

Best Practice #137

7/26/2012

Best Practice Title: Electrical Code Guidance for Decontamination and Decommissioning Activities at DOE Facilities

Facility: Idaho National Laboratory, All D&D Facilities

Point of Contact: Kirk J. Dooley, 208-533-0532, Kirk.Dooley@icp.doe.gov

Brief Description of Best Practice: Decontamination and decommissioning (D&D) of facilities at U.S. Department of Energy (DOE) sites require engineering standards to safely accomplish D&D missions. Current engineering standards do not adequately address the unique situations arising during D&D activities. A new DOE guidance document was therefore developed to establish and interpret new code guidance governing electrical design during D&D phases. NFPA 70, "National Electrical Code," Article 590, "Temporary Power," is used to establish the basis of this document.

Summary: Since current engineering standards and code requirements do not adequately address the unique situations arising during D&D activities, additional guidance is needed to clarify the current electrical code. The new guidance document provides guidance on how to interpret selected articles of NFPA 70, "National Electrical Code" (NEC), in particular certain articles within Article 590, "Temporary Power," for D&D electrical activities at DOE sites. The national consensus codes provide design guidance, which ensures safe occupancy of permanent structures but which may not comprehensively include D&D projects. As part of D&D work, the structures will be demolished and have a temporary occupancy and a temporary life span.

Why the best practice was used: The NEC was written to regulate electrical installations; consequently, all provisions may not be suitable for D&D activities. Having a guidance document that clarifies the code used for temporary installations for D&D activities is needed to ensure safety as well as efficiency and consistency during temporary use of electrical utilities and isolations.

The guidance document interprets or clarifies, and should be used in conjunction with the NEC, Article 590 code for D&D electrical design. Article 590 of the code applies to D&D. The guidance document is applicable to all DOE sites.

What are the benefits of the best practice: The intent in writing this guidance document is to provide clearer guidance for D&D work, to make D&D engineering efforts and field applications more cost effective, and to ensure the safety of D&D personnel.

What problems/issues were associated with the best practice: Without a uniform electrical code guidance for D&D activities at DOE facilities, each DOE site/project created and maintained their own policies and procedures. Some sites used the NFPA 70, "National Electrical Code," Article 590, "Temporary Power," for guidance and some did not. Now that the uniform electrical code guidance has been developed, the issue associated with this best practice will be in the implementation of the guidance across all sites and projects.

How the success of the Best Practice was measured: This guidance has been implemented at the Idaho National Laboratory over the past 6 years and has yielded hundreds of thousands in cost savings and reduced the installation of the infrastructure and temporary power by months. There have been no adverse safety effects as a result of following this guidance. In fact, the hazards to the worker have been reduced as a result of reduced excavation and cement work by running conduit above ground and/or on jersey bouncers.

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Alternative solutions considered: Previous to the development of the guidance document, each DOE site/project created and maintained their own policies/procedures to guide electrical D&D activities with varying degrees of success. A standardized consistent approach across all DOE sites and projects was needed.

Additional Information

Reference:

Electrical Code Guidance for Decontamination and Decommissioning Activities at DOE Facilities, June 2012, CWI-M-1264, Revision 0.

Comments: Reference document is attached to this best practice.

ELECTRICAL CODE GUIDANCE FOR DECONTAMINATION AND DECOMMISSIONING ACTIVITIES AT DOE FACILITIES

June 2012

DISTRIBUTION STATEMENT
Approved for public release; distribution is unlimited.

ABSTRACT

Decontamination and decommissioning (D&D) of facilities at U.S. Department of Energy (DOE) sites require engineering standards to safely accomplish D&D missions. Current engineering standards do not adequately address the unique situations arising during D&D activities. It is, therefore, proposed that a new DOE guidance document be developed that will establish or interpret new code guidance governing electrical design during D&D phases. NFPA 70, “National Electrical Code,” Article 590, “Temporary Power,” Is used to establish the basis of this document.

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U.S. Department of Energy
Idaho Operations Office

Kirk J. Dooley
Jose L. Vargas
Mark E. Slovak

Andrew Szilagyi
R. Mark Shaw
George Cava

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^a. Note: This Contents table references citation levels addressed in the pages of this guidance document and is not necessarily “in order” according to normal Table of Contents numbering criteria.

ACRONYMS

D&D	decontamination and decommissioning
DOE	U.S. Department of Energy
GFCI	ground fault circuit interrupter
NEC	National Electrical Code
NFPA	National Fire Protection Association
UL	Underwriter's Laboratory

ELECTRICAL CODE GUIDANCE FOR DECONTAMINATION AND DECOMMISSIONING ACTIVITIES AT DOE FACILITIES

INTRODUCTION

Decontamination and decommissioning (D&D) of facilities at U.S. Department of Energy (DOE) sites require engineering standards and code implementation to safely accomplish D&D missions. Current engineering standards and code requirements do not adequately address the unique situations arising during D&D activities. Additional guidance is, therefore, needed to clarify the current electrical code. This document provides guidance on how to interpret selected articles of NFPA 70, “National Electrical Code” (NEC), in particular certain articles within Article 590, “Temporary Power,” for D&D electrical activities at DOE sites.

The national consensus codes provide design guidance, which ensures safe occupancy of permanent structures but which may not comprehensively include D&D projects. As part of D&D work, the structures will be demolished and have a temporary occupancy and a temporary life span.

The NEC was written to regulate electrical installations; consequently, all provisions may not be suitable for D&D activities. Having a guidance document that clarifies the code used for temporary installations for D&D activities would ensure safety as well as efficiency and consistency during temporary use of electrical utilities and isolations.

ORGANIZATION

This document is formatted in a manner similar to the NEC, Article 590 code in that each page consists of two text columns. The first column includes the D&D code intention; the second column includes the applicable interpretation to the code intention. The numbering system of this document matches the numbering system used in the NEC, Article 590 code, thus facilitating quick reference between the two documents. Several sections in this document do not restate the entire code section.

SCOPE

This document interprets or clarifies, and should be used in conjunction with the NEC, Article 590 code for D&D electrical design. Article 590 of the code applies to D&D. This document is applicable to all DOE sites.

The intent in writing this guidance document is to provide clearer guidance for D&D work, to make D&D engineering efforts and field applications more cost effective, and to ensure the safety of D&D personnel.

Note: If there is an interruption or suspension to a D&D project, it is recommended that administrative controls and engineering evaluations be performed to ensure that the facilities are left in a safe configuration. The applicability of this guidance document may then be reevaluated on a case-by-case basis, considering future occupancy and use.

GUIDANCE

NFPA 70, “National Electrical Code,” (NEC) Article 590, “Temporary Installations,” shall be used for decontamination and decommissioning (D&D) activities.

590.1 SCOPE

Generally the emphasis to this article is as follows:

“The provisions of this article apply to temporary D&D electrical power and lighting installations for nonpermanent activities, including construction and D&D.”

590.3(A) TIME CONSTRAINTS

(No changes to this section – see Commentary)

590.4(D) GENERAL—RECEPTACLES

Generally the emphasis to this article is as follows:

“Install a separate equipment grounding conductor in all raceways.”

COMMENTARY

NOTE: *The NEC does not provide a commentary in the format of the SEI/ASCE 37-02 standard. A commentary is provided here for consistency within this document.*

This division provides interpretation and clarification when applying NEC, Article 590, “Temporary Installations,” to nonpermanent activities, including D&D activities.

C590.1 SCOPE

The interpretation to this article should be as follows:

“The intent of the scope shall also apply to D&D activities and applicable, temporary support facilities.”

C590.3 TIME CONSTRAINTS

The interpretation to this article should be as follows:

“The period of D&D also applies to D&D support facilities.”

C590.4(D) GENERAL—RECEPTACLES

The interpretation to this article should be as follows:

Even though Article 590.4(D) allows the use of a continuous length of conduit to serve as an equipment-grounding conductor, this method of installation is insufficient from a safety standpoint. Field evaluations by electrical engineers have determined that discontinuity could exist as a result of loose conduit connections. As a precaution, installation should specify a separate equipment-grounding conductor in each raceway, whether part of a temporary or permanent installation.

GUIDANCE

590.4(I) GENERAL – TERMINATIONS AT DEVICES

Generally the emphasis to this article is as follows:

“Flexible, fine-stranded cables shall be terminated only with terminals, lugs, devices, or connectors that are identified and listed for such use.”

590.6(A) RECEPTACLE OUTLETS

(No changes to this section – see Commentary)

COMMENTARY

C590.4(I) GENERAL – TERMINATIONS AT DEVICES

The interpretation to this article should be as follows:

Although NEC, Article 590, does not address the termination of fine-stranded cords, it has been recognized that terminations of flexible cords present a problem. The industry has not provided ancillary products for the many fine-stranded cords that are commercially available. Consequently, only a limited range of cable sizes can be supported by a few companies by providing crimp lugs or multi-tap connectors for the installation of fine-stranded, welding-type wire. However, acceptable or listed termination components that do exist need to be overlapped and used in combination in order to cover a larger range of fine-stranded cable sizes.

C590.6(A) RECEPTACLE OUTLETS

The interpretation to this article should be as follows:

All 125V, single-phase 15-, 20-, and 30-A cords shall have ground-fault-circuit-interrupter (GFCI) protection for personnel; however, the 125V cords do not have to be included in a color-code scheme for testing accountability. Safety will still be provided to personnel through the use of GFCIs, and at the same time, no increased cost is imposed on D&D operations by having to maintain a program for accountability of GFCI cords.

Electrical connections to a permanent or temporary structure for power during D&D shall ensure that the electrical circuit is routed through a GFCI—often referred to as a “GFCI pigtail.” This GFCI pigtail is a short extension cord with a GFCI component built into it. Using this GFCI pigtail protects personnel to a 6-mA level.

GUIDANCE

590.6(B)(1) GFCI PROTECTION

(No changes to this section – see Commentary)

COMMENTARY

C590.6(B)(1) GFCI PROTECTION

The interpretation to this article should be as follows:

This section of the NEC addresses GFCI protection for personnel using equipment rated at other than 125V and includes voltages typically used during D&D of 208V, 240V, 277V, and 480V.

GFCI protection is available for personnel at these higher voltages. Single- and three-phase GFCI for personnel protection are available and listed by Underwriter's Laboratory (UL). The GFCI designed to provide personnel protection is listed under UL Certification File #: E178442. Other UL files offer GFCI protection; however, no others are rated for personnel protection. UL943 is the only standard for GFCIs for personnel protection at these high voltage levels. GFCIs for personnel protect at a level of 4–6 ; whereas, ground fault equipment protectors (GFEPs) protect at a level of 30 ma. A GFEP, indeed, is not a GFCI.

This clarification simply emphasizes the fact that protection for personnel is available to protect personnel at the 4–6 ma level at higher voltages.