Working with High Voltage — study guide

High-voltage work is governed by a safety regulation whose whole purpose is to force planning: every activity must be adequately planned and the necessary precautions put in place before work starts. Everyone working on or in the vicinity of electrical installations must undertake safety training.[1]

What "high voltage" means

High voltage is voltage that normally exceeds 1,000 V alternating current (AC) or 1,500 V direct current (DC).[1] The regulation covers work on or in the vicinity of electrical installations, including "partly de-energised" installations.[1] Its purpose is to maintain a high level of safety through adequate planning — it does not prescribe which jobs may be done, nor does it exist to hold the shipowner accountable.

Risk evaluation

Risk evaluation and the choice of working method are integral parts of planning a job, and they run in three phases: the preliminary, planning and execution phases.[1] On a high-voltage installation the evaluation is usually carried out by the Chief Engineer. If anything is unclear, obtain clarification before starting — don't just switch method or push on with extra care.

Working methods

There are three situations: dead working, live working, and working in the vicinity of live parts.[1] Live working is more dangerous than dead working and carries risk even for a competent person. "Dead working" may be used where there is a danger of contact with live parts only if those parts can be de-energised and protected against accidental re-energising or shrouded.[1] Dead working requires control measurements to confirm the installation is de-energised.[1] Crew need training — including in the equipment — to perform live work, even on low voltage.[1]

The two barriers

Every method needs two safety barriers, matched to the method. Dead working: de-energising and voltage testing, plus protection against accidental re-energising. Live working: installation protection plus protection against accidental re-energising. Working in the vicinity of live parts on a high-voltage installation: safe distances plus personal protective equipment.[1] A barrier reduces the probability of an unwanted event or its consequences, and deviation from the two-barrier requirement is never allowed.[1]

PPE and equipment

Personal protective equipment includes insulated gloves, and their category determines the voltages at which they may be used.[2] Insulated tools and insulated floor-mats are **not** PPE. Hand-insulated tools are protected only on the grip; operationally insulated

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tools have an insulated working end.[3] The degree of tool insulation and the extent of protective shielding are evaluated together with the PPE used for each job. An electrically insulated helmet must be checked for damage before use, and its class defines the test voltage and the nominal voltage at which it may be used.[4] Hearing protection must not have a metal head-band. Shrouding protects against direct contact.[1]

Earthing, isolation and documentation

A portable earthing device must be connected to earth *before* it is connected to the installation.[1] Temporary earthing for work is earthing and short-circuiting with a less-than-fully-dimensioned device at or near the work location, and an earthing stick is an insulated rod used to attach phase clamps to the part to be earthed.[1] A single-line diagram shows the installation's lay-out. Isolation switches need visible isolation points or a reliable indicator so the disconnection can be checked reliably. Installations not protected against direct contact must be locked, with keys issued only to access-permit holders. Security cards document who has access to high-voltage installations.[1]

Responsibilities and emergencies

The two-person requirement applies to work on or near high-voltage installations and to low-voltage work with a high degree of risk.[1] The crew member who carried out the work removes the safety measures, and the first step in removing them is to notify the work team that the job is finished and no further work is allowed. Voltage testing must never endanger the tester. Current passing hand-to-hand or hand-to-foot is especially dangerous because much of it crosses the heart. If you find someone trapped in a live installation, raise the alarm first, then switch off and separate them using a non-conducting object. Accidents involving electrical injury are reported by the Master or the Shipowner.[1]

Key facts to remember

- High voltage: normally above 1,000 V AC or 1,500 V DC; the rules exist to force adequate planning.
- Risk evaluation has three phases — preliminary, planning, execution — and is part of planning; usually done by the Chief Engineer.
- Dead working: de-energising + voltage testing + protection against accidental re-energising.
- Live working is more dangerous even for the competent; two barriers are always required.
- Insulated gloves are PPE and are rated by voltage; insulated tools and floor-mats are not PPE.
- Connect a portable earthing device to earth first, then to the installation.
- Two-person rule: high-voltage work and high-risk low-voltage work.

Sources

1. EN 50110-1 — Operation of electrical installations (CENELEC); the working methods, safety-barrier and earthing concepts used here come from this standard, as implemented in the applicable national/maritime regulation.

2. IEC 60903 — Live working — Electrical insulating gloves (glove classes define the voltages they may be used at).

3. IEC 60900 — Live working — Hand tools for use up to 1,000 V AC / 1,500 V DC (hand-insulated vs operationally insulated tools).

4. EN 50365 — Electrically insulating helmets for use on low-voltage and medium-voltage installations (class defines test and nominal voltage).