

Chapter 2

Project Overview

2.1 Project Overview

The Fire Protection Research Foundation sponsored this project to address electrical surge protection for residential dwelling units. The goal of the project is to develop a data collection plan to assess loss related to electrical surges in homes, and address the potential impact electrical surge protection devices (SPDs) would have in mitigating these losses.

The project includes the following activities:

- Literature review—review of literature to include fundamental factors contributing to electrical surges, existing data associated with losses, case studies of SPD effectiveness, and overview of SPD designs.
- Preliminary data collection plan—develop a preliminary data collection plan that will address the identified data gaps. When implemented, the data collection plan should provide a comprehensive review of electrical surge related losses in homes in the United States and address the potential impact of electrical surge protection devices in mitigating these losses.

2.2 NFPA 70 Committee Report on Proposals—2013

Each update cycle for NFPA 70, *National Electrical Code*[®], includes numerous proposals for changes throughout the document. In particular, the installation of SPDs has been proposed for virtually all low-voltage (600 V or less) electrical distribution equipment. Because of the breadth of these recommendations, the proposals and their reasons for rejection are summarized here. Although this Fire Protection Research Foundation report is focused on SPDs for residential dwelling units, the proposals for SPDs cover a much broader set of electrical distribution equipment.

The *National Electrical Code® Committee Report on Proposals—2013 Annual Revision Cycle*¹ provides a summary of all proposals and their disposition in support of the 2014 edition of NFPA 70. With respect to the application of SPDs, the following proposals were submitted:

- Proposal 4-65 Log #3318 NEC-P04—New Article 225.41 Surge Protection. A Type 1 or Type 2 listed SPD shall be installed on all outside branch circuits and feeders and shall be located at the point where the outside branch circuits and feeders receive their supply.
- Proposal 4-143 Log #3319 NEC-P04—Article 230.67 Surge Protection. A Type 1 or Type 2 listed SPD shall be installed on all services.
- Proposal 4-143a Log #3504 NEC-P04—Article 230.67 Dwelling Unit Surge Protection.
 - (A) Surge Protective Device. All dwelling units shall be provided with a surge protective device (SPD) installed in accordance with Article 285.
 - (B) Location. The surge protective device shall be an integral part of the service disconnecting means or shall be located immediately adjacent thereto.
 - (C) Type. The surge protective device shall be a Type 1 or Type 2 SPD.
 - (D) Replacement. Where service equipment is upgraded, all of the requirements of this section shall apply.
- Proposal 5-244 Log #3320 NEC-P05—New Article 285.2 Required uses. A listed SPD shall be installed in or on the following equipment that is rated at 1000 V or less.
 - (1) Switchboards and panelboards
 - (2) Motor control centers
 - (3) Industrial control panels
 - (4) Control Panels for elevators, dumbwaiters, escalators, moving walks, platform and stairway chairlifts
 - (5) Power distribution units supplying information technology equipment in information technology rooms
 - (6) Solar photovoltaic (PV) combiner boxes, recombiner boxes, and inverters
 - (7) Roof-top air conditioning and refrigerating equipment
 - (8) Adjustable-speed drive systems
 - (9) Burglar alarm panels
 - (10) Fire alarm panels
 - (11) Critical Operations Power Systems
 - (12) Small Wind Electric Systems
- Proposal 9-117 Log #3321 NEC-P09—Article 408.6 Surge Protection. A listed SPD shall be installed in or on all switchboards and panelboards.

¹The *National Electrical Code® Committee Report on Proposals—2013 Annual Revision Cycle*. The 2010 version provided similar recommendations.

- Proposal 11-14 Log #3322 NEC-P11—Article 409.70 Surge Protection. A listed SPD shall be installed in or on all industrial control panels.
- Proposal 11-42 Log #3323 NEC-P11—New Article 430.92 Surge Protection. A listed SPD shall be installed in or on all motor control centers.
- Proposal 11-55 Log #3324 NEC-P11—New Article 430.121 Surge Protection. A listed SPD shall be installed in or on all adjustable-speed drive systems.
- Proposal 11-84 Log #3325 NEC-P11—New Article 440.9 Surge Protection. A listed SPD shall be installed in or on all roof-top air-conditioning and refrigerating equipment.
- Proposal 12-49 Log #3326 NEC-P12—New Article 620.56 Surge Protection. A listed SPD shall be installed in or on control panels for elevators, dumbwaiters, escalators, moving walks, platform and stairway chairlifts.
- Proposal 12-140 Log #3327 NEC-P12—New Article 645.18 Surge Protection. A listed SPD shall be installed in or on all switchboards, panelboards, and power distribution units supplying information technology equipment in information technology rooms.
- Proposal 12-169 Log #3328 NEC-P12—New Article 670.6 Surge Protection. A listed SPD shall be installed in or on all industrial machinery.
- Proposal 4-254 Log #3329 NEC-P04—New Article 690.12 Surge Protection. A listed SPD shall be installed in or on all solar photovoltaic (PV) combiner boxes, recombiner boxes, and inverters.
- Proposal 13-98 Log #3330 NEC-P13—New Article 700.8 Surge Protection. A listed SPD shall be installed in or on all emergency systems switchboards and panelboards.

Note: Although the *Committee Report on Proposals* lists the Final Action as Reject, the 2014 edition of NFPA 70 does include a new Article 700.8 that states:

700.8 Surge Protection

A listed SPD shall be installed in or on all emergency systems switchboards and panelboards.

- Proposal 4-405 Log #3331 NEC-P04—New Article 705.13 Surge Protection. A Type 1 listed SPD shall be installed at the point of connection of all interconnected electric power production sources.
- Proposal 3-131 Log #3332 NEC-P03—New Article 725.36 Surge Protection. A listed SPD shall be installed in or on all burglar alarm control panels.
- Proposal 3-179 Log #3333 NEC-P03—New Article 760.36 Surge Protection. A listed SPD shall be installed in or on all fire alarm control panels.

The NFPA 70 Panel rejected the above proposals on various bases, including:

- *Surge protection is permitted to be installed and should not be required, as surge probabilities vary by locality, and different types of electrical loads have differing surge protection requirements. Surge protection must also be periodically maintained or replaced. The user should make the decision to install this protection.*

- *While the use of SPD's is appropriate in many instances, it is not always needed in every installation. System designers should apply SPD's where needed. Equipment manufacturers frequently provide integrated surge protection when it is deemed appropriate. The substantiation provided does not warrant the imposition of this new requirement.*
- *Surge protective devices have proven to provide benefits for components and systems against the damages of voltage surges, but the substantiation for this proposal does not document that such protection would specifically benefit HVAC equipment installed on a roof. In addition this may not work with high resistance, impedance or ungrounded systems. The NFPA FPRF is working on a project in this area which may provide information in the future.*
- *CMP-13 acknowledges that surges may result in failures. However, the proposal does not state what type or level of protection should be required. Further substantiation through a formal research report that presents evidence of the type of SPD and the level of protection required would present the opportunity for the panel to reconsider the proposal.*

Miscellaneous changes were made to the 2014 edition of NFPA 70 Article 285, *Surge-Protective Devices (SPDs), 1000 V or Less*, but these changes do not affect the locations where surge protection has been required.

2.3 Report Content

This book provides information regarding:

- Surge phenomena and their sources.
- Surge protection methods.
- Surge protection strategies recommended by various sources.
- Industry standards and their recommendations.
- Available data associated with electrical surges and their impact.
- Recommended data collection in support of code-making efforts.

Data Assessment for Electrical Surge Protective
Devices

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2015, XV, 36 p. 10 illus., Softcover

ISBN: 978-1-4939-2891-0