

# **SAFE SYSTEM OF WORK – LOW VOLTAGE ELECTRICAL FIXED WIRING INSTALLATIONS INSPECTION AND TEST**

## **Purpose**

To provide task specific safe system of work for application during the inspection and test of low voltage electrical fixed wiring installations

## **General Work Activities**

All sites/locations and all work activities have the potential to introduce additional risks giving rise to danger. Additional guidance on General Work Activity Risk Assessments and Safe Systems of Work may be found in the Technical Health and Safety Manual and further supplemented by the Electrical Manual document ES-E-01-01.

## **Specific Work Activities**

The following Risk Assessments relate to the specific work activities that are required to enable the Engineer Surveyor to complete tasks in a safe manner. The construction is such that individual risk assessments may be reliant on the content of preceding assessments and should be used by cross-referencing as appropriate.

Further guidance may be found in 'Electricity at Work – Safe Working Practices' HS(G)85

## **Additional Consideration**

Whilst the utilisation of all Risk Assessments would be considered as a Safe System of Work it should be duly noted that risk will not be entirely eliminated but will be controlled in a way that will maintain a safe working environment. Whilst on site every Engineer Surveyor should be aware that their safety is also the concern of the Client. Under no circumstances should any Safe System of Work, as detailed, be compromised to give rise to danger

## **Work on or Near Live Conductors**

It is considered that application of the relevant control measures for live testing satisfy the requirements of Regulation 14 of The Electricity at Work Regulations 1989

## **Post Activity Responsibility**

It remains the duty of the Competent Person (Inspecting Engineer Surveyor) to ensure that on completion of an inspection and/or test activity all necessary checks are made to ensure that the installation is restored to the condition found at activity commencement. Notwithstanding the use of; Permit to Work Systems, warning signs and locking off procedures, an individual may consider the adoption of additional personal preferred measures to act as a reminder as to the condition of the installation; circuits isolated, enclosure security and test link status for example.

In the event a dangerous condition has been identified during the activity, the inspecting Engineer Surveyor should consult immediately and especially before re-energising circuits or equipment, with the Client's Nominated Person in order to prevent injury or damage from occurring.

Source publication ES-E-01-01 provides further guidance.

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<a href="#">ERA02</a>	Procedure for the purpose of Testing on live and/or dead electrical equipment
<a href="#">ERA02A</a>	Procedure to be adopted in the event a Hazardous Area is identified as part of the installation to be tested
<a href="#">ERA03</a>	Procedure for the purpose of conducting Earth Continuity tests
<a href="#">ERA04</a>	Procedure for the purpose of 'dead' testing
<a href="#">ERA04A</a>	Procedure for the purpose of Insulation Resistance testing
<a href="#">ERA04B</a>	Procedure for the purpose of Earth Fault Loop Impedance testing (Calculation Method)
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<a href="#">ERA08</a>	Procedure for the purpose of Thermography

## Risk matrix to be applied to all tasks

Probability	5 (Almost certain)	5	10	15	20	25
	4 (Likely)	4	8	12	16	20
	3 (Moderate)	3	6	9	12	15
	2 (Unlikely)	2	4	6	8	10
	1 (Rare)	1	2	3	4	5
		1 (Very low)	2 (Low)	3 (Medium)	4 (High)	5 (Very high)
		Severity				

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Probability of the event occurring:

- |                    |                               |
|--------------------|-------------------------------|
| 1. Rare:           | Less than once every 10 years |
| 2. Unlikely:       | Once every 5 to 10 years      |
| 3. Moderate:       | Every 1 to 5 years            |
| 4. Likely:         | Every 6 to 12 months          |
| 5. Almost certain: | Every 1 to 6 months           |

Severity of the event:

- |               |                                  |
|---------------|----------------------------------|
| 1. Very low:  | Very minor injury                |
| 2. Low:       | Minor injury requiring first aid |
| 3. Medium:    | Lost time injury                 |
| 4. High:      | RIDDOR reportable injury         |
| 5. Very high: | Fatality or life changing injury |

Ranking:

- |                  |             |
|------------------|-------------|
| Green (1- 4):    | Low risk    |
| Yellow (5 – 12): | Medium risk |
| Red (15 – 25):   | High risk   |

## Important Note

### Protocol to be adopted during an inspection and test, when the integrity of an enclosure has been compromised as a result of a work activity

In addition to applied safe systems of work and permit to work requirements, the following **MUST** be followed on every occasion:

- The suitable displaying of warning notices

During the course of an inspection and test, covers will be removed to allow the completion of specified work activities. Under no circumstances shall that item be left unattended without the application of one of the following measures:

- Replacing of the cover(s) and all provided fixing devices
- Isolate and 'lock-off' 'upstream' supplies. Ensuring there are NO live parts contained within that enclosure

In the event that all parts within the enclosure are compliant to IP2X/IPXXB the following is allowed:

- Isolate and 'lock-off' 'upstream' supplies. Ensuring there are NO live parts contained within that enclosure
- The implementation of a controlled restriction of access to the compartment/room/area containing the enclosure

# SAFE SYSTEM OF WORK – LOW VOLTAGE ELECTRICAL FIXED WIRING INSTALLATIONS INSPECTION AND TEST

## Risk Assessment ERA01

Activity/Hazard	Procedure for the purpose of obtaining entry into Electrical Enclosures prior to commencing with Visual Inspections and Testing
Persons at Risk	Engineer Surveyor Accompanying Person(s) Persons present at Location
Property at Risk	Installed Equipment not suitably prepared for loss and re-energising of Electrical supplies
Risks	Death, Electric Shock, Fire, Mechanical Movement, Damage to Equipment and Property

Prior to Safe System of Work Application		
Probability	Potential Outcome	Risk Ranking
4	5	20 (High)

### Control measures –

1/ Isolation of the equipment to be accessed shall be the Primary control measure. Permission to isolate and re-energise shall be sought from the site responsible person, however it is recognised that this may not be achievable in all circumstances.

*The following measures shall be applied in all cases:*

2/ Ensure adequate protection from external influences:

- The location should be dry and free from unreasonable air flow activity
- Ensure a safe distance (2.5m) is maintained, or adequate guarding is in place, from moving (or potential for moving) mechanical machinery
- Ensure isolation from potential distraction including pedestrian or mechanical movement, noise, loss or inclusion of lighting sources
- Ensure the adequate provision of a safe means of access

3/ Ensure the mechanical integrity of the enclosure will not be compromised during the work activity, with regard to the condition, size and weight of the equipment to be manipulated eg door, panel or cover

4/ Ensure the inadvertent operation of any device cannot be performed during the work activity

5/ Ensure a safe distance is maintained from live or potentially live exposed conducting material

6/ Due diligence shall be maintained throughout the work activity

Safe System of Work Application		
Probability	Potential Outcome	Risk Ranking
1	5	5 (Medium)

# SAFE SYSTEM OF WORK – LOW VOLTAGE ELECTRICAL FIXED WIRING INSTALLATIONS INSPECTION AND TEST

## Risk Assessment ERA02

<b>Activity/Hazard</b>	<b>Procedure for the purpose of Testing on live and/or dead electrical equipment</b>
Persons at Risk	Engineer Surveyor Accompanying Person(s) Persons present at Location
Property at Risk	All localised property with the potential of spread to adjacent property Individual items
Risks	Death, Electric Shock, Explosion, Fire, Personal Injury

Prior to Safe System of Work Application		
Probability	Potential Outcome	Risk Ranking
4	5	<b>20 (High)</b>

### Control measures –

- 1/ Ensure close liaison with site responsible person detailing testing intentions and requirements, identifying requirements for access and isolation of equipment/circuits as required
- 2/ Ensure complete location familiarisation. The presence of a Hazardous Area requires the implementation of an additional Assessment (ERA02A)
- 3/ For the purpose of live testing. Where practicable, isolate appropriate electrical supplies whilst making and breaking contact with the conductors/conducting material that the test leads are to be connected
- 4/ Utilise Allianz provided Test Equipment including test leads (live testing requires the use of test leads compliant to GS38). All equipment shall be in a good state of mechanical repair and in date for calibration or within the guidelines stated for test equipment proving (ES-E-06-01)
- 5/ Ensure adequate protection from external influences:
  - The location should be dry
  - Ensure isolation from potential distraction including pedestrian or mechanical movement, noise, loss or inclusion of lighting sources
- 6/ Contact shall not be made with any live part that does not comply to IPXXB
- 7/ In the case of dead testing reference should be made to ERA04

Safe System of Work Application		
Probability	Potential Outcome	Risk Ranking
1	5	<b>5 (Medium)</b>

# SAFE SYSTEM OF WORK – LOW VOLTAGE ELECTRICAL FIXED WIRING INSTALLATIONS INSPECTION AND TEST

## Risk Assessment ERA02A

Activity/Hazard	Procedure to be adopted in the event a Hazardous Area is identified as part of the installation to be tested
Persons at Risk	Engineer Surveyor Accompanying Person(s) Persons present at Location
Property at Risk	All localised property with the potential of spread to adjacent property
Risks	Death, Electric Shock, Explosion, Fire, Personal Injury

Prior to Safe System of Work Application		
Probability	Potential Outcome	Risk Ranking
3	5	15 (High)

### Control measures –

This safe system of work excludes the inspection and test of Hazardous Areas and relates to all others areas. Compliance to one, more or all of the below would be considered as appropriate to allow continuance

- 1/ Ensure the Hazardous Area is not electrically connected to the installation under test
- 2/ Permission to proceed should be obtained by the site responsible person via a permit to work scheme, identifying testing activities that may be carried out on the installation
- 3/ Ensure that when introducing injection type tests throughout the installation the potential for danger is eliminated by means necessary eg
  - Use of intrinsically safe test equipment
  - The nature of the Hazardous Area identifies a negligible risk

Safe System of Work Application		
Probability	Potential Outcome	Risk Ranking
1	5	5 (Medium)

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## Risk Assessment ERA03

<b>Activity/Hazard</b>	<b>Procedure for the purpose of conducting Earth Continuity tests</b>
Persons at Risk	Engineer Surveyor Accompanying Person(s) Persons present at Location
Property at Risk	None
Risks	Death or Personal Injury caused by tripping

Prior to Safe System of Work Application		
Probability	Potential Outcome	Risk Ranking
5	5	<b>25 (High)</b>

### Control measures –

1/ Eliminate the risk of introducing tripping hazards by one, or more, or all of the following methods as deemed necessary due to the location utilisation:

- Ensure the property is vacant with the exception of testing personnel
- Advise all persons via any suitable means of communication, of testing intentions, raising the awareness of all
- Provide additional persons that will act as safety sentries. To observe the long lead ensuring persons are adequately controlled when approaching the hazard
- Ensure the hazard is in view at all times
- Introduce a 'leap-frog' methodology, ensuring the hazard remains at a controllable length

Safe System of Work Application		
Probability	Potential Outcome	Risk Ranking
1	5	<b>5 (Medium)</b>

# SAFE SYSTEM OF WORK – LOW VOLTAGE ELECTRICAL FIXED WIRING INSTALLATIONS INSPECTION AND TEST

## Risk Assessment ERA04

Activity/Hazard	Procedure for the purpose of 'dead' testing
Persons at Risk	Engineer Surveyor Persons in the vicinity of re-energised equipment
Property at Risk	Installed/connected equipment
Risks	Death, Electric Shock, Fire, Damage to Equipment and Property

Prior to Safe System of Work Application		
Probability	Potential Outcome	Risk Ranking
5	5	25 (High)

### Control measures –

This procedure is a precursor to ERA04A (Insulation Resistance testing) and ERA04B (Earth Fault Loop Impedance Calculation Method)

1/ Ensure equipment/circuit under test that is assumed dead is confirmed dead by nature of appropriate voltage test equipment and the following method:

- Prove the correct operation of the selected voltage test instrument at a known source
- Test all conductors of the circuit(s) to be worked on to verify dead
- Prove the correct operation of the selected voltage test instrument at a known source

2/ Lock off necessary isolators with suitable personalised devices

3/ Clearly display suitable warning notices

Safe System of Work Application		
Probability	Potential Outcome	Risk Ranking
1	5	5 (Medium)



# SAFE SYSTEM OF WORK – LOW VOLTAGE ELECTRICAL FIXED WIRING INSTALLATIONS INSPECTION AND TEST

## Risk Assessment ERA04A

Activity/Hazard	Procedure for the purpose of Insulation Resistance testing
Persons at Risk	Engineer Surveyor, Persons within the location
Property at Risk	Installed/connected equipment
Risks	Death, Electric Shock, Fire, Burns, Damage to Equipment and Property

Prior to Safe System of Work Application		
Probability	Potential Outcome	Risk Ranking
5	5	25 (High)

### Control measures –

- 1/ Ensure by visual inspection means that 'borrowed' neutrals are not present and that circuit identification is concise and accurate
- 2/ Ensure that voltage sensitive equipment is not connected to circuits under test
- 3/ In the case that neutrals are to be removed, only connections that can be re-terminated with the use of insulated tools shall be used and suitable warning notices displayed
- 4/ Prior to re-energising of electrical supplies ensure that all connections are correctly secured and that all barriers and enclosures are replaced and secured

Safe System of Work Application		
Probability	Potential Outcome	Risk Ranking
1	5	5 (Medium)

# SAFE SYSTEM OF WORK – LOW VOLTAGE ELECTRICAL FIXED WIRING INSTALLATIONS INSPECTION AND TEST

## Risk Assessment ERA04B

Activity/Hazard	Procedure for the purpose of Earth Fault Loop Impedance testing (Calculation Method)
Persons at Risk	Engineer Surveyor, Persons within the location
Property at Risk	Installed/connected equipment
Risks	Death, Electric Shock, Fire, Burns, Damage to Equipment and Property

Prior to Safe System of Work Application		
Probability	Potential Outcome	Risk Ranking
5	5	25 (High)

### Control measures –

- 1/ Ensure by visual inspection means that circuit and component identification is concise and accurate
- 2/ Prior to re-energising of electrical supplies ensure that all connections are correctly secured, all barriers and enclosures are replaced/secured and that all shorting straps have been removed and accounted for

Safe System of Work Application		
Probability	Potential Outcome	Risk Ranking
1	5	5 (Medium)

# SAFE SYSTEM OF WORK – LOW VOLTAGE ELECTRICAL FIXED WIRING INSTALLATIONS INSPECTION AND TEST

## Risk Assessment ERA05

Activity/Hazard	Procedure for the purpose of Polarity testing
Persons at Risk	Engineer Surveyor
Property at Risk	None
Risks	Death, Electric Shock, Personal Injury

Prior to Safe System of Work Application		
Probability	Potential Outcome	Risk Ranking
5	5	25 (High)

### Control measures –

1/ Risks associated with this work activity are controlled by applying preceding detailed control measures with regard to:

- Access
- Test equipment utilisation and suitability for purpose
- Live working

Safe System of Work Application		
Probability	Potential Outcome	Risk Ranking
1	5	5 (Medium)

# SAFE SYSTEM OF WORK – LOW VOLTAGE ELECTRICAL FIXED WIRING INSTALLATIONS INSPECTION AND TEST

## Risk Assessment ERA06

Activity/Hazard	Procedure for the purpose of Earth Fault Loop Impedance testing (Measurement Method)
Persons at Risk	Engineer Surveyor Accompanying Person(s) Persons present at Location
Property at Risk	All localised property with the potential of spread to adjacent property
Risks	Death, Electric Shock, Explosion, Fire, Personal Injury

Prior to Safe System of Work Application		
Probability	Potential Outcome	Risk Ranking
5	5	25 (High)

### Control measures –

- 1/ Suitability and presence of equipotential bonding should be proven prior to continuance.
- 2/ In the event that the bonding is poor, consideration should be given to location utilisation including vulnerability of persons present at the location. Ensure that testing will not present a risk of electric shock by the virtue of the injection of a test current

Safe System of Work Application		
Probability	Potential Outcome	Risk Ranking
1	5	5 (Medium)

# SAFE SYSTEM OF WORK – LOW VOLTAGE ELECTRICAL FIXED WIRING INSTALLATIONS INSPECTION AND TEST

## Risk Assessment ERA07

Activity/Hazard	Procedure for the purpose of Residual Current Device testing
Persons at Risk	Engineer Surveyor Accompanying Person(s) Persons present at Location
Property at Risk	All localised property with the potential of spread to adjacent property
Risks	Death, Electric Shock, Explosion, Fire, Personal Injury

Prior to Safe System of Work Application		
Probability	Potential Outcome	Risk Ranking
5	5	25 (High)

### Control measures –

1/ Suitability and presence of earth continuity for the device and downstream circuit should be proven prior to continuance

Safe System of Work Application		
Probability	Potential Outcome	Risk Ranking
1	5	5 (Medium)

# SAFE SYSTEM OF WORK – LOW VOLTAGE ELECTRICAL FIXED WIRING INSTALLATIONS INSPECTION AND TEST

## Risk Assessment ERA08

<b>Activity/Hazard</b>	<b>Procedure for the purpose Thermography</b>
Persons at Risk	Engineer Surveyor Accompanying Person(s) Persons present at Location
Property at Risk	All localised property with the potential of spread to adjacent property
Risks	Death, Electric Shock, Explosion, Fire, Personal Injury

Prior to Safe System of Work Application		
Probability	Potential Outcome	Risk Ranking
5	5	<b>25 (High)</b>

### Control measures –

1/ Risks associated with this work activity are controlled by applying preceding detailed control measures with regard to:

- ERA01
- ERA02
- ERA02A

and shall include;

2/ Re-energising of circuits for the purpose of 'on load' image capture shall only be conducted with prior approval from the site responsible person. For specialised equipment and items that include complex interlocking systems, only site appointed competent persons may energise and de-energise circuits.

3/ On completion of image capture appropriate isolation procedures shall be repeated prior to the re-fitting of covers

Safe System of Work Application		
Probability	Potential Outcome	Risk Ranking
1	5	<b>5 (Medium)</b>

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