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General electricity
Bulgary and fire alarms
Biocompatible installations
Mechanical ventilation

Brief tender specifications for a problem-free electrical household installation

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Introduction

Electromagnetic compatibility (EMC)

Electromagnetic compatibility is a subject which has been widely discussed since the EEC European directive 336/89 came into force on the 1/01/96.
In fact, the EMC problems were first noted by the military, just before the Second World War and compatibility measures were introduced in around 1940, together with the relevant measurement techniques. After being adapted, these rules were then applied to the civilian sector.

What is EMC ?

As the word “compatibility” indicates, it first of all deals with two things that can exist together and which can get along.
“Electromagnetic” means that the electrical, magnetic or electromagnetic interactions between the different partners involved must be taken into account.
The arrival of electricity and electronics into all areas of daily life has increased the source environments of these interactions in such a way that they are now inevitable.
The first steps in EMC were those of “radio interference suppression”, which allowed a radio programme to be heard under satisfactory conditions even though static could interfere with the reception.
Two partners can be identified in this case:

- the radio receiver
- the static generators (a vacuum cleaner, for example).

In order for them to exist together without affecting each other, the first one must not be sensitive to static (immunity concept) and the second one must not generate interference (emissivity concept).
This therefore leads us to:

- elements that cause interference
- elements that experience interference

The interactions between these elements are very complex as an element that causes interference can experience interference and vice-versa, there can be a wide range of elements that cause interference in the same place and the elements that experience interference can have very different sensitivity thresholds depending on the type of interference…

What is EEMC ?

In the case of EMC, the elements causing interference and the elements experiencing interference are machines or appliances; in the case of EEMC, the “system” experiencing interference is part of the flora or fauna and man clearly holds a prominent place.
The electromagnetic environment can be described on the basis of:

- the frequency spectrum
- conducted signals (electricity, for example)
- radiated signals (radio waves, for example).

With the exception of the frequency spectrum for light and for infrared heat radiation, man is not able to naturally see electromagnetic energy. This means that an energy conductor which conveys 230 V at 50 Hz signals radiates electromagnetic energy, which, even if it is invisible to man, touches him, penetrates him and goes through him. It is the same case with all radiation in all the frequency spectrums.
The impact of electromagnetic energy on biological systems has been dealt with at nearly all the scientific congresses held over the last 20 years. The knowledge acquired in this area has meant that maximum exposure values for the human being are allowed.

Therefore, the CENELEC ENV 50166-2 (1994) pre-standard gives a template for the limit values according to the frequency.
Controlling the electromagnetic radiation at 50 HZ together with transient signals emitted by industrial or domestic electrical installations is possible thanks to shielded cables, to precise earthing and to the bipolar Biorupteur®.
On the other hand, controlling high-frequency electromagnetic radiation is even more difficult. In fact, the sources are increasing on a exponential basis, above all over these last years, with the arrival of the mobile telephone (GSM) and the frequencies used are getting higher and higher and more numerous. The higher frequency waves easily penetrate into a room and induce currents that cause interference in all the conductive circuits, such as cables. These circuits spread these currents and they re-emit them in the shape of waves at the same frequencies.
Other than the fact that these waves can cause interference in electronic appliances, it seems more and more obvious that their action on man needs to be urgently taken into account. Happily, the methods used in EMC are applicable. Therefore, the special wiring and shielding techniques mean that the propagation in the living area can be greatly reduced and the impact on man can therefore be limited.

Principles for problem-free electricity installation

1. General points

For a healthy living environment, electricity installation has to comply with all the legislation in force regarding electricity installations (RGIE) and certain rules set out below. Such an installation is aimed at neutralising the currently recognised problems caused by the domestic electricity network.
Briefly, there are three types of problems:

- Electricity fields: they are simply generated by alternating voltage on the network.
- Electromagnetic fields: they are generated by the current travelling through an electricity conductor.
- High interference frequency: they are generated by the radio transmitters, radio telephones, radars, etc. They are captured by the electricity distribution network and taken through the building by the domestic network.

Using these three parameters, an installation should ensure that does not harm the people living in the building.
Sweden is the only country which has legislated in this area. These standards could become European standards:

- Rest and sleep space: 5 V/m and 2 mG
- Work space: 16 V/m and 2 mG.

2. Choice of cables

The cables chosen have to comply with the electricity installation standards in force. It will exclusively use VMVB cables, except for:

1) In the bathroom where the VMVB cable is not compatible with current legislation on insulation.
2) In the case of the cooker where the power supply has to be 6 mm² cable, that is not available in VMVB. A fallback solution is to separately supply the power to the over and the hot plates in 5 G 2.5 or in 3 G 2.5 VMVB.

Description of the VMVB.

In the case of VMVB, the insulated and twisted conductors are sheathed in a layer of black EMC Com material, which replaces the stemming hose. A screen formed by a polyester aluminium tape is on the absorbent layer; this screen is in close electrical

contact with a tin-plated copper wire, called the drain lead. This wire is used to earth the shielding.

Aim

The VMVB cable is used to ensure that the electrical installations cause the minimum amount of interference on the direct environment. Those kind of wire-wrapped circuits, with no specific precautions, provide advantages in the following areas:

- Electrical fields: due to the shielding, the field components mainly raise the internal reflections phenomena, which leads to suppression.
- Electromagnetic fields: the cable clearly transports less H.F. interference that a traditional cable and therefore radiates a much weaker electromagnetic field. The EMC Com material is a magnetic material. It therefore helps to keep the magnetic field of the transported current to 50 Hz inside the cable.
- The transmissions of outside high-frequencies by using the EMC Com cladding is limited and only the low frequencies which are useful are kept.

Implementing

No special precaution needs to be taken when laying this cable which is done using the traditional methods and is within any electrician's scope. The result does not come from a specific way of laying the cable, but from the fundamental features of the cable.

Warning

The VMVB is currently the only highly compatible electromagnetic cable that has been legally authorised by the Ministry for Economic Affairs to be used in the electrical installation in domestic premises (Ministerial Decree dated the 9th of July 1992- Ref. 9EE/241/24/1604 and the 31st of May 1994- Ref. 9EE/241/1604bis).

3. Earth

The earth ring laid by the main building company at the bottom of the excavation, will be used:

- for the electrical installation's "yellow/green" earth coupler
- for the equipotential bonding of girders and metallic bodies.

It will possibly broken down the centre in order to make two independent half-rings. This earth will be less than 30 Ohms.

VMVB cable and earthing of the shielding safety conductor:

- yellow/green conductor: the RGIE rules are to be followed; the electrical installation is to be earthed and the continuity of the yellow/green conductor is to be assured.
- the VMVB's shielding continuity wire **must** be separate from the yellow/green safety conductor to the earthing switch.

4. The electrical boxes

The electrical boxes are in general to be metallic and located in an area of the living space which is hardly or not at all used. They will be fitted with the necessary differential switches and circuit breakers to protect the building. Furthermore, the electrical networks for the bedrooms and the lighting networks located under the bedrooms with unipolar switches will be fitted with bipolar Biorupteur® PSOs.

Description of the Biorupteur®

It is a modular electronic device that clips on a DIN rail and, starting from the electrical distribution box, allows an electrical circuit to be broken when it is not being used. Inversely, when the Biorupteur® detects a charge such as a lamp or a household appliance, it automatically reconnects and immediately re-establishes 220 V in the network

Aim

A circuit that is protected in this way is completely insulated from the rest of the building's electricity network, when not being used. It therefore creates a neutral space that is free of all power, where no electrical and electromagnetic fields are generated.

Use

The use of the Biorupteur® is mainly recommended for the network supplying the bedrooms. In fact, this is the place where most time is spent in a house and without electricity being needed. We do not recommend that this device be used in places such as:

- the kitchen, as there are constant or nearly constant charges (fridge, freezer, etc.)
- bathroom and passages as very little time is spent there

Operating principle

When not being used, there is low direct voltage (4 Volts DC) on one of its two electrical wires: the device works in an ohmmetric fashion, that is to say it measures the circuit's resistance. If it is to say that it is infinite, that is to say there is no charge, the device remains at rest.

If the device detects resistance (a lamp or appliance switched on), it swings and switches on the 220 V and surpresses the 4 V DC. The device then works in an amphmetric fashion, that is to say, it measures the current consumed. It remains switched in this position, allowing the 220 V to pass through, while the power is being used.

When the charge is switched off and is no longer being used, the Biorupteur® detects it 5 seconds later and bipolarly breaks the network and re-established the 4 V DC surveillance voltage.

5. Installation method

General points for all premises

Two possibilities:

- for a lighting network that is not protected by a bipolar Biorupteur®:
  - the single and 2 direction switches are bipolar
  - a bipolar remote control switch placed in a box controlled by direct low voltage will be used for lighting points controlled by more than two switches.
- for a network protected by a bipolar Biorupteur®:
  - traditional switches are used.

In the case of two circuits crossing in two neighbouring brackets, the 2 networks' earthing continuity wires are to be interconnected.
All the house's metal components, whether or not they can be seen, (girders, girders, shutter holders, lintels, central heating pipes etc.) are to be connected to the yellow/green earthing switch by a 4 mm² minimum VOB.
In the case of laying low voltage lighting, electronic transformers will need to be used. In order to reduce as much as possible the electrical field emitted by this transformer, the transformer needs to be wrapped in one or two spires of VOB connected to the shielding continuity wire.
The lighting appliances are to be preferably metallic and earthed. The neon metallic wiring is to be preferably metallic, earthed and fitted with electronic ballast. It should be noted that an ampoule manufacturer has marketed a 220 V 50 W dichroic ampoule with the same diameter as the 12 V 50 W dichroic ampoule (recommended).
A loop with the shielded continuity wire is to be made in the inlaid boxes in order to recover a maximum electricity field.

Bathroom

The bathroom is to be wired using VMVB to a bipolar switch located outside the room. VVB wiring or conventional casing is to be used from this switch.

Bedrooms

The bedroom circuits will be protected by a Biorupteur®.

6. Laying the cables

General points for all the parts

No special measures needs to be taken when using VMVB.

In the bedrooms

No other line than the one belonging to this room will be used, unless the wiring is done using VMVB.

7. Reinforced concrete floors

In the conventional buildings with reinforced concrete platforms, beams/pointing or slabs, the concrete bars in the flooring will be earth. This bars will be visible at the end of the platforms. This work has to be carried out by the building company, immediately after the platforms have been laid and before the outside walls are built. An earthing wire with a minimum section of 6 mm² will run between the bars and the electrician will then connected it to the earthing switch.

8. Recommendations

In the case of the appliances connected to the network close to the bedroom area, the power cord should be replaced by a GNLM cable and a bipolar Biorupteur® fitted.

It is essential to correctly chose where to put the television set and the computer. In fact, they should be ideally placed against an outside wall as their maximum level of

electromagnetic radiation is at the back. Under no circumstances should they be placed near to the bedroom area.
No measure needs to be taken with the television network as they are faradized.
It is strongly recommended that a telephone line should not be laid near the head of the bed.

9. Comments on anti-intrusion devices

Due to the scaling crime rate, an anti-intrusion system is installed in a large number of houses. This type is installation may also be found in buildings where a bio-compatible installation will have been executed. You should bear in mind that if you do not correctly chose your detectors, the effect of your installation may be wiped out.
The detectors can be divided into two types:

- The so-called “single technology” ones, which are mainly infrared detectors, that are harmless to people’s health, but have a greater risk of false alarms.
- The so-called “double technology” ones, which are more reliable. They combine two techniques: a conventional infrared detector connected to a radar detector, that is to say using micro-waves. Even if the power is weak, the occupants are permanently exposed.

However, it should be pointed out that there is another type of very reliable double technology detector that combines infrared and ultrasound. We believe that this technique, which is harmless to man, is preferable to any other due to the safety aspect it offers on a technological and biological level.

10. Comments on wooden houses

Given the specific problem of the propagation of electrical fields in the fibrous structure (and which have a certain humidity rate) of wood, it is absolutely essential that VMVB wiring is used throughout the house.

Absorbent shielded flexible cable
by thermal dissipation - GNLM -

Use

GNLM cable is used for electrical connections of appliances in the installations executed according to ecological guidelines. It allows the impact of the cable's high frequency radiation (HF) and the magnetic fields to be reduced as a result of using absorbent material and shielding using an aluminium/polyester tape.

Construction

- Insulated conductors:
  - Core in 0.75 mm^2 multi-stranded copper
  - PVC Insulation
  - The conductors are assembled and twisted
- Inside cladding:
  - The inside cladding is carried out using un-vulcanised elastomer with ferrite powder; this material absorbs the HF and transforms them by internal heat losses and channels the magnetic field.
- Earth coupler:
  - The earth coupler is made in the conventional way: Core in 0.75 mm^2 multi-stranded copper, insulated in yellow-green PVC.
- Shielding continuity conductor:
  - A multi-stranded conductor using 0.75 mm^2 tin-plated copper wire ensure the contact with the shielding. It is electrically separated from the yellow-green earth coupler.
- Shielding:
  - The shielding is carried out using an aluminium-polyester coiled tape. The shielding is earthed using a 0.75 mm^2 tin-plated copper wire
- Outside PVC cladding
  - The material used is identical to that used for the conventional cables.

Absorbent shielded installation cable
by thermal dissipation - VMVB - 1000 V

Utilisation

The VMVB cable is used for electrical installations executed according to ecological guidelines. It allows the impact of the cable's high frequency radiation (HF) and the magnetic fields to be reduced as a result of using absorbent material and shielding using an aluminium/polyester tape.

Construction

The VMVB cable uses components and material of the conventional VVB cable.

- Insulated conductors:
  - Core in 2.5 mm² rigid copper
  - PVC Insulation
  - The conductors are assembled and twisted
- Inside cladding:
  - The inside cladding is carried out using un-vulcanised elastomer with ferrite powder; this material absorbs the HF and transforms them by internal heat losses and channels the magnetic field.
- Earth coupler:
  - The earth coupler is made in the conventional way: Core in 2.5 mm² rigid copper, insulated in yellow-green PVC.
- Shielding continuity conductor:
  - A multi-stranded conductor using 2.5 mm² tin-plated copper wire ensure the contact with the shielding. It is electrically separated from the yellow-green earth coupler.
- Shielding:
  - The shielding is carried out using an aluminium-polyester coiled tape. The shielding is earthed using a 2.5 mm² tin-plated copper wire.
- Outside PVC cladding

  The material used is identical to that used for the conventional VVB cables.