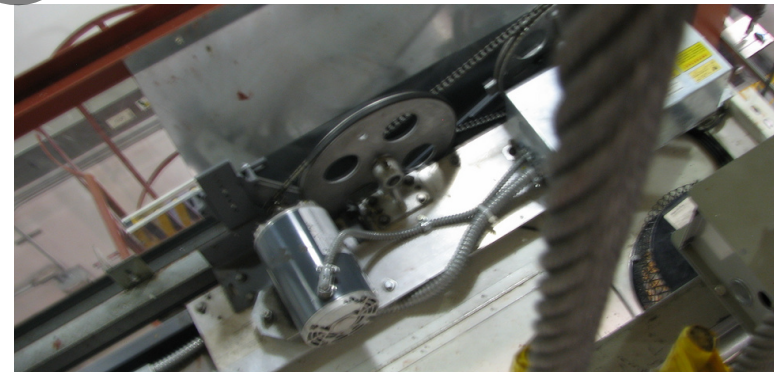
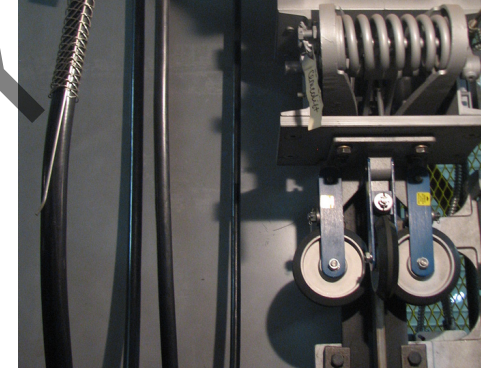


# Instructor Guide



## 214: Elevator: Electrical Systems Module 5: Safety Circuits



**Table of Contents**

Overview.....4

Safety Circuit String.....7

Safety Device Locations.....14

Safety Circuits & Fault Conditions.....29

Summary.....56

PREVIEW ONLY

# Elevator – Safety Circuits

*Instructor's Guide*



## Icons Used In This Guide



**REVIEW** slides



**ASK**



**CLASSROOM ACTIVITY**



**SMALL GROUP ACTIVITY**



**INDIVIDUAL ACTIVITY**



**WRITE**



**Multimedia**



**REFER** participants to

## Agenda

Topic #	Topic Title	Duration
1	Overview	30 Minutes
2	Safety Circuit String	60 Minutes
3	Safety Device Locations	90 Minutes
4	Safety Circuits & Fault Conditions	60 Minutes
5	Field Trip	90 Minutes
6	Summary	30 Minutes
	<b>Total Time:</b>	360 Minutes

# Elevator – Safety Circuits

## Instructor's Guide



### Overview

**Purpose** The purpose of this module is to:

Provide the participant with an explanation and discussion regarding the functions of elevator electrical safety circuit devices.

### Objectives

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

- Explain the electrical function of specific devices of a safety circuit string.
- Discuss circuit fault conditions as they relate to the safety circuit.
- Identify the locations of safety circuit components.
- 

### Materials Mandatory

Make sure you have the following

- PowerPoint Presentation
- Coursebook
- Quizzes
- Pencils
- Elevator World Educational Package and Reference Library Volume 1: Lessons II & III
- Elevator Maintenance
- Elevators 101
- ASME A17.1-2007: Table 2.26.4.3.2
- Safety Device Location Activity sheets

### 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 – Safety Circuits

## Instructor's Guide



Module Length: 360 min      Time remaining: 360 min      This section: 30 min (4 slides)      Section start time: \_\_\_\_\_      Section End Time: \_\_\_\_\_

DO	SAY	Materials Needed
<div data-bbox="34 464 144 568" data-label="Image"> </div> <div data-bbox="150 499 618 542" data-label="Text"> <p><b>REVIEW</b> introduction slides</p> </div> <div data-bbox="28 792 444 835" data-label="Section-Header"> <h3>Instructor's Notes</h3> </div> <div data-bbox="28 892 608 1242" data-label="Form"> <hr/><hr/><hr/><hr/><hr/> </div>	<div data-bbox="676 421 1023 464" data-label="Section-Header"> <p><b>In your own words:</b></p> </div> <div data-bbox="676 478 1429 571" data-label="Text"> <p>Welcome to the course on Elevator Electrical Systems: Safety Circuits.</p> </div> <div data-bbox="676 614 840 656" data-label="Section-Header"> <p><b>Advance</b></p> </div> <div data-bbox="676 699 1429 878" data-label="Text"> <p>The safety circuit is a critical part of the elevator system. By ensuring the function of the safety string, we will prevent situations like the one you see here.</p> </div> <div data-bbox="676 921 840 963" data-label="Section-Header"> <p><b>Advance</b></p> </div>	<div data-bbox="1497 464 1787 506" data-label="Text"> <p>✓PPT slides 1, 2</p> </div> <div data-bbox="1535 528 1854 763" data-label="Image"> </div> <div data-bbox="1535 778 1854 1006" data-label="Image"> </div>


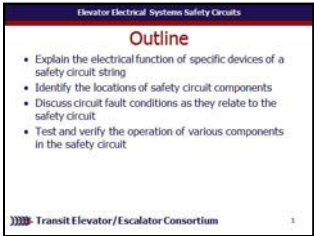


# Elevator – Safety Circuits

## Instructor's Guide



Module Length: 360 min      Time remaining: 360 min      This section: 30 min (4 slides)      Section start time: \_\_\_\_\_      Section End Time: \_\_\_\_\_

DO	SAY	Materials Needed
<div> <b>REVIEW</b> module objectives</div> <div><h3>Instructor's Notes</h3><div></div><div></div><div></div><div></div><div></div></div>	<p><b>In your own words:</b></p> <p>Today we will</p> <ul style="list-style-type: none"><li>- Today, we will take some time to look at the safety circuit and in doing so will”</li><li>- Explain the electrical function of specific devices of a safety circuit string</li><li>- Identify the locations of safety circuit components</li><li>- Discuss circuit fault conditions as they relate to the safety circuit</li></ul> <p><b>Advance</b></p>	<p>✓PPT slide 3</p> <div></div>

# Elevator – Safety Circuits

## Instructor's Guide



Module Length: 360 min      Time remaining: 360 min      This section: 30 min (4 slides)      Section start time: \_\_\_\_\_      Section End Time: \_\_\_\_\_

DO	SAY	Materials Needed
<div data-bbox="34 432 144 535"></div> <div data-bbox="160 439 245 475">ASK</div> <div data-bbox="34 556 144 659"></div> <div data-bbox="144 596 539 628">SMALL GROUP ACTIVITY</div> <div data-bbox="34 681 144 785"></div> <div data-bbox="160 709 285 745">WRITE</div> <div data-bbox="28 792 444 835">Instructor's Notes</div> <div data-bbox="28 892 608 1242"> <hr/><hr/><hr/><hr/><hr/> </div>	<div data-bbox="676 425 1023 464">In your own words:</div> <div data-bbox="691 489 1394 699">Thinking back to previous elevator courses, or elevator technical experiences in general, what do we might we already know about elevator safety components and circuits?</div> <div data-bbox="691 721 1375 982"><i>[Allow participants to think for a minute and perhaps discuss with a partner ideas as well as write down any ideas. Discuss participant responses and if possible list them on a chalk board or similar.]</i></div> <div data-bbox="691 1003 853 1039">Advance</div>	<div data-bbox="1497 454 1723 489">✓PPT slide 4</div> <div data-bbox="1541 528 1854 761"> </div> <div data-bbox="1545 803 1819 921"> <b>Optional:</b>  Chalkboard/chalk  or Paper/marker </div>

# Elevator – Safety Circuits

## Instructor's Guide



Module Length: 360 min      Time remaining: 330 min      This section: 60 min (7 slides)      Section start time: \_\_\_\_\_      Section End Time: \_\_\_\_\_

DO	SAY	Materials Needed
<div data-bbox="34 464 144 564" data-label="Image"> </div> <div data-bbox="170 492 428 528" data-label="Text"> <p><b>REVIEW</b> slides</p> </div> <div data-bbox="28 792 444 835" data-label="Section-Header"> <h3>Instructor's Notes</h3> </div> <div data-bbox="28 892 608 1242" data-label="Form"> <hr/><hr/><hr/><hr/><hr/> </div>	<div data-bbox="676 421 1023 464" data-label="Section-Header"> <h3>In your own words:</h3> </div> <div data-bbox="676 485 917 528" data-label="Text"> <p>Lets begin by:</p> </div> <div data-bbox="676 535 1439 706" data-label="List-Group"> <ul style="list-style-type: none"> <li>- Explain the electrical function of specific devices of a safety circuit string</li> <li>- Discuss circuit fault conditions as they relate to the safety circuit</li> </ul> </div> <div data-bbox="676 706 840 749" data-label="Text"> <p><b>Advance</b></p> </div>	<div data-bbox="1497 471 1787 506" data-label="Text"> <p>✓ PPT slides 5, 6</p> </div> <div data-bbox="1535 528 1854 756" data-label="Image"> </div> <div data-bbox="1535 778 1854 1006" data-label="Image"> </div>



# Elevator – Safety Circuits

## Instructor's Guide



Module Length: 360 min      Time remaining: 330 min      This section: 60 min (7 slides)      Section start time: \_\_\_\_\_      Section End Time: \_\_\_\_\_

DO	SAY	Materials Needed
<div data-bbox="34 464 144 564"></div> <p><b>REVIEW</b> slides</p> <div data-bbox="34 592 144 699"></div> <p><b>REFER</b> participants to <u>Elevator Control and Operation</u>, Vol 1 Pages IV-7 – IV-9</p> <p><b>Instructor's Notes</b></p> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>	<p><b>In your own words:</b></p> <p>Lets begin by reviewing some previous lessons on electrical principles and the safety string.</p> <p><i><b>[Refer: Participants should review the Lesson II p. IV-7 – IV-9 in Elevator Control and Operation Volume 1. Participants should read and review these pages followed by an instructor-led group discussion regarding the questions at the end of the lesson. Answers for the questions are located on p. IV-10.]</b></i></p> <p><b>Advance</b></p>	<p>✓ PPT slide 6</p> <div data-bbox="1541 528 1854 763"> </div> <p>✓ <u>Elevator World Educational Package and Reference Library</u></p>

# Elevator – Safety Circuits

## Instructor's Guide



Module Length: 360 min      Time remaining: 330 min      This section: 60 min (7 slides)      Section start time: \_\_\_\_\_      Section End Time: \_\_\_\_\_

DO	SAY	Materials Needed
<div data-bbox="34 464 144 564"></div> <p><b>REVIEW</b> slides</p> <div data-bbox="34 592 144 699"></div> <p><b>REFER</b> participants to <u>Elevator Control and Operation</u>, Vol 1 Pages IV-7 – IV-9</p> <p><b>Instructor's Notes</b></p> <hr/> <hr/> <hr/> <hr/> <hr/>	<p><b>In your own words:</b></p> <p>Lets continue by reviewing lesson III on electrical principles and the safety string.</p> <p><b><i>[Refer: Participants should review the Lesson II p. IV-11 – IV-13 in Elevator Control and Operation Volume 1. Participants should read and review these pages followed by an instructor-led group discussion regarding the questions at the end of the lesson. Answers for the questions are located on p. IV-16.]</i></b></p> <p><b>Advance</b></p>	<p>✓ PPT slide 7</p> <div data-bbox="1541 528 1854 763"> </div> <p>✓ <u>Elevator World Educational Package and Reference Library</u></p>

# Elevator – Safety Circuits

## Instructor's Guide



Module Length: 360 min      Time remaining: 330 min      This section: 60 min (7 slides)      Section start time: \_\_\_\_\_      Section End Time: \_\_\_\_\_

DO	SAY	Materials Needed
<div data-bbox="34 464 144 564" data-label="Image"></div> <div data-bbox="170 492 409 528" data-label="Text"> <p><b>REVIEW</b> slide</p> </div> <div data-bbox="28 792 444 835" data-label="Section-Header"> <h3>Instructor's Notes</h3> </div> <div data-bbox="28 892 608 1242" data-label="Form"> <hr/><hr/><hr/><hr/><hr/> </div>	<div data-bbox="676 421 1023 464" data-label="Section-Header"> <p><b>In your own words:</b></p> </div> <div data-bbox="676 485 1439 614" data-label="Text"> <p>A safety string in an elevator system prevents car movement when any safety concern has been violated.</p> </div> <div data-bbox="676 635 1439 763" data-label="Text"> <p>The safety string is made up of components within items such as the motor field to prevent energizing within the safety relay circuit.</p> </div> <div data-bbox="676 785 1400 949" data-label="Text"> <p>Furthermore, contacts in strategic locations will prevent power from being applied to the brake or motor should the safety relay not become energized.</p> </div> <div data-bbox="676 963 840 999" data-label="Text"> <p><b>Advance</b></p> </div>	<div data-bbox="1497 471 1729 506" data-label="Text"> <p>✓ PPT slide 8</p> </div> <div data-bbox="1535 528 1854 763" data-label="Image"> </div>

# Elevator – Safety Circuits

## Instructor's Guide



Module Length: 360 min      Time remaining: 330 min      This section: 60 min (7 slides)      Section start time: \_\_\_\_\_      Section End Time: \_\_\_\_\_

DO	SAY	Materials Needed
<div data-bbox="34 464 144 568"></div> <div data-bbox="170 492 428 528">REVIEW slides</div> <div data-bbox="34 592 144 702"></div> <div data-bbox="170 592 540 721">REFER participants to <u>Elevator Maintenance</u>, page 94</div> <div data-bbox="34 792 444 835"> <h3>Instructor's Notes</h3> <hr/><hr/><hr/><hr/><hr/> </div>	<div data-bbox="676 428 1023 464"><b>In your own words:</b></div> <div data-bbox="676 492 1439 571">Lets take a look at the safety string in elevator Maintenance. Turn to page 94.</div> <div data-bbox="676 592 1445 806"><i><b>[Refer: Participants should turn to p. 94 in Elevator Maintenance. Participants should read this page followed by group discussion regarding the diagrams of the safety sting.]</b></i></div> <div data-bbox="676 849 840 885"><b>Advance</b></div>	<div data-bbox="1497 471 1748 506">✓ PPT slides 9</div> <div data-bbox="1541 531 1854 763"> </div> <div data-bbox="1516 806 1787 878">✓ <u>Elevator Maintenance</u></div>

# Elevator – Safety Circuits

## Instructor's Guide



Module Length: 360 min      Time remaining: 270 min      This section: 90 min (19 slides)      Section start time: \_\_\_\_\_      Section End Time: \_\_\_\_\_

DO	SAY	Materials Needed
<div data-bbox="34 464 144 564" data-label="Image"> </div> <div data-bbox="170 492 428 528" data-label="Text"> <p><b>REVIEW</b> slides</p> </div> <div data-bbox="28 792 444 835" data-label="Section-Header"> <h3>Instructor's Notes</h3> </div> <div data-bbox="28 892 608 1242" data-label="Form"> <hr/><hr/><hr/><hr/><hr/> </div>	<div data-bbox="676 421 1023 464" data-label="Section-Header"> <h4>In your own words:</h4> </div> <div data-bbox="676 485 1439 835" data-label="Text"> <p>Lets look at safety devices found on the car and illustrated on this drawing with a dotted box at the top of the car. Here we have an ascending car overspeed protection device, a car top emergency exit electrical device, a gate electronic contacts or Car door gate switch, an inspection switch, and a top of car stop switch.</p> </div> <div data-bbox="676 856 1313 892" data-label="Text"> <p>Again, these are all located on the car.</p> </div> <div data-bbox="676 899 840 935" data-label="Section-Header"> <h4>Advance</h4> </div> <div data-bbox="676 992 1449 1206" data-label="Text"> <p>Lets look at safety devices found under the car and illustrated on this drawing with a dotted box at the bottom of the car. Here we just a load switch on a hydraulic system under the car.</p> </div> <div data-bbox="676 1213 840 1249" data-label="Section-Header"> <h4>Advance</h4> </div>	<div data-bbox="1497 471 1825 506" data-label="Text"> <p>✓ PPT slides 24, 25</p> </div> <div data-bbox="1535 528 1854 756" data-label="Image"> </div> <div data-bbox="1535 778 1854 1006" data-label="Image"> </div>



# Elevator – Safety Circuits

## Instructor's Guide

Module Length: 360 min      Time remaining: 270 min      This section: 90 min (19 slides)      Section start time: \_\_\_\_\_      Section End Time: \_\_\_\_\_



DO

SAY

Materials Needed



**REVIEW** slides

### Instructor's Notes

**In your own words:**

Lets look at safety devices found inside the car and illustrated on this drawing with a dotted box around the car. Here we have a car access panel looking device, a car door interlock, a car leveling device, an emergency stop switch, a firefighter's stop switch, an in-car equipment access panel device, an in-car stop switch, and an inspection switch.

Again, these are all located inside the car.

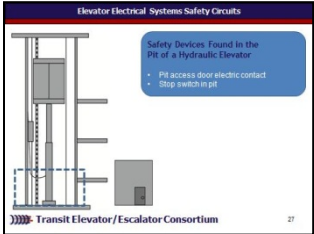
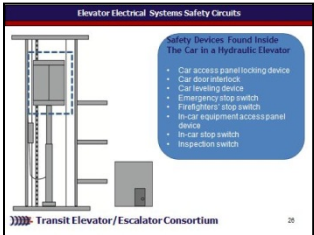
**Advance**

Lets look at safety devices found in the pit area and illustrated on this drawing with a dotted box around the pit. Here we have a stop switch and a pit access door electric contact.

Again, these are all located in the pit area.

**Advance**

✓ PPT slides 26, 27


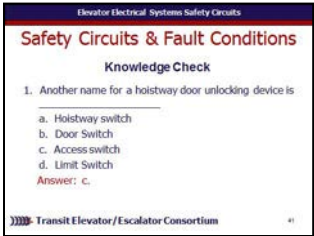


# Elevator – Safety Circuits

## Instructor's Guide



Module Length: 360 min      Time remaining: 180 min      This section: 60 min (13 slides)      Section start time: \_\_\_\_\_      Section End Time: \_\_\_\_\_

DO	SAY	Materials Needed
<div> <b>ASK</b></div> <div><b>Instructor's Notes</b> <hr/><hr/><hr/><hr/><hr/><hr/></div>	<p><b>In your own words:</b> Lets see what we have learned so far: Another name for a hoistway door unlocking device is _____</p> <ul style="list-style-type: none"><li>a. Hoistway switch</li><li>b. Door Switch</li><li>c. Access switch</li><li>d. Limit Switch</li></ul> <p><i>Call on participants for answer</i> <i>Advance once given the correct answer</i> <b>Answer: a.</b></p> <p><b>Advance</b></p>	<p>✓PPT slide 41</p> <div></div>

# Elevator – Safety Circuits

## Instructor's Guide



Module Length: 360 min      Time remaining: 30 min      This section: 30 min (2 slides)      Section start time: \_\_\_\_\_      Section End Time: \_\_\_\_\_



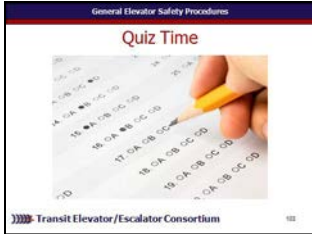
DO	SAY	Materials Needed
<div data-bbox="38 464 144 571"></div> <div data-bbox="177 489 423 568"> <p><b>CLASSROOM ACTIVITY</b></p> </div> <div data-bbox="28 792 444 835"> <p><b>Instructor's Notes</b></p> </div> <div data-bbox="28 892 608 1242"> <hr/><hr/><hr/><hr/><hr/> </div>	<p>In your own words:  <i>[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.]</i></p> <p><i>Advance</i></p>	<p>✓PPT slides 45</p> <div data-bbox="1541 531 1854 763"> </div>

# Elevator – Safety Circuits

## Instructor's Guide



Module Length: 360 min      Time remaining: 30 min      This section: 30 min (2 slides)      Section start time: \_\_\_\_\_      Section End Time: \_\_\_\_\_

DO	SAY	Materials Needed
<div><b>CLASSROOM ACTIVITY</b></div> <div><b>INDIVIDUAL ACTIVITY</b></div> <div><b>Instructor's Notes</b><div></div><div></div><div></div><div></div><div></div><div></div></div>	<p>In your own words:</p> <p><i>Administer quizzes.</i></p>	<div>✓PPT slides 46</div> <div>✓Quizzes</div> <div>✓Pencils</div> <div></div>

- ✓ PPT slides 46
- ✓ Quizzes
- ✓ Pencils