ISIS directive
For BT people

BES/ESV/A011

Issue 20, 07-Feb-2019
Use until 07-Feb-2020

Published by BT Technology

Privacy- None

Safe Working Procedures

Compliance with the Electricity at Work Regulations 1989 for AC and DC Power Work within BT

About this document ...

Author

The author of this document may be contacted at:

Gary Winter
Power Compliance Manager and Technical Specialist
Technology Power Policy (TNR8)
Post Point HW G556PO Box 67501
BT Centre
London
EC1P 1PG

Telephone: +441582562345
Fax:
Email: gary.j.winter@bt.com

Content approval

This is the Issue 20 of this document.
The information contained in this document was approved on 07-Feb-2019 by Gary Pearce, Senior Power Compliance Manager & Power Specialist

Version History

Version No.	Date	Author	Comments
Issue 20	07-Feb-2019	Gary Winter	Updated to reflect the BS7671 18th edition changes
Issue 19	22-Mar-2018	Gary Winter	Updated section 4.3 to a link to the training matrix spreadsheet to ensure latest version is always referenced
Issue 18	12-Oct-2017	Gary Winter	Re-instated method statement template in appendix
Issue 17	25-Apr-2017	Gary Winter	Major review and extensive changes both to policy and the documents contents in conjunction with BT Group Health & Safety Lead and policy / compliance leads
Issue 16	02-Mar-2015	Document Manager T	Document migrated onto new platform with no content change
Issue 16	26-Jan-2015	Gary Winter	Amendments to A350 process, addition of seperate A350 forms and simplification of training matrix.
Issue Draft 15c	9-Dec-2014	Gary Winter	Added training changes as per Mike Magin request
Issue Draft 15b	25-Jun-2014	Gary Winter	Reviewed and changes suggested incorperated
Issue Draft 15a	15-Apr-2014	Gary Winter	A350 amendments - draft consultation
Issue 15	11-Feb-2014	Gary Winter	Added examples of insulated tools, updated references to new amendment 1 and repaired training matrix.
Issue 14	1-Nov-2013	Gary Winter	Amended appendix forms headers.
Issue 13	16-Aug-2013	Gary Winter	Updated eaton website link and amended section 3.3
Issue 12	18-Jan-2013	Gary Winter	Addition to section 3.3 of the C3 elegibility criteria and NG supervisory LT paid allowance. Amendment to form in appendix D to reflect the above change
Issue Draft 11a	10-Jan-2013	Gary Winter	Addition to section 3.3 of

			the C3 Elegibility Criteria and NG Supervisory LT paid Allowance.
Issue 11	31-Jan-2012	Gary Winter	BS7671 amendment 1 changes incorperated and requirment for one day update course added.
Issue 10	8-Aug-2011	Gary Winter	Training matrix updated and DRB aproval for courses changes and new reference to ad hoc COW and ste representative short term cover,Author change and Training requirments amended
Issue 9	30-Jan-2007	Ian Cahill	Additional guidance on testing added to section 6
Issue 8	30-Jan-2006	Ian Cahill	Amendment to method statement, PEW and training requirement. Moinor amendment to sectiopn 9.1
Issue Draft 7c	30-Jan-2006	Ian Cahill	Minor amendment to section 9.1
Issue Draft 7b	3-Nov-2005	Ian Cahill	Training requirements amended
Issue Draft 7a	27-Jun-2003	Ian Cahill	Method statement & PEW requirements amended
Issue 7	9-Apr-2002	I Cahill	Changes to sections 4.2, 7.2.2, 7.2.3, 7.5 & 9.5. General update & minor amendments elsewhere

Table of Content

1 *Introduction*

This document outlines the overriding requirements that must be followed to ensure all works involving electricity or working on or near live conductors within BT are carried out in a safe and compliant manner. BT requires that all works meet all the requirements of the following regulations and all local or new regulations or rules & regulations in effect and applicable to the works being undertaken or planned at the time.

1.1 The Electricity at Work Regulations 1989 and the Health and Safety at Work etc. Act 1974

The Electricity at Work Regulations 1989 came into force on the 1st April 1990 and is made under The Health and Safety at Work etc. Act. 1974. The regulations apply to all places of work and impose duties on people in respect of electrical systems, equipment and all work activities on or near electrical equipment, which are available from the HMSO

- The Electricity at Work Regulations (EAWR) 1989 publication ISBN 0 11 096635 X.
- Memorandum of Guidance on The Electricity at Work Regulations 1989 publication ISBN 0 11 883963 2.

The Regulations state principles of electrical safety in a form that can be applied to any electrical equipment and work activity. They apply to all electrical systems and equipment whether manufactured, purchased or installed even if this pre-dates the Regulations. Where this is the case, this does not necessarily mean that it contravenes the Regulations. The equipment or system need only be replaced when it becomes un-safe or needs to be modified. The frequency of work on the electrical equipment or installation, the practicality of providing screening from live conductors and the inconvenience of making the equipment or system dead are key factors in deciding on replacement.

Warning: A breach of the requirements contained within this directive may be used in criminal and or civil proceedings as evidence that statutory requirements have been contravened.

1.2 BS7671 Requirements for Electrical Installations

For installation, recovery maintenance of or modification to Fixed wiring the Requirements for Electrical Installations BS7671 are non-statutory. They relate to the design, selection, erection, inspection and testing of electrical installations. BS7671 is widely recognised and accepted in the UK and it is

the view of the Health and Safety Executive (HSE) that compliance with BS7671 is likely to achieve compliance with relevant aspects of The Electricity at Work Regulations (EAWR) 1989.

BT supports the use of BS7671 as the minimum requirement for electrical installation works carried out in the BT estate. BS7671 18th Edition in force from the 1st January 2019 has been implemented within this ISIS.

1.3 British and European Standards Relating to Equipment

Equipment purchased to a relevant BS, EN or CENELEC Harmonised Document (HD) standard is also likely to meet the requirements of the Electricity at Work Regulations (EAWR) 1989.

1.4 BT Requirements

BT has developed an on-line Health & Safety Handbook, which outlines the minimum standards to which all Lines of Business are bound. This document complies with the requirements contained at https://hr.bt.com/en-wish_3rdParty/safety-wellbeing/safety/health-safety-handbook/electricity

It also provides the minimum standards on lock-out, tag-out processes, permit to work and a range of other requirements which maybe relevant to work on electrical systems and equipment.

2 *Scope*

All electrical fixed wired systems, installed or to be installed within BT buildings both AC and DC within the following voltage ranges 0 to 1000volts AC and 0 to 1500Volts DC (see section 2.2).

2.1 Responsibilities

2.1.1 Employer's Responsibility

It is the employer's responsibility to provide training, supervision, procedures and safe installations – this includes

- Extending UPS warranty/maintenance contracts to ensure continued maintenance of UPS systems,
- Periodic Inspection and Testing to meet the re certification dates,
- Completion of regulatory routines i.e. Emergency lighting, Vent, Fire Alarms etc.

so as to comply with regulation 4(2) of the Electricity at Works Regulations (EAWR) 1989 – to maintain so as to ensure the safety of the electrical

system, and the frequency and quality of this maintenance should be sufficient to prevent danger so far as is reasonably practicable. Employers must comply with the provisions of the Regulations in so far as they relate to matters within their control. For further details see the Health & Safety Handbook section on the BT Intranet

2.1.2 Employee's Responsibility

Every employee must:

- Co-operate with his employer so far as is necessary to enable any duty placed on that employer by the Regulations to be complied with; and
- Comply with the provisions of the Regulations in so far as they relate to matters within their control.

Employees have a responsibility to ensure that equipment is never abused and that laid down procedures and processes are adhered to. For further details see the Health & Safety Handbook as noted in section 2.1.1.

2.2 Voltage Levels

The Regulations apply to all types of electrical equipment and systems and no voltage limits are defined. Although the Regulations do not discriminate between voltages, this document applies to work areas where the following AC and DC Low Voltages (LV) exist:

- Less than or equal to 1000V AC or 1500V DC between conductors or less than or equal to 600V AC or 900V DC between conductors and earth.

Voltages above 1000V AC. are classified within BT as High Voltage (HV). HV systems used in BT are generally 3.3 kV AC. up to and including 11 kV AC. High Voltage Sub-Stations Responsibilities and Working Procedures are covered in PWR/HVS/A010, PWR/HVS/A011 and PWR/HVS/A012 respectively. All HV work and access to HV areas require a permit without exception.

3 *Competency*

BT has a responsibility to ensure that their people have been provided with the resources, instruction and training necessary to enable them to work safely on electrical equipment and installations in a manner that does not endanger themselves or others.

3.1 BT Staff

BT Staff carrying out work on electrical equipment and installations have a responsibility to make sure they keep themselves and others safe.

3.1.1 Requirements for Competency

BT deem competence is achieved by an individual having undergone suitable training and possessing appropriate skills and knowledge for the task in hand; and has been assessed by a competent manager as being so.

BT people planning, carrying out, or supervising AC or DC installation, testing or maintenance works are expected to have completed the following minimum levels of training (UK standards are outlined at the end of this page);

- Relevant technical qualification (must relate to electrical engineering).
- Country specific training courses (relating to country rules / regulations as to wiring standards, installation practice, testing regimes etc.
- Relevant knowledge of country specific regulations or rules related to electrical installations (such a qualification must be formally assessed, simply issuing a document will not be deemed suitable).

  Where no such formal training exists, a person's experience may be taken into account when assessing competence, for example, a successfully completed electrical apprenticeship, with some post-apprenticeship experience.

  In addition to the required formal training, the appropriate minimum BT internal training must be undertaken as detailed in section 4.2 & 4.3

3.1.2 Work experience & age

In addition to formal training, BT people must be familiar with the equipment and systems being worked upon and the procedures to be adopted to ensure safety. Additionally they must be fully conversant with the regulations, legislation and safety processes and procedures associated with the work being undertaken as required by regulation 16 of the EAWR.

No individual below the age of 18 will work un-supervised on any systems without being under the "close personal supervision"[1] of a qualified person

[1] Close personal supervision – this means that the person carrying out work can be physically stopped where the supervisory person believes danger is likely to arise from the action or omission of the individual

3.1.3 Persons in Training / Development

People who have not completed the required training or who are unfamiliar with the equipment or systems being worked upon may undertake such work provided they are under the close personal supervision of a fully competent person to aid them in attaining competency – commonly referred to as buddying.

3.1.4 Competent People

Those deemed competent (JRA&L completed and agreed) shall meet the requirements of this document and be assessed at least every 24 months or as specified within section 5.1 of ISIS document SFY/LAP/C031 for Technology or other similar LOB policy documents, if periodicity is less than 24 months.

Where the extent of the electrical work is limited and clearly defined, the person carrying out the work must have received the appropriate work specific training, licencing, A350 permit to work live (if appropriate) together with the Electricity at Work Regulations (EAWR) 1989 CBT course DLT142074 and have a current X03002, Emergency aid certificate.

The final decision as to whether or not a person is competent lies with the competent manager, any special cases will require formal review by the PEM, H&S manager and compliance manager and be documented (CM).

3.1.5 Competent Manager

Competent managers must meet the training requirements as set by this document; have a full knowledge of the equipment or systems being worked upon, be fully conversant with the regulations, legislation and safety processes, and procedures associated with the work being undertaken by the people under their control.

Competent managers issuing A350 permits to work live will be assessed yearly to ensure their competency, this will be carried out by the Senior Compliance Manager and a formal record of assessments be kept on the A350 SharePoint site.

Persons in this category are authorised to issue live working permits (A350)

3.2 Electrical Contractors

Electrical contractors must comply with the current regulations, and have in place safe working processes and procedures. To ensure contractors hold the

necessary qualifications and are trained to an appropriate standard they must be members of either the CERTSUR (formerly NICEIC), or another nationally approved independent accreditation association(s), must have achieved health and safety accreditation, or completed the assessment on line in the BT Health and Safety Handbook (See link below).

A request for a copy of a contracted contractor's staff training records should (in such cases) not be necessary but such requests are at the Contract Supervising Manager's discretion. For live working, contractors or their notified subcontractors must be approved for working live and the company must have suitable systems of working (permits) ensuring only competent people work live or near live conductors.

https://hr.bt.com/en-wish_3rdParty/safety-wellbeing/safety/health-safety-handbook/working-with-third-parties/control-of-contractors/selection-of-competent-suppliers-contractors

Suppliers must comply with the contractual requirements of BT which are detailed within the following links

www.selling2BT.COM

http://www.selling2bt.com/Downloads/healthSafetyContractorRules.pdf

Historically referred to as General Standard 11 or GS11 which is being phased out but which might still be referred to in long running existing contracts.

4 *Training*

4.1 Legislation

Regulation 16 of The Electricity at Work Regulations 1989 states that: *No person shall be engaged in any work activity where technical knowledge or experience is necessary to prevent danger or, where appropriate, injury, unless they possess such knowledge or experience, or is under such degree of supervision as may be appropriate having regard of the nature of the work.*

Only those who have both the knowledge and experience to make the right judgements and decisions together with the necessary skill and ability to implement them should undertake work subject to the Regulations.

Electrical competency can be summarised as follows:

- Adequate knowledge of electricity

- Adequate experience of electrical work
- Adequate understanding of the system to be worked on and practical experience of that class of system
- Understanding of the hazards which may arise during the work and the precautions which need to be taken
- Ability to recognise at all times whether it is safe for work to continue

4.2 Training

Internal training provided for electrical works will be approved for content and delivery, will be delivered by accredited and licenced trainers with regular reviews of the training content for accuracy and compliance with current regulations and BT processes. The delivery of the training shall also be reviewed to ensure a professional, consistent and correct delivery of all of the course content without unauthorised changes.

All training without exception will be registered and for electrical related training accessed. All training will also be registered and accessible via the current BT Learning Management System.

4.3 Training Matrix

The training courses detailed in the following matrix represents the minimum recommended and mandatory training requirements for the various generic work areas shown. An individual's training programme must be tailored to meet the individual's needs and may not include all of the recommended training highlighted in the training matrix, completing this training alone does not make the engineer competent as additional training or experience will usually be required as will familiarisation with the systems being worked upon.

For work areas indicated in the training matrix and for any other work area, training needs must be discussed and agreed between the individual and their competent line manager the same or similar shall apply to other LOB's.

BT has adopted the embedded standards across its operations in the UK. Other international operations will need to review this to ascertain what local standards of training might be applied;

Link to the latest version of the Training Matrix located on the Health and safety Handbook SharePoint site.

Without exception Course DLT142074 is mandatory as is Course X03002 (Emergency Aid) for all persons working on or near live equipment, maintaining electrical equipment or carrying out maintenance activities involving electricity.

Caution: People are only certified to work on the specific equipment for which they have received training. To be considered as competent, a person must also have experience with the equipment and systems being worked on and the procedures to be adopted to ensure safety.

4.4 Evidencing of Qualifications

Where formal qualifications cannot be evidenced, BT has adopted a common sense approach and experience is considered, however checked with competency assessments

Below is the criteria applied where qualifications cannot be evidenced.

Category	BT Approach to Determine Competency
Persons engaged full time in second line BT Power work currently with, in excess of 15 years continuous experience	BT accept the "experience" route is fulfilled if the person can demonstrate that they have completed and passed C&G BS7671 including amendment 3 certification Light touch assessment by PEMs and completion of PTS specific training courses for the specialised items Where formal training is specifically required, i.e. F-Gas, electrical testing this is completed and certificates are available.
Persons engaged full time in second line BT Power work currently with, less than 15 years continuous experience Where formal qualifications are available, BT require evidence of formal electrical qualifications including C&G BS7671 including amendment 3 certification	Light touch l competency assessment by approved PEMs / PTS and completion of PTS specific training courses for the specialised items Where formal training is specifically required, i.e. F-Gas, electrical testing this is completed and certificates are available.
Persons engaged full time in second line BT Power work currently, with less than 15 years continuous experience. Where formal qualifications are **not** available	Formal competency assessment by approved PEMs / PTS and completion of PTS specific training courses for the specialised items Where formal training is specifically required, i.e. F-Gas, electrical testing this is completed and certificates are available.
New entrants engaged full time in second line BT Power work	Full BTEC electrical trainings and a formal sign off at the end of the apprenticeship Light touch l competency assessment by approved PEMs / PTS and completion of PTS specific training courses for the specialised items Where formal training is specifically required, i.e. F-Gas, electrical testing this is completed and certificates are available.
Persons **not** engaged full time in	Light touch l competency assessment by approved PEMs / PTS and completion of PTS specific training courses for the

second line BT Power work currently	specialised items

Notes –

- Time durations are baseline expectations, but individuals have the right to request assessments at any stage, and their expertise can be reviewed for full or light touch assessment
- Where FPQ checks show failures, a formal action plan is agreed with the compliance manager and PEM.
- All competency assessment are registered with the JRA&L's on the compliance SharePoint.

4.5 Historic & Current Training Courses

DLT142074	Electricity at Work Regulations 1989
X03002	Emergency aid
DV001	New combined Replacement for X11371,2 & 3
X11371	Safe use of hand tools – Electricians Part 1
X11372	Introduction to electricity – Electricians Part 2
X11373	Introduction to electrical installations – Electricians Part 3
X11374	Installation & basic design – Electricians Part 4
X11375	BS7671 Compliance checking – Electricians Part 5
DLT134544	AC Power plant/systems general
T134543	AC Power plant/system maintenance
C&G2382	Stand-alone BS7671 17th Edition Certificate in the Requirements for Electrical Installations.
C&G2392	Stand-alone Certificate in Fundamental Inspection, Testing and Initial Verification
C&G2391-01 (replaced)	Inspection, testing and certification of electrical installations (Inc. course components 101 & 102)*
C&G2391-02 (replaced)	Design, erection and verification of electrical installations (Inc. course components 102, 201 & 202)*
C&G2394 (new 2014)	Initial and Fundamental Inspection and Testing
C&G 2395 (new 2014)	Periodic Inspection and Testing

*Course details are available at http://www.city-and-guilds.co.uk, and http://www.developtraining.co.uk

Note: Managers gaining competency must complete the FLM mangers training to at least the basic level – PTS manage this training and can be contacted for training arrangements and availability – course bookable via the current BT Learning Management System

Note: City & Guilds are in the process of revising current L3 and L4 qualifications, current guidance is that 2392 will remain the same and 2391 had been revised (qualifications 2394 and 2395 where short lived and have been replaced by 2391– there are no requirements to attain 2394 or 5 or the new reincarnation of 2391 for those who have already attained 2391.

5 *Categories of Work*

5.1 General

As indicated by the processes described in sections 7.1 and 7.2 it may be necessary to work on or near live conductors. As a guide only, examples are given below of instances where it would be expected (5.2) and where it would not normally be expected (5.3), that an authority to work live would be necessary – this list is not exhaustive.

Caution: The requirements of section 7 must be satisfied for all situations where live work is being considered.

Activities such as isolating a circuit or equipment shall, for the purposes of this document, constitute “live working” and be organised accordingly. It shall be sufficient for these purposes to issue an A350 Blanket Live Work permit for such activities.

5.2 Examples of When an Authority to Work Live is Likely to be required

Subject to the results of completing the processes detailed in sections 7.1 and 7.2, an Authority to work live is likely to be required when:

- Adding circuits to or carrying out work on live AC or DC uninsulated distribution boards;
- Working on isolated equipment within reach of live equipment which is not insulated or protected by permanent barriers;
- Making connections to and disconnections from live AC power systems;
- Making connections to and disconnections from live DC power systems;
- Connecting monitoring equipment to live AC or DC power systems.

5.3 Examples of when an Authority to Work Live is not likely to be required

Subject to the results of completing the processes detailed in sections 7.1 and 7.2, an Authority to work live is not likely to be required when:

- Adding circuits to or carrying out work on fully insulated distribution boards (i.e. where the connection of an outgoing circuit to the dead side of a fuseway without exposure to live parts) and compartmented insulated switchboards to BS EN 60439-1:1999 (IEC 439-1) Form 4 Type 1 or better;
- Working on isolated equipment within reach of live equipment that is adequately protected by permanent barriers;
- Carrying out initial or periodic inspection and tests in accordance with the latest edition of BS7671 and IET guidance note 3
- Fault finding on live AC or DC equipment, using GS 38 fused test leads, where the fault cannot be reasonably found with the equipment dead. e.g. VDUs, lift control panels, DC power systems;

Note: Although live testing or fault finding may be justified, it does not mean that any subsequent repair work should be carried out live.

- Work that is carried out on workbenches in Zone Repair Centres. This live work must be carried out in a controlled environment by trained people;
- Routine maintenance is carried out on DC power plant other than detailed in section 7.5;
- Routine maintenance is carried out on AC systems where the extent of the work is detailed in routine maintenance documentation and where the work does not contravene any of the other requirements given in this section (5.3);
- Working on or near live DC distribution systems on the equipment side of the Equipment Power Interface (EPI). The EPI is generally considered to be the input side of the DC final circuit distribution fuse. Typical examples are:
  - System X - the input side of the fuses located in the end suite fuse panel
  - Transmission - the input side of the fuses located in the end of suite fuse panel (EF80)
  - Miscellaneous - the input side of the shelf fuse mountings on Strowger type racks or the input side of the fuses in fully insulated distribution boards.

  Where final circuit protection is in the form of a circuit breaker, the EPI is considered to be the input side of the circuit breaker for maintenance purposes only. The provision of circuit breakers and associated cabling may involve live working if access to live distribution bars is necessary (e.g. Ericsson DC distribution units);
- Load monitoring of fully insulated distribution systems using clamp meters.

6 *Precautions to be taken on "Dead" Equipment*

WITHIN BT THE NORMAL PRACTICE IS TO WORK WITH ALL ELECTRICAL EQUIPMENT ISOLATED AND PROVEN DEAD.

Where equipment has been isolated, precautions must be taken to prevent the equipment from becoming re-energised or charged. Regulation 12 of the Electricity at Work Regulations defines isolation as: *the disconnection and separation of the electrical equipment from every source of electrical energy in such a way that this disconnection and separation is secure*

Lock out and Tag out.

A means of locking off an isolator or locking the distribution board (or the room in which the supply point is located) by means of a padlock should be used at all times to ensure the circuit being worked upon cannot be re energised and the person working on the circuit must retain control of the locking device.

The removal of fuses from an unlocked distribution board sited in a securely locked power room or riser coupled with suitable warning signs affixed to the distribution board would normally provide sufficient secure isolation.

Where, in high risk unsecured areas, it is necessary to work on unlockable distribution boards, consideration should be given to the fitting of locking facilities. This should be unnecessary where work is being carried out adjacent to the fuseboard, and it will be possible to stop others from accessing the isolated system.

If the system can be energised by transferred potential (electromagnetic induction, mutual capacitance or other stored energy) then the equipment must be earthed for the duration of the work.

Prior to testing dead, the isolation point should be operated to the isolated position, and a tag indicating why it is in the open position placed onto the isolator.

When testing for confirmation of "dead" circuits or equipment, the test instrument or voltage indicator used for the purpose must itself be proved immediately before and after testing of each circuit. All conductors must be tested to prove they are not live. Particular care must be taken due to the presence of dual feeds, back feeds from equipment with dual supplies. Before disconnecting a circuit from a source of supply, fully isolate the load end of the circuit. Isolate the supply for the circuit in question and test that it is dead. Remove the conductors one at a time and again check for presence of dangerous voltages.

Only after confirming that the circuit is dead, should a locking device be attached to the point of isolation

Should tests indicate the presence of dangerous voltages, carefully reconnect the conductors, fit temporary labels warning of the problem and investigate the secondary source of supply.

Safety signs should be displayed at the point of isolation and at the point of work when carrying out work.

Caution: Make it dead - keep it dead! – Lock out / Tag out

6.1 Contractor working

Where a contractor is to work on an isolated electrical system, it should be demonstrated to the Contractor that the electrical supplies have been disconnected and securely isolated. Documentation should be issued to the Contractor, a sample Electrical Disconnection Certificate is shown in section 10 appendix A. (This form may be reproduced/photocopied for use).

Safety signs must be displayed at the point of isolation and at the point of work when carrying out work.

6.2 Risk Assessment & Method Statement

A suitable and sufficient risk assessment must be produced for any proposed work. Additionally a method statement **is required** to detail how safety hazards and risks to both people and services will be managed. Sections 7.2.2 and 7.2.4 refer.

7 *Live Working*

WITHIN BT THE NORMAL PRACTICE IS TO WORK WITH THE EQUIPMENT DEAD.

Regulation 14 of The Electricity at Work Regulations 1989 states 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.

Caution: To comply with Regulation 14 there must be proper justification for working on or near live equipment.

The Management of Health & Safety at Work Regulations 1992 requires that suitable and sufficient risk assessments must be carried out on all work activities and those significant risks must be recorded by the manager.

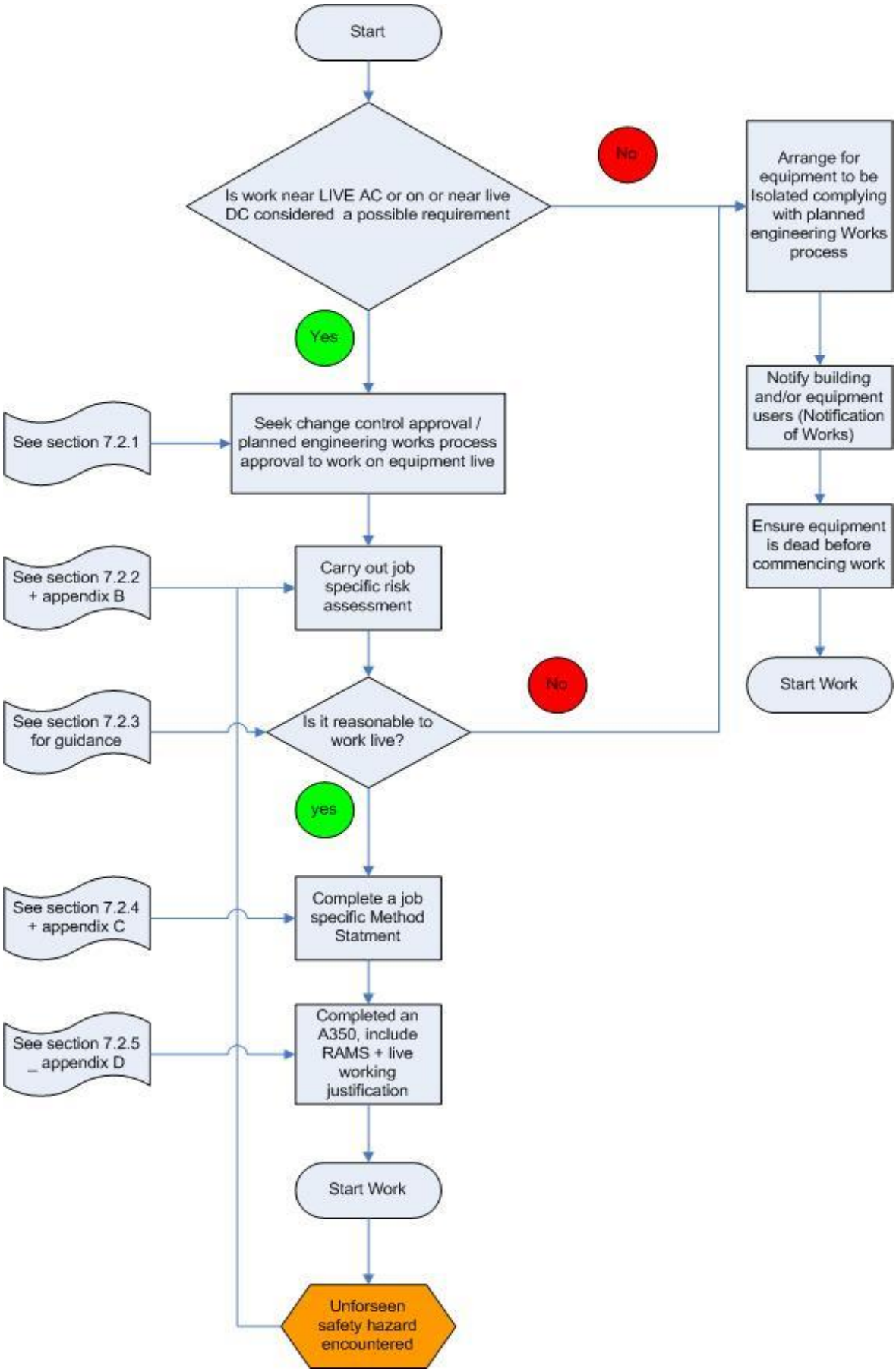
Note: Live work on AC conductors should not be necessary other than in exceptional circumstances. Any situation where it is thought that live work on AC conductors is REASONABLE should be notified to the author of this document and their line manager.

7.1 The Decision to Work Live

The factors which need to be considered when deciding if it is **REASONABLE** to work live include the following:

- When it is not practicable to carry out the work with the conductors dead. e.g. where for the purposes of testing it is necessary for the conductors to be live;
- The creation of other greater hazards (e.g. to other users of the system), by making the conductors dead.
- The need to comply with other statutory requirements such as BTs requirement not to put the network in jeopardy.
- The level of risk involved in working live and the effectiveness of the precautions available set against economic need to perform that work.
- The effect that making the conductors dead may have upon the communications network e.g. whether the 999 emergency services could be jeopardised.

The flow chart below gives an overview of the live working decision making process.


Start
Is work near LIVE AC or on or near live DC considered a possible requirement
No
Arrange for equipment to be Isolated complying with planned engineering Works process
Yes
Notify building and/or equipment users (Notification of Works)
See section 7.2.1
Seek change control approval / planned engineering works process approval to work on equipment live
Ensure equipment is dead before commencing work
See section 7.2.2 + appendix B
Carry out job specific risk assessment
Start Work
No
See section 7.2.3 for guidance
Is it reasonable to work live?
yes
See section 7.2.4 + appendix C
Complete a job specific Method Statment
See section 7.2.5 _ appendix D
Completed an A350, include RAMS + live working justification
Start Work
Unforseen safety hazard encountered

7.2 Live Working Responsibilities

There are five areas of responsibility, these being:

- System investigation
- Risk assessment
- Live Working Justification
- Method statement
- Authority to work live (A350)

The process for recording and storing A350 is detailed in the PDF file available from the following link

7.2.1 System Investigation

The responsibility for system investigation falls on the people within the power community who initiate the power work. In the majority of cases this would be a power planning group. However work may be initiated by power maintenance groups and in such cases responsibility will lie with them.

Where work is requested from outside of the power community, the need for live power work must be questioned and fully investigated by power design groups.

In all cases other than that detailed section 7.2.3, the following should be investigated and documented:

- Can the system or equipment to be worked on be switched off for the period required to complete the work?
- What level of work is required to enable the equipment or system to be made dead?
- The effect on service switching the equipment or system off would have.

Where necessary, advice should be sought from the relevant service planning group.

7.2.2 Risk Assessment

It is the responsibility of the engineer carrying out the live working to ensure a suitable and sufficient risk assessment is completed for the proposed work. However where maintenance work is initiated by those responsible for power maintenance, risk assessment responsibility will lie with them.

The hazards and associated level of risk must be investigated and documented. The means of eliminating the hazards or, if this is not possible, of reducing the risks to an acceptable level should also be documented. A Generic Risk Assessment for working on or near live conductors can be found in ISIS SFY/BTW/P020. For ease of reference the tabulated risk assessment shown in section 2 of the SFY/BTW/P020.

Groups carrying out the work must also carry out an on-site and/or local risk assessment. Where on site and/or local risk assessment identifies hazards additional to those identified in SFY/BTW/P020 the hazards and the means of their elimination must be documented. Further information and guidance on risk assessment can be found in the Risk Assessment section of the Health & Safety Handbook (https://hr.bt.com/en-wish_3rdParty/safety-wellbeing/safety/health-safety-handbook/risk-assessment).

7.2.3 Live Working Justification

The decision to work live will hinge on the level of risk involved and the effectiveness of the precautions available to minimise the risk set against the level of difficulty and amount of resource required to make the equipment or system dead. Justification must be included or referred to in the authority to work live documentation.

Responsibility for justifying live working lies with those planning the work or in the case of maintenance work, managers (competent advisors) in control of maintenance teams.

Where the proposed work allows the use of nationally agreed work methods & processes as detailed in section 7.5, it is generally accepted that detailed System Investigation is not required. In such instances, System Investigation may be limited to a reference indicating that the difficulty in organising equipment down time is recognised as out-weighing the minimal risk of working live associated with the processes, as detailed in section 7.5, are strictly adhered to.

Caution: Where people carrying out the work or people in control of people carrying out the work think it unreasonable or unsafe to work live, the work must be reviewed. The areas of concern must be addressed to everyone's satisfaction or the equipment to be worked on must be made dead – safe using Lock out / tag out process.

7.2.4 Method Statement

Those carrying out the work are expected to produce the detailed method statement. The method statement will specify how and when the work will be

carried out and address the hazards and levels of risk identified in the risk assessment. It will detail means of eliminating or minimising to acceptable levels the risks involved with the proposed work. It must identify the following:

- Site and area of work
- Purpose of work
- Timetable of events
- Indication of referenced documentation
- Names and contact details of:
  - Maintenance
  - Installations (Direct Labour or Contract)
  - Planning
  - Contract supervision
  - Power technical services
- Detailed work description in a step by step progression including actions required to reduce risks, use of specialist equipment and personal protective equipment and action owners.
- Competency of those carrying out the work and supervising or completing the risk assessments
- Contingency plans – including details of local A&E facility, and detailed routing to access services

The method statement must be signed off by those producing the method statement and the power technical support (PTS). The completed method statement must be copied to all parties listed in the contacts section of the method statement. Those producing the method statement will hold the original copy of the completed method statement..

Further guidance is available in NP&C Bulletin PAC040 – UPS Replacement and Maintenance – Process Guidance. This process is mandatory and must be followed.

7.2.5 Authority to Work Live

The authority to work live A350 Forms attached in section 10 appendix must be completed by a competent person controlling the competent people carrying out the work. The detailed process is given in section 7.3.

7.3 Authority to Work Process

If the system or equipment cannot be made dead and it is deemed essential to work on or near it live, an appropriate Authority to Work Form A350 will be required (see Section 5 Categories of Work).

All relevant sections of the appropriate A350 form must be completed.

The final decision to carry out live working, and the responsibility for issuing the appropriate Authority to Work Form A350 for working on or near live equipment, lies with the competent manager controlling electrical installation / maintenance people or their competent manager.

Where a manager does not possess the necessary knowledge, experience and training, section 3.1.5 of this document applies.

When it is necessary to issue an Authority to Work Form A350, the justification for live working must be included in or referenced out from Part 1 of the A350 Form. The supervising manager or his/her nominated competent person must complete the form and sign their name on Part 1 of the A350 Form. The Authority to Work Form must be issued to an electrically qualified and competent person, as defined in section 3.1.1, who will be carrying out the work on or near the live equipment.

In exceptional circumstances e.g. where action is required to prevent loss of service or to restore service urgently, an authority to work on or near live equipment may be given verbally by the supervising manager or his/her nominated competent person. In such instances extreme care should be taken to ensure that verbal instructions are understood by the competent person carrying out the work. The competent person should be asked to repeat the work detail back, highlighting the potential hazards and risks, the precautions to be observed together with the protective equipment to be used. However an Authority to Work Form must be completed within 48 hours.

Note: Under no circumstances should a nominated competent person issue a live working authority to him/her self.

Where indicated by the processes described in section 7.2 and to ensure BT complies with its requirement to provide a duty of care towards Contractors working on BT premises, those responsible for contract placement must issue an Authority to Work Form to a Contractor employed to work on or near live equipment. Under the Regulations the Contractor is then required to carry out their own risk assessment and produce a method statement prior to issuing their own staff with their own authority to work documentation. When placing a contract you must ensure that the Contractor, their staff and any proposed sub-contractors are competent to carry out the proposed work. The contractor must complete a suitable and sufficient risk assessment. You must also ensure that the Contractor is clear which equipment is live and appreciates the dangers present before any work is carried out on or near live equipment. Equipment to be worked on by the Contractor must be clearly marked. Contractors must work in accordance with “Contractor Safety Management Generic Standard” (GS11) which details the safety management that shall be applied by Contractors, including individuals, on all BT sites.

For further details on BT's system for the safe management of Contractors see https://hr.bt.com/en-wish_3rdParty/safety-wellbeing/safety/health-safety-handbook/working-with-third-parties/control-of-contractors.

Note: At Risk and Planned Engineering Works procedures must be complied with.

7.3.1 Accompanying Person

Where an Authority to Work Form has been issued for AC work, a second person must be present to assist whilst the work is being carried out. When carrying out electrical testing an accompanying competent person is only required when making connection to live mains distribution. At Risk and Planned Engineering Works procedures must be complied with when carrying out live electrical testing or monitoring.

For DC work an accompanying person is required when undertaking the following tasks:

- Changeover of live supply from one power system to another
- Connection of power system output to a main live distribution system. This applies where there is not already a device to enable the connection point to be isolated from the main distribution system, e.g. fuse holder (with fuse removed), switchboard or similar fitting.
- Work on live main Busbar distribution systems
- Work on UPS systems where sections of the battery exceed 120V

The accompanying person shall meet the requirements of section 3.1.1.

For many other tasks on live DC equipment, e.g. installing and testing batteries in a rack or replacing cells, an accompanying person cannot substantially contribute towards the implementation of safe working practice and is not normally required. The manager or his/her nominated competent person may dispense with the requirement for an accompanying person if, after carrying out a suitable and sufficient risk assessment, he/she is satisfied that a person working alone can complete all aspects of the task safely.

Note: **WHERE ANY INDIVIDUAL IS SUSPECTED OF HAVING COME INTO CONTACT WITH A LIVE ELECTRICAL SUPPLY, THEY MUST ATTEND HOSPITAL AND UNDERTAKE AN ECG TO PROVIDE ASSURANCE THAT NO IMPACT ON THE HEART HAS OCCURRED. THIS IS A MANDATORY REQUIREMENT, REGARDLESS OF THE INDIVIDUALS WISHES.**

7.3.2 Groups or Teams

Where groups or teams of people will be working under the authority of an A350 Permit to Work, they must be briefed on any controls put in place (such as barriers, limitations on movements, shrouding or other means of isolation adopted). They must also be made aware of any isolation points or earthing which has been put in place to provide protection for them.

It is the responsibility of the competent person who holds the A350 to ensure this information is transmitted and understood by the group or team.

7.4 Live Working Procedure

An Authority to Work on or near live equipment (up to 1000V AC. or 1500V DC only) is shown in section 10 Appendix D1 & D2. The forms are in parts.as appropriate to the work being undertaken

Part 1 is to be completed by a competent person. A copy of the completed form is given to the named competent person who is to undertake the live work. The original copy, being retained by the person issuing the form.

Note: A nominated competent person cannot issue an authority to work live to him or herself. The completion of an Authority to Work Form may be delegated to a nominated competed person. However responsibility for live working authority lies with the competent line manager.

Part 2 is signed by the person(s) under taking the work. For certain DC work an accompanying person may not be required, (see section 7.3.1).

Part 3 where appropriate shall be completed by the person(s) undertaking the work to confirm that the work has been finished or suspended. The person who issued the form completes part 4 where appropriate to cancel the Authority to Work. The person issuing the form should retain it for not more than 2 years.

7.5 Special Circumstances

Occasionally the competent manager may issue a Authority to Work Form for certain DC works on or near **live DC systems and removal of Specific DC equipment.** Authority to Work forms are issued on an individual basis and thus there are no details of the accompanying persons shown in part 2 of the form.

However, an accompanying person if needed must also hold an Authority to Work Form covering the appropriate work processes when work covered by a Authority to Work is being carried out.

Conditions additional to those given in section 7.2 required for the issue of a blanket Authority to Work are as follows:

- The Authority to Work can only be issued for a limited period of time. I.e. No longer than 12 months before being renewed if still required.
- People must be regularly employed on the work processes covered on the Authority to Work Form.
- The Authority to Work must only refer to specific and nationally agreed processes.
- Nationally agreed work processes are as follows:

Installation/recovery of batteries on rack mounted power plant where a PT specification is available

Installation of Invensys power systems and associated batteries can be found on the Eaton website URL:https://bt.powerware.com/eaton-index.php

Testing of batteries installed in rack mounted power plant, including the connection and disconnection of load frames.

Installation/recovery of batteries on UPS systems but only where isolators or interconnections are provided to split the battery into 120V or less blocks and the UPS battery breaker has been closed and any UPS system bypass or shutdown procedures completed by a competent UPS trained person.

Distribution cable connections to Ericsson DC distribution units.

Installation and recovery of Central Power Plant or generator starter and control system batteries.

Adding / replacing MCB's in Eaton PowerWare Midi 2 Power Systems and End of Suite Power distribution units (SDC) using the approved Eaton PowerWare method statements.

If the above conditions are met and an "Authority to Work" is issued then certain changes need to be made to the information normally recorded on the A350 form. The "exact location and address" section should simply say "various". The name of the accompanying person if any and the location of each job performed under the blanket "Authority to Work" should be entered on the back of the original form as work proceeds throughout the period.

Part 1 and 2 of the form should be completed and signed at the beginning of the period and part 3 and 4 at the end of the period for which the Authority is valid.

A AUTHORITY TO WORK LIVE FOR SPECIFIC DC WORKS MUST NOT BE ISSUED FOR AC WORK UNDER ANY CUIRCUMSTANCES.

8 *Precautions for Live Working*

8.1 Common precautions for AC and DC Live Work or work near live conductors

The following safety precautions **must** be taken:

- Use only insulated tools compliant with BS EN 60900:2012 see section 9 when working on or near live conductors.

- Use HSE GS38 insulated test probes and fused leads when carrying out electrical testing;
- When appropriate, stand on an insulated mat conforming with BS921;
- Key rings on chains, wrist watches particularly those with metal straps, rings, neck chains and other jewellery increase the risk of contact and should not be worn. Rings that cannot easily be removed must be covered with three layers of electrical insulation tape;
- Carefully shroud, with a suitable insulation material, (such as PVC sleeving or Perspex sheet of adequate mechanical strength for the work in hand), any parts connected to a dangerous voltage which are adjacent to the location of the work;
- Where shrouding is used (as above) then this must be suitably marked to indicate that the circuits shrouded remain live. The edges of any such shrouding should also be clearly marked (normally in red / white chevrons) to identify the end of the shrouding materials.
- Be accompanied by another qualified competent person, where an Authority to Work Form has been issued for AC work or when carrying out live AC electrical testing and/or load monitoring and/or isolation activities;
- Display appropriate safety signs (see section 9.7);
- Wear eye protection conforming to EN166 Class 8 (Face shields);
- Gloves IR must be worn where practicable, with a mechanical protective glove worn over to protect the Glove IR from puncturing;
- Fire retardant coveralls to a minimum of 20Cal/cm²
- Ensure that there is adequate access and working space to safely undertake the work.
- Ensure adequate lighting is available to safely undertake the work.
- Erect safety barriers wherever possible.
- Ensure that suitable signage indicates that persons must not enter the exclusion zone indicated by any barrier, and that live testing work is being undertaken

  Where it is found that a particular piece of equipment frequently requires work to be carried out live, consideration must be given to the installation of standby equipment incorporating by-pass arrangements.

8.2 Additional Precautions for DC Work

Most modern DC power plants systems and their associated distribution have all their live conductors either fully insulated or guarded against risk of accidental contact. This is in accordance with Specification PT1227 (Telecommunications DC Power Distribution and Earthing).

Specific guidance on safety precautions when working on or near low voltage DC power supplies are contained in ISIS SFY/ISP/A011 – Internal engineering Safety Practices. It is the responsibility of the line managers to make sure that people under their control who are asked to work on or near live DC systems are aware of the safety precautions listed in section 8.1 and SFY/ISP/A011.

In addition to the safety precautions listed above there are specific safety precautions covering DC distribution extensions and work on batteries in PWR/BCL/A012 and PWR/BCL/A011 respectively. Where appropriate these safety precautions also need to be drawn to the attention of people by their line managers.

9 *Protective Equipment*

Regulation 4(4) of The Electricity at Work Regulations 1989 states that: *Any equipment provided under these Regulations for the purpose of protecting persons at work on or near electrical equipment shall be suitable for the use for which it is provided, be maintained in a condition suitable for that use, and be properly used.*

The term protective equipment includes those special tools, protective clothing and insulating screening materials etc. necessary to undertake work safely on or near live equipment.

Note: Prior to use, all protective equipment must be checked by the user for defects – any found and the item must not be used.

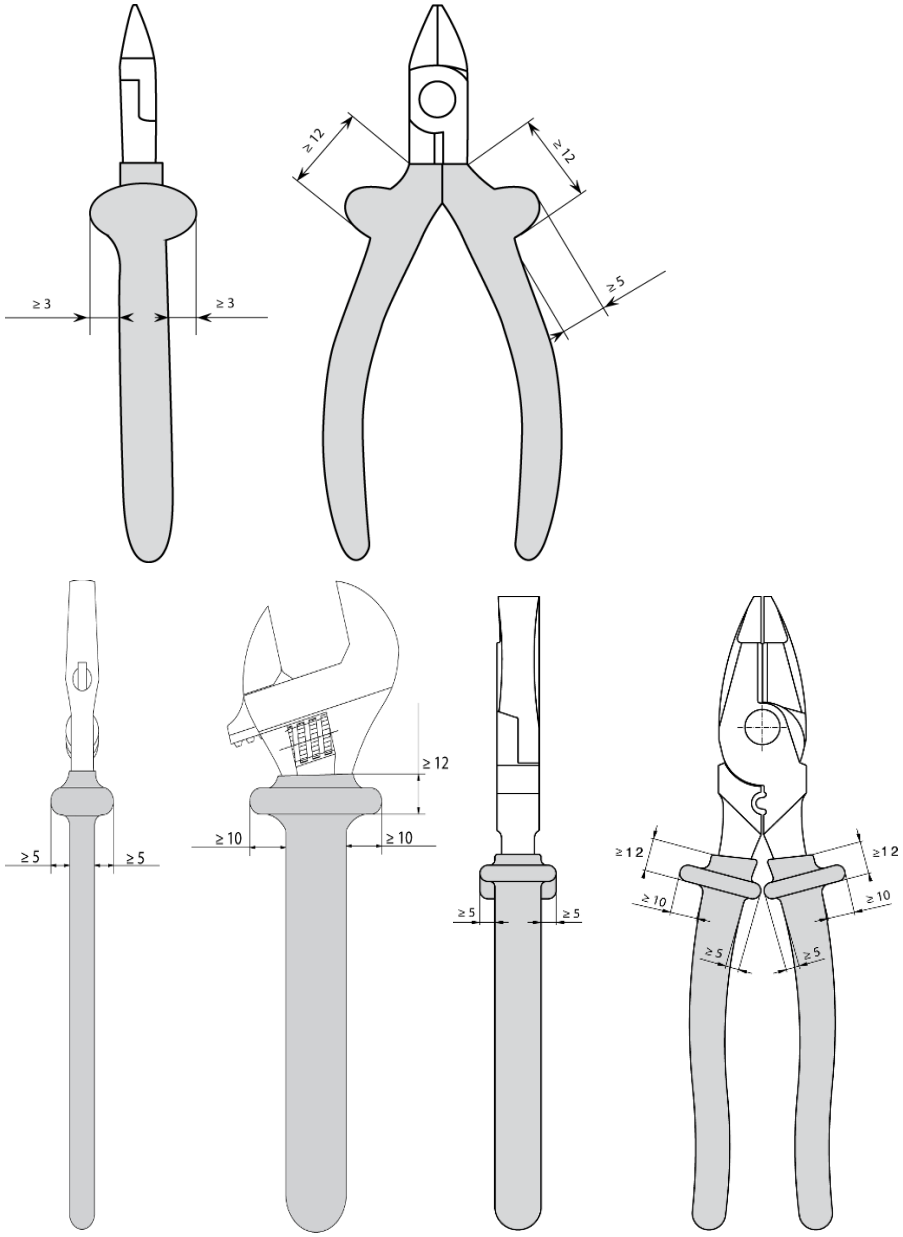
9.1 Insulated Tools

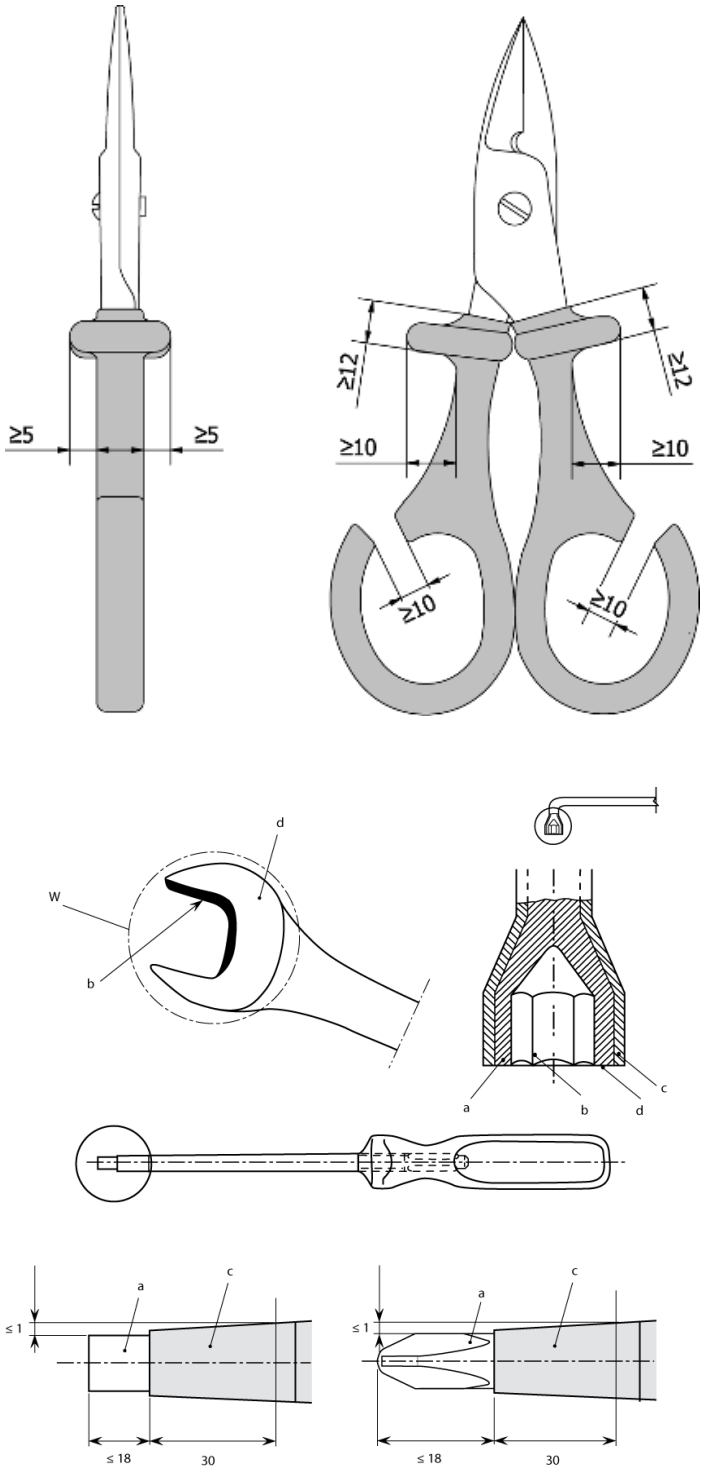
Amongst the precautions that may be required under regulation 14(c) of The Electricity at Work Regulations 1989 to prevent injury, is the provision of suitable insulated tools complying with the requirements of BS EN 60900:2012.

BT REQUIRES **ALL ENGINEERS** WORKING ON OR NEAR LIVE CONDUCTORS TO USE INSULATED HAND TOOLS

These Insulated hand tools will be marked with the following symbol and correct electrical working limit:

- They should have insulation that is robust enough to be proof against mechanical damage i.e. be suitable for the use intended and in addition be flame retardant. These tools should be inspected frequently by a suitably competent person; they should be destroyed if the insulation is damaged. A check must be carried out to ensure the insulation is not defective before commencing work.
- Example diagrams of Insulated Hand tools for working on or near live conductors:





Key

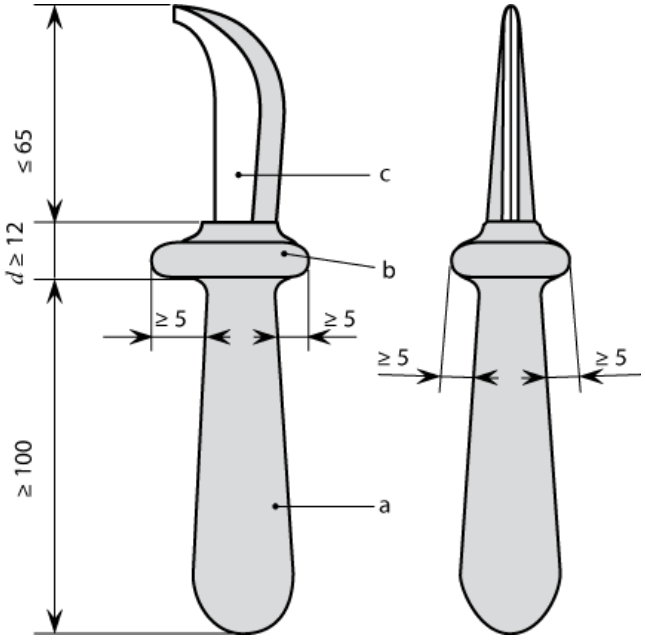
a conductive part

b working surface

c insulation

d contact area

W working head



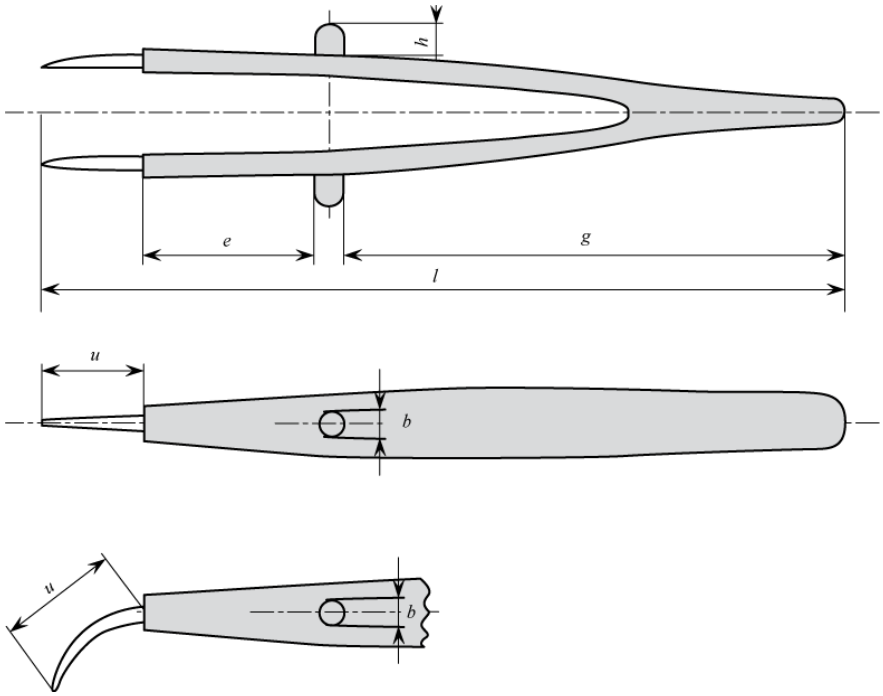
Key

a insulated handle or leg

b guard

c working head (not insulated)

d distance between the inner edge of the guard and the non-insulated part



Key

l total length of the tweezers

g length of the handle (grip)

b width of the guard

h height of the guard

e insulated part of the handle between the guard and the working head

u uninsulated part of the working head

Regulations 4(4) and 14 also makes it an absolute requirement that if it is accepted that working on or near live equipment is justified, any protective equipment necessary to reduce risks, including special tools, must be provided and should be fit for purpose and properly used.

Insulated spanners and torque wrenches for working on or near live DC conductors are available from the Electronic Engineering Stores Catalogue, tools for working on or near live AC conductors must be purchased from a reputable tools supplier – currently RS is one such an approved supplier to BT.

Tools 1000V Kit 731A item code 127497 is available from the Engineering Stores Catalogue (eASC).

Insulated tools should be visually inspected by the user before use to check that the insulation is not defective or damaged. A visual check of the tools should be carried out annually by the line manager. Any defective or damaged tools found should be destroyed and replaced. Records of annual tool checks and disposals must be maintained by the line manager.

9.2 Test Equipment

Test equipment must be suitable for the purpose it is being used for and should be manufactured in accordance with HSE Guidance note GS 38 (Electrical test equipment for use by electricians). Test equipment must be regularly calibrated as recommended by the manufacturer and environment used within, if used for recording readings as part of electrical certification or commissioning (safety related tests). Use of proving units is permitted however the proving units must be calibrated at regular intervals dependent upon its use/environment used in and the manufacturer's instructions.

Examples

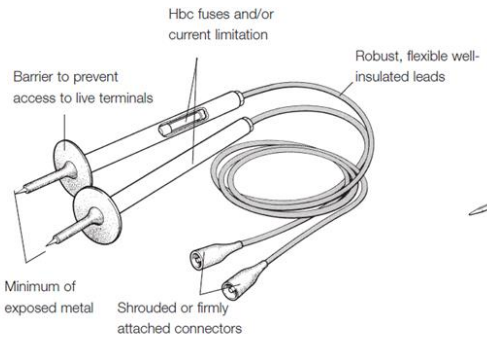


Figure 1 Test probes and leads (recommended type)

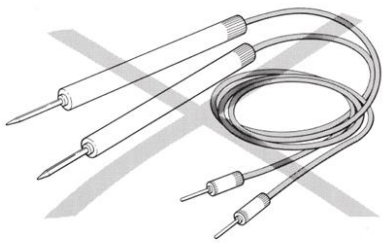
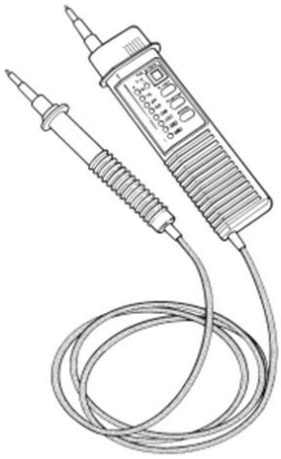


Figure 2 Test probes and leads (not recommended)

Common 2 Pole voltage tester recommended for voltage verification



A typical 2-pole voltage detector

IMPORTANT NOTE: multi ranging meters and test devices must not be used for checking for the presence of voltage due to the possibility of the user selecting the wrong range or function, which could result in false readings, damage to the test equipment, or injury to the user.

9.3 Eye Protection

Eye protection shall be in accordance with the Health and safety hand book intranet site - accessed here – Personal protective equipment. Eye shields No 5 for non-spectacle wearers and eye-shields over glasses can be worn over ordinary spectacles.

9.4 Mats IR

Insulated mats to BS 921 should be used where practicably possible.

9.5 Hand Protection

BS EN 60903: 1993 Class 00 Gloves IR should be worn where practicable and when an Authority to Work form has been issued.

Examination and testing requirements for Gloves IR made to BS EN 60903 Class 00 are as follows:

- Before use, each glove should be visually inspected then inflated to check for air leaks.
- There is no requirement to periodically electrically re-test gloves. Formal inspection and check for air leaks as part of the safety management System

check process is deemed sufficient. This should be carried out at 6 monthly periods and before each use.

Gloves failing an examination or test should be destroyed by cutting off the fingers and disposed of.

Where there is a risk of mechanical damage to the gloves, the handling of Busbar or armoured cable for example, it is recommended that leather over protectors are used. These should be inspected at the same time as the Gloves IR to check for contamination, deterioration or foreign materials that may damage the Gloves IR.

9.6 Ladders and Tower Scaffolds

Where it is unavoidable for work to be carried out at high level, ladders should be made of a non-conducting material. Further details on the safe use of ladders can be found in ISIS SFY/HSH/D030 – Access Systems.

Where work at height cannot be avoided, working dead should always be the preferred situation. Where live working cannot be avoided, then the use of platforms or other totally enclosed system should be considered. This will prevent falls from height as a consequence of electric shock causing involuntary movement.

9.7 Safety Signs

Safety signs must comply with the Safety Signs and Signals Regulations 1996. Hand written, locally produced signs are not acceptable.

10 *Appendices*

Please click here to link to Appendix A - Electrical Disconnection Certificate

Please click here to link to Appendix D1 - A350 Blanket Authority **<u>for DC working only</u>**

Please click here to link to Appendix D2 - A350 **AC or DC Authority to Work** on or near Live Equipment (Up To 1000V AC or 1500V DC)

Method Statement template

Blank template (GW version 0.1).doc

END OF DOCUMENT