blocks, notes and abbreviations. [1/0]

- drawing title blocks
  - drawing name
  - number system
  - revisions
  - dates
- reading notes
  - importance of recognition
  - data
- understanding abbreviations
- scale indication and measuring scales

3.3.2- Describe the fundamentals of visualization, projection and views. [1/0]

- orientation of objects
- third vs. first angle of projection
- basic arrangement of views
- transference of dimensions
- auxiliary and section views
- isometric and exploded views

3.3.3- Explain the fundamentals of dimensioning. [1/0]

- definition and requirements of dimensioning
- dimensioning systems
- rules for dimensioning
- checking dimensions
- English vs. metric system of units

3.3.4- Identify typical machine elements associated with elevating devices. [0/1]

- structural steel sections
- shafts, keys and pins
- fasteners
  - types

  - thread nomenclature
- weld symbols

Number 4

Title: Ladders

Duration: 1 Total Hour

Theory: 0.5 Hours Application: 0.5 Hours

Evaluation & Testing:

- Assignments related to theory and appropriate application skills.
- Minimum of one mid-term test during the term.
- Final exam at end of term.
- Periodic quizzes.

General Learning Outcome:

Upon successful completion of this reportable subject, the EDM-T is able to explain the use of ladders in accordance with government safety regulations, manufacturer's recommendations and specifications and approved industry standards.

4.1 – Describe the fundamentals of using ladders.

Learning Content:

4.1 – Describe the fundamentals of using ladders.
[0.5/0.5]

- ladder angle limits
- ensure secure footing
- determine the required height
- define correct positioning
- guard area in vicinity of ladder
- tie-off the ladder as required
- load limits
- maintenance and storage
- materials used to construct ladders
- code reference: applicable codes, standards and regulations
- C.S.A Certification and Duty Ratings

Number: 5

Title: Rigging and Hoisting

Duration: 2 Total Hours

Theory: 1.5 Hours Application: 0.5 Hours

Evaluation & Testing:

- Assignments related to theory and appropriate application skills.
- Minimum of one mid-term test during the term.
- Final exam at end of term.
- Periodic quizzes.

General Learning Outcome:

Upon successful completion of this reportable subject, the EDM-T is able to describe the safe use of rigging and hoisting equipment in accordance with government safety regulations, manufacturer's recommendations and specifications and approved industry standards.

5.1 – Define the fundamentals and types of rigging and hoisting equipment

5.3 – Explain the operating principles of rigging and hoisting equipment.

Learning Content:

5.1 – Define the fundamentals and types of rigging and hoisting equipment
[1/0]

- types of pneumatic devices

5.3 – Explain the operating principles of rigging and hoisting equipment.
[0.5/0.5]

- types of pneumatic devices
  - design
  - safety rules
  - pre-operation inspection
  - function tests
  - workplace inspection
  - operating instructions
  - maintenance schedule
  - storage

Number: 6

Title: Introduction to the CSA B44 Code Book

Duration: 6 Total Hours

Theory: 2 Hours Application: 4 Hours

Evaluation & Testing:

- Assignments related to theory and appropriate application skills.
- Minimum of one mid-term test during the term.
- Final exam at end of term.
- Periodic quizzes.

General Learning Outcome:

Upon successful completion of this reportable subject, the EDM-T is capable of describing the fundamentals of locating, accessing and interpreting the information contained within the CSA B44 Standard.

6.1 – Define the introductory information of the development of codes and standards for the CSA B44 code book.

6.2 – Define the history of the harmonized North American Elevator Code system.

6.3 – Describe the format of standards and conventions used for codes.

6.4 – Perform the procedure to access information from the CSA B44 code book.

Learning Content:

6.1 – Define the introductory information of the development of codes and standards for the CSA B44 code book.
[1/0]

- the hierarchy of Standards Canada, Canadian Standards Association (CSA) and other code writing bodies.
- code committees
- B44 Technical committee and sub-committees
  - recommended reading of the code making process at CSA
    - hierarchy
    - policies and procedures
    - organizational charts

6.2 – Define the history of the harmonized North American Elevator Code system.
[0.5/0]

- the ASME A17.1 American Elevator Standard
- NAFTA as a catalyst for harmonization

- Harmonization commencement date
- Harmonization completed with the first bi-national standard 2007 edition

6.3 – Describe the format of standards and conventions used for codes.
[0.5/0]

- the numbering system
- terminology for:
  - differences between a “code” and a “Standard”
  - interpretations
  - inquiries
  - ballots
  - letter ballots
  - define “consensus”

6.4 – Perform the procedure to access information from the CSA B44 (applicable) code book.
[0/4]

- search for keywords
- process of elimination
  - the hierarchal approach
- use of trade terms
- searching with the index
- search levels and cross references

Number: 7

Title: Mechanical Practices

Duration: 6 Total Hours

Theory: 6 Hours Application: 0 Hours

Evaluation & Testing:

- Assignments related to theory and appropriate application skills.
- Minimum of one mid-term test during the term.
- Final exam at end of term.
- Periodic quizzes.

General Learning Outcome:

Upon successful completion of this reportable subject, the EDM-T is able to describe the mechanical practice procedures for elevating device maintenance in accordance with government safety regulations, manufacturer's recommendations and specifications and approved industry standards.

7.1 – Define the fundamentals of mechanical print reading, associated mathematics and science.

7.2 – Not Required or Not Applicable

7.3 – Not Required or Not Applicable

7.4 – Not Required or Not Applicable

7.5 – Describe the fundamentals of materials and fastening technology.

7.6 – Not Required or Not Applicable

7.7 – Not Required or Not Applicable

Learning Content:

7.1 – Define the fundamentals of mechanical print reading, associated mathematics and science. [3/0]

- drawing types
  - orthographic
  - isometric
- drawing views of components
  - multi-view
  - auxiliary views
  - assembly
  - detail drawings
- applied mathematics
  - adding, subtracting, multiplying, dividing

    - conversion of fractions
    - algebra
    - trigonometry
- strength of materials
    - tensile strength
    - hardness
    - corrosion protection
    - safety factors

7.5 – Describe the fundamentals of materials and fastening technology. [3/0]

- identify and describe properties and application for:
    - ferrous metals
    - non-ferrous metals
    - alloys
- identify and describe application for non-metallic materials
    - neoprene
    - plastics
    - composites
- define the mechanical properties of metals and alloys
    - tensile strength
    - yield strength
    - hardness
    - elongation rate
- identify and select fasteners for specific applications
    - bolts
    - through bolts
    - nuts
    - lock washers
    - flat washers
    - bevel washers
    - pins
    - dowels
    - retaining rings
    - screws
    - mechanical anchors
    - chemical anchors
    - shields
    - inserts
- identify thread types
    - UNC
    - UNF
    - Metric
    - NPT
    - NPTF
- identify grade of fasteners
    - head markings
    - strength of materials

  - reference CSA B44 Section 9.1
- other fastening materials
  - W clips
  - Z clips
  - T nuts
  - nut serts
  - toggle fastenings
  - adhesives

Number: 8

Title: Traction Elevator Installation

Duration: 28.5 Total Hours

Theory: 22.5 Hours Application: 6 Hours

Evaluation & Testing:

- Assignments related to theory and appropriate application skills.
- Minimum of one mid-term test during the term.
- Final exam at end of term.
- Periodic quizzes.

General Learning Outcome:

Upon successful completion of this reportable subject, the EDM-T is able to describe the construction and installation procedures for traction elevators in accordance with government safety regulations, manufacturer's recommendations and specifications and approved industry standards.

8.1 – Site Planning

8.2 – Not Required or Not Applicable

8.3 – Not Required or Not Applicable

8.4 – Not Required or Not Applicable

8.5 – Pit Structures

8.6 – Not Required or Not Applicable

8.7 – Not Required or Not Applicable

8.8 – Not Required or Not Applicable

8.9 – Car Cab Assemblies and Traveling Cables

8.1 – Site Planning

Duration: Total Hours: 4 Theory: 4 hours Application: 0 hours

General Learning Outcome:

Upon successful completion of this reportable subject, the EDM-T is able to describe the fundamentals, features and application of site planning in accordance with government safety regulations, manufacturer's recommendations and approved industry standards.

Learning Outcomes:

Upon successful completion, the EDM-T is able to:

8.1.1 – Define the fundamentals of site planning.

8.1.2 – Describe the construction features and application of site planning.

Learning Content:

8.1.1 – Define the fundamentals of site planning.
[2/0]

- Verify if the site is ready for installation:
  - report to the site superintendent or General Contractor (GC**)**
  - visually inspect site
  - review the owners requirements
  - scheduling of equipment
  - review equipment check list
  - planning job safety
  - arrange storage space
  - confirm the integrity of all fastening points

8.1.2 – Describe the construction features and application of site planning.
[2/0]

- identify features and application procedures
  - organize tools
  - organize the equipment availability in conjunction with the delivery schedules and installation sequence
  - communication process
  - housekeeping

8.5 – Pit Structures

Duration: Total Hours: 1 Theory: 1 Hours Application: 0 Hours

General Learning Outcome:

Upon successful completion of this reportable subject, the EDM-T is able to describe the introductory information and fundamentals of installing pit structures in accordance with government safety regulations, manufacturer's recommendations and approved industry standards.

Learning Outcomes:

Upon successful completion, the EDM-T is able to:

8.5.1 – Identify pit equipment components.

Learning Content:

8.5.1 – Identify pit equipment components.
[1/0]

- identify pit equipment components:
  - channels
  - compensating sheaves
  - buffers
  - governor tension sheaves
  - pit switches
  - counterweight guards
  - ladders
  - sundry pit equipment
  - access doors

8.9 – Car Cab Assemblies and Traveling Cables

Duration: Total Hours: 23.5 Theory: 17.5 Hours Application: 6 Hours

General Learning Outcome:

Upon successful completion of this reportable subject, the EDM-T is able to describe fundamentals of installing car cab assemblies in accordance with government safety regulations, manufacturers' recommendations and approved industry standards.

Learning Outcomes:

8.9.2 – Describe the fundamentals of installing car cab assemblies.

8.9.3 – Describe the fundamentals of installing car door systems.

Learning Content:

8.9.2 – Describe the fundamentals of installing car cab assemblies.
[15/5]

- ventilation
- illumination requirements
- emergency exit
  - location
  - size
  - installation
- decorative panels
  - construction
  - installation
- acceptable materials
  - walls
  - floors
  - ceilings
- suspended ceilings
  - emergency exit panel
  - lighting
  - ventilation
  - fastening
- cab interior dimension requirements
- handrail
  - sizes
  - height
  - fastening
- adhesives
  - contact cement
  - high bonding tape
  - tile adhesive
  - caulking
  - paints
  - usage

  - personal protective equipment
  - ventilation
  - preparation
  - health hazards
  - first aid
- cleaning agents
  - usage
  - ventilation
  - health hazards
  - first aid
- car top projection (top hat)
  - size
  - location
- flooring
  - sill requirements
  - materials
  - installation
- material weight calculations
  - addition of weight
  - removal of weight
  - weight of common materials
- safety considerations relating to car / counterweight balance
  - loss of traction
  - ascending car and uncontrolled motion
  - loss of brake function
- fire rating
- smoke development classification
- horizontal clearance
- identify parts of cab assembly
- describe cab assembly installation procedures for:
  - threshold, extension and guard
  - positioning of the canopy
  - fascia and canopy
  - cab steadier
  - car operating panels
  - laying of tile floors
  - top of car equipment
  - emergency lighting power supply
- code reference: applicable codes, standards and regulations

8.9.3 – Describe the fundamentals of car door systems. [2.5/1]

- identify parts of car door systems
- describe car door system:
  - hanger and tracks
  - linkages
  - aircord
  - eccentrics

- door gibs / guides
- gate switches
- vanes and clutches
- door restrictors
- clearance checks and adjustments
- mechanical safety edges
- multi-beam devices
- detectors
- photo eyes
- proximity devices
- kinetic energy measurement and requirements
- code reference: applicable codes, standards and regulations

Number: 12

Title: Basic Electricity

Duration: 6 Total Hours

Theory: 5 Hours Application: 1 Hour

Evaluation and Testing:

- Assignments related to theory and appropriate application skills.
- Minimum of one mid-term test during the term.
- Final exam at end of term.
- Periodic quizzes.

General Learning Outcome:

Upon successful completion of this reportable subject, the EDM-T is able to describe basic fundamentals of electricity and related electrical circuits in accordance with manufacturer's recommendations and specifications and approved industry standards.

12.1 – Review basic mathematics.

12.2 – Describe the fundamentals of electricity and relation to the structure of matter.

12.3 – Not Required or Not Applicable

12.4 – Define the fundamentals and work with alternating current electrical circuits.

12.5 – Describe voltage, current and resistance measurements.

Learning Content:

12.1 – Review of basic mathematics
[1/0]

- review number systems
  - whole numbers
  - decimals
  - fractions
  - reciprocals
  - percent
  - powers
  - roots
  - ratio
  - proportion

12.2 – Describe the fundamentals of electricity and relation to the structure of matter.
[1/0]

- atomic structure of matter
  - free electrons
  - source of electricity
  - define nature of electricity
  - static electricity

12.4 – Define the fundamentals and work with alternating current electrical circuits. [1/0]

- define alternating current
- electrical terms
- electrical symbols
  - sine wave
- AC power

12.5 – Describe voltage, current and resistance measurements. [2/1]

- Identify precautions
  - switching from ohmmeter to voltage and amperage scales
  - moisture
  - electrical shock prevention
- measure AC and DC voltage and amperage
  - analog meters
  - digital meters
- measure resistance
  - ohmmeter
  - multi-meter

Number: 25

Title: Modernization/ Alterations

Duration: 24 Total Hours

Theory: 21 Hours Application: 3 Hours

General Learning Outcome:

Upon successful completion of this reportable subject, the EDM-T is able to describe elevating device modernizations and alteration procedures in accordance with government safety regulations, manufacturer's recommendations and specifications and approved industry standards.

25.1– Identify the relevant information pertaining to modernization and alterations to elevating devices.

25.2– Define the fundamentals of performing a modernization or alteration in an occupied building.

Learning Content:

25.1– Identify the relevant information pertaining to modernization and alterations to elevating devices. [15/3]

- Code requirements:
  - major alterations
  - minor alterations
  - minor alteration type A
  - minor alteration type B
  - code reference: applicable codes and standards
- fire rating of new cab panels
- counterbalancing ratios
- changes to loading on safeties
- sheave shaft load
- groove loading
- rope loading
- submissions to the TSSA
- safety factors pertaining to hydraulic elevators

25.2– Define the fundamentals of performing a modernization or alteration in an occupied building. [6/0]

- communication with building personnel
- working in occupied buildings
- planning
- site conditions
- housekeeping
- jumpers
- safety precautions
  - asbestos

  - guarding the work areas
- delivery/storage & hoisting of new equipment
- dismantling & removal of old equipment
- interfacing old equipment with new equipment
- dangers of overbalance of counterweight during cab removal
- grounding
- power requirements
- Electric Traction Elevators
  - Identify hazards when removing elevating device from service and positioning in the hoistway
    - disconnecting means lockout tagout
    - machine brake application
    - rope brake application
    - governor and safety application
  - Identify hazards when returning the elevating device to normal service
    - governor and safeties reset
    - rope brake reenergized
    - lockout tagout removed
    - be aware of any weight changes as per Director's Order ED-226-07 R1 and Director's Order ED-172-02 R2
    - is inspection required before return to service after a major alteration, minor A alteration, minor B alteration or maintenance repair or replacement?
    - is inspection required to be carried out by an EDM-A?
    - are tests required to be performed by an EDM-A?
- Hydraulic Elevators
  - Identify hazards when removing elevating device from service and positioning in the hoistway
    - disconnecting means lockout tagout
    - possibility of oil loss
    - securing car in hoistway (e.g. steel supports or drilling guide rails and installing bolts which will support the car
  - Identify hazards when returning the elevating device to normal service
    - lockout tagout removed
    - are steel supports or guide bolts supporting car removed? Use EDM-A for this function
    - be aware of any weight changes as per Director's Order ED-226-07 R1 and Director's Order ED-172-02 R2
    - is inspection required before return to service after a major alteration, minor A alteration, minor B alteration or maintenance repair or replacement?
    - is inspection required to be carried out by an EDM-A?
    - are tests required to be performed by an EDM-A?
- procedures to be performed by an EDM-A (who will remove and secure the escalator and also return it to service after a modernization or alteration)
  - approved barricades installed and secured at both ends of escalator
  - appropriate "Out of Service" signs posted
  - lockout and tagout complied with
  - if 10% or more of escalator steps removed, EDM-D shall confirm with EDM-A that escalator has been secured to prevent movement in either direction in case of weight imbalance
  - when EDM-D receives confirmation from EDM-A and verifies first three items above, EDM-D affixes lockout to main line disconnect
  - use extreme caution when walking on a partially disassembled escalator. Avoid walking on step axles as much as possible and always hold the handrail

MINIMUM EQUIPMENT & SUPPLIES FOR EACH PROGRAM REPORTABLE SUBJECT

Provide Examples of the following items

1. Safety:
- Code Books
- Acts and Regulations
- Code Adoption
- Policies and Procedures

2. Introduction to Elevating Devices:
- Fall Arrest Harness
- Personal Protective Equipment (PPE)
- Oxy-Acetylene simulator
- Fire extinguisher for A,B,C
- WSIB reporting forms
- OHSA construction

3. Mechanical Print Reading:
- Architectural, Structural and Mechanical Prints

4. Ladders, Scaffolding and Work Platforms:
- Various types of Ladders
- Scaffolding and Planks
- Various types of rope fastening devices
- Beam clamps
- Crosby clips
- Rigging hardware
- Rope terminations

5. Rigging and Hardware:
- Come along
- Small manual chain block
- Assorted slings

6. Introduction to applicable codes and standards:
- The current applicable codes and standards

7. Mechanical Practice:
- Assorted components of belt, chain and power transmission systems
- Assorted bearings, bushings and seals
- Precision measuring tools and instruments
- Assorted mechanical test instruments

8. Traction Elevator Installation:
- Various rail sizes and fastening devices
- Rail alignment tools/gauges
- MR layout drawings
- MR floor layout template
- Typical MR equipment
- Various wiring devices, tools and components
- Typical Pit equipment components

- Wire rope, fastenings and terminations
- Typical entrance frame and door components
- Typical hoistway door interlocks
- Duct and conduit systems
- Typical hoistway switches
- Typical travelling cables and fastening devices
- Car top inspection station; COP
- Typical car door operators
- Typical door protective devices
- Typical car door components
- Typical TSSA inspection forms

12. Basic Electricity:

- Various electrical components
- Hand tools and electrical testing devices
- Permanent magnets and electro-magnetic components

25. Elevator Modernization/Alterations:

- No additional equipment required