ECA GUIDANCE NOTE E01
SAFE WORKING SYSTEMS
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Safe Working Systems
Rev 2

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INTRODUCTION

In February 2016, the Electrical Contractors Association established the ECA Electrical Safety Working Group to raise awareness and prevent safety incidents in the industry, and ensure that proper procedures and protocols in relation to best practice and safe systems of work are in place.

This working group met a number of times in 2016 to develop a proposed guidance note for Electrical Contractors which would provide a practical and easy to understand document for use in the field.

In September 2016, an open workshop for the wider electrical industry was held as part of the National Construction Safety Week, where interested parties were given an opportunity to review the proposed guidance and to give their input from their particular perspective.

The Guidance Note is comprised of four strands:

1. Establishing a Competency Requirement
2. Electrical Testing
3. Risk Assessment Method Statements (RAMS)
4. Switchgear and Panels
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Notes
Part 1
Establishment of a Competency Framework in accordance with Lock Out/Tag Out (LOTO) for Low Voltage Systems
AUTHORISED PERSONS FOR ELECTRICAL WORK

Electrical Installations require the highest safety standards to ensure the safety of the people working on, near or operating the systems. To ensure these standards are maintained, it is important to understand the responsibilities of the persons involved and the roles that they must carry out. Currently, there are many documents and standards that reference these responsibilities each document using different terminology.

IS 299:2008 Part 3 (Electricity) defines an ‘authorised person’ as someone that is competent and engaged in work or duties incidental to the generation, transformation, conversion, switching, controlling, regulating, rectification, storage, transmission, distribution, provision, measurement or use of electrical energy. As this is a legal requirement for all companies engaged in this type of work, it is important to understand what the expectations are for competent authorised persons as these are not defined in this text. The standard that outlines the roles for operating an electrical installation is IS EN 50110 which also makes reference to IEC 60050-651 but the nomenclature often used is not the same as used between these documents.

Furthermore, it is recognised that many companies use their own terminology for their companies own nominated responsible and competent persons. This text aims to reference these standards and to clarify what the responsibilities and duties should be. The standard IS EN 50110 identifies four different roles that all electrical companies must have to ensure electrical safety compliance but the standard does allow doubling up of these roles where it may be more practical for smaller jobs or companies. These roles are outlined along with the duties required by the standard in this text and a summary outlined in addendum 1.

The following documents have been considered in this text:

**ET206:2009** – The Management of Electrical Safety at Work

**IS EN 50110-1:2013** – Operation of Electrical Installations Part 1

**ET101:2008** – The National Rules for Electrical Installations

**CER/16/001** – Electrical Safety Supervisory Criteria Document V 3.0

1.1 **The Person Responsible for an Electrical Installation**

The role of this person will be the same regardless of the size of the company; the person responsible for an electrical installation is the person who has overall responsibility in the company for the safe operation of the electrical installation. In many cases this may be the owner of the company or the director in charge of the company but this responsibility can be delegated to nominated staff where required. The CER Electrical Safety Supervisory Criteria document refers to this position as the Principle Duty Holder.

The duties and responsibilities can include but are not limited to the following;

- Ensures that all work is carried out by competent staff and that there is adequate and appropriate supervision
- Ensures all staff are suitably trained to carry out the work
- Have an understanding of and responsibility for the safety conditions relating to the range of electrical work undertaken by the business
- Ensures responsibility for the maintenance of the overall standard and quality of the electrical work carried out or managed by the enterprise
- To ensure that there are systems in place whereby all electrical work undertaken is carried out by competent persons who are adequately and appropriately supervised
- Ensures that the company is in compliance with the conditions set by the CER Safety Criteria Document

In large companies or in large systems the responsibility of Principle Duty Holder and Person responsible for an Electrical Installation can be delegated by the Principle Duty Holder to the Duty Holder. In some companies this person may be referred to as the Project manager or the Person in Charge of Work but regardless of the name within the company, the responsibilities are the same as listed above. The nomination should be in writing and should describe the area or system covered and the duration of the works. The person responsible for an electrical installation may further delegate the responsibility for the electrical installation to another person fulfilling the role defined in part 1.2 which follows. This nomination should be in writing.

It is the responsibility of the person responsible for an electrical installation to ensure there is good communication between all parties including but not limited to, all staff working on or in close
proximity to the electrical installation, general contractors, the general public, utility companies and any others that could be affected by the works. Access to all places where ordinary persons are exposed to electrical hazards shall be regulated. The method of regulation and control of access shall be the responsibility of the nominated person responsible for an electrical installation.

1.2 **NOMINATED PERSON IN CONTROL OF AN ELECTRICAL INSTALLATION DURING WORK ACTIVITIES**

The responsibility of the nominated person in control of an electrical installation is to ensure the safe control of work or activities carried out on electrical installations while constructing the system or operating the system and during commissioning or maintenance on the electrical installation. Activities carried out must be conducted in line with the established procedures for the electrical system and it is the responsibility of the nominated person in control of the electrical installation during normal activities to ensure that all safe guard systems are in place. The nominated person in control of an electrical installation during work activities can, for assistance, delegate some of his duties to other persons as required.

Responsibilities include but are not limited to the following;

- Ensures that Electrical safe systems of work are in place
- Ensures that electrical work is only carried out by competent qualified staff
- Lock Out and Tagging Systems are in place and a control system is implemented
- The appropriate personal protective equipment is used
- Ensures that established testing procedures and switching operations are used
- Ensures that the work has been scheduled in accordance to the planned timelines
- Control their part of the installation giving authorisation to the nominated person in control of a work activity

The nominated person in control of an electrical installation during work activities may be referred to in a number of ways by different companies or bodies and is often called the foreman or electrical supervisor.

The nominated person in control of an electrical installation during work activities must be suitably experienced and trained for this role. The minimum requirements for this role should be as follows:
• A qualified Electrician or Engineer with several years’ experience in this role
• Have a good understanding of the electrical legislation and standards
• Understand the full extent of the work to be carried out

The nominated person in control of an electrical installation during work activities and the nominated person in control of a work activity shall agree arrangements, before the work activity takes place, for any changes to the electrical system to allow the work to take place safely. They will also agree a description and scope for all activities that will take place on or near live electrical systems. Where the work activity is complex, the preparation shall be made in writing.

1.3 Nominated Person in Control of a Work Activity

The standard EN 50110-1 refers to Nominated Person in Control of a Work Activity in line with the international standard IEC 60060-651, International Electrotechnical Vocabulary. This person may have different roles in electrical companies and installations which may include some of the following activities:

• Authorised person to carry out switching of electrical energy
• Authorised to make changes to the electrical systems in agreement by the nominated person in control of the electrical installation during work activities
• shall ensure that all relevant requirements, rules and instructions are complied with before work commences
• Shall instruct all persons engaged upon the work activities of all reasonably foreseeable dangers that are not immediately apparent to them
• Should be Qualified Certifier for testing purposes where applicable

The duties may involve other tasks associated with the control of the electrical energy such as commissioning, verification of voltages present, the discharge of voltages, maintenance of electrical systems and control of persons associated with any work conducted on or near the electrical systems under their control.

Nominated Person in Control of a Work Activity may be referred to in a number of ways by different companies or bodies and is often called the Authorised person. Where there are multiple persons carrying out this role there must be one person with over all authority to ensure co-ordination.
between staff. This person will be the Senior Authorised Person or the Senior Nominated person with control of a work activity. Some companies also refer to this role as the energy marshall.

In large electrical installations or companies there maybe more than one person involved in the establishment of the electrical control procedures and policies. The nominated person in control of an electrical installation during work activities and the nominated person in control of the work activities will ensure that all persons involved in the work activities fully understand the procedures in place.

The Nominated Person in Control of a Work Activity or Authorised Person must be suitably experienced and trained for this role. The minimum requirements for this role should be as follows:

- A qualified Electrician deemed competent to carry out this role and authorised by the nominated person in control of an electrical installation during work activities
- Have a good understanding of the electrical legislation and standards
- Understand all safety procedures for the work activities to be carried out
- Understand the full extent of the work to be carried out

1.4 **WORKING TEAM**

The working team generally consists of skilled persons and instructed persons. All personnel involved in a work activity on, with, or near an electrical installation shall be instructed in the safety requirements, safety rules and company instructions applicable to their work. These instructions shall be repeated during the course of the work where the work activity is of long duration or is complex.

1.4.1 **Skilled Person**

The skilled person (electrically) is a person with relevant education, knowledge and experience to enable him or her to analyse risks and to avoid hazards which electricity could create. They must be competent and a qualified electrician or engineer who has a formal qualification from a recognised body to allow them to carry out electrical work or testing on electrical systems in a safe manner so as not to create danger to themselves, danger to other persons and to operate the electrical system
in the manner in which it was designed for:

The skilled person(s) may carry out some of the following duties:

- Construction of the electrical system when all circuits are dead
- Construction of the electrical system on or near live electrical systems
- Carry out inspections and make electrical observations
- Involved in commissioning activities
- Involved in Maintenance activities on or near live systems
- Any person employed in the role of (1.1), (1.2) and (1.3)

A competent person must have a proven record in the field of work that is relevant to the type of electrical work they are carrying out.

1.4.2 Instructed Person

Most electrical teams will have some personnel who are not qualified electricians. These personnel will generally be apprentice electricians and non-electrical instructed persons. All persons who work on or near electrical systems must be instructed. An instructed person is a person adequately advised by a skilled person to enable him or her to avoid dangers which electricity may create.

1.4.3 Electrical Buddy or Assistant

Some electrical work on ‘Live systems’ requires that the work is carried out with an electrical buddy where the risk assessment has deemed it necessary to have a second person present. The purpose of the buddy is to assist the competent skilled person either during normal working or in the event of an emergency where emergency measures must be taken. The Electrical buddy is usually the electrical apprentice that works with the electrician but this could be another electrician, engineer or an instructed person. The buddy is someone who has been trained for the work to be carried out including training in the use of safety equipment where applicable and can carry out the emergency procedures should the need arise.
1.5 **General Staff Safety**

No person shall undertake any work activity without the technical knowledge, experience, instruction or where they are under such supervision as is necessary for the work to be undertaken.

There shall be arrangements in place to ensure that any worker who objects for reasons of safety to carrying out any instruction or work activity can report those objections immediately to the nominated person in control of a work activity. That nominated person shall have the matters investigated, and if necessary, consult a higher authority for a decision.

All personnel shall wear clothing suitable for the locations and conditions where they are working with suitably rated PPE where appropriate. Tools and equipment shall be suitably rated and insulated so that electrical danger to persons is prevented.
Each installation must be placed under the responsibility of a person. The Nominated person with the overall responsibility must ensure the safe operation of the electrical installation by setting rules and organisation or framework. This person can be the owner, employer, proprietor or a delegated person. Duties can be delegated to others as required especially for large installations and networks.

The Person who is responsible during work activities for the safe operation of the electrical installation. This person has to judge the possible effects of the work activities on the electrical installation or parts of it which are in his responsibility and the effects of the electrical installation on persons carrying out the work activities. Some of these duties can be delegated to others as required. Prior to work taking place, all arrangements for activities on or near electrical installations shall be agreed between the Nominated person in control of an electrical installation and the nominated person in control of a work activity.

This is the person nominated with the ultimate responsibility for the work activity at the work location. Where any changes are to be made to the electrical installation these must be co-ordinated between the Nominated Person in Control of a Work Activity and the Nominated Person in Control of an Electrical Installation during work Activities. Before any work activity is started and during that work activity, the nominated person in control of a work activity shall ensure that all relevant requirements, rules and instructions are complied with.

Working team may consist or skilled persons and trained persons. Skilled person (electrically)-person with relevant education, knowledge and experience to enable him or her to analyse risks and to avoid hazards which electricity could create. Instructed person-person adequately advised by a skilled person to enable him or her to avoid dangers which electricity may create. Any skilled person can carry out non-complex activities in non complex installations or in maintenance work where agreed procedures are followed.
The person responsible for an electrical installation is responsible to ensure that the appropriately qualified staff are nominated to carry out the tasks. Often this person has been nominated by the company owner to fulfil this role and may be referred as the Project manager. On large installations the Project Manager can delegate their duties to foreman. Boundaries of responsibility should be clear and should be in writing. The person responsible for an electrical installation may be nominated as the Duty Holder for the Installation by the Principle Duty Holder.

The Nominated Person in Control of an Electrical Installation during work Activities is often called a Foreman and they shall control their part of the installation giving authorisation to the nominated person in control of a work activity. This person may be referred to as the Authorised person. The foremen and authorised persons will ensure that the agreed description of works for all activities on or near electrical systems follow the safety procedures required to ensure the safe operation during the activity.

In some companies this person is referred to as the Authorised person. Where there are multiple Authorised persons there needs to be one person with overall control, this is the Senior Authorised Person. Before work commences the Authorised Person ensures ensures that all safety rules and instructions are complied with. Ensures all staff are trained for the task they are assigned to carry out. This person is responsible for the switching, testing, and actual work that would take place on or near live systems.

In general most work that takes place on site will be dead work during the electrical installation which will be carried out by the working team including electricians and trained persons. The working team will be under the instruction of the foreman and where they will work close to or on electrical systems they will be instructed in the safety precautions to be taken by the authorised persons. Only qualified persons will be employed as electricians.
Part 2
Training for Safe Electrical Works and Electrical Testing
GUIDANCE FOR SAFELY TESTING LV INSTALLATIONS

2.1 INTRODUCTION

Operatives working on or near electrical systems can be exposed to a number of dangerous conditions where live voltages or energies may be present. In some cases the operative may not be aware that the danger exists or may come too close to systems that are live. This document is intended to aid registered electrical contractors (REC) to safely undertake test and inspection works on LV systems and to guide them on the precautions that can be taken to ensure their safety whilst working.

The document will also highlight control methods that minimise or eliminate any potential risk or danger to persons, property and livestock against serious or fatal electrical injuries or fires. Where the work is beyond the scope of this text the training needs will be identified.

2.2 SCOPE

Electrical safety during testing includes the following types of work, testing of new installations, testing on existing installations, visual inspections and electrical maintenance;

2.2.1 Pre-Energization testing on electrical systems

These tests include all of the ET101 mandatory testing but also include testing that may be required by a client or specific manufacturer’s requirements. These tests include the following as a minimum:

- Continuity of protective conductors and bonding conductors
- Continuity of ring final circuit conductors
- Insulation resistance of cables
- Detection of erroneous connections
- Separation of circuits
- Polarity tests
- Visual inspections
- Electric strength testing for assembles built on site,

The latter could include tests as follows, insulation resistance, contact resistance (ductor), primary injection tests, secondary injection tests, functional testing, dielectric withstand test (hi-pot test).
2.2.2 **Post Energisation Testing**

Energised electrical testing is carried out in construction of electrical systems after the systems have been connected to the permanent electricity supply or in existing installations where periodic testing is carried required. These tests include:

1. Fault loop impedance tests
2. Verification of operation of residual current devices
3. Correct operation of switches and isolators
4. Visual inspections

2.2.3 **Visual Inspections and Maintenance of Electrical systems**

1. Functionality testing
2. Power quality monitoring
3. Infra-red scanning
4. Visual inspections

2.3 **STAFF REQUIREMENTS**

The tester is legally responsible to ensure that tested installation is safe and satisfactory condition by carrying out the required electrical tests and visual inspections outlined by ET101:2008. The installer and tester who undertake the works must conform to the following:

1. Competent and qualified for the works being undertaken. (Installer)
2. Have completed an accredited V&C course within the past 5 years and possess a valid Qualified Certifier Number (QC). (Tester)

The tester is the person with responsibility to pass the installation as safe so they are in fact the Duty Holder for this portion of the work. They are also responsible to ensure that the test instruments are maintained in a safe manner and that the test probes are in good condition as they are the person who operate the test instrument and will control the testing itself.
2.3.1 Instrument Requirements

All test instruments should be stored separately and not along with other tools that may be sharp and cause damage to leads that could be difficult to detect. Instruments should be calibrated in line with the manufacturers’ guidelines which is usually one year. Meters should be inspected before use and where appropriate they should be verified as operational before testing. It is recommended that the leads and probes associated with test instruments have the following characteristics:

1. Leads should be adequately insulated and, ideally, fused.
2. Leads should be easily distinguished from each other by colour.
3. Leads should be flexible and sufficiently long for their purpose.
4. Probes should incorporate finger barriers, to prevent accidental contact with live parts.
5. The probes should be insulated and have a maximum of 2mm of exposed metal, but preferably have spring loaded enclosed tips.

2.4 Employer and Employee Responsibility

When working or testing on or near electrical equipment it is important that the person carrying out the work understands the legal responsibilities. Statutory Instrument document SI 299 Part 3, Electricity, outlines what is required by the employer and the employee. The following extract highlights some important aspects that need to be considered when testing electrical systems.
**Regulation 86: Precautions for work on electrical equipment**

(1) An employer shall ensure that;

   (a) work activity, including the operation, use and maintenance of electrical equipment or electrical installations, is carried out in a manner that prevents danger,

   (b) before work is carried out on live electrical equipment the equipment is, where appropriate, made dead so as to prevent danger,

   (c) adequate precautions are taken to prevent danger arising from

      (i) electrical equipment which has been made dead becoming live while work is carried out on or near that equipment, and

      (ii) any electrical equipment inadvertently becoming live,

   (d) where it is necessary for work to be carried out on or near any live part, other than one suitably covered with insulating material so as to prevent danger, of electrical equipment, a person is not engaged in work activity unless

      (i) It is unreasonable in the circumstances for it to be dead,

      (ii) It is reasonable in the circumstances for such person to be at work on or near it while it is live, and

      (iii) Suitable precautions are taken to prevent danger, including, where necessary, the provision of protective equipment.

Therefore it can be seen that, where possible, electrical systems must be made dead before work commences unless the conditions is 86 (1) (d) can be fulfilled. The most common activities where the system cannot be made dead are as follows:

**Test and Inspection for Low Voltage Switchboard**

Visual inspection shall be carried out for the proper installation of the Low Voltage Switchboard Installation in accordance with the ET201: 2005.

**Inspection and Test for Low Voltage Installations**

A visual inspection shall be made to verify that the installations as installed is correctly selected and erected in accordance with ET101, and that there is no apparent damage to the systems or cable.
The visual inspection shall comply with Annex 61A ET101. Electrical testing before energisation and after energisation.

Where the system is to be made dead, a suitable safety system such as Lock Out Tag Out should be in place to ensure the system is secured so as to prevent danger and prevented from inadvertently becoming live. Labelling the point of isolation or marking will help prevent inadvertent connection along with a suitable locking device. More information on Lock Out Tag Out is contained in section 2.6.2 of this document.

### 2.5 Electrical Hazards Associated with Electrical Systems Include

Accidental contact with live systems which results in electric shock can be fatal or cause severe injury depending of the severity of the shock received. Injuries resulting from shock can be primary injuries as a direct result from current passing through the body or secondary injuries as a direct result from accidents caused by the electric shock.

**Primary Injuries**

- Cardiac arrest, respiratory arrest or asphyxia resulting in death
- Electric shock through direct or indirect contact with live conductors.
- Burns sustained at the point of accidental electrical contact, or due to arcing from high voltage conductors
- Burns as a result of the very high temperature of an Arc Flash
- Ultraviolet (UV) light damage to eyes from Arc Flash
- Injury from the impact of flying debris resulting from an Arc Flash (debris could be molten)
- Fires caused by overheating or ignition of explosive atmospheres

**Secondary Injuries**

- As a result of muscle spasms during shock or, for example, falling from a ladder after a shock.
- Injury from reflex actions
2.5.1 Control of Hazards

There are many different things that contribute to ensuring that systems are tested in a safe manner so as not to cause harm. The first is that the persons involved with the testing are qualified and trained to carry out the works in question. The installation must also be constructed in accordance with the national regulations, ET101:2008 to ensure all systems are constructed safely. All systems must be constructed to ensure there can be no contact directly or indirectly with live parts. All systems are correctly earthed and tested to ensure the operation of the protective devices.

All staff who carry out testing must be instructed and trained as a qualified tester. All staff must also be instructed in the safe systems of work that are in place for the particular installation such as a Lock out Tag out procedure or a permit system.

When conducting live testing the staff must be aware of the minimum levels of personal protective equipment (PPE) that is required to safely carry out the works. Staff must ensure that all PPE is rated at the correct voltage or where appropriate at the correct calorific level when an arc flash rating is given. The typical PPE required may include some of the following:

- Non-conductive hard hat
- Face shield and fire retardant balaclava
- Fire retardant clothing with appropriate rating
- Voltage rated rubber gloves

The HSA requires that all work to be undertaken on construction sites must have a risk assessment for the task being carried out which includes an assessment of the risks that could occur and the control measures that will be implemented to reduce these risks. This is often referred to as a Risk Assessment Method Statement (RAMS) and includes the work associated with electrical testing and inspections. Most companies will have their own standard systems and standard RAMS for tasks that are carried out regularly. Where a company does not have these systems in place they can investigate the HSA web site which provides many resources for guidance including a link to the BeSmart.ie web site which allows companies generate simple risk assessments.

Before carrying out any testing or inspections on electrical systems, the operatives should carry out a risk assessment of the works to ensure they have considered all dangerous occurrences that could
occur and they should consider each of the control measures listed above and any more that may be appropriate to the task in question (See Section 3).

2.6 Testing and Inspection During Construction

There are a number of questions that need to be verified prior to work taking place in order to comply with National Wiring Rules ET101 and also SI 299 directive. These should be assessed by the tester before the risk assessment is written and before work takes place. Some sample questions are listed below to assist the tester to plan the work:

- Are there any other options to avoid someone working on or near to equipment that is live?
- What is the maximum voltage on conductors that will be exposed during the work activity?
- Has the operators PPE been chosen based on the energy that could occur at the circuit. (Circuits close to substations can have substantially higher fault levels and increased risk)
- Are the testers competent? Are they adequately trained and knowledgeable, or do they have sufficient experience to carry out the work without risk to themselves and others?
- If the testers are not considered fully competent, are they adequately supervised?
- Are the testers able to supervise the working area sufficiently and at all times, to prevent danger to others?
- What physical safeguards should be applied to the equipment under test to prevent injury?
- Is the test equipment calibrated?
- Has the test equipment test leads and probes been properly maintained? Prove the test instrument before use.
- Is anyone in danger as a result of your actions?
- Will the equipment be left unattended while live, for example while a transformer is being ‘soak tested’?
- Is it possible to reduce the number of available paths to earth to reduce the likelihood of a phase-to-earth shock, for example by using barriers, screens and insulating mats?
- Can the ‘Neutralising Link’ (TNCS) be physically checked?
Operatives should also be aware of the danger that may also arise from the mechanical movement of electrically driven equipment where a loss of electricity supply has caused plant or machinery to come to a halt and where subsequent restoration of supply automatically sets it in motion again.

Where personal safety depends in part on the operation of an RCD, the RCD must be tested using the built-in test facility at appropriate intervals. All RCDs should be tested at least annually using an RCD tester which will check the tripping current and the speed of operation.

**Other Considerations to Improve Safety**

The purpose of these tests and inspections is to ensure that all components and systems are constructed in a satisfactory and good condition.

At design the stage, consider installing easily accessible ‘end of line test points’ to aid testing. This enables the work to be done safely and without risk to the contractor’s employees, the site employees and others who might be affected. In particular, the person who is responsible for the safe isolation and state of the equipment should be identified and agreed.

**2.6.1 Safe Systems of Work**

Employers should introduce ‘safe systems of work’ where this is not already in place. These are systems that formally record the procedures that must be followed when carrying out dangerous tasks such as lock out tag out and permit to work systems.

To ensure that the system is practical and understandable to the employees, all personnel should be involved in preparing the safe systems of work. The completed documents, which will need to be reviewed from time to time, should be made readily available to employees. Test personnel employees who work in customer’s premises might have to also work under the client permit system and rules which may differ from client to client.

The contents of the written safe systems of work should include the following as a minimum:
• Who is authorised to undertake testing;
• How to access a test area and who should not enter the area (where appropriate);
• Rules for isolating equipment and how the isolation is secured;
• The correct use of additional protection measures
• What form of power supply to use to energise the equipment under test, particularly where using the wrong method would compromise safety;
• What is expected of test personnel regarding the inspection of test equipment before use, and how to report defects;
• The correct use of any warning devices that form part of the safety system at designated test areas;
• Instructions about what action to take in an emergency situation; and
• Procedures to follow when the testing is undertaken by a contractor

2.6.2 Lock-Out Tag-Out Procedure

In the interests of safety, a good principle to adopt is that the point of isolation should be under the control of the person who is carrying out the work on the isolated conductors. Where necessary, suitable means must be provided for the discharge of stored electrical energy after the system is made dead. Written instructions setting out safety isolation procedures including ‘permits to work’ may be required to ensure a safe system of work.

Prior to locking out equipment, it is recommended that a step by step ‘lock out’ procedure is written to control the sequence of isolation. Also a step by step guide to re-energisation when the ‘lock out’ has been removed. Staff should ensure that all correctly selected PPE for the works procedure is in place and worn.

The following passage lists some considerations that could be considered for a lock out tag out system and is followed by a suggested procedure. As all systems are different, these suggestions should be assessed to ensure there are no further considerations of the system in question.
2.6.3 Lock-Out Tag-Out Considerations

Testing staff should ensure all appropriate PPE for the works procedure is in place. The registered electrical contractor (REC) must be aware of any hazards that exists in the installation (hazardous gases, substances etc). Check the number of sources of power to the equipment or panel to be isolated, for example the panel could have a backup generator or UPS that may operate once the primary source has been removed. The information should be found in the electrical schematic for the project or from the facility staff that operate the building.

Isolate the Standby Generators or UPS’s, if applicable, or any other energy source such as micro generators or Power Factor Correction Units. When safe to do so then isolate equipment, place locking device on isolator and use only your own padlock to lock off. If more than one person is working on the equipment then it should be locked off using a multi-hasp locking device. This ensures that all staff have finished working on the system before the equipment can be re-energised. Always test to ensure that the system can’t be operated after the lock has been isolated.

Place a tag on the isolator with your details recorded on the tag. Where the isolation has been carried for testing purposes test the de-energised circuit with an approved voltage tester. The tester should be verified for operation on a known supply or a voltage proving unit before testing the isolated circuit and again afterwards to prove correct operation. When working in switch rooms or substations have a partner or buddy in attendance. Discharge any stored energy using an approved instrument. Consider removing fuses or disconnecting. Consider earth bonding the load side where appropriate. It is good practice to remove jewellery, watches, necklaces, rings when carrying out any electrical work. It is good practice when switching loads on or off to turn your face away and on large systems with high energies not to breathe in during switching in case of Arc Flash.

Tip
Disconnect cables in the correct sequence Phase >Neutral>Protective Conductor and reconnect in the opposite format.
2.6.4  Lock-Out Tag-Out Check List

**Before Work**

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Locate schematic and identify if there is an existing SOP</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>2. Identify points of isolation on schematic.</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>3. Identify arc study rating where applicable</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>4. Develop method statement – Use SLD where applicable</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>5. Arrange correct PPE and correct lock(s)</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>6. Apply for permit where applicable</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
</tbody>
</table>

**Procedure**

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Ensure system or equipment is safe to isolate</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>2. Ensure suitable barriers are in place if applicable</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>3. Verify correct PPE is worn.</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>4. Open isolation device or circuit breaker of energy source</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td></td>
<td>(Confirm correct device is isolated)</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>5. Ensure all auxiliary supplies have been isolated</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>6. Place lock on all isolation devices</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>7. Ensure re-connection is not possible</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>8. Place tag on device and record details</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>9. Verify voltage sources are removed using suitable devices</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>10. Discharge stored energy using appropriate equipment</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>11. Apply earths where appropriate</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
<tr>
<td>12. Return key to the key box or cabinet</td>
<td>□</td>
<td>□</td>
<td>□</td>
</tr>
</tbody>
</table>
2.7 **NON-COMPLIANT COLOUR CODE**

Some electrical installations may contain older wiring systems that do not comply with the colour code specified in the current National Rules. In such cases, it is necessary for safety reasons that warning notices be provided for the benefit of personnel that may not be familiar with the older systems. In some older installations, the colour black is used for the neutral conductor, and in three-phase circuits, the colour blue is used for a phase/line conductor.

Warning notices should be provided in the relevant locations, e.g. distribution boards, with the following wording or its equivalent:

**WARNING!**

The colours for cables and insulated conductors in this (part of the) installation may not comply with the National Rules for Electrical Installations ET 101: 2008. The core colours and their respective functions should always be verified by inspection and test.

2.8 **TRAINING**

Staff should be trained for all tasks that they must carry out and in some cases may not have received this training during their electrical apprenticeship. There are a number of courses that are available that cover many aspects to electrical safety which may cover many of the following recommended course content:

- Legal requirements
- ETCI requirements
- Qualification requirements
- Lock-out and Tag-out procedure
- HSA requirements
- Electrical safety
- Live work on main panels
- Hazardous areas training
- Circuit design to enable ease of testing
- Arc flash awareness
- Correct PPE for test being undertaken
- Disconnect/reconnect procedures
- Work on live domestic boards
- Test procedures
- Permit procedures
Part 3
Risk Assessment Method Statements (RAMS)
Hereunder is the outline of Guide to the Assessment of Risks to Safety and Health Involving Electricity for Electrical Contractors, and which will be informed by and, where appropriate, refer to applicable published Standards, Codes of Practice, and Guides. It is intended in particular, but not exclusively, for use by the Principal Duty Holder.

3.1 Purpose

To provide guidance to the Registered Electrical Contractor in relation to the identification of hazards involving electricity and the assessment of risk of personal injury from:

(i) electric shock, electric burn, electrical explosion or arcing;
(ii) fire or explosion caused by the use of electricity; and
(iii) mechanical movement of electrically driven equipment

(in normal service, intentional/unintentional re-energisation, stored electrical energy).

3.2 Cautions & Disclaimer

This document does not provide guidance on:

(i) the identification of hazards and assessment of risks to safety and health other than those relating to electricity above; or
(ii) risk rating.

Hazards and risks can vary considerably from one work situation to another, and so should not be viewed purely in generic terms. It will be necessary to identify hazards and assess risks in relation to each planned work activity and work situation.

It is the responsibility of the Registered Electrical Contractor to identify hazards present, assess the risks to safety and health, and to determine the reasonably practicable preventive and protective measures taking account of applicable statutory and regulatory provisions.

The guidance provided in this document is not intended to identify or contain all statutory and regulatory requirements applicable to the stated purpose (3.1 above), or to be a legal interpretation of any statutory and regulatory requirements identified or discussed herein. Legal interpretation of statutory and regulatory requirements must take account of any
precedent case law as laid down by the court system in this jurisdiction, which is subject to addition over time.

3.3 Terms and Definitions

This section will define terms used within the Guide and which are fundamental to the correct application of the Guide, the absence of which definitions, could give rise to misinterpretation.

3.4 Duties of Registered Electrical Contractor in relation to Risk Assessment

This section will discuss the following:

(i) Duty of employer to identify hazards and assess risks (Safety, Health and Welfare at Work Act 2005);
(ii) The General Principles of Prevention (Safety, Health and Welfare at Work Act 2005);
(iii) ‘Reasonably practicable’ in relation to the duties of an employer;
(iv) Duties relating to the provision of information, instruction, training and supervision for employees and employees of another undertaking (Safety, Health and Welfare at Work Act 2005);
(v) Duty of employers sharing a place of work to co-operate (Safety, Health and Welfare at Work Act 2005);
(vi) General duties of employers to persons other than their employees (Safety, Health and Welfare at Work Act 2005);
(vii) Duties imposed by Reg86 of the Safety, Health and Welfare at Work (General Application) Regulations 2007 Part 3, Precautions for work on electrical equipment, and in particular regarding factors to be considered in deciding whether or not it would be unreasonable to de-energise equipment, and reasonable to work on or near live equipment;
(viii) The meaning of ‘work on’ and ‘work near live electrical equipment’; and
(ix) Duty to obtain the services of a competent person (Safety, Health and Welfare at Work Act 2005).
3.5 Hazard Identification, Risk Assessment and Determination of Preventive and Protective Measures

This section will discuss a systematic approach to hazard identification, risk assessment and determination of preventive and protective measures, which takes account of:

(i) Work activity (including safe practices & procedures, discussed in relation to live working zone, vicinity zone, AF boundary, and dead working. In discussing AF boundary alone, that this Guide would stand out from I.S.EN 50110-1).

(ii) Equipment (including electrical installation, portable equipment and hand-held devices and tools) and condition of same.

(iii) Work environment (adverse or hazardous as per duty in Reg.77 of Safety, Health and Welfare at Work (General Application) Regulations 2007 Part 3 Electricity).

(iv) People (All people who may be affected and how; Competence of workers).

(v) Potential severity of injury caused by an accident involving electricity (shock, burn, other physical trauma, and in particular the need for calculation of prospective arc incident energy, effect of working distance on prospective incident energy).

(vi) NFPA70E PPE Category approach to determining requirements in relation to arc rated PPE, and the limitations of that methodology.

(vii) Use of PPE in general, and in particular arc rated PPE.
3.6 **Principles of Prevention**

All risk assessments should follow the General Principles of Prevention (Sch. 3 Safety Health and Welfare at Work Act 2005) which are as follows:

1. The avoidance of risks.
2. The evaluation of unavoidable risks.
3. The combating of risks at source.
4. The adaptation of work to the individual, especially regarding the design of places of work, the choice of work equipment and the choice of systems of work, with a view in particular to alleviating monotonous work and work at a predetermined work rate and to reducing the effect of this work on health.
5. The adaptation of the place of work to technical progress.
6. The replacement of dangerous articles, substances or systems of work by safe or less dangerous articles, substances or systems of work.
7. The giving of priority to collective protective measures over individual protective measures.
8. The development of an adequate prevention policy in relation to Safety, Health and Welfare at Work, which takes account of technology, organisation of work, working conditions, social factors and the influence of factors related to the working environment.
9. The giving of appropriate training and instructions to employees.

**Note:** BeSMART.ie is a business electronic Safety Management and Risk assessment Tool that can help small business owners/managers to prepare risk assessments and a safety statement for their workplace. It is recommended that BeSMART could be used in conjunction with ET206A “Procedural Guidelines for Working on Electrical Installations” as a starting point for companies to develop a standard risk assessment.
Part 4
Safety Considerations When Operating Different Types of Switchgear
Understanding Segregation of Low Voltage Switchgear and Motor Control Centres to BS EN 61439-2

4.1 Introduction

This section of the guidance note sets out to clarify the various forms of separation with regard to construction of Electrical Distribution Panels and Motor Control Centres. The various forms of separation shall be provided principally for:

1. Protection against contact with live parts of the adjacent functional units;
2. Limitation of the probability of initiating Arc faults; and
3. Protection against the movement of solid foreign bodies from one unit of an assembly to an adjacent unit.

Switchboard manufacturers utilise many different designs to meet the above protection. The means utilised to achieve these conditions may be partitions or barriers of metallic or non-metallic material. The partitions or barriers may provide individual separate compartments or alternatively, barriered sub-sections.

For specifiers (generally design engineers) one of the most significant choices they face when specifying a LV assembly is the form of separation.

Generally the cost of an assembly will increase with enhanced levels of separation, however choosing the most expensive arrangement will not necessarily lead to the most appropriate solution.

4.2 Useful Definitions

Assembly: Low-voltage switchgear and control gear assembly used to distribute and control energy for all types of loads intended for industrial, commercial and similar applications where operation by ordinary persons is not intended.

Functional Unit: A part of an assembly comprising all the electrical and mechanical elements that contributes to the fulfilment of the same function. Essentially this is all parts necessary to form a complete incoming or outgoing circuit.

Section: Construction unit of an assembly between two successive vertical delineations. Usually considered to be a single full height column containing one or more functional units. One or more columns are required to complete an assembly.

Sub-section: Constructional unit of an assembly between two successive horizontal or vertical delineations within a section. The area or space within a column identified and bounded by two adjacent and horizontal constructional members e.g. cross members or shelves.
Compartment: Section or sub-section enclosed except for openings necessary for interconnection, control or ventilation.

Enclosure: Housing afforded the type and degree of protection suitable for the intended application. Provides protection for equipment against certain external influences from any accessible direction and against direct contact to a degree of protection of at least IP2X.

Partition: Part of the enclosure of a compartment separating it from other compartments. A component used to form the top, bottom, sides, front or back of a compartment or enclosure and which can be manufactured from metal or an appropriate synthetic material. A device’s integral housing may also satisfy this requirement.

Barrier: Part providing protection against direct contact from any usual direction of access. Used to achieve a form of separation, it must meet the requirement of at least IP2X. It can also take the form of insulating material in direct contact with the live part, e.g. heat shrink sleeving on a busbar. Alternatively it can be rigid insulation e.g. terminal shields or an earthed metal screen appropriately positioned relative to the live part.

4.3 Achieving Separation

There is a requirement that assemblies are divided by means of partitions or barriers (metallic or non-metallic) into separate compartments or barriered sub-sections, but not for example:

- Each functional unit to be in its own compartment.
- Partitions and barriers to be manufactured from earthed metal, etc.
- Separation can be achieved in several ways. Depending on a particular application and the requirements for maintenance, this may include:
  a) PVC sleeving, wrapping or plastic coating of conductors.
  b) Insulated terminal shields or PVC ‘boots’.
  c) Rigid insulated barriers or partitions.
  d) Compartments formed from earthed metal.
  e) A device’s integral housing.

4.4 The Different Form of Separation

Form 1 covers overall assemblies which are enclosed so as to provide protection against contact with any internal live parts or components, but where no internal separation is provided for functional units or terminations.
For Form 1:

i. Busbars *are not* separated from the functional units.

ii. Functional units *are not* separated from other functional units.

iii. Functional units *are not* separated from any incoming or outgoing termination.

iv. Busbars *are not* separated from any incoming or outgoing terminations.

This Form is not commonly used in Ireland. The Exception is in the production of MCC panels. This Form is commonly used in France.

FORM 1

Typical MCC panel

Typical sub-distribution Board - Form 1

Note: These forms of separation are not relevant to arc fault containment which is not the subject of this specification, and would be subject to agreement between the designer, manufacturer, and the end user.

- Higher risk of contact with live components/connection
• ARC Flash – likelihood low
• Appropriate PPE should be worn
• Assume to be live/restriction from utility provider to isolate
• Visual inspection
  1. Busbar exposed? Validation/electrical meter
  2. Neutral flashguards in place
  3. Exposed conductors – cable stripped too far
  4. MCB lockable (legal). Local circuits – LOTO
• MCC – Form 1 – assume to be live/restriction. Risk to shock – pre-commissioning; commissioning; validation; troubleshooting; modification/additions. Awareness of LV and control ELV voltage

Form 2

Defines overall Assemblies which are enclosed to provide protection against contact with any internal live parts or components, and where there is internal separation of the busbars from functional units. The following general conditions apply:

i  Busbars are separated from functional units
ii  Functional units are not separated from other functional units.

Compliance with the requirements of Form 2 may be offered by manufacturers by any of the three methods. Specifiers and Users should clearly state their preference. FORM 2 (Form 2a) Basic form as above. However, with this method terminals are not separated from the busbars, or each other. The actual means of separation is not defined in the Standard.
FORM 2 Type 1 (Form 2b Type 1)
Main criteria as Form 2. Busbar separation is achieved by insulated coverings, e.g. PVC sleeving, wrapping or coating. Terminals are therefore separated from the busbars, but not from functional units or each other.

Form 2b
Terminals separate from Devices.
All other Devices/switchgear grouped.

Typical Sub Distribution Board – Form 2b
**FORM 2 Type 2 (Form 2b Type 2)**

Main criteria as Form 2. Busbar separation is achieved by metallic or non-metallic rigid barriers or partitions. Terminals are therefore separated from the busbars, but not from functional units or each other.

![Diagram of busbar separation](image)

**Note:** These forms of separation are not relevant to arc fault containment which is not the subject of this specification, and would be subject to agreement between the designer, manufacturer, and the end user.

- Assume live – restrictions from utility – not sub DB – main board
- Risk: terminals in common enclosure; working in close proximity of live terminals; validation that terminals are dead and treat all other terminals as live
- Form 2 pan assembly affords greater flexibility with regard to future additional services – safety
- ARC Flash classification – likelihood high – energy level may be low
- Minimise risk, e.g. temporary barriers, protection of swarf, debris, etc.
Form 3 defines overall Assemblies which are enclosed to provide protection against contact with internal live parts and components, and in which there is internal separation of the busbars from functional units and separation of all functional units from each other.

The following general conditions apply:

i. Busbars are separated from functional units.

ii. Functional units are separated from each other.

iii. Functional units are separated from incoming and outgoing terminals.

iv. Incoming and outgoing terminals are not separated from each other.

Compliance with the requirements of Form 3 may be offered by EIEMA manufacturers by any of the three methods. Specifiers and Users should clearly state their preference.

**FORM 3a**

Basic form as above. Terminals are not separated from the busbars or each other. The actual means of separation is not defined in the Standard.
**FORM 3b Type 1**
As basic Form 3. Busbar separation is achieved by insulated coverings, e.g. PVC sleeving, wrapping or coating. Terminals *are* therefore separated from the busbars, but not from each other.

Terminal Block and main isolator separated within a typical sub main distribution board – Form 3b
FORM 3b Type 2
As basic Form 3. Busbar separation is achieved by metallic or non-metallic rigid barriers or partitions. Terminals *are* therefore separated from the busbars, but *not* from each other.

Note: These forms of separation are relevant to arc fault containment which must form part of the design.

- Likelihood of contact with exposed components is reduced
- Likelihood is that the ‘incident energy’ is far higher
- Main distribution – potential for ARC Flash is higher; appropriate PPE should be worn
Form 4 covers overall Assemblies which are so enclosed as to provide protection against contact with internal live parts and components, and in which there is internal separation of the busbar system from functional units, and separation of all functional units from each other. Incoming and outgoing terminals are also required to be separated from the busbars and from each other.

The following general conditions apply:

i Busbars are separated from functional units.
ii Functional units are separated from each other.
iii Terminations to functional units are separated from each other.

Compliance with any of the requirements of Form 4 may be offered by EIEMA manufacturers by any of the following seven methods. Specifiers and Users should clearly indicate their preference.

FORM 4 Type 1 (Form 4a Type 1)
As basic Form 4. Busbar separation is achieved by insulated coverings, e.g. PVC sleeving, wrapping or coating. Cables are terminated within the same compartment as the associated functional unit. Cables may be glanded elsewhere, e.g. in a common cabling chamber.
FORM 4 Type 2 (Form 4a Type 2)
As basic Form 4. Busbar separation is achieved by metallic or non-metallic rigid barriers or partitions. Cables are terminated within the same compartment as the functional unit. Cables may be glanded elsewhere, e.g. in a common cabling chamber.
Most Common Type Form 4 Construction in Ireland.
FORM 4 Type 3 (Form 4a Type 3) As basic Form 4. Busbar separation is achieved by metallic or non-metallic rigid barriers or partitions. Cables are terminated within the same compartment as the functional unit. The termination for each functional unit has its own integral glanding facility. This Form of Construction not used in Ireland.
**FORM 4 Type 4** (Form 4b Type 4)

As basic Form 4. Busbar separation is achieved by insulated coverings, e.g. PVC sleeving, wrapping or coating. Terminals are external to the functional unit and separated by insulated coverings, e.g. PVC boots. Cables may be glanded elsewhere, e.g. in a common cabling chamber. 

*Note: Where connections between the cable terminals and the functional unit pass through the same general compartment as the busbars, busbar separation may be achieved by insulated covering of these connections only.*

*Used most commonly in micro-chip manufacturing client projects in Ireland but not generally common in Ireland*
FORM 4 Type 5 (Form 4b Type 5)
As basic Form 4. Busbar separation is achieved by metallic or non-metallic rigid barriers or partitions. Terminals are external to the functional unit compartment and separated by insulated coverings, e.g. PVC boots. Cables may be glanded elsewhere, e.g. in a common cabling chamber.
This Form of Construction is popular with ESB where cables are booted outside in cabling chamber.
FORM 4 Type 6 (Form 4b Type 6)
As main criteria for Form 4. All separation is achieved by metallic or non-metallic rigid barriers or partitions. Terminals are external to the functional unit compartment and enclosed in their own compartment by means of rigid barriers or partitions. Cables may be glanded elsewhere, e.g. in a common cabling chamber.

This Form of Construction not used in Ireland
FORM 4 Type 7 (Form 4b Type 7)
As main criteria for Form 4. All separation requirements are achieved by metallic or non-metallic rigid barriers or partitions. Terminals are external to the functional unit compartment and enclosed in their own compartment by means of rigid barriers or partitions complete with integral glanding facility.

- Likelihood of contact with exposed components is further reduced
- Likelihood is that the “incident energy” is far higher
- Improvements – layout of live busbars available
- Risk with testing – live phase rotation voltage power quality
- Need for appropriate PPE
- Drawings – need for board drawings

Safe Working - With Adjacent Equipment Energised
Working safely in part of an Assembly with adjacent sections live is a sensitive issue but cannot be ignored when considering forms of separation.
First and foremost within the UK, the requirements of The Electricity at Work Regulations 1989, must be complied with. Regulation 14 is particularly pertinent and requires that:
‘No person shall be engaged in any work activity on or so near any live conductor (other than one suitably covered with insulating material so as to prevent danger) that danger may arise unless:
a) it is unreasonable in all the circumstances for it to be dead; and
b) it is reasonable in all the circumstances for him to be at work on or near it while it is live; and
c) suitable precautions (including where necessary the provision of suitable protective
equipment) are taken to prevent injury.’

Regulation 4(4) in particular also applies to the provision and use of protective equipment.
Effectively this means that where live working is being contemplated a risk assessment and
judgement must be made for every situation by the Duty Holder. This must take account of all
relevant factors some of which include:

- the effectiveness of isolating the Assembly,
- the task to be performed,
- the skill level of the personnel carrying out the work,
- the level of separation within the Assembly,
- the suitability of the separating barriers within the Assembly for the task being
  considered,
- the effectiveness of using temporary protective measures,
- use of correct tools, instruments and other work equipment,
- use of warning signs, etc.

Switchboard manufacturers therefore cannot give all embracing assurances for safe working,
according to the form of separation with parts of the Assembly energised. Specifying a particular
form of separation will not guarantee this for any given Form number. It can only be provided
on a case by case basis depending on the work to be done. This is fully recognised in the Standard
and requires a separate agreement between Manufacturer and User, as detailed in clause 7.4
and Annex E.

Training our Apprentices in Form of Separation
For the purpose of understanding the level of training being offered to our electrical apprentices
when attending their off the job training with regard to different forms of Distribution Panels
and Motor Control Centres, we asked a number of current apprentices recently returned from
their off the job training phases. The following facts were agreed by all:

- No practical training offered in Phase 2,4 or 6 to work on Form 3 or Form 4 panels;
- No theory training offered in Phase 2,4 or 6 concentrating on the different forms (1 to
  4) of panel construction;
- The only experience garnered thus far in their apprenticeship was on the job.

N.B. Before work is carried out on live electrical equipment the equipment is, where
appropriate, made dead so as to prevent danger (Safety, Health and Welfare at Work
(General Application) Regulations 2007 (Section 86 (1)(b)) – S.I. No. 299 of 2007)
Appendix 1
May 2018

CLARIFICATION ON ROLE DEFINITIONS

Principle Duty Holder
Each company will have a Principle Duty Holder who has responsibility for the maintenance of the overall standard and quality of the electrical work carried out or managed by the enterprise and for ensuring that there are systems in place whereby all electrical work undertaken is carried out by competent persons who are adequately and appropriately supervised (CER16/001 V3.0). In large companies or organisations with multiple projects, each project will have a Duty Holder who will carry their duties in accordance with the Principle Duty Holders instructions.

Electrician
A qualified electrician shall have completed a QQI Level 6 Electrical National Craft Certificate to be deemed competent to work on live and dead systems. An electrician shall thus be qualified to do all electrical work. Live work should normally be specifically allocated on a case by case basis. The competent electrician can be nominated to act as an authorised person, foreman, the person in charge of the electrical installation or Qualified Certifier, who must fulfil the criteria set out by the SSB, RECI/Safe Electric.

Apprentice Electrician
An apprentice should be registered with Solas on an official programme and working towards a Level 6 Electrical Craft Certificate. An apprentice electrician can work on all electrical systems while under full supervision of a qualified electrician once they have undertaken training for the work being carries out, which should be based on risk assessment, time served and proof of competence.

Electrical Buddy
An electrical buddy/assistant is defined in section 1.4.3 of ECA Guidance Note E01: Safe Working Systems and may include a non-electrical person who has received role specific training in the use of safety equipment to enable them to carry out emergency procedures.
FOR FURTHER INFORMATION, PLEASE CONTACT:
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