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Guideline for Assessing the Competence of Persons involved in Live Working

Internationale Sektion der IVSS für die Verhütung von Arbeitsunfällen und Berufskrankheiten durch Elektrizität – Gas – Fernwärme – Wasser

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1 Introduction

Over the years live working in its many forms has been carried out across the world. Some countries have a long experience of many different forms of live working, for other countries some forms of live working represent a major departure from previous working practices. Over the last 5 to 10 years or so there have been a number of demonstrations of various forms of live working practices across Europe. These demonstrations have attempted to show the use of the latest technologies and demonstrate the expertise of those involved. It has been clear to many trained and experienced observers that there have, on a number of occasions, been serious and potentially dangerous practices demonstrated. Many of these deficient practices were due to a lack of competence of both those carrying out the live working activity as well as of those supervising and managing the live working activity. Subsequent to these demonstrations there was a collective agreement between many of the observers that there was a need, particularly within Europe, to develop some criteria and associated guidance for use by employers in assessing the competence of all those both employees and Contractors engaged to carry out live working.

These criteria and guidance provide a recommended framework that can be used by employers both in assessing their own employees (Managers, Engineers and other Workers) and for assessing contracting bodies and their employees that may be engaged to carry out live work.

It should be recognised that there are a great number of standards for tools, equipment and devices for use in all forms of live working. The Working Group has not, in the drafting of this document, considered these standards, developed in IEC, Cenelec and by National Standards making bodies over many years, in any detail. Those companies engaged in any form of live working are encouraged to use and adopt these standards as applicable to the live working to be undertaken.

This is the second guideline in a series produced by Working Groups set up by the Electricity Section of ISSA. The first is entitled “Guideline for the selection of personal protective clothing when exposed to the thermal effects of an electric arc” ISBN 3-9807576-3-3 which users of this document should take into account.

2 Influences for change

In more recent years there has been considerable pressure put on the electricity generation, transmission and distribution industries across Europe and other parts of the world to operate in a new commercial climate. These industries, many of which, operated as state run enterprises were sold off to become private companies operating in a totally new or different commercial climate. The emphasis is now on customer service, measured in terms of reliability of and continuity of electrical supplies. This is in addition to the pursuit of core business activity and the generation of financial reward for the shareholders. In many countries a Financial Regulator has been created to oversee the activities of these “new” industries and the drive from this Regulator is to attain value for money for the user. Further more within Europe there has been political pressure to permit greater freedom of the transfer of electrical energy across the continent; this has been exercised in the form of European Directives implemented as National legislation by the Nation States.

These drivers have resulted in the changes to existing working practices to embrace live working and particularly live line working in its three forms (bare hand, hot stick and rubber glove). In many instances work, previously carried out with the system/installation/equipment made DEAD, is now carried out live to prevent interruption of supplies to the user.

It should be recognised that there are many other forms of live working not restricted solely to the electricity generation, transmission and distribution industries. These other forms of live working need to be addressed. The necessity for all industry and commerce to achieve maximum output from 24 hour working coupled to staff reductions to achieve economies mean, in many cases, that the need to work live to keep plant and process operating is growing. To ensure the safety of persons engaged in live work, a range of safeguards and controls must be put into place. These

safeguards and controls apply among other matters to the selection and training of persons involved in live working. This document is a guideline document, which addresses these issues.

3 What is Live Working?

Live working is any work activity, which involves a worker or workers making contact with or approaching near to (within the Danger Zone) a conductor that is live. The Danger Zone, referred to in some standards as the Live Working Zone, is that space or region surrounding a live conductor within which the insulation level to prevent electrical danger is not assured without additional protective measures being taken, e.g. the use of insulating rubber gloves, insulating matting, insulating and insulated tools, insulating poles etc.

Live working can take many forms a few are listed below (these are listed in no particular order of priority and the list is not exhaustive):

- Live Line Working in its many forms [using insulating tools and poles (hot stick), insulating or rubber glove, bare hand, washing of live equipment and use of helicopters]
- Live low voltage cable jointing
- Diagnostic and Verification Testing on live installations and equipment
- Connection of new installations to existing live installations
- Installation of meters in live low voltage supplies
- Work on Extra Low Voltage supplies e.g. battery systems
- Electrical Testing (fault location, diagnostic, production line, verification etc.)
- Photovoltaic systems installation, testing and maintenance.

It must be emphasised that this list is neither exhaustive nor in any order of priority. Each of these work activities requires a differing level of knowledge, skills and experience i.e. competence, both of the worker carrying out the live working and of the supervisors, engineers and managers of the live working activities.

There is a need to recognise that some live work will not present the danger of electric shock due to the extra low voltages and limited energy levels present e.g. some electronic systems operating at voltages of the order of 5 V either fed via safety isolating transformers or from small capacity battery supplies. However, even small capacity battery systems can present hazards in the form of electrical arcs caused by inadvertent short circuits, which need to be addressed.

There will be other low and extra low voltage systems that are not safe e.g. large battery systems operating at 50 V d.c but with current outputs of 10's and 100's of Amps, or large electrolytic plants operating at 2V and 100,000 Amps, where the creation of a short circuit during live working could be catastrophic.

4 What is Competence?

Competence for any task is a combination of knowledge, skill and experience that enables workers, whatever their position in the organisations, is to carry out the required task without endangering himself or herself, or others.

Knowledge: knowing about the technologies involved, the electrical systems and equipment and in the case of electricity, of the dangers of electricity (i.e. both electric shock and burn) and precautions to prevent injury and harm from those dangers,

Skill: the ability to properly and readily carry out the working practices,

Experience: having a history of having carried out this type of work on the systems and equipment previously (this may have involved similar but not identical systems and equipment).

Clearly for those new to the work their experience will be either non-existant or very limited and there is the need for proper and adequate supervision of such persons when carrying out live working.

5 Developing the criteria

There are a number of ways to approach developing criteria. One approach considered and rejected was to base a system of requirements on differing categories of energy levels. This was rejected because of the experience, from accident and incident investigation over many years, showing that it would be impractical. IEC 60479 deals with electric shock criteria but there is no similar document dealing with current flow, arcing and burn injuries. A 12V automotive battery is capable of inflicting serious burn injuries when short-circuited due to poor or deficient working practices. There is evidence within Europe that even the small batteries and cells (typically 1.5 V) in hand held calculators and similar devices have caused both direct injury and indirect injury to persons from fires due to short circuits.

The possibility of basing the knowledge requirements or criteria solely on academic achievement was considered but due to the many and varied training and education systems employed across Europe this was rejected. It would be impossible to produce a simple set of criteria based on academic achievements alone that would apply across the whole of Europe at this time.

It is not possible to develop a single simple set of criteria that will be equally applicable to each and every live working activity. Due to the very varied nature of the work activities it is necessary for each employer to apply these general guidelines to the particular live working activity being considered.

What is clearly evident is that those engaged in live working, of whatever type, and at whatever level be it worker, supervisor, or engineer or manager are required to be skilled or instructed persons.

Appendix I sets out a formal approach that employers may care to use for establishing and measuring competence criteria. Employers and other organisations can adapt this system to their own needs and National requirements.

Appendix 2 sets out additional information for some of the terms used in this guideline.

Appendix 3 sets out examples of the methods used by some Nations for establishing and monitoring the competence of those undertaking live working.

6 Factors to be considered

There are those factors associated with the technical knowledge, skills and experience on the one hand and the “behaviours” of people on the other hand.

6.1 Knowledge, skills and experience factors

The core factors for knowledge, skills and experience that are considered the minimum that should be addressed for each person being considered for live working activity are set out below. They are in no particular order of priority.

1) Level of responsibility
2) Application of knowledge
3) Breadth and depth of experience
4) Quality and standards of work undertaken
5) Self-awareness
6) Coping with change
7) Analytical thinking and communication.

6.2 What are behaviours?

Behaviours are:

“The critical factors which really make the difference between average and outstanding performance”

The critical factors will vary according to the role; they include motives, traits, attitudes and values. Behaviours are distinct from, but complementary to, technical and job specific skills, knowledge and experience.

6.3 The Core Behaviours

These may be identified as follows (these are in no particular order of priority):

- Attention to detail
- Communication
- Methodical working
- Self confidence
- Self control (including calm disposition and patience)
- Self management
- Sense of responsibility
- Teamwork
- Safety Awareness.

This document gives guidance to employers on how these matters should be dealt with when they are considering appointing personel to undertake live working and when appointing Contractors to undertake live working. It provides an example of how the various factors can be considered and weighted where a formal system of assessment is required.

It is important that all workers, supervisors, engineers and managers look for and take remedial action when becoming aware of changing or impaired behaviours of any person involved in live working at whatever level in any organisation.

6.4 Physical and psychological selection criteria

When selecting employees or contractors for live working the following can provide a simple filter system.

In principle only trained and competent electro-technical persons should be allowed to carry out Live Working. Since it is of paramount importance that these persons work in strict accordance with working instructions and procedures when carrying out live work, particular emphasis should to be placed on staff selection policy.

Where the work being carried out requires teams of workers and in particular on systems operating at voltages greater than 1 kV, workers must be able to have confidence in and rely on their fellow workers.

It is recommended that an in-depth medical examination of the preselected workers should be carried out to ensure that they are able to perform the functions and responsibilities of the position that they are to be appointed to. It may be advisable to carry out medical tests to verify the physical co-ordination abilities of those selected and ensure that they are psychologically suitable to work in teams.

Both physical and mental requirements should be considered. Thus, it is of vital importance that the management critically evaluate their worker's performance in past and present positions. Only those individuals who have shown over several years that their professional performance is responsible, dutiful and reliable should be considered for appointment.

7 Aspects not addressed in detail in this guidance

The following issues are not restricted solely to live working; they are relevant to dead and other work. Employers are advised to develop a set of criteria, outside of this guidance, to assess these matters for general application to the whole workforce and for any contractors they may wish to employ.

Some of these issues may be regarded as part of general behaviours for an individual and include any matters relating to substance abuse whether it be alcohol, drug, or solvents abuse. This aspect could be regarded as a subset of self-control, self-management and sense of responsibility of that particular individual.

Questions relating to medical fitness i.e. medical and mental fitness, acceptable levels of hearing and vision, etc. to carry out the work are not dealt with, as these are matters that may be governed by National Regulation. Clearly there is a need for employers to establish a baseline set of criteria in relation to medical fitness both for the benefit of the individual as well as for that of fellow workers and the public who may be affected by his or her work activity.

For live working it is advisable that employers consider the following issues.
The potential effects of medication and medical implants on the ability of an individual to carry out live working need to be considered sympathetically by employers. Employers should consult their own occupational health medical advisors and any government or other national ccupational health employment medical advisors about these matters.

The past safety record of an individual both within the workplace and in relation to transport, i.e. his or her driving and accident record, is worth investigating as part of the selection process as it may provide a useful guide to the overall behaviour of that individual.

Any baseline set of criteria should be established with the assistance of occupational health advisors, this ensure that the criteria are both appropriate and suitable and will provide for a consistent level of application.

8 Competence Hierarchy

8.1 Survey of Competence Hierarchy

This is a hierarchy of COMPETENCE and NOT of operational arrangements. It is NOT a management structure.

Before starting any assessment it is important that the categories of the competence hierarchy be understood and that the employee being assessed is placed in the appropriate category. The following categories are proposed.

Practioner – generally a craftsman but may be a technician or engineer with knowledge, skill and experience of the live work being undertaken who is able to undertake the physical and practical live work. It is necessary in all types of live working to ensure that this person has successfully completed an appropriate course of training. The need for close supervision of those persons who have just completed a training course should be considered and implemented. As these people develop greater experience of the work, this close supervision can be reduced in a properly managed way.

Teamleader – a person with knowledge, skill and general experience of the live work being undertaken, who manages and controls a team(s) of practioners as the responsible leader. (i.e. a person who understands the risks involved and understands the limitations and capabilities of the tools etc. to be used).

Master/Specialist – a person with superior knowledge, skill and experience of the live work being undertaken (this may not include recent experience of the physical act of carrying out the particular live work being considered), who can understand the technical characteristics and limitations of tools, equipment and devices and/or develop safe working procedures, or can advise, instruct and act as a mentor to teamleaders and others.

Instructor/Trainer – a person with the required skills, detailed knowledge and practical experience able to instruct and train personnel in all aspects of live working for the work activity being undertaken.

Manager for Live Working – a person who manages the live working function, and is responsible for maintaining the highest safety standards and best practice across the full range of elements within the Live Work Managed System.

8.2 The Instructor/Trainer

The North American Occupational Safety & Health Administration (OSHA) states:

Instructors should be deemed competent on the basis of previous documented experience in their area of instruction, successful completion of a "train-the-trainer" program specific to the topics they will teach, and an evaluation of instructional competence.

Appropriate selection and training of instructors/trainers is the key element in ensuring that live working practitioners are provided with the necessary skills to enable them to perform their objectives competently. Should the competency of the instructor/trainer be in question then it necessarily follows that the practitioner will not achieve competency.

It is generally accepted that an instructor/trainer for live working must meet the following minimum requirements:

a) To have successfully completed a formal type of electro-technical apprenticeship or similar. They must have been provided with the core knowledge for the topic area concerned including

maintenance activitiy where appropriate. This training must include formal training in live working.

b) To have completed a specified minimum period of applied work experience (for example this may vary between 4 and 7 years depending on the Country concerned)**.** They must have gained experience in the field applying the core knowledge to be able to instruct work methods and techniques

c) To have successfully completed formalised instruction in training processes.They must have been trained in instructional techniques

d) To have had at least two years experience training apprentices in equivalent dead working techniques. They should already have experience training practitioners in the particular trade or work activity before moving into risk techniques such as live working in that trade or work activity.

There are a number of key qualities which are desirable in an instructor/trainer, these include

- Knowledge

  An instructor/trainer must know, understand and be themselves competent in the work process. They must have a working knowledge of other relevant information and be able to answer accurately any questions on the subject of live working. He or she must develop his ability to observe trainees' actions in detail and to offer quick correction and sound guidance.

- Patience

  Competency is achieved through repeated demonstration of the techniques and principles in various scenarios. The instructor/trainer must develop his/her ability to monitor and guide the trainees to a successful conclusion.

- Understanding
  Because training new practitioners is stressful to both students and the instructor/trainer, the instructor/trainer needs a calming but firm temperament. Trainees may be sensitive to abruptness, impatience, or lack of sympathy. If so, they will react immediately and unfavourably to evidence of any of these on the part of the instructor/trainer.

- Consideration
  Most trainees start out with a positive interest in their performance in the technique. An instructor/trainer who is considerate from the beginning, and who provides encouragement throughout the training, will produce positive results.

- Respect
  An instructor/trainer must be respected at all times. Respect however, is earned, and an instructor/trainer retains that respect quietly and with dignity by demonstrating a complete and thorough understanding of live working.

- Alertness
  The most capable practitioner may forget a vital point during training. The instructor/trainer must be alert for this possibility and patiently correct the error when it occurs. The instructor/trainer must constantly encourage and motivate the trainee by providing positive feedback on all progress.

- Helpful attitude
  Neither a combative nor condescending attitude will result in a positive effect and should not be countenanced.

- Encouragement
  The instructor/trainer can encourage practitioners by convincing them that good practice and high standards of live working is not a mystical science.

The systems of live working have been developed for easy and simple application using proven methods. Poor performance is usually due to lack of knowledge or faulty application of the fundamental principles on the part of the trainee. The instructor/trainer imparts his/her knowledge and helps the trainees develop the appropriate “mindset” and philosophy towards the work process.

8.3 Train the Trainer

It is accepted that for a Company to develop control over training then in addition to the provision of a practitioners training programme, a “Train the Trainer” course may be required.

8.3.1 Instructional Techniques

The candidate instructor/trainer attends a course in instructional techniques and training methodology.

8.3.2 Attend Class

The candidate instructors/trainers attend, as observers, the full live working training course delivered by a qualified instructor.

8.3.3 Co-teach with a Qualified Instructor

When the candidate instructor/trainer feels comfortable with the course material, he or she will teach the class with a qualified instructor present who will provide such mentoring as necessary.

8.3.4 Qualification

When the instructor/trainer feels confident and is deemed competent, he/she will deliver a course with a qualified instructor monitoring all the lectures. At the end of the course, a completed report of the instructor's/ trainer`s performance should be provided identifying any areas for improvement.

8.3.5 On-Going Mentoring

In order to improve the quality of course delivery on going mentoring may be provided whereby the instructor/trainer would work with a qualified instructor who would provide additional on-site co-teaching opportunities.

8.3.6 Maintenance of Competency

Instructors/trainers should be required to maintain professional competency by participating for example:

- In continuing education or professional development programs or
- By completing successfully an annual refresher course or
- Having an annual review which should include observation of an instructor's/trainer`s delivery, a review of those observations with the instructor/trainer, and an analysis of any instructor/trainer or
- Class evaluations completed by the students during the previous year.
- Or any combination of the above.

Whilst individual competence is being established and assessed, overall safety performance of any team will depend on the collective competence of that team.

8.4 Manager for Live Working

It should be recognised that there is a need to address the overall management of the live working activity. This is not an attempt to deal with the managerial structure of the organisation. The following is suggested as a possible outline for organisations to consider and adjust to their own circumstances.

8.4.1 Role Summary

The Manager for Live Working, in managing the live working function, will be responsible for maintaining the highest safety standards and best practice across the full range of elements within the Live Working Managed System.

A Live Working Managed System is one containing inherent controls and safeguards, which are designed to ensure the safety of the worker carrying out the live work, and include the following elements:

- Development of approved work methods;
- High quality training;
- Regular equipment testing;
- Workers being assessed and developed on a continuing basis through job auditing and refresher training.

8.4.2 Key Responsibilities of the Manager for Live Working

- Maintain the highest levels of safety throughout the activity.
- Responsible for overall training and approvals policy for live work.
- Maintain and continually seek improvement, together with risk assessment, of the body of documentation containing the approved live working methods.
- Monitor safety performance through management of the auditing function across all of the live workingteams, ensuring completion of resultant follow-up actions.
- Live work training: identify training needs, source training providers, and continually assess effectiveness.
- Responsible for the policy on electrical and mechanical testing of live working tools and equipment.
- Evaluation and procurement of tools and equipment used for live work, including where applicable transport.
- Ensure consistent application of standards, policy, and procedures, across the function to comply with legal requirements.
- Promote maximum utilisation of live working methods and resources.
- Research and develop new opportunities in live working methods, in order to meet business needs.
- Keep abreast of international developments in live work equipment and work methods.
- Maintain up-to-date knowledge of international technical standards that impact on live working.
- Provide technical support across the function.
- Management of change.

8.4.3 Generic Competencies for the Manager for Live Working

Focus on safety: all work is carried out on the basis that the health and safety of the worker are of paramount importance.

Change Innovation: a willingness to develop new methods and turn ideas into action.

Focus on customer needs: focus effort on understanding and meeting the needs of both managers and team members.

People/Interpersonal Orientation: develop effective relationships with others.

Technical Focus: demonstrate credibility within own area of expertise, together with understanding of technical requirements of other functional areas.

Focus on delivery of results: commitment to delivery of results on time and to agreed standard, through effective objective setting and monitoring.

8.4.4 Skills/Knowledge/Experience

Technical

- A detailed knowledge of safety issues, safety legislation, safety standards, and all international standards relating to live working.
- A thorough understanding of the technology, operations and processes.
- A detailed knowledge of the design, construction, and maintenance standards applicable to the work being undertaken.

- A detailed knowledge of work methods, materials, transport, and tools, pertaining to both live and dead work.
- A detailed understanding of audit techniques.
- An understanding of training methods and their ongoing assessment for effectiveness.
- An understanding of the contribution to the business of the live work to be carried out.

Financial

- The ability to analyse work methods and costing data for accurate business performance analysis.
- A good knowledge of budgeting and financial management techniques.

Information Technology Skills

- Management of documentation systems

General

- Qualities such as thoroughness, and methodical in approach, would be desirable attributes for a Live Working Manager

8.5 Eligibility

Any person fulfilling the above criteria can be considered as suitable for such a post. However, where this person does not have an academic qualification or background in electrical engineering, the employer should make arrangements for suitable and appropriate technical support to be made available to the manager. This support can be provided by an external resource.

See Appendix 4 for an example of a typical organisation chart.

9 Process for assessment for Live Workers

All personnel who are to be trained to carry out live working or who have been trained and are being selected for work should be interviewed. The interview panel should consist of a minimum of two persons with knowledge of the work to be undertaken. Depending on the organisation and whether there is a need for a formal system of assessment the degree of recording of information will vary. However it is recommended that even for the less formal systems of assessment some record of the interview/assessment is kept for future reference.

For formal systems of assessment the candidate can be scored against the criteria listed in Appendix 1. In such cases the employer should set out minimum acceptable scores, which may be higher than the scores suggested here.

Associated competence issues are described in greater detail in Appendix 2.

10 Examples of Competence Requirements

Appendix 3 contains descriptions of live working competence policies currently applying in several European countries. These examples outline current practice in relation to selection procedures, training and approvals, together with statutory requirements, which apply. These examples should be particularly useful for those companies who are considering the introduction of live working techniques, using either internal staff, or contractors.

Appendix A1 – Assessment Criteria for Live Working Competence

(Note this is a detailed annex but readers of this document can modify it as they consider necessary and appropriate for their own organisation).

A1.1 Knowledge, skills and experience factors

The following core factors are considered the minimum that should be addressed. They are in no particular order of priority.

a) Level of responsibility

b) Application of knowledge

c) Breadth and depth of experience

d) Quality and standards of work undertaken

e) Self-awareness

f) Coping with change

g) Analytical thinking and communication.

It is possible to set out requirements against each of these factors and to weight them accordingly.

Typical examples are given below and the tables are in no particular order of priority.

Description of Level of Responsibility	Yes/No	Score
Still receiving training and/or work is defined in detail, highly supervised and frequently checked. Work likely to be of short duration/transitory nature and/or routine.		0
Newly completed training. Working as a member of a team under supervision with spot checks on work. May have limited responsibility for others. Level of influence restricted.		1
Working generally as a member of a team, or supervised by a section leader. Expected to identify problems. Exercises influence over work method. May have technical staff reporting to them.		2
Working alone or as member of a team with responsibility for major part of project(s). Expected to problem solve. Significant influence over work method.		3
Working as team leader or manager/project manager with responsibility/control for one or more major projects or for the work of their team and for expenditure. Has substantial discretion. Likely to also carry some significant departmental responsibilities.		4

Application of knowledge

Description of level of appliction of knowledge	Yes/No	Score
Theoretical or superficial knowledge only. No or little evidence of application of knowledge or knowledge and area of work of little relevance to accreditation/certification.		0
Knowledge predominantly theoretical. Limited evidence of application. Issues dealt with uncomplicated. Work area of limited relevance.		1
Demonstrates ability to apply theoretical knowledge to issues resulting in workable solutions. Acceptable understanding/knowledge of underpinning principles. Work of general relevance to accreditation/ certification.		2
Demonstrates a good depth of knowledge, which has been applied to complex issues. Has been instrumental in implementing solutions. Good understanding/knowledge of underpinning principles. Work generally relevant with highly relevant aspects to accreditation/certification.		3
Has applied knowledge to a range of complex issues and has successfully developed and implemented solutions. Demonstrates in depth understanding knowledge of underpinning principles. Work very relevant to accreditation/ certification.		4

Breadth and depth of experience

Description of breadth and depth of experience	Yes/No	Score
Experience very narrow confined to one specific area of the discipline from a single perspective or in very little depth.		0
Experience has focused on one or very few areas of work with limited variety and exposure to new issues. Input may be limited to discrete areas or of limited duration. Depth of experience restricted.		1
Has experience in several areas or has covered a few areas from several perspectives in some depth.		2
Has experience in a range of areas or has worked in a number of areas from several perspectives and shows a good depth of experience. Input across significant parts of the lifecycle of the work/project.		3
Has experience in a wide range of areas and has operated in them from a number of perspectives, or has worked in a specialist area and shows a very strong depth of experience. Input throughout the lifecycle on substantial parts of the work/project.		4

Technical quality and standards of work undertaken

Description of quality and standard	Yes/No	Score
Majority of experience has involved routine and mechanistic work to prescribed specifications.		0
Much of work experience routine with limited opportunity to develop novel solutions. Methods applied non complex.		1
Provided evidence of experience of work, which is largely non-routine. Development of specifications and methods. Some development of complex solutions.		2
Experience of developing and applying complex methods. Substantial development of different solutions. Innovative use of knowledge. Experience of working in emerging areas or using new methods/ technologies.		3
Experience of working in complex dynamic environments or roles applying complex methods. High degree of innovative application of knowledge and development of workable solutions. Substantial experience of working in emerging areas or using new methods/technologies.		4

Description of levels of self awareness	Yes/No	Score
Very little or no evidence of being aware of his/her limitations. No evidence of being aware of when to seek assistance from others to achieve a result.		0
Lacks the capacity to recognise his/her limitations. Limited evidence of appreciating the benefit of seeking assistance from others in order to achieve a result.		1
Evidence of an effective level of self-knowledge, and reasonably aware of his/her limitations. Demonstrates the capacity to seek assistance from others in order to achieve a result.		2
Talks about him/herself and own limitations with more insight than most. Demonstrates clear understanding of own limitations. Evidence that he/she appreciates the benefit of seeking assistance from others at times, and displays confidence in doing so, in order to achieve a result.		3
Strong evidence of a high level of self-knowledge. Highly perceptive about own limitations and expresses this confidently. Readily seeks assistance from others and does so in a highly appropriate manner.		4

Coping with change

Description of ability to cope with change	Yes/No	Score
Poor example and /or no evidence of using initiative to solve a problem. Evidence of accepting and or resigning himself or herself to established ways rather than looking for new improved methods.		0
Limited evidence of initiative in coming up with new/improved ways of doing things. Limited evidence of being open to, and seeking out, new/improved ways of doing things. Demonstrates limited ability to initiate new improvements or solutions at work.		1
Example demonstrates an average level of initiative. Evidence of an ability to identify and implement new improved methods at work.		2
Example demonstrates an above average level of initiative. Evidence that he/she has searched for a new/improved approach to a problem in order to arrive at a solution. Evidence provided that he/she can also implement novel solutions.		3
Very strong example, demonstrating a high level of initiative. Demonstrates that he/she has come up with a highly innovative solution/new idea which has led to positive changes and had a beneficial impact on the working environment.		4

Description of analytica thinking ability and communication	Yes/No	Score
No evidence of having identified or assessed relevant information. No evidence of evaluating information from different sources.		0
Limited evidence of assessing and evaluating relevant information from different sources. Has failed to grasp or identify all the important details in the situation.		1
Demonstrates sound ability to identify and assess relevant information in a relatively challenging situation. Evidence of assimilating information from different sources and provides reasonable justification for solution given.		2
Evidence of above average ability to extract and critically assess relevant information in order to solve a complex problem. Clear evidence of assimilating relevant information from different sources in order to reach a solution with ease. Sound justification provided for solution reached.		3
Very strong evidence of ability to extract and critically assess relevant information and details from a range of different sources. Evidence of assimilating complex information quickly in order to arrive at a rational solution. Provides strong justification for this solution.		4

Score Summary

Factor	Score*
Level of professional responsibility	
Application of knowledge	
Breadth and depth of experience	
Technical quality and standard of work undertaken	
Self awareness	
Coping with change	
Analytical thinking and communication.	

* Score inserted to be agreed between assessors – where there is a failure to agree, the lower score to be inserted.

Suggested Minimum Factor Scores for category of worker

Factor	Scores				
	Prac-tioner	Team-leader	Master	Trainer/ Instruc-tor	Manager
Level of professional responsibility	1	4	4	4	4
Application of knowledge	1	2	3	4	2
Breadth and depth of experience	1	2	3	4	2
Technical quality and standard of work undertaken	1	2	3	4	3
Self awareness	2	3	4	4	3
Coping with change	2	3	4	3	3
Analytical thinking and communication	2	2	4	4	3

Appendix A2 – Further Criteria for Live Working Competence

Explanations of the terms used in the guide to competence assessment.

A2.1 Knowledge

The experience in developing competence criteria for otherwork activites shows that it is not practical to assess knowledge on the basis of examinations passed or qualifications gained. Across Europe the technical education systems are very different and would not lend themselves to consideration of minimum levels of qualification or examinations passed as a suitable and practical way to assess the required level of knowledge for a particular work activity.
However it is possible to set criteria for the minimum content for any knowledge based learning.

A2.2 Skills

This requirement lends itself more readily to the setting of practical skill levels that can be assessed by practical examination and tests. Clearly manual and dexterity skills are more important for the workers undertaking the work activity than perhaps for the supervisors, engineers and managers. However supervisors, engineers and managers would need to have an appreciation of the effort involved in order to properly assess the risks and hazards involved in the work. There are certain subsets of requirements that can be gathered under the broad heading of skills and these are listed below.

A2.3 Experience of electrical work

It is necessary that anyone undertaking electrical work should have experience of carrying out that kind of work. It is not acceptable to request someone to undertake a task that they either have no knowledge or experience of. They need to understand the system to be worked on coupled to practical experience of that kind of work. Minimum periods of 3 years experience and competence in dead working have been suggested

This requirement can be considered as a time related criteria i.e. the longer someone is engaged in a work activity the better their practical skills should become, coupled to the development of suitable and appropriate knowledge both of the systems and of the equipment to be worked on.

A2.4 Understanding of the hazards and precautions necessary

Those undertaking work need to be able to identify the hazards associated with the proposed work and be able to implement the proper precautions to protect both themselves and others against these hazards. Assessing this aspect may be well addressed by suitable questioning and practical examination.

A2.5 Understanding when to stop due to danger arising

All workers need the ability to recognise when it is NOT safe to commence or continue their work for whatever reason. Again this criterium may be tested by examination and questioning.

A2.6 Supervision

The degree of supervision of any task will depend upon the experience of the person undertaking the work. For a new worker the supervision may be immediate or close i.e. the supervisor is alongside the person during the whole of the task, whereas for an experienced worker carrying out a familiar task it will be much less frequent. This aspect will need to be included in the criteria to be set for live working.

A2.7 Accompaniment

Some Nations require accompaniment during live work others regard it as a “desireable” measure. In either case it is necessary to consider the competence of such a person when live working is involved. Training of such persons is necessary and appropriate criteria must be applied. It is necesasary to consider the role of this person in the achievement of safe working, e.g. why are they there, and what are they to do? The usual role is to be able to electrically isolate the installation, system or equipment without endangering himself or herself when something goes wrong and to render help to the worker carrying out the live work activity. Rarely are they there to oversee the work in progress and so ensure no mistakes take place.

A2.8. First Aid

It is recommended that all workers engaged in live work undergo a formal course in first aid including resuscitation and cardiac massage and that this is updated each year.

The European Resuscuitation Council publish standards for basic life support skills. Guidelines are available at the website www.erc.edu. National Committeess responsible for setting standards for basic life support skills use these guidelines and adapt them for national use.

Appendix A3 – Examples for National Competence Criteria

The following examples of requirements for competence for live working as used by various Nations in Europe, are given to enable readers of the document to understand what has to be put into place. Readers of this document may care to select the example or examples most suited to their needs to provide a model for implementation of the guidelines.

A3.1 Czech Republic requirements for workers carrying out live work on low voltage overhead lines

In the Czech Republic Live Working activity is regulated by Czech Standard ČSN 34 3100 and Guideline 50/78 (Guideline No. 50/78Sb of Czech Body for Labour Safety).
Live Line Working on low voltage overhead line systems is considered as a routine work of person who is responsible for operation, maintenance and installation of distribution network.

A3.1.1 Persons who undertake live work must fulfil following qualification conditions:

a) Successful completion of the final examination of Electrotechnical Training Institution or Electrotechnical College or Faculty of Electrotechnics of a Technical University.

b) Based on this level of education the shortest permitted time for practical experience is one year of dead working on electrical systems up to 1000 V a.c.

c) After fulfilling this experience the person will be authorised in writing for live work on systems up to 1000 V a.c. and and possibility be qualified in educational training for Live Working on systems up to 1000 V a.c.

d) Personal training is carried out in training centres with relevant accreditation from the Ministry of Education.

c) Training centres issue certificate of successful graduation in theoretical and practical training for selected types of Live Working activities for low voltage with a statement of the types of working procedures that have been successfully completed.

d) Each working procedure taught in a training centre must pass a legal approval process.

e) Organisations undertaking selected types of Live Working activities issue their own guide instructions or procedures and also lists of protective and working aids, operating precautions and specified qualifying demands. These operating instructions and procedures incorporate conditions for verification of knowledge of persons appointed to management and performance of Live Working. Verification of this knowledge must be followed in accordance with Guideline 50/78 with a minimum period of not less than three years experience, unless it is stated otherwise.

f) Organisations undertaking Live Working have to authorise their employees to this activity.

A3.2 French requirements for those carrying out live work on high voltage overhead lines and substations

A3.2.1 General conditions and training

The practice of live working in France is strictly regulated. The legal framework has been established over the period since the early sixties, by successive steps upto 1989. In parallel with the establishment of this legal framework has been the agreement to and generalization of live working at *Electricité de France* (EDF), on the whole distribution and transmission systems in France.

According to a Decree of 1982, operation and maintenance of distribution systems has to be carried out in compliance with the requirements laid down in a collection of general provisions for electrical safety, i.e. the publication UTE C18-510. The Ministries have approved this collection.

Live working must be carried out in compliance with these general instructions and with a set of technical requirements related on one side to procedures, safety rules and work methods (denominated “Conditions of Work Execution”) and, on the other side, to the use of work equipment (“Technical Sheets”).

In cases where the task cannot be carried out in strict compliance with these provisions, the task must not be carried out under live conditions.

A statutory body, the Live Working Committee, gives authorizations and approvals.

The training is delivered by authorized training centres and in accordance with approved programs.

Practitioners must already have a minimum period of experience of dead working and have sufficient knowledge of the relevant distribution and/or transmission systems.
Other prerequisites necessary to gain access to the initial training, are a minimum standard of academic knowledge in:

- Mathematics
- Electrotechnics
- Mechanics
- Technology of the components of the HV installations
- The ability to work from poles/towers or from aerial devices.

The initial training focuses on:

- The knowledge of a set of general and technical requirements as described above (theoretical component of the training), and
- The ability of these persons to carry out the specific maintenance tasks in compliance with the previous theoretical requirements (practical component of training).

A set of training modules have been developed to fit the various needs, depending on the voltage range, the work methods and the type of electrical installation.

Typically, training modules at medium voltages (Distribution levels) refer to the following work methods or any combinations of them (this is not an exhaustive list):

- Distance method (hot stick)
- Glove method
- Bare hand method.

Training modules at higher voltages (Transmission levels) refer to:

The working method:

- Distance method (hot stick)
- Bare hand method.

Specific techniques like cleaning, washing or use of helicopters.
The nature of the HV installations, such as:

- Overhead lines
- Substations.

Transfering skills through practical exercises is intended at first to develop the individual ability to identify the specific risks associated to live working, from the earlier stage of the process (preparation of the work).

According to the type of modules, a series of practical exercises, representative of the maintenance practices and objectives, as selected by the employers, must be completed by the participants.

When the training is completed, the practitioner is issued with a certificate, which acknowledges his/her ability to implement the live working methods, in a specific area of application.

The employer may then allow him/her to work on live installations in the relevant area, taking also into account his/her general behaviour. The employer delivers an individual authorization form to the practitioner. This form is valid for a period of one year and the recipient must be re-examined every year.

A3.2.2 Competence of live working teams

The previous requirements are pre-requisite to any live work practice, and apply to every practitioner.
The management of the company is then responsible to maintain the global competence of the live working teams and to maintain the quality level of their practice.
General speaking, the following criteria are considered by the management of EDF and "*Réseau de Transport*" (RTE).

Practitioners must follow a progressive course of training, extending step by step their field of practice and the variety and complexity of the operations they are allowed to undertake.

Live working activities are managed in order to ensure that the live working teams have each year a sufficient amount of tasks to be carried out under actual live working conditions.

Knowledge and skills are checked regularly, and in particular every year when the authorization must be renewed. If the knowledge and skills are found to be deficient, or in case of a long interruption of the live working activitiy (several months), it is recommended that the practitioners be re-trained.

External audits may be scheduled, with the support of experts, who are not part of the management of the live working teams.

A3.3 German requirements for those undertaking live working

A3.3.1 Training and education, refresher training

Skilled persons for live working have to undergo a special training. Admission to training courses is only possible, if the person can give evince of two years' experience with dead working.

At the end of the training courses candidates have to pass theoretical and practical examinations, which must be repeated every four years.

The level of knowledge has to be checked every two years in theory and practice. An annual follow-up course is required for personal that works on live parts only seldom or less frequently. A decision on how frequently such a knowledge check is required has to be taken by the responsible super visior.

Attending special training courses for live working requires the technical qualification “Electrical skilled person” acc. to the national regulation (BGV A2 § 2, sect. 3) and evidence of a valid first-aid training course.

Training courses must meet the following minimum requirements:

A3.3.2 Theoretical training course

The training includes:

- Basics of labour protection
- Legal consequences of any disregard of regulations
- Terms
- Electrical hazard, accidents
- Requirements to be met for live working acc. to the national regulation (BGV A1, BGV A2, DIN VDE 0105 – 100)
- Technical and organisational in-house requirements to be met for live working
- Competence for live working
- Instructions and work permit for live working
- Safety-technical precautions for live working
- Use, handling, maintenance and inspection of the tools, equipment, protective devices for live working
- Principles for the preparation, performance and completion of live working
- Techniques applied to live working
- Remaining risks with live working
- Instructions on first aid.

If required:

- In-house management structure
- In-house standards.

A3.3.3 Basic literature

- Labour Protection Act
- Regulations for the prevention of accidents VBG 1 “General Regulations“
- Regulations for the prevention of accidents BGV A2 “Electrical hazards“
- DIN VDE 0105 - 100 “Operation of electrical Installation“
- VDE series volume 13 “Operation of electrical Installation“
- Leaflet BG F + E “First aid in case of accidents caused by electricity“.

The theoretical training course ends with a written test on standards, regulations and basic questions of labour protection with live working.

A3.3.4 Practical training course requirements

- The person qualified in the theoretical examination.
- The training is run in compliance with nationally accepted live working techniques.
- Work instructions are available for each live working specified.

- For the training each person has the tools, equipment, protective devices available, which are demanded in the work instructions.
- Training is performed on live equipment.
- Training objects have to be designed such that they are as near to practice as possible.

Training includes the following:

- The person lists the live working required for the training on the basis of his training catalogue.
- The person must completely execute each live working chosen at least once and under the supervision of the instructor.
- The work by the training group is performed under practice-related conditions:
- Written work permit
- Nominated person in central of a work activity, supervision
- Place of work, work task
- Evaluation of the work place
- Job-related instructions
- Equipment acc. to work instructions
- Work-process.

A3.3.5 End of course

The practical training course is evaluated in a final talk. The instructor marks the performance of the candidates and communicates the result of the training course – qualified or not qualified.

A3.3.6 Certification

- Upon qualification each person receives a certificate.
- The certificate gives evidence of the person being an “skilled person having qualified in special training live working”.
- The certificate specifies the live working, in which the person qualified.
- The certificate is only valid for the live working specified.
- The validity period of the certificate is limited to maximum interval of Four years. Validity will be extended after a qualification in a new training course.

A3.3.7 Further training

Within the validity period of a certificate an skilled person who underwent a special training course live working can undergo further practical further training in further live working. Live working he qualified in will additionally be entered in the certificate. Thus the validity period is not altered. The subsequent repeated training course comprises all live working certified.

A3.3.8 Refresher training course

I. Objective of the training course

The refresher-training course for skilled person for the live working is intended to activate and update knowledge and skills acquired for live working. The refresher-training course consists of two parts:

- A theoretical part and
- A practical part

The items listed below are the minimum refresher-course requirements.

II. Requirements

Those persons attending a refresher-training course require the technical competence as a “skilled person with special training for live working“ and a valid certificate.

III. Theoretical training

The contents of the theoretical training subjects for the “Special training of live working“ are repeated in a short form and amended with reference to new laws, standards, rules, regulations etc. The theoretical training course is completed by an examination on the entire contents of the training course.

IV. Practical training course

The practical training course includes:

The live working procedures listed in the certificate repeated either as a whole or – according to the personal specifications – partly and adapted to the state of the art.

The person undertaking the refresher-training executing each chosen live working procedure in the decisive process at least once on live equipment and under the instructor’s supervision.

V. End of course

Upon successful completion of the refresher-training course the validity of the candidate’s certificate will be extended. The live working procedures carried out by the person in the practical training course are confirmed in the certificate.

The extension of the validity period in the certificate is limited to a maximum of four years. Further extension can be achieved by a repeated examination. If the person does not qualify, the validity period of the certificate “skilled person with special training live working” comes to an end.

A3.4 ESB Networks Policy on Developing and Maintaining Competency for carrying out Live Work

A3.4.1 Statutory Requirements for carrying out Live Work in Republic of Ireland

The statutory requirements governing live work in the Republic of Ireland are detailed in Regulation 46 of Statutory Instrument No. 44 of 1993, and are as follows:

1. Every work activity, including the operation, use and maintenance of electrical equipment or installations, shall be carried out in such a manner as not to cause danger.

2. A person shall not be engaged in any work activity on or near any live part (other than one suitably covered with insulating material so as to prevent danger) where danger may be caused unless:

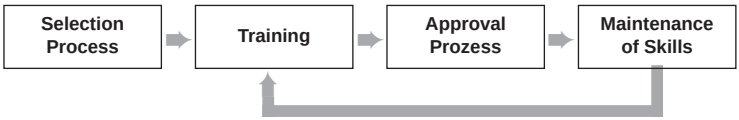
a) it is unreasonable in the circumstances for it to be dead;
b) it is reasonable in the circumstances for such a person to be at work on or near it while it is live;
c) suitable precautions (including, where necessary, the provision of protective equipment) are taken to prevent danger

Any equipment provided under this Part for the purpose of protecting employees 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.

Live work is therefore allowed, but only in compliance with the statutory requirements above. The guidelines to these requirements indicate that:

- The persons who undertake live work should operate to a safe system of work,
- They must be competent and be properly trained to carry out the live work,
- They must be properly informed of the risks,
- The equipment used must be properly maintained,
- Use suitable insulating barriers where needed,
- A second competent trained person must be present when carrying out live work on high voltage (>1000V) systems.

A3.4.2 Process Model for Managing Competency



The following applies to workers engaged in Rubber Glove work at MV:

I. Selection Criteria for Training in Live Work

- Minimum 2 years experience of dead-line working over full range of work

- Impeccable safety record
- A background consistent with showing care for vehicles and equipment
- Good eyesight – taking account the importance of the role of Dedicated Observer
- In regard to behaviours; teamwork and communication skills, as well as being of calm disposition, would be regarded as highly desirable.

II. Crew Training

- Attend training course of 3 weeks duration in ESB's Technical Training Centre.
- Training is based on approved procedures and Safety Rules.
- One week on site accompanied by a training instructor – with emphasis placed on a work mix representing the widest possible range.
- An additional 4 weeks accompanied by an 'experienced person'. This is a member of another crew having at least 2 years live working experience.
- Upon successful completion of the training programme, workers competency is certified by the Technical Training Centre.

A3.4.3 Work Approvals

Local managers assess Live Workers at 2-year intervals on their continuing competency for carrying out live work, and approvals are issued as appropriate.

A3.4.4 Live Work Skills Maintenance

- Typically, a panel of 5 trained persons supports a 3-person crew. This is to ensure crew availability in circumstances where one or 2 members are unavailable for whatever reason.
- All 5 persons are required to carry out live working in any 3-month period.
- The role of Dedicated Observer is rotated among all crewmembers.
- Crewmembers who have not worked within a 3 month period must be briefed and assessed by local management for competency, prior to resuming live working.
- Crewmembers who have not carried out live work for more than 6 months must be briefed and assessed by local management for competency (to include on-site evaluation) prior to resuming live working.
- If crewmembers do not engage in live working during a 12-month period, their competence is deemed to have lapsed, and their approval is no longer valid. In order to resume involvement in live working, they are required to attend the Technical Training Centre for refresher training after which their competence is re-assessed.
- All crews undergo a one-week refresher-training course in the Technical Training Centre. This operates over a 4 year cycle.
- All crewmembers attend one-day seminars at regular intervals, at which developments in equipment and procedures are communicated, and feedback obtained.

Auditing of Crews:
Crews are audited by local managers on a quarterly basis, and by the Central Live Work Unit every 2 years.

A3.4.5 Live Work Crew Manager Training

Crew Managers of Rubber Glove Crews undergo a 3-Day training course in all aspects of Rubber Glove working and in its management. The ongoing maintenance of crew skills and their assessment is a core component of this course.

The topics covered in this course include the following:

- Live Work Safety Rules, Clearances, etc.
- Familiarity with dangers and hazards inherent in the work.
- Familiarity with associated equipment; hotsticks, cover-up, IAD, etc.
- Identification of jobs suitable for RG work – Limitations/ Constraints.
- Familiarity with equipment testing regime.
- Ability to carry out Local Safety Audits.
- Requirements for local Equipment cleaning facility.
- Crew documentation requirements.
- Skills maintenance/importance of crew rotation.
- Importance of ensuring that crews are exposed to the full range of procedures on an ongoing basis.
- Method of Crew Assessment after skills lapse.
- Field Demonstrations.

Appendix A4 – Management Elements of Live Working