Instructor Guide



219: Elevator: Inspection and Basic Maintenance Module 2: Lighting

TRANSIT ELEVATOR/ESCALATOR CONSORTIUM



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Instructor's Guide

Icons Used In This Guide



REVIEW slides



INDIVIDUAL ACTIVITY



ASK



WRITE



CLASSROOM ACTIVITY



Multimedia



SMALL GROUP ACTIVITY



REFER participants to

Agenda

<u> </u>	·	
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

Instructor's Guide



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

Module Length: 240 min

Time remaining: 240 min



SAY **Materials Needed**

REVIEW introduction slides

DO

In your own words:

Welcome to the course on the inspection and maintenance of lighting for elevator systems.

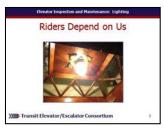
Advance

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





Instructor's Notes

Instructor's Notes

Instructor's Guide



Module Length: 240 min

Time remaining: 240 min

This section: 30 min (7 slides)

Section start time:

Section End Time:

Materials Needed

REVIEW module objectives

DO

In your own words:

Today we will

List Maintenance Procedures for Lighting

SAY

- 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

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

Mr. Transit Elevator/Escalator Consortion

Module Length: 240 min

Time remaining: 240 min



This section: 30 min (7 slides) Section start time: _____ Section End Time: _____

SAY Materials Needed

DO **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

Elevator Inspection and Haintenance: Lighting					
Key Terms					
Fluorescent Incandescent LED Light switch Socket Vapor resistance Waterproofing					
)))))): Transit Elevator/EscalatorConsortium					

Module Length: 240 min

Time remaining: 240 min

This section: 30 min (7 slides)

Section start time:

Section End Time:

DO

In your own words:

Materials Needed



ASK participants what they remember about safety and elevators

SMALL GROUP ACTIVITY



WRITE

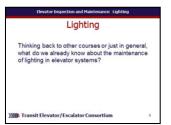
Instructor's Notes

Thinking back to other courses or just in general, what do we already know about the maintenance of lighting in elevator systems?

SAY

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



Module Length: 240 min

Time remaining: 240 min

This section: 30 min (7 slides)

Section start time:

Section End Time:

Materials Needed

DO **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.

SAY

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





Instructor's Guide

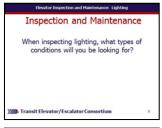
Time remaining: 210 min



Module Length: 240 min This section: 20 min (9 slides) Section start time: Section End Time: DO SAY **Materials Needed** In your own words: **REVIEW** slides Ask When inspecting lighting, what types of conditions will you be looking for? **ASK** Discuss possible answers with participants. Advance Instructor's Notes ✓ Bulb When inspecting lights in transit elevator √ Switch √ Bulb covering systems it is important to check the condition √Lens or cage of the bulb itself, its associated switch and the bulb covering, be it a lens and/or a cage.

Advance

✓ PPT slides 8, 9





Time remaining: 210 min



Module Length: 240 min This section: 20 min (9 slides) Section start time: Section End Time: DO SAY **Materials Needed** In your own words: ✓ PPT slide 10 **REVIEW** slide First inspect the cover. If the cover is cracked, missing or dirty, then clean or replace the Inspection and Maintenance 1. Inspect Cover cover. - Clean or replace if cracked, missing or dirty 2. Test Light Switch Advance - Test for off and on - If bulb does not respond right away, replace with new bulb Next test the associated **light switch** to make sure that flicking/toggling the switch both turns Transit Elevator/Escalator Consortion the light on and off. If the light does not Instructor's Notes 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

Instructor's Guide

Time remaining: 210 min



Module Length: 240 min This section: 20 min (9 slides) Section start time. Section End Time: DO SAY **Materials Needed** In your own words: ✓ PPT slide 11 **REVIEW** slide If the lighting fixtures and switches have special characteristics such as Inspection and Maintenance 3. Check Special Characteristics waterproofing, vapor resistance, or other - Waterproofing, vapor resistance, other safety safety features, these features should be - Follow authority procedures 4. Brightness - Visually observe for brightness, steady, and inspected and verified per Authority correct color - If dull, check cover or replace bulb - If flickering, replace bulb procedure. Transit Elevator/Escalator Consortiun **Advance** When the light is on, visually Instructor's Notes 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



Module Length: 240 min

Time remaining: 210 min

This section: 20 min (9 slides)

Section start time:

Section End Time:

Materials Needed

REVIEW slide



REFER participants to Course book

DO

Instructor's Notes

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.

SAY

Advance

✓ PPT slide 12

Inspection and Maintenance Course Book p. 22-24 Table 1 - Fluorescent Lights Table 2 - Incandescent Lights Table 3 - LED Lights Transit Elevator/Escalator Consortium

Course book

DO



Module Length: 240 min

Time remaining: 210 min

This section: 20 min (9 slides)

Section start time:

Section End Time:

Materials Needed

ASK

Instructor's Notes

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

SAY

Answer:

Improper voltage Defective unit

Advance

✓ PPT slide 13

Inspection and Maintenance Knowledge Check 1. You have a flickering problem with an LED

light. What are two possible corrective actions you can take?

Transit Elevator/Escalator Consortion

DO



Module Length: 240 min

Time remaining: 210 min

This section: 20 min (9 slides)

Section start time:

Section End Time: ___

Materials Needed

?

ASK

Instructor's Notes

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.

SAY

Call on participants for answer
Advance once given the correct answer

Answer:

Yes

Advance

✓ PPT slide 14

Inspection and Maintenance Lighting

Inspection and Maintenance
Knowledge Check

2. Yes or No. Bobby may need to check wiring connections if a fluorescent lamp will not operate.

Transit Elevator/Escalator Consortion

DO



Module Length: 240 min

Time remaining: 210 min

This section: 20 min (9 slides)

Section start time:

Section End Time:

Materials Needed

ASK

Instructor's Notes

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.

SAY

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

Inspection and Maintenance Knowledge Check

3. 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.

M. Transit Elevator/Escalator Consortion

DO



Module Length: 240 min

Time remaining: 210 min

This section: 20 min (9 slides)

Section start time:

Section End Time:

Materials Needed

ASK

Instructor's Notes

In your own words:

Using the tables in the course book

Yes or No. A blinking incandescent light may mean high ambient temperature.

SAY

Call on participants for answer Advance once given the correct answer

Answer:

Yes

Advance

✓ PPT slide 16

Inspection and Maintenance Knowledge Check 4. Yes or No. A blinking incandescent light may mean high ambient temperature.

Transit Elevator/Escalator Consortion

Module Length: 240 min

Time remaining: 190 min



DO SAY **Materials Needed** In your own words: ✓ PPT slide 17 **REVIEW** slide As described in module 1 there are three different types of maintenance: preventive, Lighting Replacement **Predictive Maintenance** reactive, and predictive. Preventive · Life cycle is predetermined **ASK** - Transit authority specifications maintenance is what we just reviewed: - PM checklist - OEM materia checking to make sure that conditions are such that the life of the bulb can be as long as Mr. Transit Elevator/Escalator Consorti possible. Reactive maintenance in this case Instructor's Notes 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

Instructor's Guide





This section: 40 min (21 slides) Section start time: Section End Time:

DO SAY **Materials Needed** In your own words: **REVIEW** slide 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 Instructor's Notes function at their ideal state. Advance



Time remaining: 190 min



This section: 40 min (21 slides) Section start time: Module Length: 240 min Section End Time: DO SAY **Materials Needed** In your own words: ✓ PPT slide 18 **REVIEW** slide Ask Again, what is reactive maintenance? Lighting Replacement Reactive Maintenance Allow participants to discuss ideas. Common reasons **ASK** >Dim lighting Advance >Flickering lighting > Evidence of burning There are times when replacement of lighting Transit Elevator/Escalator Consort components is reactive. Some common Instructor's Notes 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

Instructor's Guide





Module Length: 240 min DO SAY **Materials Needed** In your own words: ✓ PPT slides 19, 20 **REVIEW** slide Whenever replacing a lighting component, follow all precautions related to locking out the Lighting Replacement elevator before beginning the process of lamp Always · Lock out elevator before lamp replacement Use correct replacement. √ Type √ Wattage When replacing the lamp(s), insure that the Mr. Transit Elevator/Escalator Consorti correct size, type, and wattage is used. Instructor's Notes Advance Lighting Replacement Warning: Safety Precautions Remember that the lighting circuits and the Remember that the lighting circuits and the operational the operation of the elevator does not necessarily nean that the lighting circuit will be disabled. operational circuits may not be the same and removing power from the operation of the Transit Elevator/Escalator Consortiur elevator does not necessarily mean that the lighting circuit will be disabled. Advance

Instructor's Guide

Time remaining: 190 min



Module Length: 240 min This section: 40 min (21 slides) Section start time: Section End Time: DO SAY **Materials Needed** In your own words: ✓ PPT slide 21 **REVIEW** slide You are all familiar with fluorescent lighting



ASK

Instructor's Notes				

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



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** In your own words: ✓ PPT slides 22, 23 **REVIEW** slides Oneunique feature of fluorescent bulbs is their containment of mercury. The photo on your Lighting Replacement Fluorescent Lighting right shows "A pound coin (density ~7.6 g/cm³) floating in mercury due to the combination of the buoyant force and surface tension." Mercury can be toxic. Transit Elevator/Escalator Con Advance Instructor's Notes Lighting Replacement Fluorescent Lighting Avoid bulb breakage The fill pressure inside the **fluorescent light** - Fill pressure in fluorescent light tube is 1/750 of atmospheric pressure tube is only about 1/750 that of atmospheric - Implosion upon breaking of bulb pressure. This low pressure creates a vacuum inside which creates an impressive implosion Transit Elevator/Escalator Consortiu when they break. Since all fluorescent bulbs contain mercury, breaking the bulbs should be avoided. Advance

Module Length: 240 min

Time remaining: 190 min



This section: 40 min (21 slides) Section start time. Section End Time:

DO SAY **Materials Needed** In your own words: ✓ PPT slide 24 **REVIEW** slides In the case of a broken fluorescent bulb, make sure to ventilate the area and leave the Lighting Replacement area for at least fifteen minutes. Additionally, **Broken Fluorescent Bulb** · Ventilate the area Leave area for at least 15 minutes shut off any central air systems so this air · Shut off central air systems Hard surfaces Using stiff paper or cardboard, carefully push glass does not circulate through the system. and powder into a secure sealable containe Collect all remnant glass and powder with sticky tape and damp paper towel, dispose of correctly **Advance** For hard surfaces, carefully brush Disnose exposed clothing Transit Elevator/Escalator Consortiun up the glass shards and powder with a Instructor's Notes 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

Instructor's Guide

Time remaining: 190 min



This section: 40 min (21 slides) Section start time. Module Length: 240 min Section End Time: DO SAY **Materials Needed** In your own words: **REVIEW** slide Any **clothing** worn in the presence of an ✓ PPT slide 25 explosion of a fluorescent tube will have to Lighting Replacement be disposed of as washing will allow any **REFER** participants to **Broken Fluorescent Bulb** · Dispose exposed clothing mercury to be dispersed into the water Course book · Wipe shoes with damp rag and dispose of rag · Consult local and state government disposal supply. Shoes can be wiped with a damp . Consult OSHA QuickCard™, course book p. 27 rag. Properly dispose of the rag. Transit Elevator/Escalator Consortium Check with your local or state government Instructor's Notes Course book 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



Module Length: 240 min

Time remaining: 190 min

This section: 40 min (21 slides) Section start time:

SAY

Section End Time:

Materials Needed

DO **REVIEW** slide **REFER** participants to Course book **Instructor's Notes**

In your own words: Have participants turn to pages in their course book. Review those pages together.

Advance

✓ PPT slide 25

Lighting Replacement **Broken Fluorescent Bulb** · Dispose exposed clothing · Wipe shoes with damp rag and dispose of rag · Consult local and state government disposal . Consult OSHA QuickCard™, course book p. 27 Transit Elevator/Escalator Consortium

Course book



Module Length: 240 min

Time remaining: 190 min

This section: 40 min (21 slides) Section start time:

Section End Time:

Materials Needed

DO

REVIEW slide

Instructor's Notes

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.

SAY

Advance

1	Lighting Replacement
	Warning: Safety Precautions!
lighting	scent light tubes contain mercury and broken g should be handled in accordance with your nity's procedures for biohazard materials.





Module Length: 240 min

Time remaining: 190 min

This section: 40 min (21 slides) Section start time.

Section End Time:

DO SAY **Materials Needed** In your own words: ✓ PPT slide 27 **REVIEW** slide Unlike incandescent bulbs, fluorescent lights cannot be directly connected to electric lines. Lighting Replacement Fluorescent Lighting - Ballast They use what is called a **ballast** to regulate Regulates starting and sustaining voltage to light Match the bulb type to the ballast type both the starting and sustaining voltage going Replace for > Strobing >Excessive noise to the fluorescent light. >Complete non-operation Replace according to manufacturer recommendations **Advance** First, you need to make sure you Transit Elevator/Escalator Consortiu match the type of bulb to the type of ballast as Instructor's Notes 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

Instructor's Guide





This section: 40 min (21 slides) Section start time: Module Length: 240 min Section End Time: DO SAY **Materials Needed** In your own words: ✓ PPT slides 28, 29 **REVIEW** slides Here is an example ballast by Elliot Electric. Advance Lighting Replacement Fluorescent Lighting - Ballast Once the correct ballast type has been secured, follow these steps to install: Remove power from the system Remove the bulb Instructor's Notes Remove old ballast Lighting Replacement Fluorescent Lighting - Ballast Installations 4. Replace the new ballast 2. Remove bulb 3. Remove old ballast Replace the bulb 4. Replace new ballast 5. Replace bulb 6. Return power to system 6. Return power to the system. Test the system afterwards to make sure Transit Elevator/Escalator Consortion 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

Instructor's Guide

Module Length: 240 min

Time remaining: 190 min



This section: 40 min (21 slides) Section start time: Section End Time: SAY **Materials Needed**



REVIEW slides

DO

Instructor's Notes

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





- Unscrew faulty bulb
- · Wrap bulb in newspaper sheet
- · Place in sealable bag & then in trash can
- · Replace bulb with same wattage

Mr. Transit Elevator/Escalator Consortiur



Module Length: 240 min

Time remaining: 190 min

This section: 40 min (21 slides) Section start time:

Section End Time:

REVIEW slides

DO

Instructor's Notes

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.

SAY

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.

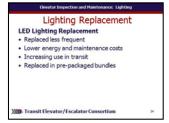
Advance

✓ PPT slides 32, 33, 34

Materials Needed









Module Length: 240 min

Time remaining: 190 min

This section: 40 min (21 slides) Section start time:

Section End Time:

Materials Needed

REVIEW slides

DO

In your own words:

Here is an example of an LED bulb one may find in transit.

SAY

Advance

✓ PPT slides 35



Instructor's Notes

DO



Module Length: 240 min

Time remaining: 190 min

This section: 40 min (21 slides) Section start time:

Section End Time:

Materials Needed

ASK

Instructor's Notes

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.

SAY

Call on participants for answer Advance once given the correct answer

Answer: Yes

Advance.



DO



Module Length: 240 min

Time remaining: 190 min

This section: 40 min (21 slides) Section start time:

Section End Time:

Materials Needed

ASK

Instructor's Notes

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.

SAY

Call on participants for answer Advance once given the correct answer

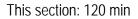
Answer: No – fluorescent bulbs contain mercury.

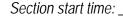
Advance

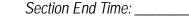


Instructor's Guide









Materials Needed

Module Length: 240 min

ASK



CLASSROOM ACTIVITY

DO

Instructor's Notes

In your own words:

Take time to visit the field to provide an example demonstration and opportunities for participants to perform the following tests:

SAY

- Identify Faults in lighting systems that would require replacement
- Identify procedures for replacement of lighting related components

Advance





Module Length: 240 min

Time remaining: 30 min

This section: 30 min (3 slides)

Section start time:

Section End Time:

DO SAY **Materials Needed** In your own words: Read slide. ✓ PPT slides 39, 40 **CLASSROOM** For each objective, briefly review what **ACTIVITY** Conclusion was learned in this module or ask · Identify general safety practices · Relate safe work practice to elevator participants to share what they have · Explain safe practices related to the use of scaffolding learned for each learning objective and · Identify protocol for authority PM documentation briefly discuss as a class. manual Elevator/Escalator Consortiu Advance Instructor's Notes Conclusion Barricade · Original Equipment Lets take a look at some of the key words we Manufacturers' (OEMs) · Buffers Personal Fall Arrest · Corrective Maintenance · Fall Protection have defined as moved through this module. Planned Maintenance . Landing The Car · PM Checklist · Log Books Predictive Maintenance Read slide. Discuss definitions as a Lubrication · Preventive Maintenance Maintenance Management Software group. Transit Elevator/Escalator Consortiur Advance Read slide. Discuss definitions as a group. Advance

Module Length: 240 min

Time remaining: 30 min

This section: 30 min (3 slides)

SAY

Section start time:

Section End Time:

Materials Needed

CLASSROOM ACTIVITY



INDIVIDUAL ACTIVITY

DO

Instructor's Notes					

In your own words:

Administer quizzes.

- ✓ PPT slides 41
- ✓ Quizzes
- ✓ Pencils

