

# Trainer Manual

## Module D

### Electrical safety

<p><b>Objectives:</b></p>	<p>No person shall undertake any work activity where technical knowledge or experience is needed to prevent electrical danger or injury, unless that person has such technical knowledge or experience, or is under such supervision as is necessary for the work undertaken.</p> <p>National legislation can set out the minimum age and the criteria for competence of persons.</p> <p>The following criteria shall be used in assessing the competence of persons:</p> <ol style="list-style-type: none"> <li>1. Know about the basic concept of electricity</li> <li>2. Understanding the hazards which can arise during the work and the precautions to be observed</li> <li>3. Gain knowledge how to acquire experience of electrical work</li> <li>4. Understanding of the installation or type of equipment to be worked on</li> <li>5. Know about observation and application of measures for occupational health and safety and accident prevention regulations.</li> <li>6. Know about appropriate personal protective equipment</li> <li>7. Know about observation and application of environmental protection and rational use of material resources and energy</li> <li>8. Know about tools, equipment and devices that shall be used in accordance with the instructions and/or guidance provided by the manufacturer or supplier</li> <li>9. Acquire ability to recognise at all times whether it is safe to continue working</li> </ol>	
<p><b>Duration:</b></p>	<p>D1 – Electrical concepts</p>	<p>40'</p>
	<p>D2 – Electrical terms</p>	<p>80'</p>
	<p>D3 – Types of power supply</p>	<p>20'</p>
	<p>D4 – Electromagnetic induction</p>	<p>20'</p>
	<p>D5 - Capacitors</p>	<p>10'</p>
	<p>D6 - Rectifiers</p>	<p>15'</p>
	<p>D7 – Three-phase induction motor</p>	<p>40'</p>
	<p>D8 – Single-phase AC Motors</p>	<p>40'</p>
	<p>D9 – Electrical Safety Tests</p>	<p>90'</p>

	D10 – Electrical safe isolation	135'
	D11 – Protection & Instrumentation	160'
	D12 – Electrical regulations & earthing	60'
	D13 – Terminating cables and flexes	90'
	D14 - Connections to the Public Network and Safety checks	60'
	<b>TOTAL</b>	<b>860'</b> <b>~ 14.5°</b> <b>Theory</b>
<b>Material:</b>	PPT presentation, projector, calculators, pens, paper D_HO_Safe electric isolation procedure D_HO_Insulation test record	
<b>Demonstration equipment</b>	Various electrical components (transformers, capacitors, rectifiers, three phase motor, single phase motors complete with various starting components) Example protective devices (Fuses, circuit breakers and RCDs), Socket outlet testers (according to national specifications), various RCDs	
<b>Tools &amp; equipment:</b>	Multimeters and Clamp meters, Voltage Indicators (ideally complete with proving unit), lock offs, isolation cables, insulation resistance test meter, cable termination tools, insulated pliers and screw drivers, plugs and various compression cable lugs	

Each session contains several sub-sessions.

Please note that it is advisable to adapt each course according to specific local circumstances.

There are three exemplary practical exercises available for this module. These, or similar/additional exercises, can be integrated wherever the trainer sees fitting. The total time of these three exercises is about 240 minutes. The exercises are:

- PE1 – Electrical safe isolation
- PE2 – Build electrical lighting circuit
- PE3 – Electrical testing of compressors

Abbreviations:

PPT: Presentation slides; TM: Trainer manual; HO: Handout; DM: Demonstration material

Summary – Session Overview

Chapter: D1 – Electrical concepts				
Time	Content	Objectives	Training material / demonstration equipment	Description of training sessions and trainer notes
40'	<ol style="list-style-type: none"> <li>1. Electricity</li> <li>2. Electrical charge</li> <li>3. Commonly used electrical symbols</li> <li>4. Conductors and insulators</li> <li>5. Free electrons</li> </ol>	<ul style="list-style-type: none"> <li>• Understand the origins of electricity</li> <li>• Understanding the difference between insulators and conductors</li> <li>• Knowing about the link between magnetic fields and electricity</li> <li>• Knowing about electrical symbols for technical communication</li> </ul>	<p>Module D_PPT_Electrical safety_1-2_Basic_Concepts &amp; Terms</p> <p>Module D_TM_Electrical safety</p>	<p><u>Plenary</u></p> <p>Trainer should start the session with questions regarding participants' experience to assess previous knowledge.</p> <p>Trainer supplements knowledge gaps through PPT.</p> <p>Trainer explains how electricity was first discovered by Michael Faraday and the concept of electrons moving in a material to produce a flow in a conductor</p> <p><u>Exercise for the class:</u></p> <p>Draw a simple electrical circuit and explain what is required for electricity to flow.</p>
<b>40 min</b>	<b>Total time</b>			

Chapter: D2\_ Electrical Terms

Time	Content	Objectives	Training material / demonstration equipment	Description of training sessions and trainer notes
80'	<ol style="list-style-type: none"> <li>1. Potential difference</li> <li>2. Electrical current</li> <li>3. Resistance</li> <li>4. Relationship between voltage, current and resistance</li> <li>5. Ohm's law</li> <li>6. Calculate equivalent resistance                             <ul style="list-style-type: none"> <li>• Resistors in series connection</li> <li>• Variable resistance</li> <li>• Parallel circuits</li> </ul> </li> <li>7. Electric power calculation</li> </ol>	<ul style="list-style-type: none"> <li>• Understand the main electrical terms</li> <li>• Measure resistance, voltage and current</li> <li>• Learn to apply Ohm's law</li> <li>• Work out equivalent resistance of resistors in series/parallel circuits</li> <li>• Learn to apply the power calculation methods</li> </ul>	<p>Module D_PPT_Electrical safety_1-2_Basic_Concepts &amp; Terms</p> <p>Module D_TM_Electrical safety</p> <p>Multimeter</p>	<p><u>Plenary</u></p> <p>Trainer should start the session with questions regarding participants' experience to assess previous knowledge.</p> <p>Trainer supplements knowledge gaps through PPT. Trainer uses PPT for explanation.</p> <p>Trainer uses multi meter to demonstrate how to measure resistance, voltage and current (<b>ensure all necessary safety precautions are taken to prevent any accidents</b>).</p> <p><u>Exercises for class:</u></p> <p>Trainer produces some exercises to get class to work out:</p> <ul style="list-style-type: none"> <li>• Total resistance of resistors in series</li> <li>• Total resistance of resistors in parallel</li> <li>• Different values using OHM's Law</li> </ul> <p>Different values using the Power triangle</p>
80 min	<b>Total time</b>			

Chapter: D3_ Types of Power Supply				
Time	Content	Objectives	Training material / demonstration equipment	Description of training sessions and trainer notes
20'	<ol style="list-style-type: none"> <li>1. Alternating current</li> <li>2. Advantages of alternating current</li> <li>3. Root Mean Square (RMS) current and voltage</li> </ol>	<ul style="list-style-type: none"> <li>• Learn about AC and DC electricity</li> <li>• Know the advantages of alternating current</li> </ul>	Module D_PPT_Electrical safety_3-8_Electrical Power Supply & Components  Module D_TM_Electrical safety	<u>Plenary</u>  Trainer should start the session with questions regarding participants' experience to assess previous knowledge.  Trainer uses PPT to explain AC and DC electricity plus the advantages of alternating current.
20 min	<b>Total time</b>			

Chapter: D4_ Electromagnetic induction				
Time	Content	Objectives	Training material / demonstration equipment	Description of training sessions and trainer notes
20'	<ol style="list-style-type: none"> <li>1. Mutual induction</li> <li>2. Transformers</li> <li>3. The rating of a transformer</li> </ol>	<ul style="list-style-type: none"> <li>• Know the theory of electromagnetic induction</li> <li>• Understand how transformers work</li> <li>• Know how transformers are rated</li> </ul>	Module D_PPT_Electrical safety_3-8_Electrical Power Supply & Components  Module D_TM_Electrical safety  Variety of transformers	<u>Plenary</u>  Trainer uses PPT and transformers to explain  <u>Exercises for class:</u>  Using multimeters participants measure the resistance of both input and output sides of transformers
20 min	<b>Total time</b>			

**Chapter: D5\_ Capacitors**

<b>Time</b>	<b>Content</b>	<b>Objectives</b>	<b>Training material / demonstration equipment</b>	<b>Description of training sessions and trainer notes</b>
10'	1. Capacitors	<ul style="list-style-type: none"> <li>• Understand the way a capacitor is built</li> <li>• Understand the purpose of a capacitor</li> <li>• Understand their potential hazards</li> <li>• Know about capacitor sizing</li> <li>• Know about manual discharging of a capacitor</li> </ul>	<p>Module D_PPT_Electrical safety_3-8_Electrical Power Supply &amp; Components</p> <p>Module D_TM_Electrical safety</p> <p>Variety of capacitors (at least one with a bleed resistor fitted)</p>	<p>Trainer uses PPT and capacitors to explain</p> <p><u>Exercises for class:</u></p> <p>Viewing of different capacitors including those with bleed resistors which allow the capacitor to slowly discharge.</p>
<b>10 min</b>	<b>Total time</b>			

**Chapter: D6\_ Rectifiers**

<b>Time</b>	<b>Content</b>	<b>Objectives</b>	<b>Training material / demonstration equipment</b>	<b>Description of training sessions and trainer notes</b>
15'	1. Rectifiers	<ul style="list-style-type: none"> <li>• Understand the purpose of a rectifier</li> <li>• Understand the different types of rectifier</li> <li>• Know about smooth DC</li> </ul>	<p>Module D_PPT_Electrical safety_3-8_Electrical Power Supply &amp; Components</p> <p>Module D_TM_Electrical safety</p> <p>Variety of rectifiers</p>	<p>Trainer uses PPT and rectifiers to explain</p> <p><u>Exercises for class:</u></p> <ul style="list-style-type: none"> <li>• Viewing of different rectifiers</li> <li>• Suggesting some everyday uses of rectifiers</li> </ul>
<b>15 min</b>	<b>Total time</b>			

**Chapter: D7\_ Three-phase induction motor**

Time	Content	Objectives	Training material / demonstration equipment	Description of training sessions and trainer notes
40'	<ol style="list-style-type: none"> <li>1. Stator</li> <li>2. Rotor</li> <li>3. Three-phase windings rotating fields</li> <li>4. Three-phase motor speed</li> </ol>	<ul style="list-style-type: none"> <li>• Understand the construction of a three-phase motor</li> <li>• Be able to describe the different parts of three phase motors</li> <li>• Know the purposes of a three-phase motor</li> <li>• Know how a three-phase motor. works</li> <li>• Know how to alter the speed of a three-phase motor</li> <li>• Know the difference between synchronous speed and actual speed</li> </ul>	<p>Module D_PPT_Electrical safety_3-8_Electrical Power Supply &amp; Components</p> <p>Module D_TM_Electrical safety</p> <p>Three phase motor/s (ideally one which has been sectioned, i.e. cut open to be able to see internal parts of the motor)</p>	<p>Trainer uses PPT and example three phase motor to explain</p> <p><u>Exercises for class:</u></p> <ul style="list-style-type: none"> <li>• Viewing of different component parts of a three-phase motor</li> </ul> <p>Suggesting some everyday uses of three phase motors</p>
<b>40 min</b>	<b>Total time</b>			

**Chapter: D8\_ Single phase AC motors**

Time	Content	Objectives	Training material / demonstration equipment	Description of training sessions and trainer notes
40'	<ol style="list-style-type: none"> <li>1. The split-phase motor</li> <li>2. Capacitor start motor</li> <li>3. Capacitor start, capacitor run motor</li> </ol>	<ul style="list-style-type: none"> <li>• Understand the construction of a single-phase motor</li> </ul>	<p>Module D_PPT_Electrical safety_3-8_Electrical Power Supply &amp; Components</p>	<p>Trainer uses PPT and example single phase motors to explain</p>

Chapter: D8_ Single phase AC motors				
Time	Content	Objectives	Training material / demonstration equipment	Description of training sessions and trainer notes
	4. Equivalent circuit diagrams	<ul style="list-style-type: none"> <li>Be able to describe the different parts of single-phase motors</li> <li>Know the purposes of a single-phase motor</li> <li>Know how a single-phase motor works</li> <li>Know the various starting methods for single phase motors</li> </ul>	<p>Module D_TM_Electrical safety</p> <p>Single phase motor/s (ideally one which has been sectioned, i.e. cut open to be able to see internal parts of the motor)</p> <p>Examples of different starting components of single-phase motors, including start and run capacitors</p>	<p><u>Exercises for class:</u></p> <ul style="list-style-type: none"> <li>Viewing of different component parts of a single-phase motor</li> <li>Viewing of different starting components of single-phase motors</li> </ul> <p>Suggesting some everyday uses of single-phase motors allow the capacitor to slowly discharge.</p>
40 min	Total time			

Chapter: D9_ Electrical Safety Tests				
Time	Content	Objectives	Training material / demonstration equipment	Description of training sessions and trainer notes
90'	1. Inspection and testing	<ul style="list-style-type: none"> <li>Understand which items require inspection prior to testing</li> </ul>	Module D_PPT_Electrical safety_9_Electrical_Safety_Tests	<p><u>Plenary</u></p> <p>Trainer should start the session with questions regarding participants experience to assess previous knowledge.</p>
	2. Earth continuity check	<ul style="list-style-type: none"> <li>Know how to carry out an Earth Continuity check</li> <li>Be able to carry out an Earth Continuity check</li> </ul>	Module D_TM_Electrical safety	<p>Trainer supplements knowledge gaps through PPT.</p> <p>Trainer demonstrates how to carry out the various electrical tests</p>

Chapter: D9_ Electrical Safety Tests				
Time	Content	Objectives	Training material / demonstration equipment	Description of training sessions and trainer notes
	3. Short circuit check	<ul style="list-style-type: none"> <li>Know how to carry out a Short circuit check</li> <li>Be able to carry out a Short circuit check</li> </ul>	Practical Exercise Module D_PE_3_ Electrical Testing of Compressors	Trainer demonstrates how to use multi-function measuring device  <b>Trainer ONLY</b> carries out measuring of <b>LIVE</b> voltage  <u>Plenary</u>  Exercises for class: <b>Trainer led exercises</b> <ul style="list-style-type: none"> <li>Earth continuity test</li> <li>Short circuit test</li> </ul> Resistance to earth test
	4. Resistance to earth check	<ul style="list-style-type: none"> <li>Know how to carry out a Resistance to Earth check</li> <li>Be able to carry out a Resistance to Earth check</li> </ul>		
	5. Measuring the earth fault loop impedance	<ul style="list-style-type: none"> <li>Understand the purpose of an Earth fault loop impedance check</li> </ul>		
	6. Measuring the operating voltages	<ul style="list-style-type: none"> <li>Know the hazards when measuring live voltage</li> <li>Understand the readings expected when measuring live voltage</li> </ul>		
	7. Testing of protection systems	<ul style="list-style-type: none"> <li>Understand the testing of protection systems</li> </ul>		
90 min	<b>Total time</b>			

Chapter: D10_ Electrical Safe isolation				
Time	Content	Objectives	Training material / demonstration equipment	Description of training sessions and trainer notes
20'	1. Effects of electrical current on the human body	Understand:	Module D_PPT_Electrical safety_10_Safe_Isolation	<u>Plenary</u>

Chapter: D10\_ Electrical Safe isolation

Time	Content	Objectives	Training material / demonstration equipment	Description of training sessions and trainer notes
		<ul style="list-style-type: none"> <li>• how electricity effects the human body,</li> <li>• the difference between current and voltage</li> <li>• resistance/impedance</li> <li>• how duration of contact effects the human body</li> </ul> Know: <ul style="list-style-type: none"> <li>• what levels of current cause which problems on the human body</li> <li>• which criteria effect the resistance of the human body</li> </ul>	Module D_TM_Electrical safety D_HO_Safe electric isolation procedure Example of RCD Example of safe voltage testing instrument and unsafe testers Example of professional insulated safety tools	Trainer uses PPT for explanation and voltage indicator (and ideally proving unit) to explain and demonstrate a safe isolation procedure ( <b>ensure all necessary safety precautions are taken to prevent any accidents</b> ). <u>Exercises for class:</u> <ul style="list-style-type: none"> <li>• Viewing of voltage indicator (and ideally proving unit)</li> </ul>
25'	2. Electric shock	Understand: <ul style="list-style-type: none"> <li>• how to protect against electric shock</li> <li>• how an electric shock effects the human body</li> </ul> Know: <ul style="list-style-type: none"> <li>• how to differentiate between direct- and indirect contact</li> <li>• how to safely remove someone who has come in to contact with live electrical equipment</li> <li>• the first aid treatment for electric shock casualties</li> </ul>		Trainer uses PPT for explanation and examples of direct and indirect contacts to conductive live parts <u>Exercise for the class:</u> Trainees exercise to rescue someone that has come into contact with live parts of electrical equipment

**Chapter: D10\_ Electrical Safe isolation**

<b>Time</b>	<b>Content</b>	<b>Objectives</b>	<b>Training material / demonstration equipment</b>	<b>Description of training sessions and trainer notes</b>
25'	3. Electrical faults	<ul style="list-style-type: none"> <li>• Understand different electrical faults</li> <li>• Know the measures used to protect against electric shock</li> <li>• Know the electrical safety devices used in RACHP work</li> </ul>		Trainer uses PPT for explanation and examples of electrical faults finding instrumentation as exhibits to show candidates
20'	4. The Five Safety Rules	<ul style="list-style-type: none"> <li>• Know the 5 safety rules</li> <li>• Understand the safety measures incorporated into electrical test equipment</li> </ul>		Trainer uses PPT for explanation and examples how to apply the safety rules (including exceptions)
30'	5. Voltage indicating devices	<ul style="list-style-type: none"> <li>• Know about the design (multifunctional) safe voltage tester</li> </ul>		Trainer uses PPT for explanation and examples of testing devices as exhibits to show and demonstrate to candidates
15'	6. Safety precautions when on or near to live electrical equipment	<ul style="list-style-type: none"> <li>• Know the safety precautions when working on or near to live electrical equipment</li> </ul>		Trainer uses PPT for explanation and examples of testing devices and insulated safety tool as exhibits to show and demonstrate to candidates
<b>135 min</b>	<b>Total time</b>			

**Chapter: D11\_ Protection & Instrumentation**

<b>Time</b>	<b>Content</b>	<b>Objectives</b>	<b>Training material / demonstration equipment</b>	<b>Description of training sessions and trainer notes</b>
15'	1. Electrical protection classes and ratings	<ul style="list-style-type: none"> <li>Know the 5 different protection classes (0, I, OI, II and III)</li> <li>Knowledge of Ingress Protection (IP) ratings</li> </ul>	<p>Module D_PPT_Electrical safety_11_Instrumentation</p> <p>Module D_TM_Electrical safety</p>	<p><u>Plenary</u></p> <p>Trainer should start the session with questions regarding participants experience to assess previous knowledge.</p> <p>Trainer supplements knowledge gaps through PPT.</p> <p>Trainer explains the reasons for having the different protection classes and IP ratings</p>
10'	2. Electrical check of appliances and systems	<p>Understand:</p> <ul style="list-style-type: none"> <li>how to carry out a detailed inspection of an item of portable powered equipment or a system</li> </ul>	<p>Module D_PPT_Electrical safety – Electrical check of appliances and systems</p> <p>Module D_TM_Electrical safety</p>	<p><u>Plenary</u></p> <p>Trainer uses PPT for explanation and an example of a power tool and carries out the various checks to ensure that it is safe</p>
45'	3. Instrumentation	<ul style="list-style-type: none"> <li>Understand the dangers when using test equipment</li> <li>Knowledge of the requirements of test probes, clips and leads</li> <li>Understand the differences between CAT II, III and IV test instruments</li> </ul>	<p>Module D_PPT_Electrical safety – Instrumentation</p> <p>Module D_TM_Electrical safety</p>	<p><u>Plenary</u></p> <p>Trainer uses PPT for explanation and examples electrical test meters as exhibits to show candidates</p>
30'	4. The multimeter	<ul style="list-style-type: none"> <li>Know how to select the correct function and range setting</li> </ul>	<p>Module D_PPT_Electrical safety – Multimeter</p> <p>Module D_TM_Electrical safety</p>	<p><u>Plenary</u></p> <p>Trainer uses PPT for explanation and demonstration of an example multimeter as exhibits to show candidates</p> <p><u>Exercises for class</u> (use group exercises as appropriate):</p>

**Chapter: D11\_ Protection & Instrumentation**

Time	Content	Objectives	Training material / demonstration equipment	Description of training sessions and trainer notes
		<ul style="list-style-type: none"> <li>• Be able to carry out pre use checks on a multi meter</li> <li>• Be able to check for correct calibration</li> <li>• Be able to check the battery condition and continuity of the leads</li> <li>• Know the safety requirements of testing for voltage</li> <li>• Know the requirements of the test leads for measuring for voltage</li> <li>• Be able to measure voltage</li> <li>• Be able to measure resistance of a component</li> <li>• Know how to measure the current (1. with a multi meter and 2. with a clamp meter)</li> </ul>		<ul style="list-style-type: none"> <li>• Selecting correct function and range on a multi meter</li> <li>• Carry out pre-use checks on a multi meter</li> <li>• Check for correct calibration</li> <li>• Check battery condition and continuity of leads</li> <li>• Use a multi meter for measuring voltage (under supervision from the trainer)</li> <li>• Measure resistance of a range of components (e.g solenoid valve coils, thermistors, motor windings)</li> <li>• Measure current using a clamp meter (under supervision from the trainer)</li> </ul>
30'	5. Measuring insulation resistance (IR)	<ul style="list-style-type: none"> <li>• Know what is meant with insulation resistance</li> <li>• Understand the reason why to execute insulation resistance test</li> </ul>	Module D_PPT_Electrical safety – Measuring insulation resistance  Module D_TM_Electrical safety	Trainer uses PPT for explanation and examples of insulation resistance testing.  Trainer demonstrates IR testing at an electrical component or appliance

**Chapter: D11\_ Protection & Instrumentation**

<b>Time</b>	<b>Content</b>	<b>Objectives</b>	<b>Training material / demonstration equipment</b>	<b>Description of training sessions and trainer notes</b>
		<ul style="list-style-type: none"> <li>Understand the danger related to insulation resistance measuring processes</li> <li>Know how to fill in the testing report</li> </ul>	Insulation resistance test device  D_HO_Insulation test record	
30'	6. How to identify single-phase compressor electrical terminals	<ul style="list-style-type: none"> <li>Be able to identify the electrical terminals on a suitable motor (probably a refrigeration / air conditioning compressor)</li> <li>Be able to use the multi meter to test the resistance between each pair of terminals</li> <li>Be able to work out from the resistance readings which terminal is which</li> </ul>	Module D_PPT_Electrical safety – How to identify single-phase compressor electrical terminals  Module D_TM_Electrical safety  Multimeter test device	Trainer uses PPT for explanation and examples motors as exhibits to show and demonstrate to candidates how to identify the electrical terminals on a single phase motor  Exercises for class (use group exercises as appropriate): <ul style="list-style-type: none"> <li>Identify electrical terminals on a motor</li> <li>Measure resistance between each pair of terminals</li> </ul> Use those resistance readings to identify which terminal is which.
<b>160 min</b>	<b>Total time</b>			

**Chapter: D12\_ Electrical Regulations & Earthing**

<b>Time</b>	<b>Content</b>	<b>Objectives</b>	<b>Training material / demonstration equipment</b>	<b>Description of training sessions and trainer notes</b>
15'	<ul style="list-style-type: none"> <li>Electrical Regulations</li> </ul>	<ul style="list-style-type: none"> <li>Have an overview of the electrical regulations</li> </ul>	Module D_PPT_Electrical safety_12_Regulations&Earthing  Module D_TM_Electrical safety	<p><u>Plenary</u> Trainer should start the session with questions regarding participants experience to assess previous knowledge.</p> <p>Trainer supplements knowledge gaps through PPT.</p> <p>Trainer explains the reasons for having the various electrical regulations</p>
25'	<ul style="list-style-type: none"> <li>Earthing arrangements and protective conductors</li> </ul>	<ul style="list-style-type: none"> <li>Understand the purpose of earthing</li> <li>Know the various protective devices in use to reduce the chances of getting an electric shock</li> <li>Have an overview of the different earthing systems in use (TT, TN, IT)</li> <li>Understand sizing of protective conductors</li> <li>Understand that there are different types of protective conductors</li> <li>Understand what is Electrostatic Discharge and how it can be avoided or removed</li> </ul>		<p><u>Plenary</u> Trainer should start the session with questions regarding participants' experience to assess previous knowledge.</p> <ul style="list-style-type: none"> <li>What is your understanding about "Earthing"</li> <li>How is "Earthing" maintained in your home?</li> <li>Do you have an example of Electrostatic Discharge?</li> </ul> <p>Trainer supplements knowledge gaps through PPT.</p> <p>Trainer demonstrates the build-up of electrostatic discharge and the release (e.g. air balloon)</p>
20'	<ul style="list-style-type: none"> <li>Equipotential bonding</li> </ul>	<ul style="list-style-type: none"> <li>Understand why equipment requires bonding</li> </ul>		<p>Trainer uses PPT for explanation</p> <p><u>Exercises for class:</u></p>

Chapter: D12_ Electrical Regulations & Earthing				
Time	Content	Objectives	Training material / demonstration equipment	Description of training sessions and trainer notes
		equipment requires main bonding		Trainer led class discussion on bonding requirements
60 min	<b>Total time</b>			

Chapter: D13_ Terminating Cables and Flexes				
Time	Content	Objectives	Training material / demonstration equipment	Description of training sessions and trainer notes
30'	<ul style="list-style-type: none"> <li>Basic types of cable / flex and factors for their selection</li> <li>Cable laying and fixing</li> </ul>	<ul style="list-style-type: none"> <li>Know the basic types of cable and flex</li> <li>Know which factors affect selection of cables and flexes</li> <li>Be aware of harmonized cable colours</li> <li>Know the requirements for laying and fixing of cables</li> <li>Understand the different cable entry systems (cable glands)</li> </ul>	Module D_PPT_Electrical safety_13_Terminating Cables&Flexes  Module D_TM_Electrical safety  Examples of stripping tools and compression lugs	<u>Plenary</u> Trainer should start the session with questions regarding participants experience to assess previous knowledge.  Trainer supplements knowledge gaps through PPT.  Trainer demonstrates how to terminate cable into a plug and how to terminate cable with a compression cable lug  <u>Plenary</u> Exercises for class: <b>Trainer led exercises</b> <ul style="list-style-type: none"> <li>terminate cable into a plug</li> <li>terminate cable with a compression cable lug</li> </ul>
60'	<ul style="list-style-type: none"> <li>Cable insulation stripping tools</li> <li>Terminating cables and flexes</li> </ul>	<ul style="list-style-type: none"> <li>Be able to correctly terminate flexes into a plug</li> </ul>		

Chapter: D13_ Terminating Cables and Flexes				
Time	Content	Objectives	Training material / demonstration equipment	Description of training sessions and trainer notes
		<ul style="list-style-type: none"> <li>Be able to correctly terminate cables using compression cable lugs</li> </ul>		
90 min	Total time			

Chapter: D14_ Connections to the Public Network and Safety checks				
Time	Content	Objectives	Training material / demonstration equipment	Description of training sessions and trainer notes
60'	<ul style="list-style-type: none"> <li>Examples of suitable electrical connections</li> <li>Inappropriate examples from field installations</li> <li>RCD protection</li> <li>Supply safety checks</li> </ul>	<ul style="list-style-type: none"> <li>Understand the standard required when connecting to the public electricity grid</li> <li>Be able to recognize inappropriate connections to the public electricity grid</li> <li>Have an overview of how an RCD protects the user</li> <li>Be able to use a socket outlet tester</li> <li>Understand the readings given by a socket outlet tester</li> <li>Be able to recognize an RCD</li> </ul>	<p>Module D_PPT_Electrical safety_14_Connections to the Public Network and Safety checks</p> <p>Module D_TM_Electrical safety</p> <p>Socket outlet tester RCDs</p>	<p><u>Plenary</u> Trainer should start the session with questions regarding participants experience to assess previous knowledge.</p> <p>Trainer supplements knowledge gaps through PPT.</p> <p>Trainer let discussion on suitable and inappropriate connections to the public electricity grid network.</p> <p><u>Exercises for class:</u> Trainer led exercises</p> <ul style="list-style-type: none"> <li>Using a socket outlet tester</li> <li>Interpreting the results from the socket outlet tester</li> <li>Examining various RCDs</li> </ul>

**Chapter: D14\_Connections to the Public Network and Safety checks**

<b>Time</b>	<b>Content</b>	<b>Objectives</b>	<b>Training material / demonstration equipment</b>	<b>Description of training sessions and trainer notes</b>
<b>60 min</b>	<b>Total time</b>			