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IEEE Standard for the Electrical Protection of Communication Facilities Serving Electric Supply Locations Through the Use of Hybrid Facilities

IEEE Power and Energy Society

Sponsored by the
Power System Communications Committee

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IEEE Standard for the Electrical Protection of Communication Facilities Serving Electric Supply Locations Through the Use of Hybrid Facilities

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of the
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Abstract: Safe and reliable methods for the electrical protection of telecommunication facilities serving electric supply locations through the use of metallic wire-line components in part of the telecommunication circuit and optical fiber systems in the remainder of the telecommunication circuit are presented in this standard. Hybrid applications have an equipment junction between the metallic wire-line and the fiber cable, i.e., a wire-line–fiber cable junction (CFJ).

Keywords: CFJ, copper-fiber junction, electric power stations, electric supply locations, electrical protection, fiber-optic systems, ground potential rise, high-voltage environment, IEEE 487.3™, optical fiber systems

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Introduction

This introduction is not part of IEEE Std 487.3-2014, IEEE Standard for the Electrical Protection of Communication Facilities Serving Electric Supply Locations Through the Use of Hybrid Facilities.

Wire-line telecommunication facilities serving electric supply locations often require special high-voltage protection (HVP) against the effects of fault-produced ground potential rise (GPR) or induced voltages, or both. Some of the telecommunication services are used for control and protective relaying purposes and may be called on to perform critical operations at times of power system faults. Even when critical services are not involved, special HVP may be required for both personnel safety and plant protection at times of power system faults.

Effective protection of any wire-line telecommunication circuit requires coordinated protection of all circuits provided over the same telecommunication cable.

Some electrical environments, collectively called *electric supply locations*, require the application of unique electrical protection techniques because of their special nature. One such environment is the electric power station or substation. Another is at or near power line transmission and distribution structures such as towers or poles. Such structures often provide a convenient site for the location of wireless, personal communications service, and cellular antennas and their associated electronic equipment that is served by a link to the wired telecommunications network.

This standard describes applications consisting of both metallic cables and optical fiber cables, i.e., hybrid facilities or, in other words, applications using metallic wire-line components in part of the telecommunication circuit and optical fiber cables in the remainder of the telecommunication circuit. Hybrid applications have an equipment junction between the metallic wire-line and the optical fiber cable, i.e., a wire-line–fiber cable junction (CFJ). This standard also describes the special case when the CFJ is placed inside the zone of influence (ZOI). For applications consisting entirely of optical fiber cables, the user is referred to IEEE Std 487.2™.[a]

This standard presents workable methods for the electrical protection of wire-line telecommunication circuits serving electric supply locations through the use of hybrid facilities.

This project is part of a reorganization of the IEEE 487™ documentation in which the main document is broken down into a family of related documents (i.e., dot-series) segregated on the basis of technology:

- IEEE Std 487™ for general considerations
- IEEE Std 487.1™ for applications using on-grid isolation equipment
- IEEE Std 487.2™ for applications consisting entirely of optical fiber cables
- IEEE Std 487.3™ for applications of hybrid facilities where part of the circuit is on metallic wire-line and the remainder of the circuit is on optical fiber cable
- IEEE Std 487.4™ for applications using neutralizing transformers
- IEEE Std 487.5™ for applications using isolation transformers

This standard has been prepared by the Wire-Line Subcommittee of the Power System Communications Committee of the IEEE Power and Energy Society, and it represents the consensus of both power and telecommunications engineers.

This standard, along with IEEE Std 487.2, replaces, in its entirety, the recommended practice IEEE Std 1590™-2009, which covered electrical protection of communication facilities serving electric supply locations using optical fiber systems.

[a] Information about normative references can be found in Clause 2.

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IEEE Standard for the Electrical Protection of Communication Facilities Serving Electric Supply Locations Through the Use of Hybrid Facilities

1. Overview

Wire-line telecommunication facilities serving electric supply locations often require special high-voltage protection (HVP) against the effects of fault-produced ground potential rise (GPR) or induced voltages, or both. Some of the telecommunication services are used for control and protective relaying purposes and may be called on to perform critical operations at times of power system faults. This requirement presents a major challenge in the design and protection of the telecommunication system because power system faults can result in the introduction of interfering voltages and currents into the telecommunication circuit at the very time when the circuit is most urgently required to perform its function. Even when critical services are not involved, special HVP may be required for both personnel safety and plant protection at times of power system faults. Effective protection of any wire-line telecommunication circuit requires coordinated protection on all circuits provided over the same telecommunication cable. This standard does not include optical fiber cables that are used entirely within electric power substations, as this is covered by IEEE Std 525™[B27].[1]

[1] The numbers in brackets correspond to the numbers of the bibliography in Annex A.