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ELECTRICAL RESISTANCE FOR INDUSTRIAL SAFETY HELMETS

EXPLANATION AND COMPARISON OF ELECTRICAL RESISTANCE TO EN 397 AND EN 50365

EN 397: 1995 – Specification for Industrial Safety Helmets

Extract from Standard:

"The electrical resistance option within EN 397 is intended to provide protection to the wearer against short term, accidental contact with live electrical conductors at voltages up to 440 V a.c."

Test Method:
It is intended to simulate closely the in-use situation – that is, the leakage current to the wearer via a live conductor touching the shell. The test is dependant upon the transverse resistance of the complete shell (thickness). This effectively precludes the use of a metal shell and of metal fasteners or ventilation holes passing through the shell. The test is also dependent only upon the surface resistance of the shell, and effectively precludes the use of shells which have a conductive surface (eg metal electro-plating). This test was deemed to be necessary in order to obviate the danger to the wearer should he try to remove a helmet whose shell was in contact with a live conductor.

EN 50365:2002 – Electrically insulating helmets for use on low voltage installations

Extract from Standard (SCOPE):
This standard is applicable to electrically insulating helmets used for working live or close to live parts on installations not exceeding 1000 V a.c. or 1500 V d.c.

Test Method:
The helmet has to be tested on testing head form type K and D according to EN 960. The testing head forms have to be wrapped up in aluminum foil. An electric circuit in the sense of a continuity check has to be built up between an IP3X testing wire according to EN 60529 and the aluminum foil in order to prove that there is an electric contact between both parts.

Each ventilation hole has to be tested by a wire which fulfils the requirements of EN 60529. The wire (ref IP 3X test is in the form of a 2,5mm steel wire) has to be inserted (with a force of 3 N) as deep as possible. Then the wire shall be moved free in all directions. The test is considered as passed if the wire does not get in contact with the testing head form during the test.

In summary, EN 397 does not allow a helmet with ventilation to be approved to the Electrical Resistance option, whereas EN 50365 does enable a ventilated helmet to be approved.

Why do the two standards differ?

Electrical resistance option with EN 397 and EN 50365 have completely different test parameters and essentially were introduced to provide protection against different circumstances/environments.

In Scandinavia for example, a large part of the LV network is on overhead lines running at 690V as most of the customers are located in rural areas. The overhead lines are nearly always fed straight into small commercial and agricultural premises. In the UK, the practice of 400V a.c. overhead lines has all but disappeared.

For Scandinavian and other European countries, there is a much higher risk of people who are not electricians (council employees working on street lighting, construction workers, painters etc) coming into accidental contact with overhead lines. However, because the overhead lines are constructed in a different way, the risk of contact due to a stray conductor passing through the ventilation hole in a safety helmet is virtually zero. Any break in a cable conductor normally results in that conductor unraveling for a distance in both directions from the break point and forming a tangle which is highly visible. As it is not always guaranteed that the helmet will be a non-vented type (as the person who comes into accidental contact is not always an electrician) this is one of the main reasons why the standard was developed in the way it was - it replicates what is most likely to happen in practice.

The reason the IP3X test method is used is that this replicates the risk of a 2.5mm solid rod coming into contact with the head of a wearer of a vented helmet. However the IP3X test is normally used to test electrical enclosures to ensure that hand tools (i.e. screwdrivers) cannot be pushed into the cover and make contact with live conductors inside. A more arduous test would be to use an IP4X test wire of diameter 1.0mm rather than a rod of 2.5mm. A 1.0 mm wire would be more flexible than a 2.5mm rod and could be inserted further into any vent holes on a safety helmet and would possibly better simulate the risk of the wearer of a ventilated helmet coming into contact with a stray live conductor in an electrical environment.

In the UK, the vast majority of our overhead line system is either 11kV or 33kV. These are on exposed conductors and the biggest risk with utilities lies in this sector. For high voltage applications the ANSI (American) standard in our view is far more practical than either EN397 or EN 50365 as it tests to 20kV to allow for overhead line working at 11kV. It is also important to note that the test methods in all cases involve testing the helmet in a bath of water (either fresh or saline), and this does not give a guarantee of insulation in arduous weather conditions. Both tests are on conducted using new product, and consideration must also be given to any possible sources of contamination (dirt, grease, conductive dust etc) which would affect the electrical resistance of the helmet shell. In addition, the wearing of helmet mounted accessories (ear defenders) or jackets with high collars may in fact provide a path to earth should the helmet wearer come into contact with a live conductor in conditions of rain and snow. Environmental factors must always be taken into consideration when assessing the risk of electrical contact with live conductors.

In conclusion, EN 50365 was introduced in Germany to allow approval for some types of ventilated helmets (where the test wire could not come in contact with the headform) due to the reduced risk of electrocution in certain areas. However the IP3X used in EN 50365 test is normally used to test electrical enclosures to ensure that hand tools (i.e. screwdrivers) cannot be pushed into the enclosure and make contact with live conductors inside. In low voltage environments, it is the opinion of Centurion that an non-vented helmet should always be used where there is a risk of coming into contact with live conductors of small cross sectional area which could penetrate the holes of ventilated helmet and pose a risk of electrocution.

The Health and Safety Officer within a company specifying safety helmets to employees should access the type of risk to determine whether a helmet to EN 50365 or EN 397 is required.