



DUTY HOLDER (AUTHORISED PERSON)

COURSE 400: 2 DAYS: Max 8 Candidates

Many employers are justifiably concerned that, in the absence of a formal and routine method of assessing competence, it would be difficult to prove compliance with current statutory regulations. This course is designed to provide real evidence that personnel can safely carry out electrical and mechanical isolations. Repeating the course at regular intervals ensures that personnel retain the essential knowledge and continue to use best practices. For companies that prefer the course on-site, site-specific company documentation and procedures can be incorporated into the course.

PARTICIPANTS

This course is not an entry-level course. Prior electrical competence is assumed. An eligibility assessment for access to this course is available on request.

COURSE PRESENTATION

The course covers the statutory regulations, the dangers of electricity, safe systems of work and isolation procedures. Each candidate must complete both a knowledge based assessment and, most importantly, a practical assessment to ensure their understanding of the issues and an ability to apply best practices. Comprehensive course notes are provided.

COURSE OBJECTIVES

On completion of the course, participants will be able to

- understand the relevant statutory regulations (the Electricity at Work Regulations, etc)
- understand the dangers associated with electricity and moving machinery
- describe how mechanical isolations differ from electrical isolations
- correctly and safely test for dead in single and three phase systems
- perform safe electrical isolations in a range of common industrial scenarios
- understand how to legally justify live working
- recognise the precautions necessary for safety and protection of equipment
- understand the importance of using insulated tools
- safely carry out live functional testing procedures.



Successful completion of the course leads to the award of the Technical Training Solutions Certificate of Competence 400: Duty Holder (Authorised Person)

Note: The Duty Holders course is a combination of the EAW Regs (380) and the Electrical Isolations (420) courses. It combines the knowledge of the legal requirements with performance of the isolations to produce strong evidence for the candidates' competence.

What do candidates on the Duty Holder (Authorised Person) course actually do?

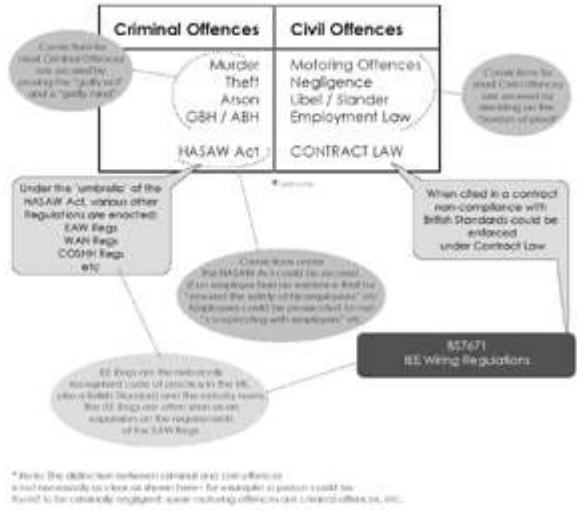
The Duty Holder course is often 'tuned' to suit the audience and our instructors like to get feedback from the candidates as the course progresses but the following gives a general breakdown of the main parts of the course. The course begins by learning about the Electricity at Work Regulations.

The Legal Implications: We begin by analysing the legal situation regarding the Electricity at Work Regulations. Candidates learn about the relationships between the relevant legal Acts, codes of practice and regulations (the Health & Safety at Work Act, the IEE Wiring Regulations etc).

Candidates are engaged in this part of the course by exploring the various scenarios that might arise - for example: Would non-compliance with the EAW Regs be a criminal or a civil offence? In what situations would compliance with the EAW regulations be necessary? Would a defence be needed to prove compliance with the EAW Regulations?

This analysis of the legal situation helps the candidates to clearly see the **scope** of the regulations - who, where and what they apply to. A syndicate exercise is staged here to help to reinforce these issues.

We then look at the broad subject area of the regulations so that the candidates can start to understand what the regulations cover and (in general) what the Regulations are trying to achieve. The **definitions** are then clearly explained - this is important as the meaning of 'live' or 'charged', for example, can have far-reaching implications when considered in the context of the specific requirements of the individual EAW regulations when they are studied later on in the course.



WHO Is Affected by the EAW Regulations?						
• Employees						
• Self-employed						
• Businesses (including individuals)						
Because the regulations are modelled under Rule 10(1)(a) of the ECA, they will affect anyone with rights in:						
A duty to complete a transaction under Section 1 of the EEA such as Investors, Manufacturers, Importers, Agents, Directors, Lawyers and Notaries.						
WHAT Is Affected by the EAW Regulations?						
• All intellectual property, equipment and intangibles						
• All assets of the service user/obliged debtor						
Notes: The Regulations apply to existing systems initiated under the 1999 Regulations. Existing systems which do not change must be made to comply. However, if they do not necessarily follow the spirit of the new law, a case of illegitimacy will be presumed. These Regulations will be in operation from 1st January 2010.						
Finally, customers complying with the EEA will have to apply to the relevant court to receive a writ of execution under the EEA 1999 Regulations. Note: The Writ Requirements apply only to Insolvent companies up to 1000.						
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 5px; width: 15%;">Last Update 01/01/09</td> </tr> <tr> <td style="padding: 5px;">Written by E.C.</td> </tr> <tr> <td style="padding: 5px;">ECCPIS</td> </tr> <tr> <td style="padding: 5px;">Reviewed by E.C.</td> </tr> <tr> <td style="padding: 5px;">Editorial Committee</td> </tr> </table>		Last Update 01/01/09	Written by E.C.	ECCPIS	Reviewed by E.C.	Editorial Committee
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INTERVIEWER'S NOTES	
Syndication Exercises	
Scenario 1:	A company is working from the top of the 10-storey building. At night, someone comes into the penthouse and measures the conductivity of the insulation inside walls and piping. The readings are 2-3 millivolts above what's normal (without heat). The salesperson feels he's got all the information he needs to make a decision about whether to recommend replacing the components that have risen to 10 millivolts. Answer points to the sections, should that be requested.
Question 1:	Was this a classified or unclassified measurement?
Answer:	It was a voltage reading.
Question 2:	Were there any losses in the E&I system?
Answer:	No, the conductors were protected by metal supports (14 gauge copper).
Question 3:	Is it possible for someone to tamper with the metering device in a powerline?
Answer:	Yes, it is possible. There is no need to cut or strip the fibre in the powerline. That is illegal. To be honest as an electrician at least, the safety test he selected is to check the strength which did not concern me. If the head supervisor received a call for the testing of height limiters he would not have been required to do it.
Question 4:	What does T-1 do not consider what can be an actual point one thing you are doing enough as a fire conductor for fibres. As far as I'm told, there can be a problem with the insulation of the powerline. So if the insulation is not good enough to withstand the heat of the circumstances then it is in danger. When the E&I system is not good enough to withstand the heat of the circumstances then it is in danger. So the person can think they can get away with it because the insulation is not good enough to withstand the heat of the circumstances then it is in danger. The fact that there are no permit and that the insurance of the private insurance companies (the insurance companies) are not going to cover the cost of the damage if there is a fire in the house and there is no evidence. So the electrician had to prove that he could not have increased it or that it was safe to touch, or other words, insulation.

INSTRUCTOR'S NAME	
Broad Subject Areas of the Regulations	
This document regulations will be subdivided into broad sections relating to specific areas of safety. These areas are as follows:	
INTRODUCTION	
Reg. 1	General
Reg. 2	Definitions
Reg. 3	Permit-required (this section)
MATERIAL, DIMENSIONS, COMPETENCE AND INSPECTION	
Reg. 4	Permittee has contracted to prevent damage due from
	ABSOLUTE
SATE SYSTEMS DESIGN AND INSTALLATION	
Reg. 5	Systems construction
Reg. 6	System design
Reg. 7	Strength and capacity of electrical equipment
Reg. 8	Induction or induced currents
Reg. 9	Connections
Reg. 10	Means for protecting high-voltage conductors
	ABSOLUTE
	ABSOLUTE
	ABSOLUTE
SAFE DESIGN - PROTECTION AGAINST ELECTRIC SHOCK	
Reg. 11 & 12	General protection and protection against electric shock
Reg. 13	Protection against overvoltage conditions
Reg. 14	Earthings of other voltage installations
Reg. 15	Integrity of earthing conductors
Reg. 16	Connections
	ABSOLUTE
	ABSOLUTE
	ABSOLUTE
SATE SYSTEMS WORKING SPACES, ACCESS AND WORKING	
Reg. 17	Ensuring space, access and lighting
	ABSOLUTE
SATE SYSTEMS OF WORK	
Reg. 18	Work activities
Reg. 19	Protective equipment
Reg. 20	Means for cutting off the power of installations
Reg. 21	Prohibition of work on equipment under load
Reg. 22	Means for isolating live parts
	ABSOLUTE
	ABSOLUTE
	ABSOLUTE
	ABSOLUTE

Page 10 of the course notes for the Duty Holder (Authorised Person) course, describing who and what is affected by the Regulations

**Page 11 of the course notes for the
Duty Holder (Authorised Person)
course, where we introduce syndicate
exercises to engage the candidates in
thinking about what the Regulations
would have to say about various
scenarios**

**Page 12 of the course notes for the
Duty Holder (Authorised Person)
course, listing the broad subject
areas of the Regulations and
highlighting which regulations are
absolute requirements**

A structured slide-show is used by our instructors to help convey the meaning of each of the EAW Regulations. Candidates can read the exact wording of the Regulations provided in the course notes and then discuss what this means in reality.

- WHERE NECESSARY TO PREVENT DANGER, EVERY JOINT AND CONNECTION IN A SYSTEM SHALL BE MECHANICALLY AND ELECTRICALLY SUITABLE FOR USE.
- MECHANICALLY SUITABLE REFERS TO STRENGTH (E.G. CORD GRIPS). ELECTRICALLY SUITABLE REFERS TO THE EFFECTS OF VOLTAGE AND CURRENT (E.G. INSULATION, CONDUCTOR SIZE ETC).

- ALTHOUGH REGULATION 14 IS AN ABSOLUTE, SUB SECTIONS (A) AND (B) USE THE WORDS UNREASONABLE AND REASONABLE. THIS ALLOWS COST AND TECHNICAL DIFFICULTY TO BE CONSIDERED.
- THE GREATER THE DANGER, THE HARDER IT IS TO JUSTIFY.

One of the Slides used for the Duty Holder (Authorised Person) course, explaining the requirements made by the EAW Regulations with regard to electrical connections

One of the Slides used for the Duty Holder (Authorised Person) course, explaining what the EAW Regulations mean by working live

We then look at the issues surrounding the term '**duty holder**' referred to in the EAW Regulations. This is an important concept as the candidates need to be made aware who might be held legally responsible. It is also important that candidates gain a proper understanding of the effects of electric shock, and this subject is taught next, with research information and graphs shown of the known effects of electric shock in the candidates' course notes.

Reg 3: Duty Holders

Regulation 3 applies to categories of duty holder:

- Employers
- Self-employed persons
- Businesses

Employers and self-employed persons

Employers or self-employed persons of all sizes and trades who have been given the power and obligation:

- Safe guard and promote health
- Implementing of policies and systems
- Adequate resources, including a person(s) etc.
- Adequate place of work
- A safe working environment

Regulation 4 of the EAW Duty Holders

"It shall be the duty of every employer, whether or not:

- To take reasonable care for the health and safety of himself and of other persons who may be affected by his acts or omissions;
- To regard any duty or requirement imposed on his employer or any other by or under any of the relevant statutory provisions, to be a duty to be performed by him personally or by another that duty or requirement is to be performed or observed with;

Employees

Under section 7 of the Health & Safety at Work Act:

"It shall be the duty of every employee while at work:

- To take reasonable care for his own health and safety and that of other persons who may be affected by his acts or omissions;
- To regard any duty or requirement imposed on his employer or any other by or under any of the relevant statutory provisions, to be a duty to be performed or observed with;

Regulation 5 of the EAW Duty Holders

"It shall be the duty of every employee while at work:

- To take reasonable care for his own health and safety and that of other persons who may be affected by his acts or omissions;
- To regard any duty or requirement imposed on his employer or any other by or under any of the relevant statutory provisions, to be a duty to be performed or observed with;

Regulation 29 of the EAW (Duty Holders)

"It may provide for an exemption from non-compliance of regulations ... if that is necessary to prevent the risk of reasonably assess and exercised all that diligence to avoid the commission of that offence." It would also include that regulation.

REGULATIONS INDEX

Dangers of Electricity

The Electricity at Work Regulations 1989 (EAWS) set out a code of practice. The code of practice, which can range from a slight shock to death, is described upon the following chart:

- Death: Electric shock
- Electrical insulation
- Spontaneous ignition
- Heating
- Has relation to electrical energy
- Examples: Unauthorised electrical wiring

Electric Shock

When AC/DC current passes through a person, the result of shock, which can range from a slight tingle to death, is described upon the following chart:

- Death: Current
- Brain damage
- Heart stop
- Paralysis
- Impaired voice

The magnitude of the body current is dependent on the potential difference between the two points of contact (that touch-voltage) and the impedance of the shunt path in parallel with the body. The greater the voltage, the greater the current and the more heat will be produced at the point of contact. At a low voltage most of the body's resistance is in the skin and fat. As the voltage increases the impedance reduces significantly increasing the current. At 500V AC the current level of resistance decreases due to the effect of skin resistance.

AC (50/60 Hz) touch voltage vs. body current

Touch Voltage (V)	Body Current (mA)
10	0.001
100	0.01
1000	0.1
10000	1.0
100000	10.0
1000000	100.0

DC and Higher-frequency Shocks

For direct current (DC), a curve that the body's resistance is 1000 ohms, it can be seen that DC would form some of voltage differences, of higher voltage, the difference in the body's resistance would increase, so the current would decrease. The effects of DC current depend heavily on the frequency of the current. At high frequencies (50Hz) the body's resistance reduces, causing the level of safety protection to be reduced. At low frequencies (DC) the body's resistance is high, so the current is high. These three things, current, area and frequency (factors which contribute to the power supplied to the body) affect the intensity of the current and therefore the danger than 50Hz current.

INTRODUCING RIDDIT

"If a worker was quite unfortunate and got this much, the first assumption from the medical profession is that they had a heart attack. In fact, he had a stroke. He had a stroke because he had a heart attack. He had a heart attack because he had a stroke. He had a stroke because he had a heart attack."

In the context that those in construction often work in cramped spaces, Riddit has developed a simple device to help workers identify if they are experiencing a heart attack or a stroke. The hands-on tool has a conductive electrode designed to detect the electrical activity of the heart. If the hands-on tool detects a heart attack, it will tell the user that they are experiencing a heart attack. If the hands-on tool detects a stroke, it will tell the user that they are experiencing a stroke. These tools are designed to help the user quickly identify if they are experiencing a heart attack or a stroke.

DC and Higher-frequency Shocks

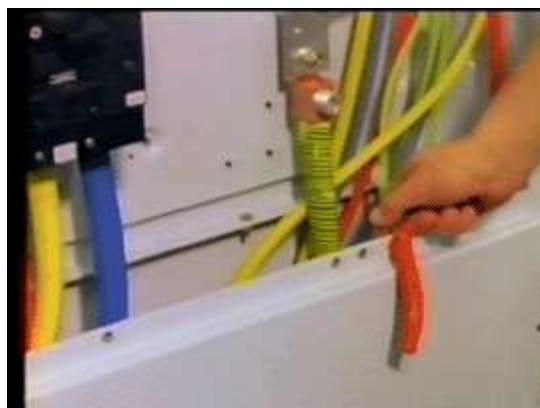
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Page 13 of the course notes for the Duty Holder (Authorised Person) course, describing the term 'duty holder' used in the Regulations

Page 14 of the course notes for the Duty Holder (Authorised Person) course, explaining the effects of electric shock

Page 15 of the course notes for the Duty Holder (Authorised Person) course, explaining the effects of electric shock

We also show the candidates a short video which helps to explain the regulations in a slightly different context. The following are screen shots from this video, depicting the issues of **live working**.



Part of the video used for the Duty Holder (Authorised Person) course, depicting some of the issues surrounding live working



Part of the video used for the Duty Holder (Authorised Person) course, depicting some of the issues surrounding live working

We then look at the important issues surrounding the term '**competence**' referred to in the EAW Regulations. We look at how this relates to the candidates' work activities and the issues of supervision etc. The next regulations we study are regarding the issues of **insulation, earthing and isolation**. The following are extracts from the candidates' course notes.

Reg 7: Insulation, Protection and Placing of Conductors

Regulation 7: Insulation

All conductors in a system which may give rise to danger shall either:

- (a) be insulated or connected with insulating materials; or
- (b) have such insulation, insulation in respect of live parts (including adjacent conductors) which is appropriate for the circumstances concerned so as to prevent an electric shock occurring.

The requirements imposed by the regulations are intended to reduce the risk of electric shock through control of both the insulation and the insulation resistance.

Prevention of electric shock

- insulation of conductors, devices and fittings, and on parts that are likely to be touched;
- protection from the influence of heat, moisture, or chemicals;
- protection by shielding.

Insulation

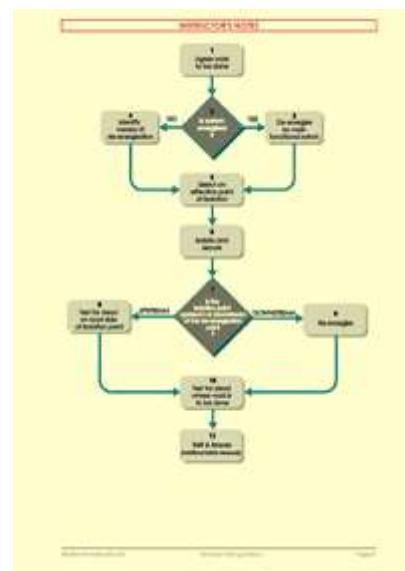
This article has been written to assist you in understanding the requirements of Regulation 7 of the Electricity at Work Regulations 1989. It is not a substitute for the regulations themselves. You should always refer to the regulations for the full details.

Regulation 7: Earthing

The context of specifying regulation 7 is to ensure that electrical installations are safe, environments of electrical equipment are safe, and that there is no risk of electric shock. This regulation requires that all conductors in a system which may give rise to danger shall be connected to earth. This includes conductors which carry current when a voltage appears across them, unless such conductors are bonded together.

Spare's Discretion

To help protect the user of tools, switchgear, RCDs.



Page 24 of the course notes for the Duty Holder (Authorised Person) course, describing the various ways that the Regulations require prevention from electric shock to be achieved

Page 27 of the course notes for the Duty Holder (Authorised Person) course, explaining the methods by which earthing is used to reduce or eliminate the effects of electric shock

Page 35 of the course notes for the Duty Holder (Authorised Person) course, explaining the methods by which electrical isolations may be achieved

Day 1 of the course finishes by summarising each of the regulations that have been taught and reminding the candidates what they should have learned from them. The course notes provide a useful short **summary** of all the EAW Regulations. In order to ensure that the candidates have understood each of the key objectives of the course properly, we issue a multiple-choice **assessment** paper which they have to answer and return to our instructor. The instructor then fully debriefs each and every question, ensuring that every single candidate has understood all of the important points of the day.

Summary

The Electricity of Work Regulations 1989:

- Apply to all places where work on or near electrical equipment is carried out;
- Are statutory regulations;
- Are only concerned with electrical safety;
- Apply to all electrical systems and electrical equipment;
- Apply to all levels of voltage;
- Apply to all work activities including electrical design, installation and commissioning;
- Apply to all places where work on or near electrical equipment is carried out;
- Impose responsibilities for safety on all persons concerned with electrical work.

The following are brief descriptions of each of the regulations. Please consult the appropriate parts of this document for further details.

Regulation 1
Object and commencement
Cited in the Electricity of Work Regulations 1989, they came into force on 1st April 1990.

Regulation 2
Interpretation
(1) In these Regulations, unless the context otherwise requires:
control
danger
electrical equipment
injury
systems

Regulation 3
Persons whom duties are imposed by these regulations, i.e. employers, self-employed and employees.

Page 43 of the course notes for the Duty Holder (Authorised Person) course, providing a summary of the requirements of each of the EAW Regulations

Knowledge Assessment for Course 380 Electricity at Work Regulations

This assessment consists of 16 multiple-choice questions.

Your Name: _____

Your Score (out of 16) _____

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■

Your Percentage Score _____

Note

Your instructor will mark this paper and return it to you. You must then ensure that you find out the correct answers to any questions that you answered incorrectly. Your instructor will then collect your paper for recording, feedback and ongoing improvement purposes.

Page 43 of the course notes for the Duty Holder (Authorised Person) course, providing a summary of the requirements of each of the EAW Regulations

Knowledge Assessment for Course 380 Electricity at Work Regulations

3: Under the Electricity of Work Regulations 1989 a Duty Holder is:

- a) anyone who has responsibilities imposed by virtue of his activities of work;
- b) only electrically qualified people who have served a recognised apprenticeship;
- c) a person who feels confident in doing the work;
- d) someone in a managerial position only.

2: the Electricity of Work Regulations 1989 apply to:

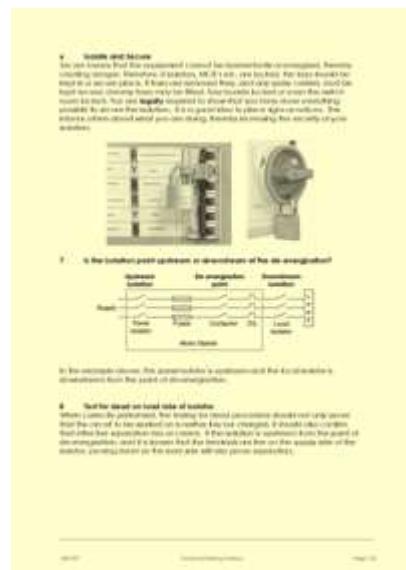
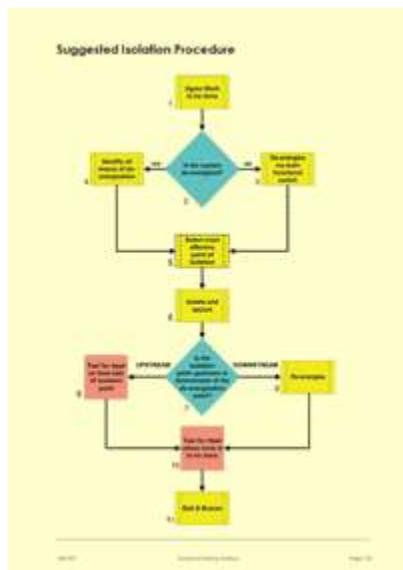
- a) all electrical systems and equipment;
- b) only low voltage equipment up to 1000V;
- c) electrical equipment in a fixed installation only;
- d) only portable electrical equipment.

3: the Electricity of Work Regulations 1989 is one of a set of regulations made under:

- a) The Factories Act;
- b) The Health & Safety at Work Act;
- c) The British Standard - BS7671;
- d) The Management of Employees Act.

Page 2 of the multiple-choice assessment paper used on the Duty Holder (Authorised Person) course: There are 15 questions in all

On the second day of the course the candidates are introduced to typical examples of employer's electrical policies and procedures (Company-specific policies for courses that are being run on a customer's premises can be introduced into the course at this stage).



Page 13 of the course notes for the Duty Holder (Authorised Person) course, showing the necessary steps which should be considered within an isolation procedure

The voltage testers and proving units that we use on the Duty Holder (Authorised Person) course

Page 17 of the course notes for the Duty Holder (Authorised Person) course, detailing some of our recommended isolation procedures

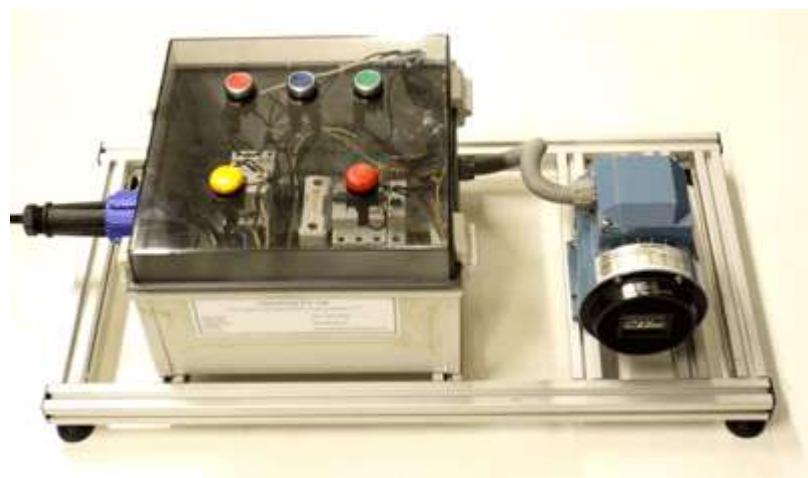
The candidates then proceed to apply their knowledge in a demonstrable manner by completing a number of practical equipment isolation exercises. These isolations encompass single phase and three phase isolations on industrial, commercial and domestic systems. The following is one of the units that are used to check that the candidates are able to isolate a single-phase system properly:

This is one of the units that are used to check that the candidates are able to isolate a single-phase system.

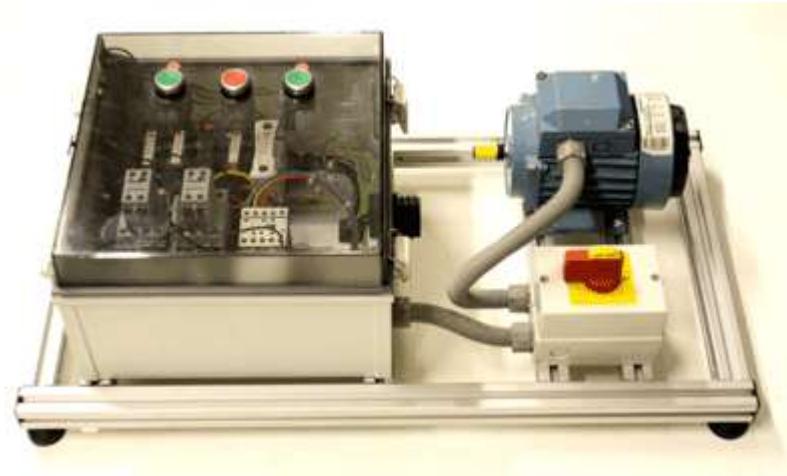


The following are two of the panels that are used to check that the candidates are able to isolate three-phase systems properly:

This is one of the panels that are used to check that the candidates are able to isolate three-phase systems.



This is one of the panels that are used to check that the candidates are able to isolate three-phase systems.



The rigs used are slightly different, requiring the candidates to think carefully about the advantages and disadvantages of panel isolations, local or remote isolation versus removal of fuses or locking off circuit breakers inside the panel. They can also explore the merits (or otherwise) of control circuit isolation rather than isolation of the load circuit and how this might be dangerous.

Candidates on the Duty Holder (Authorised Person) course also have to show that they can create a sensitively thought-out isolation procedure for scenarios where production downtime versus the dangers of moving machinery have to be carefully balanced.

The act of testing for dead is explored, and the various ways in which this could be done is explained. We advocate using properly approved voltage testers and proving units. To ensure that the candidates understand this we use a rig that simulates three three-phase motor terminal boxes wired through three isolators. The candidates have to test for dead at each set of motor terminals and some will test out OK whereas others won't and the candidates have to explain what the reasons for this are.

The voltage testing rig, where candidates use the voltage testers to test for dead on three sets of motor terminals: Some test out OK but some don't and the candidates need to be able to explain why this is.



We then look at live working. Many of the candidates will presume that they are never going to work live, but on exploration of the legal definition they invariably find that they already are - until equipment is proved dead or during live functional testing, for instance, they are technically working live. A short lecture/discussion around these issues follows, and we discuss the merits of live working risk assessments, the way in which hazardous voltage thresholds can be defined and how the environment can be categorised as kind or unkind. We explore examples of electrical accidents and get the candidates to think about the causes and how the accidents could have been avoided by not working live, using PPE, applying supervision, shrouding terminals etc.

Next we apply the aforementioned knowledge to a series of practical exercises, where the candidates practice making voltage, current and frequency measurements on live equipment. This is often characterised as 'live functional testing' in employers' policies.



The exercise that involves measuring three-phase voltages on the live working part of the course

The exercise that involves measuring frequency on the live working part of the course

The exercise that involves measuring three-phase currents on the live working part of the course

The final exercise on the course requires the candidates to attach a cable to a potentially live set of busbars.

This is obviously something that would be extremely difficult to justify and the reasoning behind this needs to be explored so that the candidates can make a meaningful distinction between what is justifiable and what isn't; so that they can clearly see how live functional testing might be allowable whereas the manipulation of live conductors might not be. This also provides the opportunity to explore what their own company policies have to say about these activities.

By presenting the candidates with this equipment they are forced to think these issues through, and this is the value of actually doing the exercise - enabling them to think, understand and remember the attendant issues and how they relate to their activities at work.



Note that even though we've put "Warning 415V" stickers on everything that we do in fact power all of the equipment that has exposed live parts from a three-phase 40V supply, so that the candidates are not in any danger. We don't necessarily tell the candidates about this though!

If you would like to learn more about the Duty Holder (Authorised Person) course then please call us.



CONTACT US

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