

665.26 Grounding and Bonding. Bonding to the equipment grounding conductor or inter-unit bonding, or both, shall be used wherever required for circuit operation, and for limiting to a safe value radio frequency voltages between all exposed non-current-carrying parts of the equipment and earth ground, between all equipment parts and surrounding objects, and between such objects and earth ground. Such connection to the equipment grounding conductor and bonding shall be installed in accordance with Article 250, Parts II and V.

Informational Note: Under certain conditions, contact between the object being heated and the applicator results in an unsafe condition, such as eruption of heated materials. Grounding of the object being heated and ground detection can be used to prevent this unsafe condition.

Because of stray currents between units of equipment or between equipment and the ground, bonding presents special problems at radio frequencies. Special bonding requirements are particularly needed at dielectric heating frequencies (100 to 200 megahertz) because of the differences in radio frequency potential that can exist between the equipment and surrounding metal units or other units of the installation. Bonding has been accomplished by placing all units of the equipment on a flooring or base consisting of a copper or aluminum sheet, then thoroughly bonding by soldering, welding, or bolting. Such special bonding holds the radio frequency resistance and reactance between units to a minimum, and any stray circulating currents flowing through the bonding will not cause a dangerous voltage drop.

The operator can be protected from high radio frequency potentials by shielding at dielectric heating frequencies. Interference with radio communications systems at such high frequencies can be eliminated by totally enclosing all components in a shielding of copper or aluminum.

665.27 Marking. Each heating equipment shall be provided with a nameplate giving the manufacturer's name and model identification and the following input data: line volts, frequency, number of phases, maximum current, full-load kilovolt-amperes (kVA), and full-load power factor. Additional data shall be permitted.

ARTICLE

668

Electrolytic Cells

668.1 Scope. This article applies to the installation of the electrical components and accessory equipment of electrolytic cells, electrolytic cell lines, and process power supply for the production of aluminum, cadmium, chlorine, copper, fluorine, hydrogen peroxide, magnesium, sodium, sodium chlorate, and zinc.

Not covered by this article are cells used as a source of electric energy and for electroplating processes and cells used for the production of hydrogen.

Informational Note No. 1: In general, any cell line or group of cell lines operated as a unit for the production of a particular metal,

gas, or chemical compound may differ from any other cell lines producing the same product because of variations in the particular raw materials used, output capacity, use of proprietary methods or process practices, or other modifying factors to the extent that detailed *Code* requirements become overly restrictive and do not accomplish the stated purpose of this *Code*.

Informational Note No. 2: See IEEE 463-2013, *Standard for Electrical Safety Practices in Electrolytic Cell Line Working Zones*, for further information.

Within a cell line working zone, both an electrolytic cell line and its direct current (dc) process power-supply circuit are treated as an individual machine supplied from a single source, even though they might cover acres of space, have a load current in excess of 400,000 amperes dc, or have a circuit voltage in excess of 1000 volts dc. The cell line process current passes through each cell in a series connection, and the load current cannot be subdivided the way it can in the heating circuit of a resistance-type electric furnace. Because a cell line is supplied by its individual dc rectifier system, the rectifier or the entire cell line circuit is de-energized by removing its primary power source.

In some electrolytic cell systems, the terminal voltage of the process supply can be significant. The voltage to ground of exposed live parts from one end of a cell line to the other is variable between the limits of the terminal voltage. Hence, operating and maintenance personnel and their tools are required to be insulated from ground.

668.3 Other Articles.

(A) Lighting, Ventilating, Material Handling. Chapters 1 through 4 shall apply to services, feeders, branch circuits, and apparatus for supplying lighting, ventilating, material handling, and the like that are outside the electrolytic cell line working zone.

(B) Systems Not Electrically Connected. Those elements of a cell line power-supply system that are not electrically connected to the cell supply system, such as the primary winding of a two-winding transformer, the motor of a motor-generator set, feeders, branch circuits, disconnecting means, motor controllers, and overload protective equipment, shall be required to comply with all applicable sections of this *Code*.

(C) Electrolytic Cell Lines. Electrolytic cell lines shall comply with the provisions of Chapters 1 through 4 except as amended in 668.3(C)(1) through (C)(4).

(1) Conductors. The electrolytic cell line conductors shall not be required to comply with Articles 110, 210, 215, 220, and 225. See 668.12.

(2) Overcurrent Protection. Overcurrent protection of electrolytic cell dc process power circuits shall not be required to comply with the requirements of Article 240.

(3) Grounding. Except as required by this article, equipment located or used within the electrolytic cell line working zone or associated with the cell line dc power circuits shall not be required to comply with Article 250.