

Elevator Constructor

Industry Training Criteria

DOT CODE 825.361 010

March 2006

Elevator Constructor Industry Standards Criteria

DOT CODE 825.361 010

1. Length of Training

Program sponsors shall establish a minimum of a four (4) year program of not less than 6,800 hours of on-the-job training.

2. Related Supplemental Instruction

The required prescribed courses of related and supplemental instruction shall be no less than 144 hours per year. This instruction must include at a minimum the related and supplemental training processes listed in Exhibit "A".

3. On-the-Job Training

Skills to be learned. See Exhibit "B".

4. Competency Testing

All apprentices must pass a competency test prior to the time of their classification advancement to the next higher period. The tests shall be based on all Related and Supplemental Instruction and manipulative skills tests based on laboratory assignments.

5. Completion Percentages

Program sponsors must have a 55% graduation rate of all apprentices that satisfactorily complete the program's probationary period.

6. Revisions

The schedule for revisions to the Elevator Constructor Industry training criteria shall be in accordance with Labor Code Section 212.01.

EXHIBIT "A"

Related and Supplemental Instruction Topics For Elevator Constructor Industry Criteria

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RELATED AND SUPPLEMENTAL INSTRUCTION

APPRENTICESHIP COURSE OUTLINE YEAR 1

1. Safety for Elevator Constructors
 - a. Introduction to Safety
 - b. Safety During Construction and Maintenance
 - c. Safety During Maintenance and Repairs
 - d. Alcohol and Other Drugs

2. Introduction to OSHA
 - a. Hazard Communication
 - b. PPE SM Materials Handling
 - c. Tool Safety
 - d. Electrical Safety
 - e. Scaffold Safety
 - f. Fall Protection
 - g. Stairways and Ladders
 - h. Confined Spaces
 - i. Ergonomics
 - j. Fire Safety

3. Diversity Training
 - a. Harassment and Discrimination in the Workplace
 - b. Diversity and Success
 - c. Case Studies

4. Customer Relations
 - a. Customer Focus
 - b. Presentation
 - c. Communications
 - d. Dealing with Customers

5. Fundamentals of Print Reading
 - a. Introduction to Installation Drawings
 - b. Detail Drawings and Material Specifications

6. Material Handling, Rigging and Hoisting
 - a. Tools and Material Handling
 - b. Rigging and Hoisting
 - c. Crosby Fasteners

7. Pit Structures
 - a. Pit Structures
 - b. Welding Basics
8. Guide Rails
 - a. Introduction to Guide Rails
 - b. Installation of Guide Rails
9. Machine Room and Overhead Installation
 - a. Machine and Sheave Installation
 - b. Elevator Control Equipment Installation
10. Car and Counterweight Assembly, Roping and Re-roping
 - a. Car and Counterweight Assembly and Roping
 - b. Elevator Rope and Roping
 - c. Re-roping
 - d. Elevator Cab Modernization, Refinishing and Floor Covering

TOTAL: 144 Hours

APPRENTICESHIP COURSE OUTLINE YEAR 2

1. Basic Math Review
 - a. Elementary Technical Mathematics
2. Basic Electricity
 - a. Arithmetic Review
 - b. Basic Electricity Introduction
 - c. Understanding the Relationship Between Voltage, Current, and Resistance
 - d. Basic Electrical Circuit Components
 - e. Series and Parallel DC Resistive Circuits
 - f. Magnetism and Electromagnetism
 - g. DC Generators and Motors
 - h. Alternating Current Theory
 - i. Transformers
 - j. AC Motors
3. Meters
 - a. Introduction to Analog and Digital Meters
 - b. Meters Experiments
4. Advanced DC Motors and Generators
 - a. DC Generator and Motor Theory
 - b. Components of DC Motors and Generators
 - c. Types of DC Motors and Generators
 - d. Maintenance and Service

TOTAL: 144 Hours

APPRENTICESHIP COURSE OUTLINE YEAR 3

1. Construction Wiring
 - a. Planning, Piping and Wiring
 - b. Piping the Machine Room and Hoistway
 - c. Traveling Cables
 - d. Wiring the Hoistway and Machine Room
 - e. Piping and Wiring the Car
 - f. Start-Up Procedures

2. Doors and Operators
 - a. Introduction to Passenger and Freight Entrances
 - b. Passenger Elevator Doors and Entrance Installations
 - c. Elevator Cab Assembly and Door Operators
 - d. Freight Elevator Doors and Gates
 - e. Passenger Door Operators
 - f. Freight Door Operators
 - g. Door Protective Devices
 - h. Troubleshooting Door Operators
 - i. Dumbwaiters

3. Hydraulics
 - a. Drilling and Casing the Jack Hole
 - b. Installing and Servicing the Jack
 - c. Piping and Temporary Operation
 - d. Basic Hydraulic Theory

4. Escalators and Moving Walks
 - a. Safety and General Installation Procedures
 - b. Escalator Components and Installation Procedures
 - c. Moving Walk Components and Installation Procedures
 - d. Escalator Safety and Terminology
 - e. Escalator Steps and Step Chains
 - f. Escalator Handrails
 - g. Escalator Service and Maintenance

TOTAL: 144 Hours

APPRENTICESHIP COURSE OUTLINE YEAR 4

1. Basic Elevator Solid State Electronics
 - a. Capacitors and Capacitance
 - b. Inductors and Inductance
 - c. Diodes
 - d. Transistors and Thyristors
 - e. Analog Integrated Circuits
 - f. Digital Integrated Circuits

2. Circuit Tracing
 - a. Introduction to Circuit Tracing
 - b. Relays and Timers
 - c. Power and Power Control
 - d. Logic Controls
 - e. Constant Pressure Push Button Systems & Single Automatic Push Button Systems
 - f. Collective Systems
 - g. Variable Voltage Selective-Collective Control Systems

3. Elevator Maintenance
 - a. Hoistway Maintenance
 - b. Car top Maintenance
 - c. Machine Room Maintenance

TOTAL: 144 Hours

EXHIBIT "B"

Work Process for Elevator Constructor Industry Criteria

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WORK PROCESS

A. CONSTRUCTION/MODERNIZATION

1. SAFETY

- Identify job hazards
- What proper safety equipment to wear and use
- Common sense safety around elevators and escalators
- Fundamentals of first aid & MSDS information
- Avoiding electric shock, GFCI's
- Codes that apply to the Elevator Constructor Industry

2. PRINT READING

- Read prints
- Survey the hoistway for new installation and modernization
- Convert to meter equivalents

3. HANDLING MATERIALS & TOOLS: RIGGING & HOISTING

- Safety Procedures
- Properly handle and store elevator/escalator equipment
- Tie and identify knots, bends and hitches
- Safety procedures for hoisting heavy equipment
- Building a safe working platform & scaffolding
- Use all safety devices

4. PIT STRUCTURES

- Safety Procedures
- Introduction to the pit components and their purpose
- Install pit equipment: buffers, compensating sheaves, compensating ropes and chains
- Testing of pit equipment for proper operation

5. GUIDE RAILS

- Safety Procedures
- Prepare rails and rail runs
- Build templates, drop lines and plumb hoistways of single, multiple or corner post installations
- Install guide rails
- Use a rail gauge and align rails

6. MACHINE ROOM, ESCALATOR & OVERHEAD INSTALLATIONS

- Safety Procedures
- Layout and properly align & set equipment
- Properly align sheaves, tracks and gears
- Offset roping
- Calibrate and test
- Proper inspection and maintenance procedures for the equipment

7. CAR & COUNTERWEIGHT ASSEMBLY & ROPING

- Safety Procedures
- Assemble car and counterweight sling
- Why elevators use counterweights
- Proper handling & storage of wire ropes
- Plan a rope run and learn other methods of installing and reroping

8. WIRING INSTALLATION

- Safety Procedures
- Terminology for various tools and electrical equipment
- Plan and install raceway and conduit
- Bend conduit
- Plan wiring and pulling wires safely and efficiently
- Accurately prepare and install traveling cables
- Bonding and grounding equipment
- Prepare the elevator/escalator for running operation

9. DOOR INSTALLATION

- Safety Procedures
- Proper terminology for doors and relating equipment
- Install car and hoistway entrances and door equipment accurately
- Install & adjust elevator doors, gates for passenger, freight & dumbwaiter

10. HYDRAULICS

- Safety Procedures
- Drill a hole for a hydraulic jack
- Properly install and plumb the casing & jack with specific tools
- Layout a pipe run and connections to power unit and jack
- Hydraulic theory and valve operation
- Adjust the valves for proper operation
- Troubleshoot and isolate system problems

B. SERVICE/REPAIR/MODERNIZATION/CONSTRUCTION

1. BASIC WIRING/ELECTRICITY

- Procedures for working safely with electricity
- Principle on which all electrical concepts are based
- What is electricity and where does it come from?

2. SOLID STATE ELECTRONICS/RELAY LOGIC

- Safety Procedures
- Terminology and safety equipment used on electronic devices
- Binary & hexadecimal systems are related to digital circuitry
- Capacitors and capacitance are used on elevator equipment
- Inductance and inductors are used in circuits
- How a semi-conductor works
- Diode, zener diodes, photodiodes and light emitting diodes
- Understanding transistors and how they operate
- How SCR's are operated and used in elevator circuits
- Various digital gates and their function
- The functions of integrated power supplies
- Different configurations and uses of the Op Amp
- Relay logic

3. CIRCUIT TRACING/RELAY LOGIC

- Safety Procedures
- Read a wiring diagram symbol and apply it to the equipment on the job
- Sequence of operation of individual circuits such as starting, stopping car and hall call cancellation and direction selection
- Troubleshoot particular circuits that are malfunctioning
- Locate and repair electrical problems such as ground, opens, defective contacts and coils
- Troubleshoot electrical problems with confidence

C. GENERAL REPAIR/MODERNIZATION

1. REROPING, RECABLING

- Safety Procedures
- Inspecting for defective rope, selector tape & cable
- Staging and routing ropes, tapes & cables
- Shackling and socketing

2. DOOR OPERATOR & RELATING EQUIPMENT

- Safety Procedures
- Passenger & freight door, gate repairs and replacements
- Door Operators, repair, replace and adjustments
- Door protective devices and troubleshooting

3. TRAVELING CABLE

- Safety Procedures
- Repair and replacement of traveler in existing hoistways

4. MOTORS, GENERATORS, BEARINGS, SHEAVES, DRIVERS

- Safety Procedures
- Cleaning and lubrication
- Testing and replacing motors, generators, bearings, sheaves and drivers
- Turn and undercut a commutator
- Test shunt and series field coils
- Learn how to check bearings and replace

5. ESCALATORS, MOVING WALKS & SIMILAR EQUIPMENT

- Safety Procedures
- Repair/replace equipment
- Clean and lubricate
- Maintenance on equipment

TOTAL HOURS:6800 hrs



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