

**ELEVATOR/ESCALATOR CONSTRUCTOR & MODERNIZER
(Hybrid)**

APPENDIX A

O*NET CODE 47-4021.00

Hybrid apprenticeships are premised on attainment of demonstrated, observable and measurable competencies in addition to meeting time-based work experience and on-the-job learning requirements.

This training outline is a minimum standard for Work Processes and Related Instruction. Changes in technology and regulations may result in the need for additional on-the-job or classroom training.

WORK PROCESSES

APPROXIMATE HOURS

A. Safety, Tools, print reading, and layout work 850

1. Demonstrate knowledge of workplace policies and procedures.
2. Identify job hazards.
3. Identify the proper safety equipment and PPE to use.
4. Demonstrate safety around conveyances.
5. Fundamentals of first aid.
6. Learn how to use Safety Data Sheets.
7. Become aware of how to properly use ground-fault circuit interrupter (GFCI) to avoid electrical shock.
8. Become familiar with the codes that apply to the conveyance industry.
9. Understand the safe and proper use of hand and power tools.
10. Understand the safe and proper use of testing equipment.
11. Read and interpret prints to properly locate and lay out locations of conveyance components.
12. Survey hoistway and well way for new installation and modernization.
13. Convert metric and US equivalents.

B. Material Handling, Rigging and Hoisting 800

1. Become familiar with the procedures for rigging and hoisting conveyance components.
2. Tie and identify knots, bends, and hitches.
3. Properly handle and store conveyance equipment on the jobsite.
4. Build a safe working platform and scaffold.
5. Understand the proper use of ladders.
6. Determine appropriate rigging equipment and methods for load, weight, and rise.
7. Properly inspect rigging equipment for damage and wear.
8. Proper use of hoists, cable slings, chain falls, power chain falls, electric chain hoists, well wheel, and rope.
9. Use proper hand signals for hoisting.
10. Use all safety devices.

C. Pit Equipment, Rail Brackets, and Guide Rails

950

1. Become familiar with the procedures for installing pit equipment.
2. Learn pit components and their purpose.
3. Installing pit equipment: pit channels, buffers, compensating equipment, etc..
4. Lubricate and test pit equipment for proper operation.
5. Safety procedures for installing rail brackets and guide rails.
6. Build templates, drop lines, and plumb hoist ways of single, multiple, or corner post installations.
7. Prepare rails and rail runs.
8. Install brackets and rails according to specifications.
9. Align rails using various alignment tools.

**D. Machine Rooms, Overhead Spaces, and Escalator/
Moving Walks**

800

1. Become familiar with the procedures for machine rooms, overhead installations, and escalators/moving walk installations.
2. Layout locations for equipment according to specifications.
3. Install, align, and plumb overhead machine equipment such as machine foundations, machines, controller,

governor, group controller, sheaves, and all related components.

4. Install, align, and plumb escalator/moving walk equipment.

E. Doors, Frames, Car and Counterweight Frame, Elevator Cab, and Suspension Means **1,250**

1. Safely install door and frame.
2. Become familiar with terminology for doors and related equipment.
3. Install passenger hoistway entrances and doors including sills, struts, headers, frames, door hangers, and doors.
4. Install freight hoistway doors including, tracks, locks, motors, and door panels.
5. Install and adjust passenger and freight car doors and gates for proper operation and clearances including door operators.
6. Install door protective devices and troubleshooting.
7. Examine and identify passenger and freight door, gate, and operator maintenance, repair, and replacement.
8. Safety during counterweight frame, cab, and suspension means Installation.
9. Assemble the car and counterweight frame including guide shoes and guide rollers.
10. Learn and understand the function of counterweights.
11. Install car platform, wall panels, and cartop.
12. Properly handle and store suspension means such as hoist cables and belts.
13. Plan the rope run, installing, and connecting suspension means including hoist cables and belts.
14. Understand re-roping/re-beltting including staging, routing, re-socketing, and re-shackling suspension means.

F. Wiring and Conduit **1,150**

1. Safety during wiring and conduit installation.
2. Become familiar with terminology of various tools and electrical equipment.
3. Plan and install raceway, conduit, and related equipment for machine room, hoistway, and car.
4. Bend conduit.
5. Plan wiring and pull wires safely and efficiently.

6. Accurately prepare and install traveling cables.
7. Repair or replace traveling cable in existing hoistways.
8. Properly bond and ground equipment.
9. Prepare the conveyance for running operation.

G. Hydraulics

350

1. Safety during hydraulic installation.
2. Drill hole for a hydraulic jack.
3. Properly install and plumb the casing and jack using specific tools.
4. Layout the pipe run and connections for the power unit and jack.
5. Become familiar with hydraulic theory and valve operation.
6. Adjust hydraulic valves for proper operation.
7. Troubleshoot and correct system problems.

H. Solid State Electronics, Circuit Tracing, and Relay Logic

1,250

1. Become familiar with the procedures for working safely with electricity.
2. Recognize the principle on which all electrical concepts are based; what is electricity and where does it come from.
3. Learn terminology and safety equipment used on electronic devices.
4. Understand binary & hexadecimal systems and how they relate to digital circuitry.
5. Gain an understanding of how solid-state electronic devices such as resistors, capacitors, diodes, inductors, transistors, silicone-controlled rectifiers, integrated power supplies, and operational amplifiers operate, are how they used in conveyance circuits.
6. Become familiar with relay logic circuits.
7. Read and interpret wiring diagram symbols and apply them to the equipment on the job.
8. Demonstrate and understanding of sequence of operation of individual circuits such as starting, stopping, car and hall call cancellation, and direction selection.
9. Troubleshoot malfunctioning circuits.
10. Locate and correct electrical problems such as grounds, opens, defective contacts and coils.

11. Troubleshoot electrical problems.

I. Maintenance, Repair, Inspection, and Testing Practices 500

1. Safety during maintenance, repair, inspection, and testing of conveyances.
2. Clean, lubricate, and adjust machine equipment.
3. Maintain controller components.
4. Examine and identify escalator/moving walk maintenance, repair, and replacement of components.
5. Follow maintenance control plan including monthly Firefighter Service Tests.
6. Understand the requirements for lubrication, repair, and replacement of bearings.
7. Implement hydraulic pump and motor inspection, maintenance, repair, and replacement.
8. Perform Category 1 and Category 5 safety tests.
9. Understand governor inspection, maintenance, repair, and replacement.
10. Turn and undercut a commutator.
11. Test shunt and series field coils.
12. Maintain re-groove process on a worn drive sheave.

J. Installing Related Equipment (Optional) 100

1. Safety.
2. Install, repair, and replace dumbwaiters and their components.
3. Install, repair, and replace stair lifts and their components.
4. Install, repair, and replace wheelchair lifts and their components.
5. Install, repair, and replace theater stage lifts and their components.
6. Install, repair, and replace rack and pinion hoists and their components.

Approximate Total Hours 8,000

Apprentices in this Hybrid Apprenticeship Program shall participate in no fewer than 8000 documented hours of on-the-job training, and until they have demonstrated a competency for each skill in the Work Processes, with the understanding competency will be demonstrated reasonably proximate to the maximum on-the-job training hours. Competency Assessment described in further detail in Appendix B.

Apprenticeship work processes are applicable only to training curricula for apprentices in approved programs. Apprenticeship work processes have no impact on classification determinations under Article 8 or 9 of the Labor Law. For guidance regarding classification for purposes of Article 8 or 9 of the Labor Law, please refer to <https://dol.ny.gov/public-work-and-prevailing-wage>.

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APPENDIX B

RELATED INSTRUCTION

Safety

1. General construction site safety
2. OSHA 10-Hour Construction Course – if required for Public Work
3. Using personal protective equipment, including full body harness
4. Safely using, storing, disposing of chemicals (e.g. – cleaning compound, hydraulic oil)
5. Asbestos Awareness – minimum 4 hours (see attached)
6. Alcohol and drug awareness
7. First Aid – minimum 6.5 hours every 3 years
8. Sexual Harassment Prevention Training – must comply with section 201-g of the Labor Law

Mathematics

1. Basic arithmetic
2. Measurement
3. Math for Basic Electricity
4. Algebra
5. Financial Tools for the Trades

Trade Theory

1. Applied physics
2. Electrical theory
3. Local and national electrical codes
4. Electronic theory

Trade Science

1. Introduction to Elevators
2. Trade Terminology
3. Material handling, rigging, hoisting
4. Guide rails
5. Machine room and overhead, installations

6. Elevator roping
7. Car and counterweight assembly and roping
8. Pit structures
9. Hydraulics
10. Electrical wiring for elevator/escalator construction
11. Circuit tracing
12. Basic elevator solid state electronics
13. Solid state digital logic circuitry
14. Doors and operators
15. Escalators
16. Welding
17. Basic Components and Series and Parallel Resistance
18. Magnetism, Electromagnetism, AC Theory and Transformers
19. Capacitors and Capacitance
20. Inductors and Inductance
21. Diodes
22. Transistors and Thyristors
23. Analog Integrated Circuits
24. Digital Integrated Circuits

Blueprints

1. Introduction to Installation Drawings
2. Detail Drawings and Material Specifications
3. Reading building, elevator and electrical prints
4. Basic sketching

Interpersonal Skills

1. Communication skills
2. Tools for Success: Critical Skills for the Construction Industry
3. Customer relations skills

Other required courses as necessary

Competency Assessment

1. Test Prep

2. NEIEP Mechanics Exam

A minimum of 144 hours of Related Instruction are required for each apprentice for each year.

Appendix B topics are approved by New York State Education Department.

ATTACHMENT TO APPENDIX B

Asbestos Awareness

This course must be delivered by one of the following:

1. A provider currently approved by the New York State Department of Health to deliver asbestos safety training.
2. A person holding a current Asbestos Handler certificate from the New York State Department of Labor in the title of: Inspector, Supervisor, Project Monitor, Management Planner, or Project Designer.
3. Anyone otherwise approved by the New York State Education Department.

Minimum course contents must include the following:

1. Definition of asbestos
2. Types and physical characteristics
3. Uses and applications
4. Health effects:
 - a. Asbestos-related diseases
 - b. Risks to families
 - c. Cigarette smoking
 - d. Lack of safe exposure level
5. Employer-specific procedures to follow in case of potential exposure, including making a supervisor or building owner immediately aware of any suspected incidental asbestos disturbance so that proper containment and abatement procedures can be initiated promptly.

Notwithstanding the above course requirement, employers are advised that they must also be in compliance with New York State Department of Labor Industrial Code Rule 56 at all times.

Employers are further advised, and must advise all apprentices, that completion of the above course requirement does not authorize any person to remove, encapsulate, enclose, repair, disturb, or abate in any manner, any friable or non-friable asbestos, asbestos containing material, presumed asbestos containing material, or suspect miscellaneous asbestos containing material.