IMPLEMENTATION OF LIVE WORKING ON LOW VOLTAGE IN SLOVENIA
Arc Flash Risk Assessment

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DEFINITION OF LIVE WORKING

EUROPEAN STANDARD EN 50110-1:2013
Operation of electrical installations – Part 1: General requirements

Working procedures are divided into three different procedures: dead working, **live working**, working in the vicinity of live parts.

All these procedures are based on the use of protective measures against electric shock and/or the effects of short-circuits and arcing.
DEFINITION OF LIVE WORKING

EUROPEAN STANDARD EN 50110-1:2013 (point 3.4.4)

live working

all work in which a worker deliberately makes contact with live parts or reaches into the live working zone with either parts of his or her body or with tools, equipment or devices being handled.

Note: At low voltage, live working is carried out by the worker, when making contact with bare live parts. At high voltage, live working is carried out by the worker, when entering the live working zone, regardless of whether contact is made with bare live parts or not.

DEFINITION OF LIVE WORK

EUROPEAN STANDARD EN 50110-1:2013

3.6.1 extra-low voltage (ELV)
normally not exceeding 50 V alternating current (a.c.) or 120 V ripple free direct current (d.c.) whether between conductors or to earth
Note: This includes SELV, PELV and FELV (see HD 60364-4-41).
[SOURCE: IEC 60050-826:2004, IEV 826-12-30 modified]

3.6.2 low voltage (LV)
normally not exceeding 1 000 V a.c. or 1 500 V d.c.

3.6.3 high voltage (HV)
normally exceeding 1 000 V a.c. or 1 500 V d.c.
An arc flash is an undesired electric discharge that travels through the air between conductors or from a conductor to a ground. The resulting explosion can cause fires and serious harm to equipment and people.

The temperature of an arc flash may exceed 10,000 degrees Celsius, which is capable of vaporizing metal and sending a blast of plasma and molten metal in all directions with extreme force.
What is arc flash?

What is Arc Flash?

- Electrical hazard
- Severe health effects on human being
  - Burns
  - Death
- Triggered by
  - Equipment defects
  - Defect of tools
  - Human errors:
    - Lack of distance to live parts
    - Lack of insulating blankets
    - Errors by switch off equipment (5 safety rules)
DEFINITION of arc flash

Risk assessment for the occurrence of arc flash that can have very damaging consequences for personnel and equipment in electrical facilities is increasingly applicable in advanced countries such as USA, Canada and the EU (Slovenia - in the promotion phase).

These countries have regulations and norms to regulate legislative issues and obligations regarding risk assessments as well as the mandatory use of PPE for personnel that may be exposed to such risks.
Arc flash risk assessment is today a mandatory part of each risk assessment for electrical workplaces and several recommendations exist in different countries: (for example national OSHA rules in USA, EN 50110-1 and PPE Directive in Europe).

The Electricity Section of the International Social Safety Association ISSA published guidelines for users to select PPE against the thermal hazards of electric fault arcs ...
Slovenia has EU adopted Directives & has national legislation & use EN/SIST standards and IEC standards to regulate this field.

For example Germany uses a standard and recommendations:

- DGUV Information 203-077
- GS-ET-29:2011-05 Test Principles
Arc flash risk assessment

On following questions you/we have to answer:
1. Who needs arc rated PPE?
2. For which operations and type of work your/our electricians need Arc rated PPE?
3. Which type and arc protection level of PPE your/our electricians need?
4. How you/we can convert the calculated arc protection level in practical and useful products?
## Arc Flash Calculation Methods

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<th>US approach</th>
<th>German Approach</th>
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Arc Flash risk assessment

Arc Flash option in EasyPower Arc Flash module
RENblad 1710 Arc Flash Calculator

User Interface of BSD Arc Calculator
Arc Flash PPE label

Print Report of BSD Arc Calculator
Arc Flash PPE

Arc flash risk assessment

What is Arc Flash PPE?

- **Hand Protection**
  - Non-insulating gloves
  - Insulating gloves

- **Face protection**
  - Face shields
  - Hoods

- **Body protection**
  - Jacket
  - Trousers
  - Shirts
  - Coat
  - BIB overalls

Daily workwear

Switching kits

Risk = Severity \times Likelihood

- Depends on:
  1. arc flash energy
  2. incident energy
  \rightarrow Calculable by IEEE or DGUV

- Depends on:
  1. Quality of equipment
  2. Qualification level of employee
  \rightarrow Only conditionally calculable
DEFINITION OF LIVE WORKING

EUROPEAN STANDARD EN 50110-1:2013

Hot stick working – Safe clearance working

Insulating glove working

Bare hand working
LW has a hundred year tradition in the world.

In 1913 the first carrying out of LW was documented in the USA and in 1933 in Poland and in 1963 in France and ...

in 2006 in Croatia
in 2009 in Slovenia:
- from 2009 in nuclear power plant Krško,
- from 2010 in paper mill Vevče
- from 2011 in distribution & transmission
- from 2011 in University Medical Centre Ljubljana ...!
LW has a hundred year tradition in the world.
LIVE WORKING on LV (e.g. 0,4 kV)
LIVE WORKING on MV (ca. 20 kV)
LIVE WORKING on HV (> 110 kV)
LWA: Live Working Association

CIGRE: Conseil International des Grands Réseaux Electriques (Council on Large Electric Systems)

IEEE: Institute of Electrical and Electronics Engineers

CIER: Comisión de Integración Eléctrica Regional

ICOLIM: International Conference on Live Line Maintenance (LWA)
The impact of LW on the quality of electricity can be measured by the satisfaction of customers:

- uninterrupted supply of electricity by distributor or
- uninterrupted supply of electricity by work on internal electrical installations.
Live Working as an Example of Electrical Installation Maintenance with the Zero Accidents Philosophy

LW can be considered a contribution to safety and quality of electrical installation maintenance procedures on all voltage levels.
There have been quite a few attempts around the world to promote the concepts of maintenance work without accidents or with “zero accidents”.

Organisations with an integrated management system (ISO 9001 & OHSAS 18001/ISO 45001) have excellent organisational conditions for safe implementation of live working and can therefore achieve the goal of “zero defects” or the idea of “zero accidents” or “zero injuries” at work due to electrical shock and arc flash.