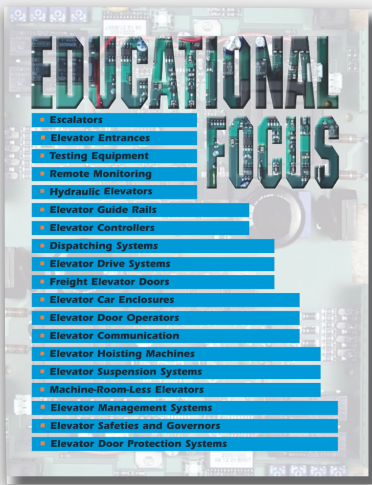


# Educational Focus, Vol. 1



## All Courses:

21 contact hours credit  
for CET® or QEI

16 contact hours credit  
for CAT®



## Individual Courses:

1-3 contact hours credit

### Approved by:

- ◆ National Association of Elevators Contractors for CET®/CAT®
- ◆ NAESA for QEI
- ◆ States of: AL, AR, CO, FL, GA, IL, IN, KY, MD, MS, MO, NJ, OK, PA, VT, VA, WA, WV and WI
- ◆ Canada Province of British Columbia & Ontario

## Program Materials

The *Educational Focus* book is a compilation of 55 articles from Elevator World published in 19 magazine issues between March 2002 and October 2003. The book is available from Elevator World at [www.elevatorbooks.com](http://www.elevatorbooks.com). Sixteen of 19 chapters (49 of the 55 articles) can be used to receive contact hours of continuing education. A maximum of (21) hours of credit is possible from those chapters if all approved tests are passed.

- The NAEC Education Committee has approved all 16 chapters (21 hours) for credit toward **Certified Elevator Technician (CET)** recertification and The NAEC Education Committee has approved 11 chapters (16 hours) toward **Certified Accessibility Lift and Residential Elevator Technician (CAT)** recertification.
- NAESAI Certification Board has approved all 16 chapters (21 hours) towards **Qualified Elevator Inspector (QEI)** recertification.

## Instructions and Course Specifics

- Purchase the *Educational Focus* book if you do not already own it.
- Download the *Educational Focus Guide to CE* (available at [www.elevatorbooks.com](http://www.elevatorbooks.com))
- Read the Learning Objectives (in the *Educational Focus Guide to CE*) for the chapter or grouping of chapters for which you wish to receive credit.
- Read the chapter or grouping of chapters in the *Educational Focus* book.
- Study the Learning Reinforcement Questions (in the *Educational Focus Guide to CE*) for the chapter or grouping of chapters for which you wish to receive credit.
- Purchase the test or package of tests at [www.elevatorbooks.com](http://www.elevatorbooks.com) if you have not already done so. You will receive a login and password at that time.
- Answer the Learning Assessment Examination Questions for that chapter, either online at Test.com or by filling out the Elevator World Continuing Education Reporting Form for the corresponding chapter and submit by mail with payment.
- 80% is a passing grade. If you take the test online, you will immediately know if you passed. One free retake is included in the purchase price of the test. You have two years to complete the tests.
- You will be given an option to print a certificate of completion for the contact hours of continuing education you have earned.
- Elevator World will keep a record of your tests and scores for 7 years.

## Curriculum

### Individual courses:

- Elevator Controllers
- Elevator Door Operators
- Hydraulic Elevators
- Dispatching Systems
- Elevator Drive Systems/Communication
- Door Protection Systems
- Elevator Guide Rails
- Elevator Safeties and Governors
- Elevator Car Enclosure
- Elevator Hoisting Machines
- Escalators
- Elevator Suspension Systems
- Testing Equipment
- Elevator Entrances
- Freight Elevator Doors

## Cost

As a general rule, contact hours of credit for text-based material are \$35.00 for the first contact hour and \$20.00 for each subsequent hour. However, the entire package of exams can be purchased at a discount when bought all at once and the exams can be taken over a two-year period. Note: This *Educational Focus Guide to CE* is FREE. It may be downloaded and printed anytime from [www.elevatorbooks.com](http://www.elevatorbooks.com). Costs:

- The *Educational Focus* book: \$63.25
- Chapters can be purchased individually for \$5.00 each by contacting [sales@elevatorworld.com](mailto:sales@elevatorworld.com) or (251) 479-4514, ext. 19
- Buy more and save:
  - All 21 hours of credit for a CET or QEI: \$435 (\$369.75 for subscribers). *Tests bought individually would cost \$570.* (QEI applied for 9/1/07)
  - All 16 hours of credit for a CAT: \$335 (\$284.75 for subscribers). *Tests bought individually would cost \$420.*

## Learning Objectives

### Chapter 1 – ELEVATOR CONTROLLERS

Study Material: Four articles (Educational Focus pages 1-19)

Credit available: Two contact hours

Cost of test: \$55.00 (\$46.75 for subscribers) if not purchased in a package

#### Learning Objectives

- Four different types of controller systems and their applications
- Diagnosing problems with controller systems
- Installation peculiarities of the different controller systems
- Testing controller systems prior to turnover
- Maintenance issues involving the controllers in these articles

#### Learning Reinforcement Questions

- What are the application differences between the controllers?
- What is the most important thing to remember when troubleshooting microprocessor control systems?
- What are programmable profiles for inspection?
- What are “data traps”?
- What voltage changes affect communicating with controllers?
- Troubleshooting controllers requires what type of knowledge?
- In the Swift Wizard software, how are numerical parameters adjusted?
- What does a technician use “data traps” for in the controller Performa?
- What systems must be closed before the microprocessor will allow the elevator to move?
- What is the most important thing to remember when troubleshooting microprocessor-based control systems?

### Chapter 2 - ELEVATOR DOOR OPERATORS

Study Materials: Two articles (Educational Focus pages 19-30)

Credit available: Two contact hours

Cost of test: \$55.00 (\$46.75 for subscribers) if not purchased in a package

#### Learning Objectives

- The operation of several different door operators
- How to keep a door-operator package working properly
- What the main difference is in elevator controllers
- The kinds of door controllers used for glass doors or doors on unusual size
- The electrical-safety issues involved in installing door operators

#### Learning Reinforcement Questions

- The operation of several different door operators
- How to keep a door-operator package working properly
- What the main difference is in elevator controllers
- The kinds of door controllers used for glass doors or doors on unusual size
- The electrical-safety issues involved in installing door operators

### Chapter 3 - HYDRAULIC ELEVATORS

- Study Materials: Three articles (Educational Focus pages 31-38)

Credit available: One contact hour

Cost of test: \$35.00 if not purchased in a package

#### Learning Objectives

- The steps to take to avoid hydraulic failure
- The outline for modernization of obsolete hydraulic components or systems
- The features of the UV-5 hydraulic control valve
- Why the advent of the submersible pump has reduced component size
- Why control valves should not need constant adjusting, and what to do if they do

#### Learning Reinforcement Questions

- Why is an inexpensive filter a real money saver?
- What are the innovative features of the UV-5 hydraulic control valve?
- What two things affect the pressure in a hydraulic system?
- Why are hydraulic elevators considered safer in certain emergency situations?
- The pressure-relief valve should be set at what percentage of the working pressure?
- What are the reasons for an uneven ride?
- What is the standard to determine if a valve must be serviced for leakage?

### Chapter 4 - DISPATCHING SYSTEMS

Study materials: Two articles (Educational Focus pages 39-46)

Credit available: One contact hour

Cost of Test: \$35.00 if not purchased in a package

#### Learning Objectives

- The major zoning methods for dispatching
- The structure of the controller area network (CAN)
- The three kinds of controllers that form a signal control based on CAN
- The number of signal lines needed for CAN-based dispatching
- How easy or difficult CAN may be to adjust (add or reduce landings)

#### Learning Reinforcement Questions

- What are the three zoning methods?
- How can dynamic zoning shorten passenger waiting times and solve up-peak problems?
- What are the three types of controllers that CAN is composed of?
- How does CAN prioritize multiple signals?
- What aspect of CAN allows transmission of control signals in serial communication?

### Chapter 5 - ELEVATOR DRIVE SYSTEMS *with* Chapter 12 - ELEVATOR COMMUNICATION

Study materials: Eight articles (Education Focus pages 47-66 and pages 129-130)

Credit available: Three contact hours

Cost of Test: \$75.00 if not purchased in a package

#### Learning Objectives

- Proper installation methods for AC, DC and hydraulic elevator drives
- The correct wire to use for control and signal circuit leads.
- Common issues encountered with the Magnetek HPV 900 AC drive
- How to solve various start-up problems with DC drives
- Proper installation of hydraulic soft-start drives
- The composition of carbon brushes
- How to select a size of a drive motor
- The application of serial communication to elevator drives

#### Learning Reinforcement Questions

- What are the differences in installation of AC and DC drives?
- What should a technician observe about encoder polarity?
- How does software solve common installation issues with Magnetek's drives?
- What is the preferred method for mounting an encoder?
- What are the routines involved in "advanced diagnostics"?

- Be aware of the common faults encountered in DC drive startups.
- What is stall prevention, a unique feature of Magnetek's HPV 100?
- Is lead ever used in elevator brushes?
- Why is a film or skin on a commentator surface important?
- Why is serial communication important in high-performance drives?
- Explain what an AC variable-frequency drive is.
- What type of wire should be used for control and signal-circuit leads?
- What is the maximum allowable bar-to-bar height differential in adjacent bars?
- Why would asbestos never be used as a base material in any brush?
- In drive setup, define the term "High Speed Setting."

### Chapter 6 - DOOR PROTECTION SYSTEMS

Study materials: Three articles (Educational Focus pages 67-77)

Credit available: One contact hour

Cost of test: \$35.00 if not purchased in a package

#### Learning Objectives

- The conditions that affect elevator light screen door controls.
- The difference between light curtains and 3D detection.
- The installation methods for the Pana40 family of detectors and the doors they are designed to fit best.
- Understand the importance of plus and alignment in installing door-protection devices.
- Understand the proper maintenance techniques for door-protection devices.
- The major benefits of electronic door-detector units.

#### Learning Reinforcement Questions

- What conditions do today's light screens have to be immune to?
- What are the Pana40 family of door detectors programmed to detect?
- How do 3D detectors differ from light curtains?
- What does a Memco Vision system have that other systems do not?
- Why should transmitter and receiver units be installed slightly back from the leading edge of the door panel?
- What are most callbacks on door-protection units caused by?
- Describe the maintenance routine for door-protection units

### Chapter 7 - ELEVATOR GUIDE RAILS

Study materials: Three articles (Educational Focus pages 78-89)

Credit available: One contact hour

Cost of test: \$35.00 if not purchased in a package

#### Learning Objectives

- The primary function of guide rails
- The forces that are at play on guide rails
- The proper way to install guide rails
- Alignment techniques and testing
- What the most important part of any guide rail installation is

#### Learning Reinforcement Questions

- What is the first and most important action of a guide-rail installation?
- What is the first main rail called?
- Facing the rails refers to which procedure?
- The last operation in installation of guide rails is called "\_\_\_ the rail joints."
- How do you apply tension to a plumb line?
- Describe the tools and equipment used to install guide rails.

### Chapter 8 - ELEVATOR SAFETIES AND GOVERNORS

Study materials: Three articles (Educational Focus pages 90-98)

Credit available: One contact hour

Cost of test: \$35.00 if not purchased in a package

#### Learning Objectives

- How the European code addresses safeties and governors
- The various types of safety gears used in the U.S.
- The types of governors and how they are connected to the elevator car and system
- How to properly maintain and/or repair safeties and governors
- Lift testing systems used in Europe and their benefits

**Learning Reinforcement Questions**

- What is ADIASYSTEM, and what does it do?
- Describe the benefits of the TUV testing system.
- Do counterweights have governors?
- How often should the safety gear be checked?
- Misplacement of the safety gear could lead to what kind of damage?
- Braking the elevator in the upward direction is a new concept that is mandated by which code?
- What are the two types of safety gears

**Chapter 9 - ELEVATOR CARENCLOSURES**

Study materials: Three articles (Educational Focus pages 99-109)

Credit available: One contact hour

Cost: \$35.00 if not purchased in a package

**Learning Objectives**

- Design and customizing of elevator enclosures (cabs)
- The role that the cab plays in the elevator system
- The different materials used to build elevator cabs
- Code requirements having to do with elevator cabs
- The design and materials used for interlocking panels
- How to achieve the right look in cab design

**Learning Reinforcement Questions**

- What should freight cabs always have as part of their design?
- What are the three styles of ceiling design?
- Which three safety issues are addressed in the ASME
- A17.1 code in reference to elevator cabs?
- What are the two categories of elevator cab?
- Cabs represent which of the three “B’s” – brains, brawn or beauty?
- Should design issues be addressed before manufacturing, or is “field verification” allowed in elevator cab design?

**Chapter 10 - ELEVATOR HOISTING MACHINES**

Study materials: Two articles (Educational Focus pages 110-120)

Credit available: One contact hour

Cost of test: \$35.00 if not purchased in a package

**Learning Objectives**

- The tools required for installing the elevator hoisting machine
- The technique of leveling the bed for the elevator hoisting machine
- How to adjust the brake
- The tools required for maintenance of gear machines
- The exact procedure for gear-machine maintenance
- How to install new bearing
- The kind of damage that necessitates replacement of the worm and gear

**Learning Reinforcement Questions**

- What are the signs that the gear may need replacement?
- What technique is used to remove the gear (which is machined to a shrink fit)?
- What is the most critical maintenance task?
- What is “clearance,” and how does it happen?
- How do you avoid contamination of new oil?
- Name several ways to detect main shaft bearing failure.
- What is the most important aspect in installing the reducer?
- What do you underlay the machine bed frame with to level it out?

**Chapter 11 - ESCALATORS**

Study materials: Three articles (Educational Focus pages 121-128)

Credit available: One contact hour

Cost of test: \$35.00 if not purchased in a package

**Learning Objectives**

- The benefits of thermoplastic escalator handrails
- The proper storage conditions for escalator handrails
- The things that contribute to handrail slippage
- Proper escalator alignment techniques
- How to accurately find the center line on an escalator
- The proper tools for escalator alignment
- What is the most common cause of excessive heat in handrails?
- Describe the proper storage techniques for handrails.
- After storage, how long should a handrail “relax” before installation?
- Describe how to accurately find the center line on an escalator.

**Learning Reinforcement Questions**

- How long does it typically take eight workers to dismantle, survey and reassemble an escalator?
- What is a Watt's Link?
- In what circumstances do step chains lengthen unnaturally?

## Chapter 14 - ELEVATOR SUSPENSION SYSTEMS

Study materials: Four articles (Education Focus pages 135-153)

Credit available: Three contact hours

Cost of test: \$75.00 if not purchased in a package

### Learning Objectives

- The safe and proper installation of wedge sockets
- The steps to be taken and report to be written on an elevator-rope investigation
- How a modernization can affect rope wear and slippage
- How a piece of chalk and a magnet can be used in a rope investigation
- The advantages of steel wire rope
- The application of various types of elevator ropes
- How compensation rope and governor ropes differ from elevator rope
- Lubricants and application methods
- Rust on ropes and its causes
- How compensating weight is mounted
- How to correctly order elevator rope

### Learning Reinforcement Questions

- Describe the maintenance of wedge sockets.
- Describe the tools needed for an elevator-rope investigation.
- Where is the worst area of wear on elevator ropes?
- Describe how a magnet may indicate problems in a rope investigation.
- What is the most common strand construction for elevator rope?
- Describe the ideal "elevator rope."
- Describe the proper method for lubricating ropes.
- Describe proper installation and handling methods for elevator ropes.
- Describe the development of rust and what it means.
- What is the principle of compensation weight (ropes, chains or cable)?
- Describe the advantages of flat compensation cables.
- What special feature must the inspector's clock/watch have to aid in measuring rope tension?
- Describe the tools needed to conduct a rope slippage test.
- What tools are needed to conduct a rope slippage test?
- What rope change is the criterion for rope retirement?

## Chapter 15 - TESTING EQUIPMENT

Study materials: Four articles (Educational Focus pages 154-165)

Credit available: One contact hour

Cost of test: \$35.00 if not purchased in a package

### Learning Objectives

- The procedures for using the SafeTach Elevator Performance Meter
- The proper use of the Adiasystem for testing elevators
- The parameters that the Adiasystem can test with different types of elevators
- The procedures and proper use of the Lat Lazer JZC system
- The factors that affect ride quality in an elevator

### Learning Reinforcement Questions

- Describe the process and the number of people needed to use the SafeTach.
- List the advantages of the Adiasystem over physical testing methods.
- What is the software base for Adiasystem?
- Describe the features of the LAT Lazer.
- What simple tool does the Lat Lazer replace?
- What international standard was developed to address ride quality?

## Chapter 16 - ELEVATOR ENTRANCES

Study materials: Three articles (Educational Focus pages 166-167)

Credit availability: One contact hour

Cost of test: \$35.00 if not purchased in a package

### Learning Objectives

- Proper installation techniques for 3D elevator-door safety edges
- Adjustment and troubleshooting issues for 3D elevator-door safety edges

- The suitability of 3D elevator-door safety edges for different types of doors
- The two alternating roles of the hoistway entrance
- The various types of elevator-door operation and entrances
- The fail-safe aspects of elevator-door operation.

### Learning Reinforcement Questions

- What are the three components of the 3D elevator-door safety edge?
- Are 3D safety edges a closed- or open-loop system?
- Explain the three operating modes for 3D elevator-door safety edges.
- Why should 3D elevator safety edges be tested on different floors?
- What are the two alternating roles of the elevator entrance?
- Describe the different types of elevator doors and their application.
- Why are elevator door locks opened by positive action?
- Why does the ground-floor door assembly require more attention than all the other entrances?

## Chapter 18 - FREIGHT ELEVATOR DOORS

Study materials: Two articles (Educational Focus pages 186-195)

Credit availability: One contact hour

Cost of test: \$35.00 if not purchased in a package

### Learning Objectives

- The basic components of the freight-door controller
- The installation techniques and placement for the freight-door controller
- The ways to reduce hoistway wiring for freight doors
- The advantages of using limit switches and proximity sensors
- The relationship between the car gate and the landing door
- How to find out if three-phase motors are phased properly
- The field survey and why it is important freight-door installation
- The proper installation techniques for freight-elevator doors, interlocks and controllers

### Learning Reinforcement Questions

- Describe the five basic components of the elevator freight-door controller.
- What are the three places freight-door-controller wiring needs to connect?
- Explain the role of proximity sensors and the advantages of their use.
- What does it mean when the door or car-gate motors run in the wrong direction?
- What are the advantages of vertically bi-parting doors on freight elevators?
- Describe the process for installing freight-elevator doors, operators and interlocks.

## Provider Information

Elevator World, Inc. is the largest publisher in the world devoted to the elevator industry: publishing seven industry-specific magazines; compiling the Elevator World SOURCE©, the most inclusive directory in the industry; publishing numerous books used for industry education; maintaining ten email newsletters; and developing the Elevator World online network, a group of specialized websites with more than 70,000 users a month. Elevator World is the publisher and distributor of the print-based materials for the four-year Certified Elevator Technician (CET) Education Program. The company is 68 years old and has played a key role in the transfer of knowledge in the vertical-transportation industry.

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