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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	Inspection and Maintenance	20 Minutes
3	Replacement	40 Minutes
4	Field Trip	120 Minutes
5	Summary	30 Minutes
	Total Time:	240 Minutes

Overview

Purpose The purpose of this module is to:

Provide the participant with an overview on how to inspect, maintain and replace lighting components on transit elevators.

Objectives

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

- List Maintenance Procedures for Lighting
- Describe normal Operation of Lighting in Transit Elevators
- Identify Faults in lighting systems that would require replacement
- Identify procedures for replacement of lighting related components

Materials

Mandatory Make sure you have the following

- PowerPoint Presentation
- Coursebook
- Quizzes
- Pencils

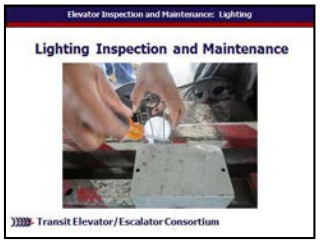
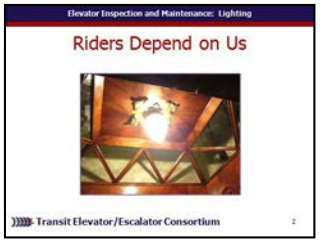
Optional You may also want the following for optional activities:

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

Elevator – Lighting

Instructor's Guide

Module Length: 240 min | Time remaining: 240 min | This section: 30 min (7 slides) | *Section start time: _____* | *Section End Time: _____*

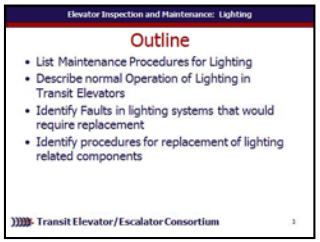
DO	SAY	Materials Needed
REVIEW introduction slides **Instructor's Notes** _____ _____ _____ _____ _____	**In your own words:** Welcome to the course on the inspection and maintenance of lighting for elevator systems. ***Advance*** Without lighting in an elevator system, passenger comfort as well as safety during inspection and maintenance would be greatly diminished to say the least. (This photo is from Elevator Bob and is of lighting in an antique elevator in the Casa Batllo in Spain, built between 1905 – 1907.) ***Advance***	✓PPT slides 1, 2  

Elevator – Lighting

Instructor's Guide

Module Length: 240 min Time remaining: 240 min This section: 30 min (7 slides) *Section start time:* _____ *Section End Time:* _____

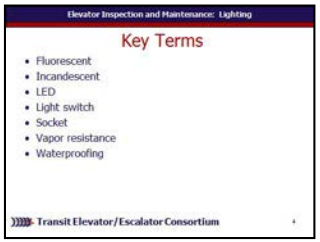
DO	SAY	Materials Needed
REVIEW module objectives **Instructor's Notes** _____ _____ _____ _____ _____	**In your own words:** Today we will • List Maintenance Procedures for Lighting • Describe normal Operation of Lighting in Transit Elevators • Identify Faults in lighting systems that would require replacement • Identify procedures for replacement of lighting related components ***Advance***	✓PPT slide 3



Elevator – Lighting

Instructor's Guide

Module Length: 240 min | Time remaining: 240 min | This section: 30 min (7 slides) | *Section start time: _____* | *Section End Time: _____*

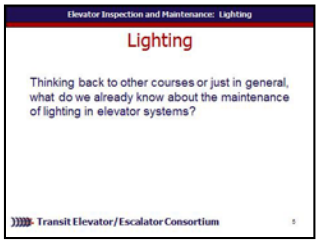
DO	SAY	Materials Needed
REVIEW key terms **Instructor's Notes** _____ _____ _____ _____ _____	**In your own words:** Lets take a look at some of the key words we will be defining as move through this module: • Fluorescent • Incandescent • LED • Light switch • Socket • Vapor resistance • Waterproofing ***Advance***	✓PPT slide 4 

Elevator – Lighting

Instructor's Guide

Module Length: 240 min | Time remaining: 240 min | This section: 30 min (7 slides) | *Section start time: _____* | *Section End Time: _____*

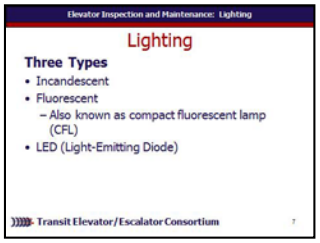
DO	SAY	Materials Needed
ASK participants what they remember about safety and elevators **SMALL GROUP ACTIVITY** **WRITE** **Instructor's Notes**	**In your own words:** Thinking back to other courses or just in general, what do we already know about the maintenance of lighting in elevator systems? ***Allow 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.*** ***Advance***	✓PPT slide 5



Elevator – Lighting

Instructor's Guide

Module Length: 240 min | Time remaining: 240 min | This section: 30 min (7 slides) | *Section start time: _____* | *Section End Time: _____*

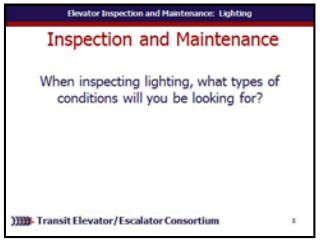
DO	SAY	Materials Needed
REVIEW slides **Instructor's Notes** _____ _____ _____ _____ _____	**In your own words:** It is important that all lighting function properly in a transit elevator as it is a safety concern when visibility is not at its height. ***Advance*** There are generally three types of lights used in transit elevator systems: **Incandescent** **Fluorescent** also known as *compact fluorescent lamp (CFL)* **LED (Light-Emitting Diode)** There are maintenance procedures related to all three types of lighting as well as steps to visually inspect them. This module covers maintenance, inspection and replacement of lighting components in transit elevators. ***Advance***	✓PPT slides 6, 7  

Elevator – Lighting

Instructor's Guide

Module Length: 240 min | Time remaining: 210 min | This section: 20 min (9 slides) | *Section start time: _____* | *Section End Time: _____*

DO	SAY	Materials Needed
REVIEW slides **ASK**	**In your own words:** ***Ask*** When inspecting lighting, what types of conditions will you be looking for? ***Discuss possible answers with participants.*** ***Advance*** When inspecting lights in transit elevator systems it is important to check the condition of the bulb itself, its associated switch and the bulb covering, be it a lens and/or a cage. ***Advance***	✓PPT slides 8, 9



Instructor's Notes

Elevator – Lighting

Instructor's Guide

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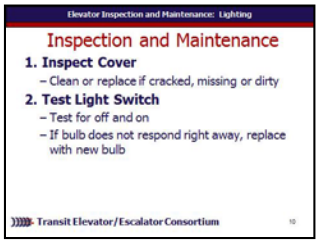
DO	SAY	Materials Needed
REVIEW slide	**In your own words:** First inspect the cover. If the cover is cracked, missing or dirty, then clean or replace the cover. ***Advance*** Next test the associated **light switch** to make sure that flicking/toggling the switch both turns the light on and off. If the light does not respond the right way, the bulb may be burnt out. As this is the easiest thing to test and/or fix start by trying a new bulb that is known to work in the socket. ***Advance***	✓PPT slide 10



Instructor's Notes

Elevator – Lighting

Instructor's Guide

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DO	SAY	Materials Needed
REVIEW slide	**In your own words:** If the lighting fixtures and switches have special characteristics such as **waterproofing**, **vapor resistance**, or other safety features, these features should be inspected and verified per Authority procedure. ***Advance*** When the light is on, visually observe its **brightness**, that it is **steady** and that it is projecting the right color. For example if a light bulb is supposed to be projecting a white light, but it is instead yellow in tone there may be problems with the bulb or its covering. In cases where the problem is not the covering or the light is dull or flickers, replace the bulb. ***Advance***	✓PPT slide 11

Instructor's Notes

Elevator – Lighting

Instructor's Guide

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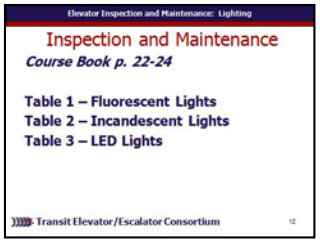
DO	SAY	Materials Needed
REVIEW slide **REFER** participants to Course book	**In your own words:** ***Have participants turn to pages in their course book. Review those pages together and use the tables to review and answer questions on the following slides.*** ***Advance***	✓PPT slide 12  ✓ Course book

Instructor's Notes

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Elevator – Lighting

Instructor's Guide

Module Length: 240 min | Time remaining: 210 min | This section: 20 min (9 slides) | *Section start time:* _____ | *Section End Time:* _____

DO	SAY	Materials Needed
ASK	**In your own words:** ***Using the tables in the course book*** You have a flickering problem with an LED light. What are two reasons for this problem? ***Call on participants for answer*** ***Advance once given the correct answer*** Answer: Improper voltage Defective unit ***Advance***	✓PPT slide 13

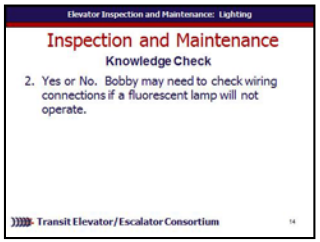
Instructor's Notes

Elevator – Lighting

Instructor's Guide

Module Length: 240 min | Time remaining: 210 min | This section: 20 min (9 slides) | *Section start time: _____* | *Section End Time: _____*

DO	SAY	Materials Needed
ASK	**In your own words:** ***Using the tables in the course book*** Yes or No. Bobby may need to check wiring connections if a fluorescent lamp will not operate. ***Call on participants for answer*** ***Advance once given the correct answer*** Answer: Yes ***Advance***	✓PPT slide 14



Instructor's Notes

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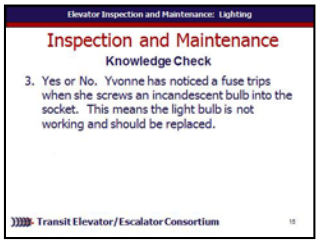
Elevator – Lighting

Instructor's Guide

Module Length: 240 min | Time remaining: 210 min | This section: 20 min (9 slides) | *Section start time: _____* | *Section End Time: _____*

DO	SAY	Materials Needed
ASK	**In your own words:** ***Using the tables in the course book*** Yes or No. Yvonne has noticed a fuse trips when she screws an incandescent bulb into the socket. This means the light bulb is not working and should be replaced. ***Call on participants for answer*** ***Advance once given the correct answer*** Answer: No, but the plug or light socket may be defective. ***Advance***	✓PPT slide 15



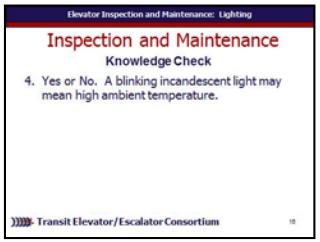
Instructor's Notes

Elevator – Lighting

Instructor's Guide

Module Length: 240 min | Time remaining: 210 min | This section: 20 min (9 slides) | *Section start time: _____* | *Section End Time: _____*

DO	SAY	Materials Needed
ASK	**In your own words:** ***Using the tables in the course book*** Yes or No. A blinking incandescent light may mean high ambient temperature. ***Call on participants for answer*** ***Advance once given the correct answer*** Answer: Yes ***Advance***	✓PPT slide 16

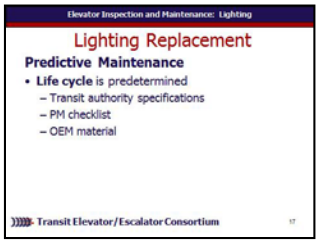


Instructor's Notes

Elevator – Lighting

Instructor's Guide

Module Length: 240 min | Time remaining: 190 min | This section: 40 min (21 slides) | *Section start time:* _____ | *Section End Time:* _____

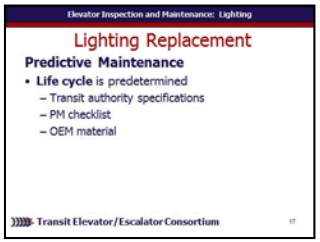
DO	SAY	Materials Needed
REVIEW slide **ASK** **Instructor's Notes**	**In your own words:** As described in module 1 there are three different types of maintenance: preventive, reactive, and predictive. Preventive maintenance is what we just reviewed: checking to make sure that conditions are such that the life of the bulb can be as long as possible. Reactive maintenance in this case could consist of replacing a bulb (or related component) because it is no longer functioning. In many cases, replacement of light bulbs in transit elevator systems is **predictive**. ***Ask*** What is predictive maintenance? ***Allow participants to discuss ideas.*** ***Advance***	✓PPT slide 17 

Elevator – Lighting

Instructor's Guide

Module Length: 240 min | Time remaining: 190 min | This section: 40 min (21 slides) | *Section start time:* _____ | *Section End Time:* _____

DO	SAY	Materials Needed
REVIEW slide	**In your own words:** The average **life cycle** of a light under certain conditions is usually predetermined by either the authority or light manufacturer. Replacement may be included in PM checklists - done on a yearly cycle for example. The OEM may also offer advice on how often bulbs should be replaced to function at their ideal state. ***Advance***	✓PPT slide 17



Instructor's Notes

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Elevator – Lighting

Instructor's Guide

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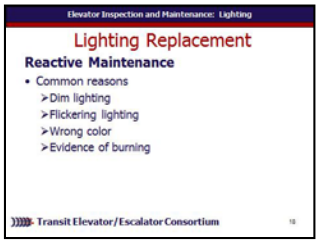
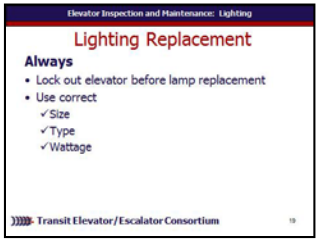
DO	SAY	Materials Needed
REVIEW slide **ASK** **Instructor's Notes**	**In your own words:** ***Ask*** Again, what is reactive maintenance? ***Allow participants to discuss ideas.*** ***Advance*** There are times when replacement of lighting components is **reactive**. Some common reasons for replacing lighting components outside of their normal predictive replacement schedule include: Lighting is dim Lighting is flickering Lighting is not producing the intended color Bulb, or other components, are warm to the touch or show evidence of burning ***Advance***	✓PPT slide 18 

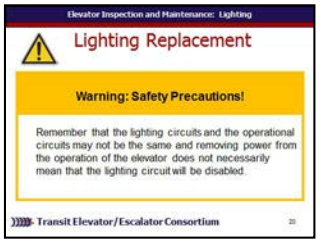
Elevator – Lighting

Instructor's Guide

Module Length: 240 min | Time remaining: 190 min | This section: 40 min (21 slides) | *Section start time:* _____ | *Section End Time:* _____

DO	SAY	Materials Needed
REVIEW slide	**In your own words:** Whenever replacing a lighting component, follow all precautions related to locking out the elevator before beginning the process of lamp replacement. When replacing the lamp(s), insure that the correct size, type, and wattage is used. ***Advance*** Remember that the lighting circuits and the operational circuits may not be the same and removing power from the operation of the elevator does not necessarily mean that the lighting circuit will be disabled. ***Advance***	✓PPT slides 19, 20





Instructor's Notes

Elevator – Lighting

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DO	SAY	Materials Needed
REVIEW slide **ASK** **Instructor's Notes** _____ _____ _____ _____ _____	**In your own words:** You are all familiar with fluorescent lighting like the one in this photo found in a control room in South Eastern PA Transportation Authority. ***Ask*** How often do you encounter these types of lights in your transit authority? ***Allow participants to discuss ideas.*** This type of light can be unique and has some special considerations. ***Advance***	✓PPT slide 21 

Elevator – Lighting

Instructor's Guide

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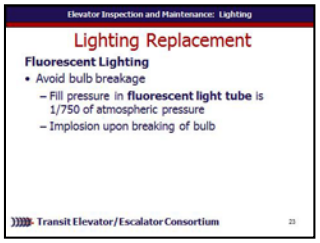
DO	SAY	Materials Needed
REVIEW slides	**In your own words:** Oneunique feature of fluorescent bulbs is their containment of mercury. The photo on your right shows "A pound coin (density ~7.6 g/cm^3) floating in mercury due to the combination of the buoyant force and surface tension." Mercury can be toxic. ***Advance*** The fill pressure inside the **fluorescent light tube** is only about 1/750 that of atmospheric pressure. This low pressure creates a vacuum inside which creates an impressive implosion when they break. Since all fluorescent bulbs contain mercury, breaking the bulbs should be avoided. ***Advance***	✓PPT slides 22, 23



Instructor's Notes

Elevator – Lighting

Instructor's Guide

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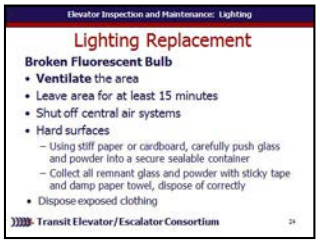
DO	SAY	Materials Needed
REVIEW slides	**In your own words:** In the case of a broken fluorescent bulb, make sure to **ventilate** the area and leave the area for at least fifteen minutes. Additionally, shut off any central air systems so this air does not circulate through the system. ***Advance*** For hard surfaces, carefully brush up the glass shards and powder with a disposable piece of stiff paper or cardboard. Place all shards, powder and paper used in a secure sealable container designed for that purpose. Collect all remnant glass and powder with sticky tape and then a damp paper towel. Make sure to dispose of these correctly. ***Advance***	✓PPT slide 24



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Elevator – Lighting

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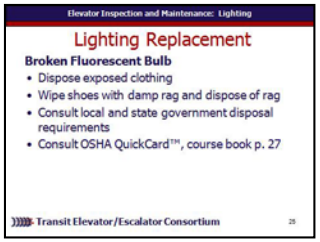
DO	SAY	Materials Needed
REVIEW slide **REFER** participants to Course book **Instructor's Notes** _____ _____ _____ _____ _____	**In your own words:** Any **clothing** worn in the presence of an explosion of a fluorescent tube will have to be disposed of as washing will allow any mercury to be dispersed into the water supply. Shoes can be wiped with a damp rag. Properly dispose of the rag. Check with your local or state government about disposal requirements in your specific area. Some states prohibit such trash disposal and require that broken and unbroken mercury-containing bulbs be taken to a local recycling center. The Occupational Safety and Health Administration (OSHA,) publishes a QuickCard™ with procedures on how to avoid mercury exposure from fluorescent bulbs. ***Do Not Advance***	✓PPT slide 25  Elevator Inspection and Maintenance: Lighting Lighting Replacement Broken Fluorescent Bulb • Dispose exposed clothing • Wipe shoes with damp rag and dispose of rag • Consult local and state government disposal requirements • Consult OSHA QuickCard™, course book p. 27 Transit Elevator/Escalator Consortium ✓ Course book

Elevator – Lighting

Instructor's Guide

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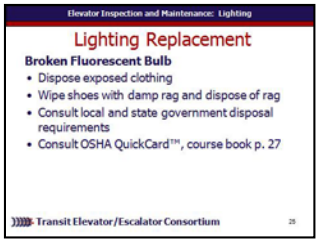
DO	SAY	Materials Needed
REVIEW slide **REFER** participants to Course book	**In your own words:** ***Have participants turn to pages in their course book. Review those pages together.*** ***Advance***	✓PPT slide 25  ✓ Course book

Instructor's Notes

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Elevator – Lighting

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DO	SAY	Materials Needed
REVIEW slide	**In your own words:** Remember: Fluorescent light tubes contain mercury and broken lighting should be handled in accordance with your Authority's procedures for biohazard materials. ***Advance***	✓PPT slide 26

Instructor's Notes

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Elevator – Lighting

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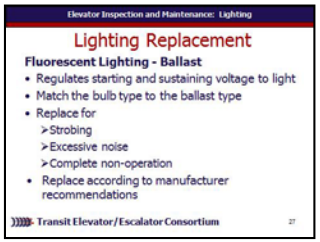
DO	SAY	Materials Needed
REVIEW slide **Instructor's Notes** _____ _____ _____ _____ _____	**In your own words:** Unlike incandescent bulbs, fluorescent lights cannot be directly connected to electric lines. They use what is called a **ballast** to regulate both the starting and sustaining voltage going to the fluorescent light. ***Advance*** First, you need to make sure you match the type of bulb to the type of ballast as there are different kinds of bulbs and ballasts, depending on how rapidly the bulb will start. If you use an ordinary fluorescent bulb in w ***Advance*** The ballast may need to be replaced in instances such as strobing, excessive noise, or complete non-operation of the light. ***Advance*** As with bulbs, make sure to replace existing ballasts with the correct type per the manufacturer's recommendations. ***Advance***	✓PPT slide 27 

Elevator – Lighting

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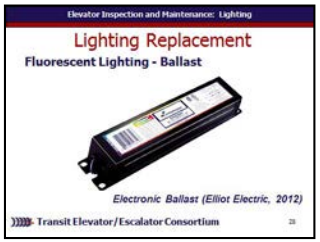
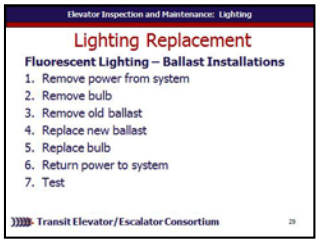
DO	SAY	Materials Needed
REVIEW slides	**In your own words:** Here is an example ballast by Elliot Electric. ***Advance***	✓PPT slides 28, 29
Instructor's Notes _____ _____ _____ _____ _____	Once the correct ballast type has been secured, follow these steps to install: 1. Remove power from the system 2. Remove the bulb 3. Remove old ballast 4. Replace the new ballast 5. Replace the bulb 6. Return power to the system. 7. Test the system afterwards to make sure the issue is resolved. With a rapid start ballast, the bulb will have a short life. Use rapid start bulbs with rapid start ballasts. ***Advance***	 

Elevator – Lighting

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DO	SAY	Materials Needed
REVIEW slides	**In your own words:** Fluorescent lighting systems also contain a **socket** also known as a *tombstone*. The purpose of the socket is to hold the bulb and contacts for pins that supply power to the bulb. ***Advance*** Replacing incandescent light bulbs is a lot more straight-forward than replacing fluorescent lights. Simply remove any protective covering over the faulty light, unscrew the faulty bulb. Wrap it in a sheet of newspaper. Place it in a sealable plastic bag and place it in the trash can. Take care to replace the bulb with a bulb of the same wattage. ***Advance***	✓PPT slides 30, 31

Instructor's Notes

Elevator – Lighting

Instructor's Guide

Module Length: 240 min | Time remaining: 190 min | This section: 40 min (21 slides) | *Section start time:* _____ | *Section End Time:* _____

DO	SAY	Materials Needed
REVIEW slides	**In your own words:** Here is an example of replacing an incandescent light bulb. ***Advance*** If the light bulb has just burned out, wait until it has cooled before removing it from the light fixture. ***Advance*** Replacing incandescent light bulbs is a lot more straight-forward than replacing fluorescent lights. Simply remove any protective covering over the faulty light, unscrew the faulty bulb. Wrap it in a sheet of newspaper. Place it in a sealable plastic bag and place it in the trash can. Take care to replace the bulb with a bulb of the same wattage. ***Advance***	✓PPT slides 32, 33, 34

Instructor's Notes

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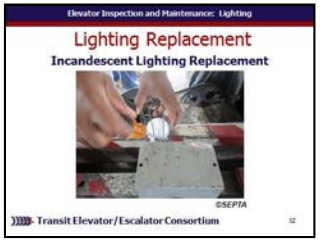

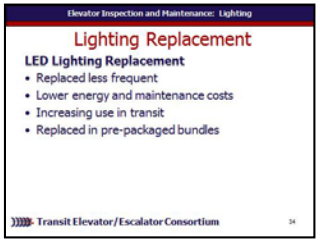

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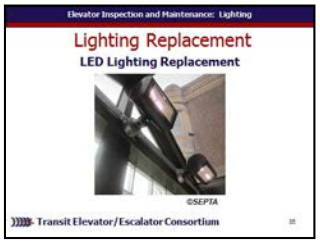
Instructor's Guide

Module Length: 240 min | Time remaining: 190 min | This section: 40 min (21 slides) | *Section start time:* _____ | *Section End Time:* _____

DO	SAY	Materials Needed
REVIEW slides	**In your own words:** Here is an example of an LED bulb one may find in transit. ***Advance***	✓PPT slides 35



Instructor's Notes

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Instructor's Guide

Module Length: 240 min | Time remaining: 190 min | This section: 40 min (21 slides) | *Section start time:* _____ | *Section End Time:* _____

DO	SAY	Materials Needed
ASK	**In your own words:** Lets see what we have learned so far: Yes or No. You have a bulb that has just burned out and must wait a few minutes for the bulb to cool before replacing. ***Call on participants for answer*** ***Advance once given the correct answer*** Answer: Yes ***Advance.***	✓PPT slide 36

Instructor's Notes

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Elevator – Lighting

Instructor's Guide

Module Length: 240 min | Time remaining: 190 min | This section: 40 min (21 slides) | *Section start time:* _____ | *Section End Time:* _____

DO	SAY	Materials Needed
ASK	**In your own words:** Yes or No. Incandescent light tubes contain mercury and broken lighting should be handled in accordance with your Authority's procedures for biohazard materials. ***Call on participants for answer*** ***Advance once given the correct answer*** Answer: No – fluorescent bulbs contain mercury. ***Advance***	✓PPT slide 37

Instructor's Notes

Elevator – Lighting

Instructor's Guide

Module Length: 240 min | Time remaining: 150 min | This section: 120 min | *Section start time: _____* | *Section End Time: _____*

DO	SAY	Materials Needed
ASK **CLASSROOM ACTIVITY**	**In your own words:** ***Take time to visit the field to provide an example demonstration and opportunities for participants to perform the following tests:*** • Identify Faults in lighting systems that would require replacement • Identify procedures for replacement of lighting related components ***Advance***	✓PPT slide 38

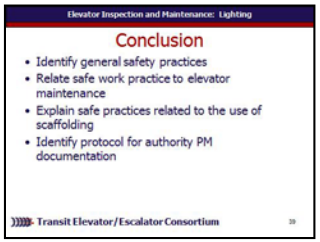
Instructor's Notes

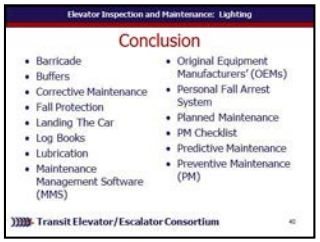
Elevator – Lighting

Instructor's Guide

Module Length: 240 min | Time remaining: 30 min | This section: 30 min (3 slides) | *Section start time: _____* | *Section End Time: _____*

DO	SAY	Materials Needed
CLASSROOM ACTIVITY **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***	✓PPT slides 39, 40





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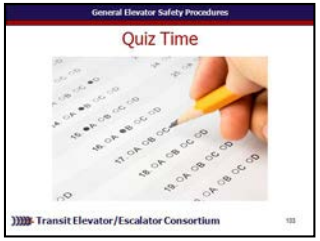
Module Length: 240 min | Time remaining: 30 min | This section: 30 min (3 slides) | *Section start time:* _____ | *Section End Time:* _____

DO	SAY	Materials Needed
CLASSROOM ACTIVITY **INDIVIDUAL ACTIVITY**	**In your own words:** ***Administer quizzes.***	✓PPT slides 41 ✓Quizzes ✓ Pencils 

Instructor's Notes

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