Elevator Constructor

Industry Training Criteria

O*NET CODE 47-402100

Elevator Constructor Industry Standards Criteria

O*NET CODE 47-402100

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

O*NET CODE 47-402100

RELATED AND SUPPLEMENTAL INSTRUCTION

Apprenticeship Courses			
COURSE		**UNIT**	**UNIT TITLE**
100	**Trade Skills**	**105**	Introduction to Safety
		110	Safety During Construction and Modernization
		115	Safety During Maintenance and Repairs
		120	Alcohol and Other Drugs
		125	Introduction to OSHA
		126	Hazard Communication
		127	PPE
		128	Materials Handling
		129	Electrical Safety
		130	Tool Safety
		131	Fall Protection
		132	Stairways and Ladders
		133	Confined Spaces
		134	Motor Vehicle Safety
		135	Ergonomics
		136	Fire Safety
		137	Scaffold Safety
		140	Competent Person Training for Framed Scaffolds
		145	Training Program for Suspended Scaffolds
		146	Going Green: Relevant Discussions on Green Technology in the Elevator Industry
		150	Harassment and Discrimination in the Workplace
		151	Diversity and Success
		152	Case Studies
		155	Customer Relations
		160	Labor History and IUEC History
		165	Basic Mathematic Concepts
		170	Measurement
		175	Introduction to Installation Drawings
		180	Detail Drawings and Material Specifications
			Total: 72 Hours
200	**Hoistway Structures**	**205**	Tools and Material Handling
		210	Rigging and Hoisting
		212	Crosby Fasteners (CD-ROM)

		215	Pit Structures
		220	Introduction to Guide Rails
		225	Installation of Guide Rails
		230	Machine and Sheave Installation a. Machine room-less elevators (MRL)
		235	Elevator Control Equipment Installation
		240	Car and Counterweight Assembly and Roping
		245	Elevator Rope and Roping
		250	Reroping
		255	Elevator Cab Modernization, Refinishing and Floor Covering
			Total: 72 Hours
300	**Electrical Fundamentals**	**305**	Signed Numbers and Powers of 10
		310	The Metric System
		315	Equations and Formulas
		320	Ratio and Proportion
		325	Electrical Safety
		330	Basic Electricity Introduction
		335	Understanding the Relationship Between Voltage, Current, and Resistance
		340	Basic Electrical Circuit Components a. Energy efficient and environmentally friendly lighting
		345	Series and Parallel DC Resistive Circuits
		350	Alternating Current Theory
		355	Magnetism and Electromagnetism
			Total: 72 Hours
400	**Electrical Theory & Application**	**405**	Introduction to Analog and Digital Meters
		410	Transformers
		415	DC Generator and Motor Theory
		420	Components of DC Motors and Generators
		425	Types of DC Motors and Generators
		430	Maintenance and Service
		435	AC Motors
			Total: 72 Hours
500	**Installation**	**505**	Planning, Piping and Wiring
		510	Piping and Wiring the Machine Room and Hoistway
		515	Piping and Wiring the Car
		520	Start-Up Procedures
		525	Passenger Elevator Door and Entrance Installation
		530	Elevator Cab Assembly and Door Operators
		535	Freight Elevator Doors and Gates
		540	Freight Door Operators
		545	Dumbwaiters

		550	Machine Room Maintenance a. Recycling lubricants
		555	Hoistway Maintenance
		560	Asbestos Awareness
			Total: 72 Hours
600	**Solid State**	**605**	Mathematics for Ohm's Law
		610	Basic Components and Series and Parallel Resistance
		615	Magnetism, Electromagnetism, AC Theory and Transformer
		620	Capacitors and Capacitance
		625	Inductors and Inductance
		630	Diodes
		635	Transistors and Thyristors
		640	Analog Integrated Circuits
		645	Digital Integrated Circuits
		646	Solid State Student's Lab Manual
			Total: 72 Hours
700	**Power & Logic**	**705**	Introduction to Circuit Tracing
		710	Relays and Timers
		715	Power and Power Control a. Regenerative and stand-by power conserving systems
		720	Logic Controls
		725	Constant Pressure Push Button Systems & Single Automatic Push Button Systems
		730	Collective Systems
		740	Variable Voltage Selective-Collective Control Systems a. Destination dispatching for energy conservation
			Total: 72 Hours
800	**Advanced Topics in Elevators**	**805**	Installing and Servicing the Jack
		810	Piping and Temporary Operation
		815	Basic Hydraulic Theory
		820	Hydraulic Elevator Maintenance a. Waste oil disposal and recycling
		825	Escalator Components and Installation Procedures a. Passenger sensing smart drives
		830	Moving Walk Components and Installation Procedures
		835	Service, Maintenance, and Repair
		840	Residential and LULA Elevators
		845	Residential and LULA Platform and Chair Lifts
		850	Rack and Pinion Hoists
			Total: 72 Hours

EXHIBIT “B”

Work Process for

Elevator Constructor Industry Criteria

O*NET CODE 47-402100

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 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
- Handling, storing, and recycling of hazardous wastes and oils
- 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
- Oil clean-up and disposal procedures
- 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?
- Selecting environmentally friendly replacement components

2. SOLID STATE ELECTRONICS/RELAY LOGIC
- Safety Procedures
- Terminology and safety equipment used on electronic devices
- Binary & hexidecimal 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
- Stand-by power controls
- Destination dispatching controls

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 1000 hrs
1. REROPING, RECABLING
- Safety Procedures
- Inspecting for defective rope, selector tape & cable
- Staging and routing ropes, tapes & cables
- Shackling and socketing
- Disposal of old cables

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