This requirement applies to EGCs that are separately installed as specified in 250.190(C)(1). It also applies to a conductor installed in a cable assembly, other than the cable shield, that is used as an EGC. An EGC contained within a cable assembly can be a single conductor, or it can be sectioned (comprising multiple conductors within the cable jacket or sheath to form a single EGC) as permitted by 310.10(G)(5).

250.191 Grounding System at Alternating-Current Substations. For ac substations, the grounding system shall be in accordance with Part III of this article.

Informational Note: See IEEE 80, *IEEE Guide for Safety in AC Substation Grounding*, for further information on outdoor ac substation grounding.

250.194 Grounding and Bonding of Fences and Other Metal Structures. Metal fences enclosing, and other metal structures in or surrounding, a substation with exposed electrical conductors and equipment shall be grounded and bonded to limit step, touch, and transfer voltages.

Δ **(A) Metal Fences.** If metal fences are located within 5 m (16 ft) of the exposed electrical conductors or equipment, the fence shall be bonded to the grounding electrode system with wire-type bonding jumpers as follows:

(1) Bonding jumpers shall be installed at each fence corner and at maximum 50 m (160 ft) intervals along the fence.
(2) If bare overhead conductors cross the fence, bonding jumpers shall be installed on each side of the crossing.
(3) Gates shall be bonded to the gate support post, and each gate support post shall be bonded to the grounding electrode system.
(4) Any gate or other opening in the fence shall be bonded across the opening by a buried bonding jumper.
(5) The grounding grid or grounding electrode systems shall be extended to cover the swing of all gates.
(6) The barbed wire strands above the fence shall be bonded to the grounding electrode system.

Alternate designs performed under engineering supervision shall be permitted for grounding or bonding of metal fences.

Informational Note No. 1: A nonconducting fence or section may provide isolation for transfer of voltage to other areas.

Informational Note No. 2: See IEEE 80, *IEEE Guide for Safety In AC Substation Grounding*, for design and installation of fence grounding.

(B) Metal Structures. All exposed conductive metal structures, including guy wires within 2.5 m (8 ft) vertically or 5 m (16 ft) horizontally of exposed conductors or equipment and subject to contact by persons, shall be bonded to the grounding electrode systems in the area.

Metal fences around substations must be grounded to limit the rise of hazardous voltage on the fence. For situations where considerations of step potential and touch potential indicate that additional grounding and bonding design is required, alternative designs performed under engineering supervision are permitted.