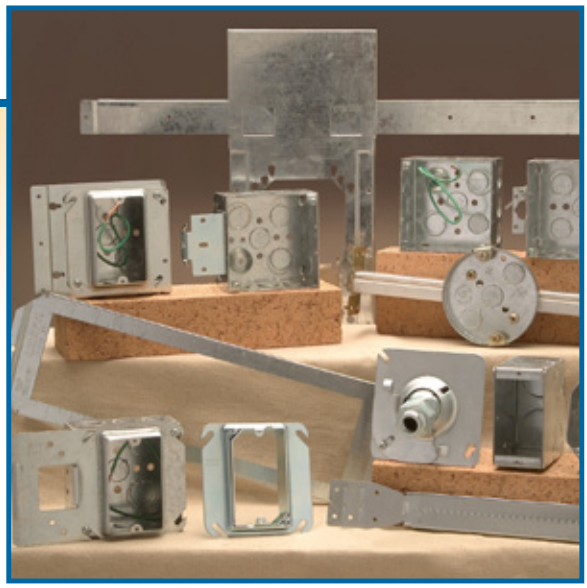
Overview

NEC® Reference

Article 314 of the National Electrical Code® covers the installation and use of boxes. The article includes table references that guide the electrician in the selection of the proper box size necessary to safely accommodate electrical service requirements. The box capacity table shown (**page A-5**) is reproduced in part from the NEC® as a quick reference and guide. The NEC® should be consulted for complete details.



Article 314 — Boxes and Fittings

314.16 Number of Conductors in Outlet, Device, and Junction Boxes, and Conduit Bodies.

Boxes and conduit bodies shall be of sufficient size to provide free space for all enclosed conductors. In no case shall the volume of the box, as calculated in 314.16(A), be less than the fill calculation as calculated in 314.16(B). The minimum volume for conduit bodies shall be as calculated in 314.16(C).

The provisions of this section shall not apply to terminal housings supplied with motors or generators. Informational Note: For volume requirements of motor or generator terminal housings, see Article 430.12. Boxes and conduit bodies enclosing conductors #4 AWG or larger shall also comply with the provisions of 314.28.

(A) Box Volume Calculations.

The volume of a wiring enclosure (box) shall be the total volume of the assembled sections and, where used, the space provided by plaster rings, domed covers, extension rings and so forth, that are marked with their volume or are made from boxes the dimensions of which are listed in Table 314.16(A).

(1) Standard Boxes. The volumes of standard boxes that are not marked with their volume shall be as given in Table 314.16(A).

(2) Other Boxes. Boxes 1650 cm^3 (100 $in.^3$) or less, other than those described in Table 314.16(A), and nonmetallic boxes shall be durably and legibly marked by the manufacturer with their volume. Boxes described in Table 314.16(A) that have a volume larger than is designated in the table shall be permitted to have their volume marked as required by this section.

(B) Box Fill Calculations.

The volumes in paragraphs 314.16(B)(l) through (B)(5), as applicable, shall be added together. No allowance shall be required for small fittings such as locknuts and bushings.

(1) Conductor Fill. Each conductor that originates outside the box and terminates or is spliced within the box shall be counted once, and each conductor that passes through the box without splice or termination shall be counted once. Each loop or coil of unbroken conductor not less than twice the minimum length required for free conductors in 300.14 shall be counted twice. The conductor fill shall be calculated using Table 314.16(B). A conductor, no part of which leaves the box, shall not be counted.

Exception: *An equipment grounding conductor or conductors not over four fixture wires smaller than #14 AWG, or both, shall be permitted to be omitted from the calculations where they enter a box from a domed luminaire or similar canopy and terminate within that box.*

(2) Clamp Fill. Where one or more internal cable clamps, whether factory or field supplied, are present in the box, a single volume allowance in accordance with Table 314.16(B) shall be made based on the largest conductor present in the box. No allowance shall be required for a cable connector with its clamping mechanism outside the box.

(3) Support Fittings Fill. Where one or more luminaire studs or hickeys are present in the box, a single volume allowance in accordance with Table 314.16(B) shall be made for each type of fitting based on the largest conductor present in the box.

(4) Device or Equipment Fill. For each yoke or strap containing one or more devices or equipment, a double volume allowance in accordance with Table 314.16(B) shall be made for each yoke or strap based on the largest conductor connected to a device(s) or equipment supported by that yoke or strap. A device or utilization equipment wider than a single 50mm (2 in.) device box as described in Table 314.16(A) shall have double volume allowances provided for each gang required for mounting.

(5) Equipment Grounding Conductor Fill. Where one or more equipment grounding conductors or equipment bonding jumpers enter a box, a single volume allowance in accordance with Table 314.16(B) shall be made based on the largest equipment grounding conductor or equipment bonding jumper present in the box. Where an additional set of equipment grounding conductors, as permitted by 250.146(D), is present in the box, an additional volume allowance shall be made based on the largest equipment grounding conductor in the additional set.

(C) Conduit Bodies.

(1) General. Conduit bodies enclosing #6 AWG conductors or smaller, other than short-radius conduit bodies as described in 314.16(C)(2), shall have a cross-sectional area not less than twice the cross-sectional area ofthe largest conduit or tubing to which they can be attached. The maximum number of conductors permitted shall be the maximum number permitted by Table 1 of Chapter 9 for the conduit or tubing to which it is attached.

(2) With Splices, Taps or Devices. Only those conduit bodies that are durably and legibly marked by the manufacturer with their volume shall be permitted to contain splices, taps or devices. The maximum number of conductors shall be calculated in accordance with 314.16(B). Conduit bodies shall be supported in a rigid and secure manner.

(3) Short-Radius Conduit Bodies. Conduit bodies such as capped elbows and service-entrance elbows that enclose conductors #6 AWG or smaller, and are only intended to enable the installation of the raceway and the contained conductors, shall not contain splices, taps or devices and shall be of sufficient size to provide free space for all conductors enclosed in the conduit body.

Thomas&Betts

United States
Tel: 901.252.8000
800.816.7809
Fax: 901.252.1354

Technical Services
Tel: 888.862.3289

www.tnb.com

Overview

Article 314 — Boxes and Fittings *(continued)*

Table 314.16(A)
Metal Boxes

MM	BOX TRADE SIZE (IN.)		MINIMUM VOLUME CM3	MINIMUM VOLUME IN.3	MAXIMUM NUMBER OF CONDUCTORS* 18	16	14	12	10	8	6
100 x 32	(4 x 1¼)	Round/Octagonal	205	12.5	8	7	6	5	5	5	2
100 x 38	(4 x 1½)	Round/Octagonal	254	15.5	10	8	7	6	6	5	3
100 x 54	(4 x 2⅛)	Round/Octagonal	353	21.5	14	12	10	9	8	7	4
100 x 32	(4 x 1¼)	Square	295	18.0	12	10	9	8	7	6	3
100 x 38	(4 x 1½)	Square	344	21.0	14	12	10	9	8	7	4
100 x 54	(4 x 2⅛)	Square	497	30.3	20	17	15	13	12	10	6
120 x 32	(4L x 1¼)	Square	418	25.5	17	14	12	11	10	8	5
120 x 38	(4L x 1½)	Square	484	29.5	19	16	14	13	11	9	5
120 x 54	(4L x 2⅛)	Square	689	42.0	28	24	21	18	16	14	8
75 x 50 x 38	(3 x 2 x 1½)	Device	123	7.5	5	4	3	3	3	2	1
75 x 50 x 50	(3 x 2 x 2)	Device	164	10.0	6	5	5	4	4	3	2
75 x 50 x 57	(3 x 2 x 2¼)	Device	172	10.5	7	6	5	4	4	3	2
75 x 50 x 65	(3 x 2 x 2½)	Device	205	12.5	8	7	6	5	5	4	2
75 x 50 x 70	(3 x 2 x 2¾)	Device	230	14.0	9	8	7	6	5	4	2
75 x 50 x 90	(3 x 2 x 3½)	Device	295	18.0	12	10	9	8	7	6	3
100 x 54 x 38	(4 x 2⅛ x 1½)	Device	169	10.3	6	5	5	4	4	3	2
100 x 54 x 48	(4 x 2⅛ x 1⅞)	Device	213	13.0	8	7	6	5	5	4	2
100 x 54 x 54	(4 x 2⅛ x 2⅛)	Device	238	14.5	9	8	7	6	5	4	2
95 x 50 x 65	(3¾ x 2 x 2½)	Masonry Box/Gang	230	14.0	9	8	7	6	5	4	2
95 x 50 x 90	(3¾ x 2 x 3½)	Masonry Box/Gang	344	21.0	14	12	10	9	8	7	4
Min. 44.5 depth	FS – Single-Cover/Gang (1¾)		221	13.5	9	7	6	6	5	4	2
Min. 60.3 depth	FD – Single-Cover/Gang (2⅜)		295	18.0	12	10	9	8	7	6	3
Min. 44.5 depth	FS – Multiple-Cover/Gang (1¾)		295	18.0	12	10	9	8	7	6	3
Min. 60.3 depth	FD – Multiple-Cover/Gang (2⅜)		395	24.0	16	13	12	10	9	8	4

*Where no volume allowances are required by 314.16(B)(2) through 314.16(B)(5).
Underwriters Laboratories Inc. File Number: E2969 (U.L. 514A)
Canadian Standards Association File Number: LR 12798
Federal Manufacture Number: 56501 (Cage Code)
Products designed to meet Federal Specification Number: W-J-800
Verification of file numbers and compliance with federal specifications for individual items available upon request.
Box and cover material and plating specification; .062" minimum thickness, hot rolled, pre-galvanized steel, minimum spangle.
ASTM G-60-U, AISI C-1008
Bracket material: All brackets except MS style; 16 gauge (.060") hot rolled, pre-galvanized steel AISI C-1008, G-90-U. MS style bracket; 20 gauge (.036") cold rolled spring steel AISI C-1055, heat treated to R. 35 zinc plated .0005 thick.

Table 314.16(B)
Volume Allowance Required per Conductor

SIZE OF CONDUCTOR (AWG)	FREE SPACE WITHIN BOX FOR EACH CONDUCTOR CM³	IN.³
No. 18	24.6	1.50
No. 16	28.7	1.75
No. 14	32.8	2.00
No. 12	36.9	2.25
No. 10	41.0	2.50
No. 8	49.2	3.00
No. 6	81.9	5.00

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Underwriters Laboratories Inc. File Number: E2969 (U.L. 514A)
Canadian Standards Association File Number: LR 12798
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Metallic Boxes — Fire Resistance Rating

Wall Penetrations

Listed single- and double-gang metallic outlet and switch boxes and octagon ceiling boxes with metallic or non-metallic cover plates may be used in bearing and non-bearing wood stud and steel stud walls with ratings not exceeding 2 hours. These walls shall have gypsum wallboard facings similar to those shown in Design Nos. U301, U411, and U425. 4 in. square boxes may be used in 2 hr. fire rated ceilings.

The surface area of individual metallic outlet or switch boxes shall not exceed 16 sq. in. The aggregate surface area of the boxes shall not exceed 100 sq. inches per 100 sq. ft. of wall. Boxes located on opposite sides of walls or partitions shall be separated by a horizontal distance of 24 inches.

The metallic outlet or switch boxes shall be securely fastened to the studs and the opening in the wallboard facing shall be cut so that the clearance between the box and the wallboard does not exceed ⅛ in.