

NEMA OS 3-2007

Selection and Installation Guidelines for Electrical Outlet Boxes



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SELECTION AND INSTALLATION GUIDELINES FOR ELECTRICAL OUTLET BOXES

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Selection and Installation Guidelines for Electrical Outlet Boxes

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CONTENTS

	Foreword	iii
	Introduction	iv
Section 1	PRODUCT SELECTION	1
1.1	The Outlet Box for the Type of Wiring System Used	4
1.1.1	Connection to the Wiring System	4
1.1.2	Wiring Systems Employing Tubing or Conduit	4
1.1.3	Wiring Systems Employing Metal Jacketed or Nonmetallic-Sheathed Cable	4
1.1.4	Grounding	5
1.2	Select the Box Based on Contents and Function after Installation	5
1.2.1	Internal Volume Capacity of Boxes	5
1.2.2	Junction and Pull Boxes	6
1.2.3	Outlet and Device Boxes – Mounting of Wiring Devices	6
1.2.4	Outlet and Device Boxes – Support of Fixtures/Luminaires, Ceiling Suspended Fans, and Other Products	7
1.2.5	Outlet and Device Boxes with Fire Resistance Ratings (hours)	8
1.2.6	Boxes for High and Low Voltage Wiring Circuits (Class 1, Class 2, and Class 3 Circuits)	8
1.3	Select the Outlet Box for the Intended Location of Installation	9
1.3.1	General	9
1.3.2	Boxes for Installation in or on Walls or Ceilings	10
1.3.3	Boxes for Installation in Floors	11
1.3.4	Boxes for Other Locations	12
1.3.5	Outlet and Device Boxes for use in Fire Resistance-Rated Construction	14
1.3.6	Special Use Boxes	15
1.3.7	Covers and Cover Plates for Dry Locations	15
1.3.8	Extension Rings and Box Extenders	16
Section 2	PRODUCT INSTALLATION	22
2.1	Introduction	22
2.1.1	Storage and Preparation for Installation	22
2.1.2	Coordinating Trades (after Boxes are Mounted)	22
2.2	Fire Resistance-Rated Construction	22
2.2.1	Metallic Boxes	23
2.2.2	Nonmetallic Boxes	24
2.3	Mounting and Securing of Electrical Boxes	25
2.3.1	General	25
2.3.2	Surface Mounting on Walls or Ceilings	25
2.3.3	Boxes Supported by Raceways	25
2.3.4	Flush Mounting in Walls and Ceilings	25
2.3.5	Pendant Mounting	26
2.3.6	Pedestal Mounting	27
2.3.7	Masonry Wall Mounting	27
2.3.8	Floor Box Mounting	27
2.3.9	Poke-through Floor Fitting-Mounting	28
2.3.10	Other Boxes	28
2.4	Connection to Wiring Systems	29
2.4.1	General	29
2.4.2	Connection to Conduit Entries	29
2.4.3	Connection to Cable Entries	31
2.4.4	Connection to High and Low Voltage Wiring Circuits	33
2.5	Completing the Installation	33
2.5.1	Introduction	33
2.5.2	Grounding and Bonding	33

2.5.3	Installation of Wiring Devices	35
2.5.4	Flush-Device Boxes: Coordination with Finished Wall Surface Installation	37
2.5.5	Installation of the Cover and/or Cover Plate	38
2.6	Verification of Installation	38

Tables

1-1	Summary Table for Support of Luminaires/Fixtures and Other Products	8
2-1	Recommended Set Times for Cemented Joints	31

Figures

1-1	Typical Box Mounting Positions	17
1-2	Typical Box Mounting Styles	19
1-3	Separately Supplied Box Supports.....	20
2-1	Square Boxes In 4" X 4" Wall Opening	24
2-2	Typical Threaded Conduit Entries	30

Foreword

User input has been considered in the development of this Standards Publication. The Standards Publication was developed by the NEMA Outlet and Switch Box Section, which periodically reviews it for any revisions necessary to address changing conditions, product listing and installation requirements, and technical progress. Comments for proposed revisions are welcomed and should be submitted to:

Vice President, Technical Services
National Electrical Manufacturers Association
1300 North 17th Street, Suite 1752
Rosslyn, VA 22209

Introduction

There may be no other component of our electrical distribution system that serves more purposes than the electrical outlet box.

When installed with a cover, the box

1. provides connection to a raceway system and a means to access wiring;
2. houses and provides a degree of mechanical protection for conductor splices, and wiring devices such as switches and receptacles; and
3. limits access to live parts; and where applicable, bonds electrically conductive components to the equipment grounding conductor.

When designed and specifically identified for the purpose, a box and other components form an enclosure system which

1. provides degrees of protection from external environmental conditions (rain, dust, scrub water, etc);
2. preserves the integrity of fire resistance rated walls, ceilings, floors, partitions, or furniture in which it is installed; and/or
3. provides independent support for attached fixtures such as luminaires, ceiling suspended fans, and safety and security devices.

For the most part, boxes within the scope of these guidelines fall into just a few general classifications. Each classification has been adapted over the years to meet market needs.

These guidelines are written by the NEMA Outlet and Switch Box Section (5-OS) to provide qualified designers, installers, and inspectors with an industry perspective of the appropriate selection and installation criteria based on the designed, intended use of the product. The member companies of the NEMA 5-OS Section promote selection and installation of listed boxes and covers, and listed raceways and fittings. Listing of electrical system components qualifies them to minimum performance requirements and provides for ongoing conformity surveillance. Listed boxes and covers can be recognized by the trademark of the qualified electrical testing laboratory on the part or its smallest unit container.

It is our objective to develop a closer liaison with the installers of our products and the professional electrical inspector. Through this liaison, we intend to provide uniform education and understanding as to the intended use and application of our products. Through education, we hope to develop an alliance, founded in trust that will ensure that the concerns and challenges we each face are addressed.

Compatibility of Boxes with Metallic and Nonmetallic Wiring Systems—Grounding and Bonding

Metal and nonmetallic outlet boxes are typically designed for use in electrical distribution systems rated 600 volts or less.

Metal systems and raceways that are recognized as equipment grounding conductors provide protection by grounding and bonding the entire system. All the components of the system (boxes, fittings, devices, fixtures, raceways, etc.) with proper installation are designed to maintain continuous grounding and bonding throughout the system. Products must be installed so that the removal of any device, fixture or box cover does not interrupt the downstream grounding or bonding path.

Nonmetallic systems protect the installer and end users by providing isolation (insulation) throughout the wiring system. All the components (boxes, fittings, devices, fixtures, raceways, etc.) with proper installation are designed to maintain this isolation (insulation).

When properly installed:

- a) there are no ungrounded exposed metal parts that may be likely to become energized in case of a ground fault;
- b) ground wires are installed inside the raceways and throughout the system; and
- c) ground wires are joined so that removal of a device or fixture does not interrupt the downstream ground path.

Generally, this is done by joining the incoming and outgoing ground wires with a third ground wire that then attaches to the device or fixture. Thus, the removal of the device or fixture does not affect the downstream ground path.

Each system is designed to distribute electrical power while protecting the installer and end users. Metallic and nonmetallic systems employ different means to provide protection. Therefore, for safety reasons, these two systems should not be randomly mixed without due consideration.

Where it is necessary and desirable to mix metallic and nonmetallic components in a wiring system, special products, applications and procedures can be used to ensure the desired level of safety in accordance with the *National Electrical Code*[®].

Product Standards and Installation Codes

Boxes and covers within the scope of these guidelines are designed for installation in compliance with the *National Electrical Code*[®] (*NEC*[®]) NFPA 70. The broadest range of general purpose designs are included in ANSI/NEMA OS 1, *Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports*; and ANSI/NEMA OS 2, *Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports*. NEMA FB 1, *Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Tubing, and Cable Assemblies*, contains those boxes described in its title, and ANSI/NEMA WD 6, *Wiring Devices—Dimensional Requirements*, includes flush-device cover plates. Conformity to these standards provides assurance of the compatibility and interchangeability of box designs with covers, raceways, wiring devices and other components of the electrical distribution system whose performance may be dependent on the box design.

Listed boxes are typically evaluated to the safety and performance requirements of ANSI/UL 514A, *Metallic Outlet Boxes* or ANSI/UL 514C, *Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers*. The safety and performance requirements for flush-device cover plates are covered in ANSI/UL 514D, *Covers for Flush-Mounted Wiring Devices*. Boxes intended to provide degrees of protection from external environmental conditions may also be subject to the requirements found in ANSI/NEMA 250, *Enclosures for Electrical Equipment (1000 Volts Maximum)* or ANSI/UL 50, *Enclosures for Electrical Equipment*. Nonmetallic boxes intended to be installed in fire resistant rated walls, ceilings, floors, partitions, or furniture must also be separately evaluated to establish a rating classification in accordance with ANSI/UL 263 and ASTM E 119.

Given that all listed boxes have met the same minimum safety and performance requirements, **selection** of the right box for the application is the single most important factor for safe, effective, and permanent installations. Design preference completes the selection process, as there are many optional features that distinguish alternative brands. Beyond **selection**, almost every other variable comes down to good **workmanship**, something every craftsman takes pride in and that is fundamentally required by the *NEC*[®].

NOTE: All references to the *NEC*[®] are to the 2005 edition.

Coordination of Trades

With regard to workmanship, the quality of a box installation can be seriously compromised when an effort is not made to coordinate the installation of electrical outlet boxes with other construction trades. In particular, installation problems have been evidenced where there was insufficient coordination with the

trades that apply finished surfaces (drywall) and poured concrete (concrete boxes and floor boxes). Every effort should be made to coordinate with these and other trades who, through lack of careful consideration may compromise the quality of an installation.

Scope

This publication covers guidelines for selection and installation of general purpose and specialty metallic, nonmetallic, and composite outlet boxes such as device boxes, fixture boxes, and junction boxes; extension rings; covers; and flush-device cover plates. The boxes addressed in these guidelines are intended for use in ordinary, non-hazardous locations. With the exception of masonry boxes and some multi-gang boxes and floor boxes, the boxes addressed in these guidelines are limited to 1650 cm³ (100 in³) internal volume.

Section 1 PRODUCT SELECTION

GENERAL

The three key elements to the selection of an electrical outlet box are:

- Type of wiring system
- Contents and function after installation
- Location and type of construction

The following chart illustrates the critical underlying elements that should be considered when making the appropriate outlet box selection. The sections that follow are intended to further guide the user in making these choices.