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Electrical Rigid Metal Conduit – Steel

November 28, 2022



Standard for Safety for Electrical Rigid Metal Conduit – Steel

Third Edition, Dated November 28, 2022

Summary of Topics

This new edition dated November 28, 2022 includes the following:

- Updated references in Annex [A](#)***
- Correction of typo in the measurement for length in millimeters; [5.5.2](#)***
- Introduction of a range for specific gravity of copper sulfate solution; [6.2.2.1](#)***

Commitment for Amendments

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Preface

This is the harmonized ANCE, CSA Group, and UL standard for Electrical Rigid Metal Conduit – Steel. It is the third edition of NMX-J-534-ANCE, the third edition of CSA C22.2 No. 45.1, and the fifteenth edition of UL 6. This edition of NMX-J-534-ANCE supersedes the previous edition published 2019. This edition of CSA C22.2 No. 45.1 supersedes the previous edition published 2007. This edition of UL 6 supersedes the previous edition published 2019.

This harmonized standard was prepared by the Association of Standardization and Certification (ANCE), CSA Group, and Underwriters Laboratories Inc. (UL). The efforts and support of the conduit manufacturing industry and the Technical Harmonization Subcommittee for Conduit and Tubing of the Council of the Harmonization of Electrotechnical Standards for the Nations of the Americas (CANENA) are gratefully acknowledged.

This standard is considered suitable for use for conformity assessment within the stated scope of the standard.

The present Mexican standard was developed by CT Technical Committee 23 Electrical Accessories from the Comité de Normalización de la Asociación de Normalización y Certificación, A.C., CONANCE, with the collaboration of the metal conduit and tubing manufacturers and users.

This standard was reviewed by the CSA Subcommittee on Metal Conduit and Tubing, under the jurisdiction of the CSA Technical Committee on Wiring Products and the CSA Strategic Steering Committee on Requirements for Electrical Safety, and has been formally approved by the CSA Technical Committee. This standard has been developed in compliance with the Standards Council of Canada requirements for National Standards of Canada. It has been published as a National Standard of Canada by CSA Group.

Application of Standard

Where reference is made to a specific number of samples to be tested, the specified number is to be considered a minimum quantity.

Note: Although the intended primary application of this standard is stated in its scope, it is important to note that it remains the responsibility of the users of the standard to judge its suitability for their particular purpose.

Level of harmonization

This standard uses an IEC format, but is not based on, nor is it to be considered an IEC standard.

This standard is published as an equivalent standard for ANCE, CSA Group, and UL.

An equivalent standard is a standard that is substantially the same in technical content, except as follows: Technical national differences are allowed for codes and governmental regulations as well as those recognized as being in accordance with NAFTA Article 905, for example, because of fundamental climatic, geographical, technological, or infrastructural factors, scientific justification, or the level of protection that the country considers appropriate. Presentation is word for word except for editorial changes.

Reasons for differences from IEC

The Technical Harmonization Subcommittee identified several IEC standards that address electrical conduit and tubing included in the scope of this standard. The IEC standards for electrical conduit and tubing are recognized as being generally system-specific, containing the requirements for the relevant conduits and cables and associated fittings in several discrete IEC standards.

The THSC determined the safe use of electrical conduit and tubing is dependent on the design and performance of the conduit and tubing systems with which they are intended to be installed. Significant investigation is required to assess safety and system compatibility issues that may lead to harmonization of traditional North American electrical conduit and tubing and associated fittings with those presently addressed in the known IEC standards. The THSC agreed such future investigation might be facilitated by completion of harmonization of the North American standards for electrical conduit and tubing and their fittings.

Interpretations

The interpretation by the standards development organization of an identical or equivalent standard is based on the literal text to determine compliance with the standard in accordance with the procedural rules of the standards development organization. If more than one interpretation of the literal text has been identified, a revision is to be proposed as soon as possible to each of the standards development organizations to more accurately reflect the intent.

Electrical Rigid Metal Conduit – Steel

1 Scope

1.1 These requirements cover electrical rigid metal conduit – steel (ERMC-S), elbows, couplings, and nipples for use as a metal raceway for installation of wires and cables in accordance with CSA C22.1, Canadian Electrical Code, Part I, NOM-001-SEDE, Standard for Electrical Installations, and NFPA 70, National Electrical Code (see Reference Item No. 1, Annex [A](#)). ERMC-S is provided with a zinc, zinc-based, nonmetallic, or other alternate corrosion-resistant exterior coating and an organic or zinc interior coating. It is the user's responsibility to determine the appropriate product for their application.

1.2 Non-ferrous and stainless steel conduits are covered by the standards listed in Reference Item No. 2, Annex [A](#).

2 Normative References

2.1 Products covered by this standard shall comply with the referenced installation codes and standards noted in Annex [A](#) as appropriate for the country where the product is to be used. When the product is intended for use in more than one country, the product shall comply with the installation codes and standards for all countries where it is intended to be used.

2.2 For undated references to standards, such reference shall be considered to refer to the latest edition and all revisions to that edition up to the time when this standard was approved. For dated references to standards, such reference shall be considered to refer to the dated edition and all revisions published to that edition up to the time the standard was approved.

3 Definitions

3.1 The following definitions apply in this standard.

3.2 BARE THREADED TUBE – A standard length of threaded tube intended to be coated with an alternate corrosion-resistant coating and having a separate coupling.

3.3 COATING(S), ALTERNATE CORROSION-RESISTANT – A primary coating(s) other than one consisting solely of zinc, which upon evaluation has demonstrated the ability to provide the level of corrosion resistance required on the exterior of conduit. See [6.2.4](#).

Note: The coating(s) may include zinc.

3.4 COATING(S), ORGANIC – An interior coating(s), other than one consisting solely of zinc, which, upon evaluation, has demonstrated the ability to provide the level of corrosion resistance necessary where the coating is not subject to physical damage. See [6.2.3](#).

Note: The coating(s) may include zinc.

3.5 COATING(S), ZINC – A primary coating consisting solely of zinc, which upon evaluation has demonstrated the ability to provide the level of corrosion resistance required on the exterior or interior of conduit as applicable. See [6.2.2](#).

3.6 ELBOW – A manufactured curved section of ERMC-S threaded on each end.

3.7 ELECTRICAL RIGID METAL CONDUIT – STEEL (ERMC-S) – ERMC-S is a threadable steel raceway of circular cross-section designed for the physical protection and routing of wire conductors and use as an equipment grounding conductor when installed utilizing appropriate fittings.

3.8 FINISHED CONDUIT – A straight conduit with one coupling attached.

3.9 NIPPLE – A straight section of ERMC-S generally not more than 0.6 m (2 ft) long and threaded on each end.

3.10 PRIMARY COATING – A coating on the outside of the conduit for protection against corrosion. See [5.3.1.1](#).

3.11 STRAIGHT CONDUIT – A straight length of ERMC-S with the protective coating applied but without coupling.

3.12 SUPPLEMENTARY COATING – A coating on the outside of the conduit, in addition to the primary coating, for protection against severe corrosive conditions. See [5.3.5](#).

3.13 THREADED COUPLING – An internally threaded cylinder that connects two sections of ERMC-S.

4 Units of Measurement and General Requirements

4.1 In Canada and Mexico, the values given in SI (metric) units shall be normative. Any other values given shall be for information purposes only.

In the United States, the values stated in either SI units or inch-pound units shall be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems can result in nonconformance with the standard.

4.2 In Canada, general requirements applicable to this standard are given in CSA C22.2 No. 0.

5 Construction

5.1 Tube

5.1.1 Each tube shall be of steel, shall be straight and shall have a circular cross-section, with dimensions as specified in [Table 5.1](#), thereby facilitating the cutting of clean, true threads. The wall thickness shall be uniform throughout the length of the tube. All seams shall be thoroughly welded.

5.1.2 A welded seam shall not have metal trimmings, sharp edges, or sharp projections on the interior or exterior surfaces of the tube. A slight bead on the interior wall at the weld line shall be allowed if the bead is not sharp and if the bead does not exceed 0.38 mm (0.015 in) in height for the trade size 12 – 53 (3/8 – 2) or 0.51 mm (0.020 in) in height for the trade size 63 – 155 (2-1/2 – 6).

5.1.3 Before the protective coating is applied, the interior and exterior surfaces of each tube shall be free from scale, flash, or any other protrusion other than as specified in [5.1.2](#).

Table 5.1
Dimensions of ERM-C-S

Metric designator	Outside diameter, ^a mm	Trade size	Outside diameter, ^a in
12 ^b	17.15	3/8 ^b	0.675
16	21.34	1/2	0.840
21	26.67	3/4	1.050
27	33.40	1	1.315
35	42.16	1-1/4	1.660
41	48.26	1-1/2	1.900
53	60.33	2	2.375
63	73.03	2-1/2	2.875
78	88.90	3	3.500
91	101.60	3-1/2	4.000
103	114.30	4	4.500
129	141.30	5	5.563
155	168.28	6	6.625

^a Tolerances: Trade Size 12 – 41 (3/8 – 1-1/2) ±0.38 mm (±0.015 in)
Trade Size 53 – 155 (2 – 6) ±1 %
^b In the United States and Mexico, 12 (3/8) trade size may be used for special applications. In Canada, 12 (3/8) trade size is not permitted according to the Canadian Electrical Code, Part I.

5.2 Finished conduit

5.2.1 The length of straight conduit, and the weight of finished zinc-coated conduit or bare threaded tube to be coated with an alternate corrosion-resistant coating with one coupling, shall be as indicated in [5.2.2](#) and [Table 5.2](#). Typical dimensions of conduit complying with the requirements in this standard are provided for information only in Annex [B](#).

5.2.2 The production of lengths shorter or longer than the standard length specified in [Table 5.2](#) shall be allowed, whether threaded or unthreaded and with or without couplings. Lengths other than standard lengths shall have a minimum acceptable weight proportional to the weights specified in [Table 5.2](#). The length tolerances in [Table 5.2](#) shall be applicable for standard and non-standard lengths.

5.2.3 Standard lengths of finished conduit with a primary coating of zinc shall be provided with one threaded coupling attached or shall have one assembled-on integral coupling. Conduit produced from bare threaded tube provided with an alternate corrosion-resistant coating shall have one separate coupling.

5.2.4 The exterior and interior surfaces of the finished conduit shall be free of poor coatings, hard scale, burrs, fins, or other defects. See Annex [D](#).

Table 5.2
Length and Weight of Standard 3.05-m (10-ft) Lengths of Conduit

Metric designator	Length of straight conduit ^a ±6 mm	Minimum acceptable weight of ten lengths of conduit with ten couplings, kg		Trade size	Length of straight conduit, feet and inches ^a ±1/4 in	Minimum acceptable weight of ten lengths of conduit with ten couplings, lbs	
		Finished zinc coated conduit ^b	Bare threaded tube ^c			Finished zinc coated conduit ^b	Bare threaded tube ^c
12 ^d	3035	23.4	22.0	3/8 ^d	9 – 11-1/2	51.5	48.6
16	3030	35.8	34.2	1/2	9 – 11-1/4	79.0	75.4
21	3030	47.6	45.5	3/4	9 – 11-1/4	105.0	100.4
27	3025	69.4	66.8	1	9 – 11	153.0	147.2
35	3025	91.2	87.8	1-1/4	9 – 11	201.0	193.5
41	3025	112.9	109.0	1-1/2	9 – 11	249.0	240.4
53	3025	150.6	145.6	2	9 – 11	332.0	321.1
63	3010	239.0	233.1	2-1/2	9 – 10-1/2	527.0	513.9
78	3010	309.6	302.4	3	9 – 10-1/2	682.0	666.6
91	3005	376.9	368.6	3-1/2	9 – 10-1/4	831.0	812.6
103	3005	441.0	431.6	4	9 – 10-1/4	972.3	951.6
129	2995	595.8	584.2	5	9 – 10	1313.6	1288.0
155	2995	791.7	777.8	6	9 – 10	1745.3	1714.7

^a The lengths indicated are designed to produce a 3.05 m (10 ft) length of conduit when a straight-tapped conduit coupling is attached.

^b This conduit is protected with a zinc or zinc-based coating consisting primarily of zinc.

^c This conduit is intended to be protected with an alternate corrosion-resistant coating.

^d In the United States and Mexico, 12 (3/8) trade size may be used for special applications. In Canada, 12 (3/8) trade size is not permitted according to the Canadian Electrical Code, Part I.

5.3 Protective coatings

5.3.1 General

5.3.1.1 The exterior surface of ERM-C-S shall be protected against corrosion by a coating solely of zinc as described in [5.3.2](#) or an alternate corrosion-resistant coating as described in [5.3.3](#). If evaluated for two or more primary coatings, the conduit shall be marked in accordance with [7.11](#). The interior surface of ERM-C-S shall be protected against corrosion by a coating of zinc or an organic coating, as described in [5.3.2](#) and [5.3.4](#) respectively. See Annex C for an overview.

5.3.1.2 Primary coatings applied over other primary coatings on conduit, elbows, and nipples shall comply with [6.2.4.9](#).

5.3.1.3 Conduit, elbows, or nipples provided with a primary coating that is prepared or modified for the application of an additional primary coating shall undergo the preparation process before being subjected to the tests in [6.2](#).

5.3.2 Zinc coating

5.3.2.1 A protective coating of zinc shall cover completely, shall adhere firmly at all points, shall be smooth and free from blisters and other defects that can lessen the protective value of the coating, shall be in metal-to-metal contact with the steel, and shall comply with [6.2.2](#). See [5.4.2](#) regarding threads.