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Section 730: onshore units of electrical shore connections for inland navigation vessels

In this article, Geoff Cronshaw writes about a new standard HD 60364-7-730, which was published by CENELEC in August 2015, and the impact this may have for you in the future.

Section 730 applies to onshore installations that are dedicated to the supply of inland navigation vessels for commercial and administrative purpose, berthed in ports and berths.

Most, if not all, of the measures used to reduce the risks in marinas equally apply for electrical shore connections for inland navigation vessels. One of the major differences between supplies to vessels in a typical marina and electrical shore connections for inland navigation vessels is the size of the supply needed. For example, vessels used on inland waterways in Europe can be up to 10, 000 tonnes. This is considerably larger than the average size of vessel used in a marina, which are generally small recreational craft (up to 24 m long). Generally, socket-outlets with a rating of 16 A will be provided for each craft in a marina. However, many of the risks associated with electrical installations in marinas, such as the presence of water and movement of structures and harsh environmental conditions, are the same as for electrical shore connections for inland navigation vessels. In this article we summarise some of the key requirements of Section 730.

Supplies

Section 730 requires that the nominal supply voltage shall be 400 V three-phase AC 50 Hz.

Important: where the supply system is protective multiple earthed (PME), Regulation 9(4) of the Electricity Safety, Quality and Continuity Regulations prohibits the connection of the neutral to the metalwork of any caravan or boat in the UK.

Galvanic separation

The immersion of metal components of a vessel in water, particularly in salt water, provides the natural mechanism of galvanic corrosion. Where dissimilar metals on the electro-chemical series are within proximity, the detrimental effect of galvanic couples can be exacerbated. For this reason, small vessels, recreational craft, houseboats, ships and many immersed metal structures are provided with sacrificial anodes (zinc for salt water) to which the more valuable/essential immersed metal parts such as propellers, shafts, hull fittings and fixings are electrically bonded and the sacrificial anode(s) preferentially deplete as a consequence of providing galvanic corrosion protection to such immersed parts.

Section 730 recognises that there is an additional risk of electrolytic corrosion resulting from circulating galvanic currents in the protective conductor from the shore supply to a vessel.

There have also been reports of increased rate of depletion of the sacrificial anodes of vessels, which are connected on a longer-term basis to shore supplies, believed by some observers to be associated with the connection of the vessels' protective earth terminal (to which immersed components and sacrificial anodes are bonded) to the shore supply earth in an inland waterway or marina.

Section 730 recognises the use of an isolating transformer to prevent galvanic currents circulating between the hull of the vessel and the metallic parts on the shore side. Where a fixed on-shore isolation transformer is used to prevent galvanic currents circulating between the hull of the vessel and metallic parts on the shore side, equipment complying with BS EN 61558-2-4 shall be used.

Protection against electric shock

As you would expect, the protective measures of obstacles, placing out of reach, non-conducting location and protection by earth-free local equipotential bonding are not permitted in Section 730. These measures are not for general application. They are only for application in installations controlled or supervised by skilled or instructed persons.

Operational conditions and external influences

Any wiring system or item of equipment selected and installed must be suitable for its location and able to operate satisfactorily during its working life. In ports and berths consideration must also be given to the possible presence of corrosive or polluting substances.

Section 730 requires that equipment shall be selected with a degree of protection of at least IP44.

Types of wiring system

Cables must be selected and installed so that mechanical damage due to tidal and other movement of floating structures is prevented.

Section 730 recognises that the following wiring systems are suitable for distribution circuits in berths and ports:

(i) underground cables;
(ii) overhead cables or overhead insulated conductors;
(iii) cables with copper conductors and thermoplastic or elastomeric insulation and sheath installed within an appropriate cable management system taking into account external influences such as movement, impact, corrosion and ambient temperature;
(iv) mineral-insulated cables with a thermoplastic protective covering;
(v) cables with armouring and serving of thermoplastic or elastomeric material; and
(vi) other cables and materials that are at least as suitable as those listed above.

Section 730 recognises that the following wiring systems and cables are suitable for distribution circuits on floating landing stages:

(i) cables with copper conductors and thermoplastic or elastomeric insulation and installed within an appropriate cable management system taking into account external influences such as movement, impact, corrosion and ambient temperature; and
(ii) armoured cables with a thermoplastic or elastomeric covering.

Other cables and materials that are at least as suitable as those listed under (i) or (ii) may be used.

Section 730 requires that underground distribution cables shall, unless provided with additional mechanical protection, be buried at a sufficient depth to avoid being damaged, for example, by vehicle movement. Overhead cables are not permitted over waterways. Where overhead conductors are used they must be insulated. Poles and other supports for overhead wiring must be located or protected so that they are unlikely to be damaged by any foreseeable vehicle movement.

Overhead conductors shall be at a height above ground of not less than 6 m in all areas subjected to vehicle movement and 3.5 m in all other areas.

Isolation, switching and control

Automatic disconnection of supply

RCD protection

Section 730 gives additional requirements concerning RCD protection. Socket-outlets with a rated current up to 63 A shall be individually protected by an RCD that provides additional protection and that has a rated residual operating current not exceeding 30 mA.

The RCD selected shall disconnect all live conductors, i.e. phases and neutral.

Socket-outlets with a rated current above 63 A shall be individually protected by an RCD having a rated residual operating current not exceeding 300 mA. The RCD selected shall disconnect all live conductors, i.e. phases and neutral.

NOTE: the purpose of these RCDs is to protect the shore supply and the flexible cable. They are not intended to provide protection for on-board circuits, which are outside the scope of Section 730.

Devices for protection against overcurrent

Similar to the requirements in marinas, socket-outlets shall be individually protected by an overcurrent protective device.

Isolation

Similar to the requirements in marinas, at least one means of isolation shall be installed for each distribution board. This device shall disconnect all live conductors.

Requirements for socket outlets

Socket-outlets shall comply with BS EN 60309-1 and BS EN 60309-4 and socket-outlets with a current rating up to and including 125 A shall comply with EN 60309-2. Where interchangeability is not required, socket-outlets shall comply with BS EN 60309-1 and BS EN 60309-4 and need not comply with BS EN 60309-2.
Socket-outlets shall be located as close as practicable to the berth to be supplied.
No more than four socket-outlets shall be grouped together in any one enclosure.
Each socket-outlet shall supply only one electric circuit of a vessel.
Socket-outlets shall be placed at a height of not less than 1 m above the highest water level. In the case of floating pontoons or walkways only, this height may be reduced to 0.3 m above the highest water level provided that appropriate additional measures are taken to protect against the effects of splashing.
Socket-outlets shall be placed in an enclosure in accordance with BS EN 15869-2.

Conclusion

Important: this article only gives an overview of electrical shore connections for inland navigation vessels. For more information refer to HD 60364-7-730. These requirements are at CENELEC level and may or may not be included in BS 7671 in the future.