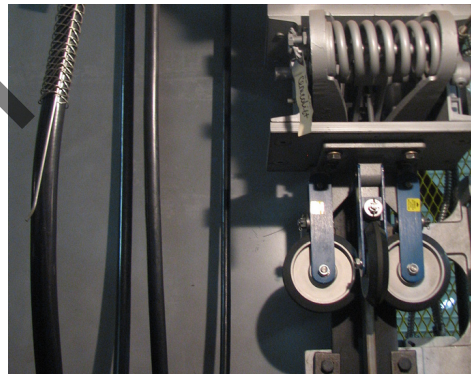
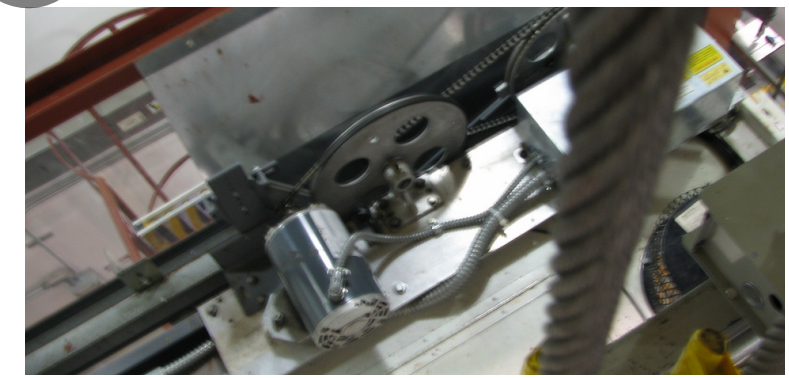
Instructor Guide





217: Elevator: Traction Elevator
Module 3: Control Systems

TRANSIT ELEVATOR/ESCALATOR CONSORTIUM

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Icons Used In This Guide

REVIEW slides

INDIVIDUAL ACTIVITY

ASK

WRITE

CLASSROOM ACTIVITY

Multimedia

SMALL GROUP ACTIVITY

REFER participants to

Agenda

Topic #	Topic Title	Duration
1	Overview	30 minutes
2	Systems Operation	40 minutes
3	Door Controllers	20 minutes
4	Selectors	30 minutes
5	Traveling Cables	30 minutes
6	Hoist Drives	30 Minutes
7	Video	20 minutes
8	Summary	20 Minutes
9	Related Field Trips	210 Minutes
	Total Time:	420 Minutes

Overview

Purpose The purpose of this module is to:

- The purpose of this unit is to explain and discuss the foundation of control systems in transit electric traction elevator systems. The key concepts discussed will aid the trainee in their future applications of elevator concepts and terminology.

Objectives

At the end of this lesson, the transit elevator/escalator trainee will be able to:

- Identity the different types of control systems encountered in elevator systems
- Discuss methods of interfacing between elevator car and controller
- Explain purpose of traveling cable, (fastening, securing, looping)
- Identify control systems and associated components
- Name the associated safety circuit and safety devices
- Identify and describe types of selectors

Materials

Mandatory Make sure you have the following

- PowerPoint Presentation
- Course book
- Quizzes
- Pencils
- Paper

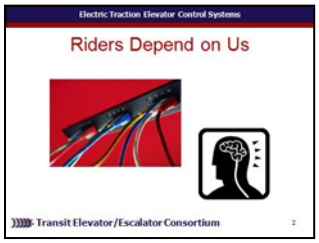
Optional You may also want the following for optional activities:

- Chalk board with chalk, large paper with marker, etc.
- Internet connection
- Lab, simulator or out of service elevator

Elevator – Electric Traction Control Systems

Instructor's Guide

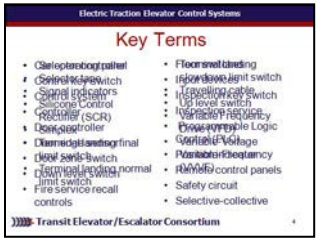
Module Length: 420 min Time remaining: 420 min This section: 30 min (9 slides) *Section start time: _____* *Section End Time: _____*

DO	SAY	Materials Needed
REVIEW introduction slides **Instructor's Notes** _____ _____ _____ _____ _____	**In your own words:** Welcome to the control systems module for electric traction elevators. ***Advance.*** Riders depend on us, and the vast and complex electrical control system is the power behind every elevator component action and car movement. ***Advance.***	✓PPT slides 1, 2  

Elevator – Electric Traction Control Systems

Instructor's Guide

Module Length: 420 min Time remaining: 420 min This section: 30 min (9 slides) *Section start time: _____* *Section End Time: _____*

DO	SAY	Materials Needed
REVIEW key terms **Instructor's Notes** _____ _____ _____ _____ _____	**In your own words:** ***Advance.*** And continuing on, Selector controller, Selector tape, Signal indicators, Silicone Control Rectifier (SCR) Simplex, Terminal landing final limit switch Terminal landing normal limit switch, ***Advance.*** Terminal landing slowdown limit switch, Travelling cable, Up level switch Variable Frequency Drive (VFD) Variable-Voltage Variable-Frequency (VVVF) ***Advance.***	✓PPT slide 4 

Elevator – Electric Traction Control Systems

Instructor's Guide

Module Length: 420 min Time remaining: 420 min This section: 30 min (9 slides) *Section start time: _____* *Section End Time: _____*

DO	SAY	Materials Needed
REVIEW slide **Instructor's Notes** _____ _____ _____ _____ _____	**In your own words:** You will recall from course 213 that an electric traction elevator includes a hall call station and car operating station, both found in hydraulic elevator systems and both controlled by the controller. But unlike hydraulic elevator system, an electric traction elevator system moves by means of a drive motor with a sheave, governor, and counterweight all controlled by the controller as well. ***Advance.***	✓PPT slide 6 

Elevator – Electric Traction Control Systems

Instructor's Guide

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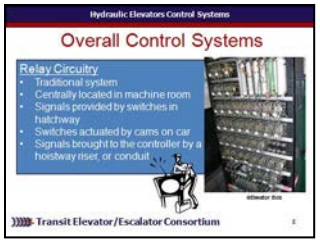
DO	SAY	Materials Needed
REVIEW slide	**In your own words:** Traditionally, all of the control functions of an electric traction elevator have been performed by relay circuitry centrally located in the machine room adjacent to the pump unit. Car position signals are provided by switches mounted at appropriate locations in the hatchway. The switches are actuated by cams mounted on the car and signals are brought to the controller by a hoistway riser also known as a *conduit*. But just like anything else, technology changes with time. ***Advance.***	✓PPT slide 8

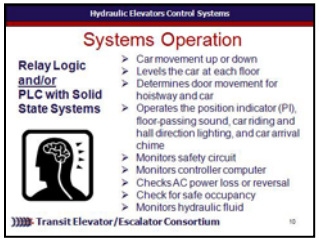
Instructor's Notes



Elevator – Electric Traction Control Systems

Instructor's Guide

Module Length: 420 min Time remaining: 390 min This section: 40 min (17 slides) *Section start time: _____* *Section End Time: _____*

DO	SAY	Materials Needed
REVIEW slide **Instructor's Notes** _____ _____ _____ _____ _____	**In your own words:** ***Advance.*** The controller acts as the brain for all elevator operations. ***Advance.*** Whether a relay system, a solid state system, a PLC, or some combination of these, the elevator controller performs the following functions, many of them simultaneously: ***Advance.*** controls the elevator car movement upward and downward; ***Advance.*** levels the elevator car at each floor; ***Advance.*** determines when to open and close the elevator doors for the hoistway and for the elevator car; ***Do Not Advance.***	✓PPT slide 10 

Elevator – Electric Traction Control Systems

Instructor's Guide

Module Length: 420 min Time remaining: 390 min This section: 40 min (17 slides) *Section start time: _____* *Section End Time: _____*

DO	SAY	Materials Needed
REVIEW slide	**In your own words:** Inside the elevator car is the car operating panel which, along with floor buttons, may include an inspection key switch for normal "run" or "inspection" operation. ***[Discuss the various buttons on the panel.]*** ***Advance.***	✓PPT slide 12

Instructor's Notes

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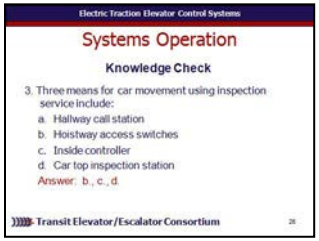
Elevator – Electric Traction Control Systems

Instructor's Guide

Module Length: 420 min Time remaining: 390 min This section: 40 min (17 slides) *Section start time: _____* *Section End Time: _____*

DO	SAY	Materials Needed
REVIEW slides **Instructor's Notes** _____ _____ _____ _____ _____	**In your own words:** On some elevators there may be another type of control key switch that is designated for independent service. When activated the car can be removed from automatic operation and be operated manually. Independent service has full control of starting, stopping, and direction of the car travel. The car responds only to the car buttons. ***Advance.*** Fire service recall controls are three-position key-switches which are integrated into the hall call stations. These controls come with a instructions on the mounting plate. ***Advance.*** Here is an example of a traction elevator controller in transit. ***Advance.***	✓PPT slides 20, 21, 22   

Module Length: 420 min Time remaining: 390 min This section: 40 min (17 slides) *Section start time: _____* *Section End Time: _____*

DO	SAY	Materials Needed
ASK **Instructor's Notes** _____ _____ _____ _____ _____	**In your own words:** Three means for car movement using inspection service include: a. Hallway call station b. Hoistway access switches c. Inside controller d. Car top inspection station ***Call on participants for answer.*** ***Advance for correct answer.*** Answer: b., c., d. ***Advance.***	✓PPT slide 26 

Elevator – Electric Traction Control Systems

Instructor's Guide

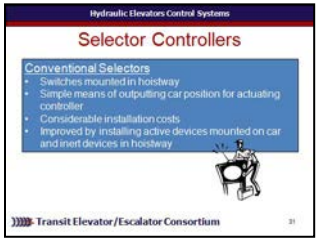
Module Length: 420 min Time remaining: 280 min This section: 20 min (5 slides) *Section start time: _____* *Section End Time: _____*

DO	SAY	Materials Needed
REVIEW slide **Instructor's Notes** _____ _____ _____ _____ _____	**In your own words:** The first intrusion during a stop at any landing will cancel the normal dwell time for the doors and substitute a door protective system time commencing with the removal of the intrusion. ***Advance.*** If during this period another intrusion occurs, the same delay period shall apply and this cycle will continue until traffic through the doorway ceases. The doors will commence to close immediately after the expiration of the determined period once the last intrusion has been removed. ***Advance.*** If the doors are prevented from closing for a longer period, they will close at a reduced speed and a buzzer alarm will sound indicating a possible problem with the system. This condition is sometimes described as "nudging." ***Advance.***	✓PPT slide 29 

Elevator – Electric Traction Control Systems

Instructor's Guide

Module Length: 420 min Time remaining: 260 min This section: 30 min (14 slides) *Section start time: _____* *Section End Time: _____*

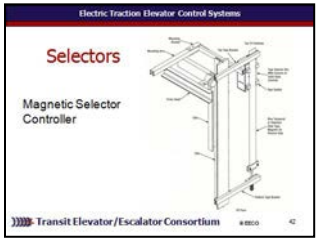
DO	SAY	Materials Needed
REVIEW slide **Instructor's Notes** _____ _____ _____ _____ _____	**In your own words:** Conventional electric traction elevator selectors utilize switches mounted in the hoistway. This involves considerable installation costs, but the use of discrete switches for each control signal provides a simple method of outputting car position as a signal suitable for actuating the controller. Since each hoistway position requires a discrete switch, it is not practical to mount a corresponding number of separately actuated, discrete switches on the elevator car. There is however, an advantage to locating all of the active devices in a factory-wired unit mounted on the car, and in using only inert devices in the hoistway. ***Advance.***	✓PPT slide 34 

DO	SAY	Materials Needed
REVIEW slides **Instructor's Notes** _____ _____ _____ _____ _____	**In your own words:** Selector Controllers can read these pulses either optically or magnetically (Hall Effect). In a slotted optical switch, an LED is mounted in a plastic housing, facing a phototransistor, but separated by a gap. As the selector tape moves into the gap, it either blocks the light path between the LED and the phototransistor or allows light to pass through when the tape slots are present. ***Advance.*** And here is an optical selector controller by Virginia Controls. ***Advance.***	✓PPT slides 39, 40  

Elevator – Electric Traction Control Systems

Instructor's Guide

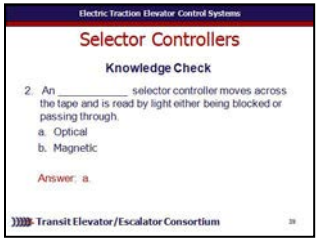
Module Length: 420 min Time remaining: 260 min This section: 30 min (14 slides) *Section start time: _____* *Section End Time: _____*

DO	SAY	Materials Needed
REVIEW slides **Instructor's Notes** _____ _____ _____ _____ _____	**In your own words:** A selector unit mounted on the car has guides for engaging the ends of the tape, a bar magnet and a magnetic sensor to detect car movement, a magnetic sensor array in vertical alignment with the floor landing magnets and another magnetic sensor array in vertical alignment with the door zone magnets. Preferably, the magnetic sensors are Hall Effect devices and are mounted on a flat board, e.g. a printed circuit board, with a special mount piece. Similarly, the bar magnets are mounted on the printed circuit board by way of a special centering mounting piece. ***Advance.*** And here is an magnetic selector controller by EECO. ***Advance.***	✓PPT slides 42, 43  

Elevator – Electric Traction Control Systems

Instructor's Guide

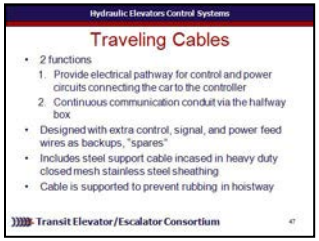
Module Length: 420 min | Time remaining: 260 min | This section: 30 min (14 slides) | *Section start time: _____* | *Section End Time: _____*

DO	SAY	Materials Needed
ASK **Instructor's Notes** _____ _____ _____ _____ _____	**In your own words:** An _____ selector controller moves across the tape and is read by light either being blocked or passing through. a. Optical b. Magnetic ***Call on participants for answer.*** ***Advance for correct answer.*** Answer: a. ***Advance.***	✓PPT slide 45 

Elevator – Electric Traction Control Systems

Instructor's Guide

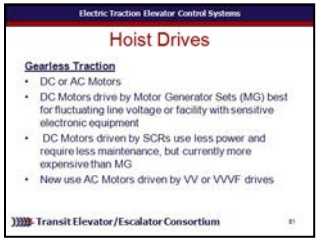
Module Length: 420 min | Time remaining: 230 min | This section: 30 min (3 slides) | *Section start time: _____* | *Section End Time: _____*

DO	SAY	Materials Needed
REVIEW slide **Instructor's Notes** _____ _____ _____ _____ _____	**In your own words:** In an elevator system traveling cables have two functions. First, they provide an electrical pathway for control and power circuits from the elevator car to the controller in the machine room. Second, the traveling cable provide a conduit for the various communication demands of the elevator system and this is continuous from the car to the communications interface cabinet in the elevator machine room via the halfway box. ***Do Not Advance.***	✓PPT slide 47 

Elevator – Electric Traction Control Systems

Instructor's Guide

Module Length: 420 min Time remaining: 130 min This section: 30 min (15 slides) *Section start time: _____* *Section End Time: _____*

DO	SAY	Materials Needed
REVIEW slide **Instructor's Notes** _____ _____ _____ _____ _____	**In your own words:** Gearless traction machines use ***Advance.*** DC or AC motors. ***Advance.*** DC motors driven by motor generator sets (MG) are best suited when there is a possibility of fluctuating line voltage or the facility contains very sensitive electronic equipment. ***Advance.*** DC motors driven by silicon-controlled rectifiers (SCR) use less power and require less maintenance although they are currently more expensive than MG. ***Advance.*** Nowadays, virtually all new gearless traction machines use AC motors driven by the VV or VVVF drive. ***Advance.***	✓PPT slide 61 

Elevator – Electric Traction Control Systems

Instructor's Guide

Module Length: 420 min Time remaining: 20 min This section: 20 minutes (3 slides) *Section start time: _____* *Section End Time: _____*

DO	SAY	Materials Needed
REVIEW slides **ASK** **Instructor's Notes** _____ _____ _____ _____ _____	**In your own words:** ***Read slide.*** ***[For each objective, briefly review what was learned in this module or ask participants to share what they have learned for each learning objective and briefly discuss as a class.]*** ***Advance.*** Lets take a look at some of the key words we have defined as moved through this module. ***[Read slide. Discuss definitions as a group.] Advance. [Read slide. Discuss definitions as a group.]*** ***Advance.*** ***[Read slide. Discuss definitions as a group.] Advance. [Read slide. Discuss definitions as a group.]*** ***Advance.***	✓ PPT slides 68, 69