

Foundation Earth Electrodes

Foundation earth electrodes are conductive metal parts embedded in the concrete of the building foundation. Concrete embedded directly in the ground has natural moisture content and can be considered as conductive matter, with conductivity similar to that of the earth. Because of the large area of this type of electrode, low resistance can be achieved. Furthermore, the concrete protects the metal parts against corrosion and steel electrode elements embedded in the concrete do not need any additional corrosive protection. Foundation earth electrodes are nowadays recommended as a very practical solution to building earthing.

In practice there are two basic foundation earth electrode constructions;

- (1) in a foundation without concrete reinforcement (Figure 1) &
- (2) in a foundation with concrete reinforcement (Figure 2).

In both cases the earth electrode is made from;

- (1) steel strip with a rectangular cross-section not less than 30 mm x 3.5 mm, or
- (2) steel bar with a round cross-section not less than 10 mm diameter.

The steel elements can be galvanised (i.e. with a zinc coating), but this is not necessary if the layer of concrete covering the electrode is greater than 50 mm, because the concrete ensures sufficient protection against the corrosion, as shown in Figure 1.

In a foundation without concrete reinforcement (Figure 1) the electrode usually follows the contour of building foundation, i.e. it is placed under the main walls. In buildings with extensive foundations, the electrode is usually made in the form of loops, covering the parts of foundation outlines, and connected to each other.

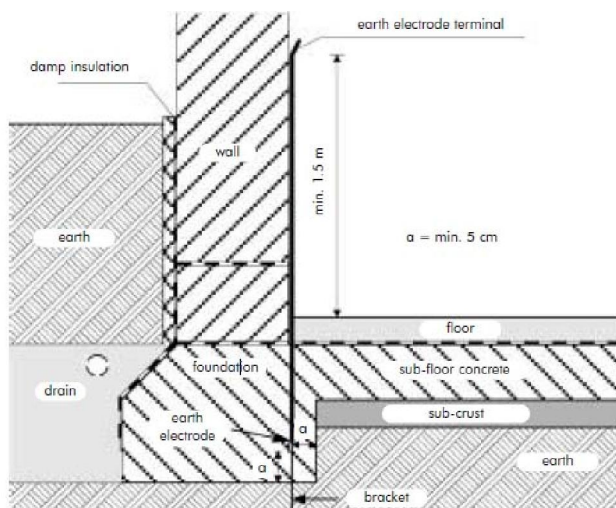


Figure 1 – Illustration of the placement of the foundation earth electrode in a foundation without concrete reinforcement.

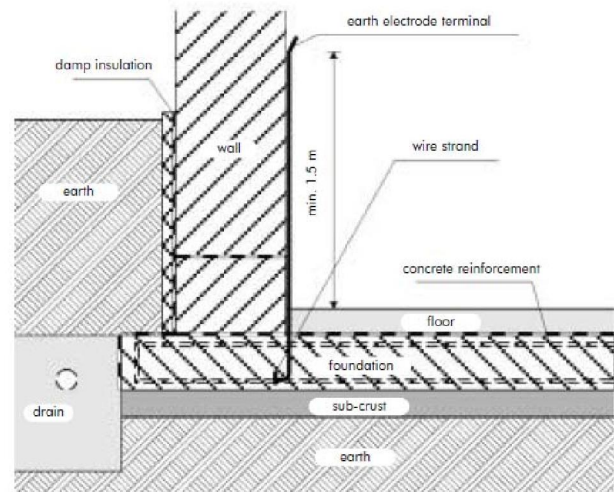


Figure 2 – Illustration of the placement of the foundation earth electrode in a foundation with concrete reinforcement

In a foundation with concrete reinforcement the earth electrode is placed over the lowest layer of wire-mesh reinforcement (Figure 2), thus ensuring adequate corrosion protection for the electrode. The electrode should be fastened to the reinforcement mesh with wire strands at intervals of not more than 2 m over the electrode length. It is not necessary to make a sound electrical connection at each point because the main electrical connection is via the concrete. If the foundation is constructed as separate panels connected to each other with expansion joints, the earth electrodes of each panel should be galvanically connected to each other. These connections must be flexible and must be located so that they remain accessible for measurement and maintenance purposes. The foundation earth resistance can be calculated using the following simplified equation:

$$R = 0.2 \rho / (\sqrt[3]{V}), \text{ where: } R \text{ is in } \Omega \text{ \& } V \text{ is the volume of the foundation in } m^3.$$

The terminal of the foundation earth electrode should have a minimum length of 150 cm above the floor level (Figures 1 and 2). It should be placed as close as possible to the main earthing terminal of the building installation. The connection of the foundation earth electrode to the lightning protection should be placed outside the building.