

BONDING & GROUNDING

Where natural conditions, including humidity, do not ensure a conductive path to prevent accumulation of static electricity, artificial conducting paths (bonding, grounding) might be necessary. Bonding is the process of connecting two or more conductive objects together by means of a conductor. Grounding (earthing) is the process of connecting one or more conductive objects to the earth and is a specific form of bonding. A conductive object can also be grounded by bonding it to another conductive object that is already connected to the ground. Some objects are inherently bonded or inherently grounded by their contact with the earth. Examples are underground piping or large storage tanks resting on the ground. Bonding eliminates the potential difference between conductive objects. Grounding eliminates potential differences between objects and the earth.

When grounding and bonding wires are used to dissipate static electric charges, the currents are quite small and even the smallest of wires are usually adequate to carry the current. The currents encountered in the bond connections used in the protection against accumulations of static electricity are on the order of microamperes (one millionth of an ampere). However, the wires used for bonding and grounding must be able to withstand the rigors of the workplace. The acceptable resistance in a ground connection depends on the type of hazard for which it is intended to give protection. To prevent the accumulation of static electricity, the resistance need not be less than 1 MΩ and in most cases may be even higher. To protect electrical power circuits, the resistance must be low enough to ensure operation of the fuse or circuit breaker under fault conditions. Any ground that is adequate for power circuits or lightning protection is more than adequate for protection against static electricity.

A bond or ground is composed of suitable conductive materials having adequate mechanical strength, corrosion resistance, and flexibility for the service intended. Since the bond or ground does not need to have low resistance, nearly any conductor size will be satisfactory from an electrical standpoint.

Solid conductors are satisfactory for fixed connections. Flexible conductors are used for bonds that are to be connected and disconnected frequently. Conductors can be insulated, although this is not necessary, or uninsulated. Some prefer uninsulated conductors so that defects can be easily spotted by visual inspection. If insulated for mechanical protection, the concealed conductor should be checked for continuity at regular intervals, depending on the inspector's experience. Connections can be made with pressure type ground clamps, brazing, or welding. Battery clamps, or magnetic or other special clamps, ensure good metal-to-metal contact. A special situation requiring substantial conductors might arise if there is a possibility that a ground wire might be called upon to carry current from power circuits or lightning protection systems.

Reference:

Scarborough, Don R. Control of Electrostatic Ignition Sources. Fire Protection Handbook 20th Edition. Massachusetts: NFPA. (2008)

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