W-C-571C
January 15, 1981
SUPERSEDING
Fed. Spec. W-C-571b
November 23, 1960

FEDERAL SPECIFICATION

CONDUIT AND FITTINGS, NONMETAL, RIGID; (ASBESTOS-CEMENT OR FIRE CLAY CEMENT), (FOR ELECTRICAL PURPOSES)

This specification was approved by the Commissioner, Federal Supply Service, General Services Administration, for the use of all Federal agencies.

1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification covers conduit, asbestos-cement or fire clay cement, and fittings of equivalent material for use in the installation of electrical wires and cables, underground burial.

1.2 Classification. The conduit and fittings shall be of the following types and sizes (see 6.2).

Type I - Intended for use encased in concrete after installation.

Sizes - 3, 3-1/2, 4, 5, and 6 inches.

Type II - Intended for installation directly in earth without concrete encasement.

Sizes - 3, 4, 5, and 6 inches.

1.2.1 Definitive part number. Items furnished in accordance with this specification shall be identified by a definitive part number (DPN). This number is intended for cataloging and ordering purposes; it is not intended for surface printing on items in accordance with this specification. The DPN shall consist of the Federal Specification symbol plus the specification part number (SPN) (see 1.2.2). The DPN shall be written as indicated below (see 6.5):

DPN	W-C-571C	XX
Fed. Spec. symbol		
SPN (see 1.2.2)		

1.2.2 Specification part number. The SPN shall be a two position numeric code which identifies items in accordance with this specification (see table I).

TABLE I. Specification part number identification.

Sizes in inches for Type I conduit	Type I conduit and fittings SPN's								
	Conduit SPN	Reducer SPN	Increaser SPN	Bell Ends	Adapter SPN	Bends SPN			
						45°	30°	22-1/2°	11-1/4°
3 inch	01	11	21	31	41	51	61	71	81
3-1/2 inch	03	13	23	33	43	53	63	73	83
4 inch	05	15	25	35	45	55	65	75	85
5 inch	07	17	27	37	47	57	67	77	87
6 inch	09	19	29	39	49	59	69	79	89
Size in inches for Type II conduit	Type II conduit and fittings SPN's								
	Conduit SPN	Reducer SPN	Increaser SPN	Bell Ends	Adapter SPN	Bends SPN			
						45°	30°	22-1/2°	11-1/4°
3 inch	02	12	22	32	42	52	62	72	82
4 inch	04	14	24	34	44	54	64	74	84
5 inch	06	16	26	36	46	56	66	76	86
6 inch	08	18	28	38	48	58	68	78	88

2. APPLICABLE DOCUMENTS

2.1 The following documents, of the issues in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.

(Activities outside the Federal Government may obtain copies of Federal specifications, standards, and commercial item descriptions as outlined under General Information in the Index of Federal specifications, standards and commercial item descriptions. The Index, which includes cumulative bimonthly supplements as issued, is for sale on a subscription basis by the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

(Single copies of this specification, other specifications, and commercial item descriptions required by activities outside the Federal Government for bidding purposes are available without charge from General Services Administration Business Service Centers in Boston; New York; Philadelphia; Washington, DC; Atlanta; Chicago; Kansas City, MO; Fort Worth; Houston; Denver; San Francisco; Los Angeles; and Seattle, WA.

(Federal Government activities may obtain copies of Federal specifications, standards, and commercial item descriptions, and the Index of Federal Specifications, Standards and Commercial Item Descriptions from established distribution points in their agencies.)

Military Standards:

MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.
MIL-STD-129 - Marking for Shipment and Storage.

(Copies of Military specifications and standards required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.2 Other publications. The following document forms a part of this specification to the extent specified herein. Unless a specific issue the is identified, the issue in effect on date of invitation for bids or 1 request for proposal shall apply.

Underwriters's Laboratories, Inc., (UL):

UL 651 - Standard for Rigid Nonmetallic Conduit.

(Application for copies should be addressed to the Underwriters' Laboratories, Inc., 333 Pfingsten Road, Northbrook, IL 60062.)

3. REQUIREMENTS

3.1 Description. The conduit shall be a uniform cylindrical tube composed of an intimate mixture of cement, silica and asbestos, or of finely ground soapstone, clay, and cement well mixed and thoroughly cured and ranging in length from 5 to 13 feet.

3.2 First article. When specified (see 6.2.1), the contractor shall furnish a complete conduit or conduit fitting of the type and size required for first article inspection and approval (see 4.2.1 and 6.4).

3.3 Codes and standards compliance. Electrical conduits and fittings (asbestos-cement or fire clay cement) shall meet the applicable requirements of UL 651.

3.3.1 UL certification. Prior to approval of the first article if one is submitted, or prior to approval of the first shipment, the contractor shall submit to the contracting officer or his authorized representative, satisfactory evidence that the type I and II conduit fittings he proposes to furnish under this specification complies with requirements of UL 651 as applicable. Acceptable evidence of meeting the requirements of UL 651 shall be the UL label or UL listing mark, or a certified test report from a recognized independent testing laboratory acceptable to the contracting officer, stating that the type I and II conduit and fittings have been tested and conform to UL 651 as applicable (see 6.3).

3.4 Standard commercial product. The conduit and fittings shall, as a minimum, be in accordance with the requirements of this specification and shall be the manufacturer's standard commercial product. Additional or better features which are not specifically prohibited by this specification but which are a part of the manufacturer's standard commercial product, shall be included in the conduit and fittings being furnished. A standard commercial product is a product which has been sold or is being currently offered for sale on the commercial market through advertisements or manufacturer's catalogs, or brochures, and represents the latest production model.

3.5 Interchangeability of items. All conduits and fittings of the same classification, furnished under a specific contract, shall be identical to the extent necessary to insure interchangeability of component parts, assemblies, accessories, and spare parts. No deviations shall be acceptable without prior written approval of the contracting officer.

3.6 Materials. Materials used shall be free from defects which would adversely affect the performance or maintainability of individual components or of the overall assembly. Materials not specified herein shall be of the same quality used for the intended purpose in commercial practice. Unless otherwise specified herein, all equipment, material, and articles incorporated in the work covered by this specification are to be new and fabricated using materials produced from recovered materials to the maximum extent possible without jeopardizing the intended use. The term "recovered materials" means materials which have been collected or recovered from solid waste and reprocessed to become a source of raw materials, as opposed to virgin raw materials. None of the above shall be interpreted to mean that the use of used or rebuilt products are allowed under this specification unless otherwise specified.

3.7 Fittings.

3.7.1 Adapters, reducers, increasers, bends and bell ends. Unless otherwise specified, couplings, adapters, reducers, increasers, bends and bell ends shall be of the same material as the conduit.

3.8 Bore.

3.8.1 Bore of conduit. The bore of the conduit shall pass freely a mandrel 36 inches long and 1/4 inch less in diameter than the nominal inner diameter of the conduit.

3.8.2 Tolerance in diameter. The average inside diameter measured at the ends of the conduit shall be within 0.1 inch of the nominal diameter. The maximum difference between any two inside diameters of any one piece of conduit when measured at the ends shall not exceed 0.2 inch.

3.8.3 Bore of bends and elbows. The inner dimensions of the bends and elbows shall be such that a ball 1/4 inch less in diameter than the nominal bore of the conduit shall pass freely through them.

3.9 Joints. The ends of each length of conduit shall be either straight or tapered by machining (to furnish tight joints which have no play when assembly is made).

3.10 Chemical resistance. The finished conduit shall not be damaged when subjected to corrosive soil, sewer gases, heat, moisture, steam, or frost; and it shall not corrode cable sheaths (see 4.6.1).

3.11 Alkalinity. The conduit shall be tested to determine the alkalinity (see 4.6.2).

3.12 Absorption. The water absorption of the conduit at 48 hours shall be not more than 30 percent, when subjected to the test specified (see 4.6.3).

3.13 Composition, dimensions, and thickness. Composition, dimensions, and thickness of wall for types I and II conduit shall be as follows:

3.13.1 Composition. The conduit shall be composed of an intimate mixture of portland cement, silica, and asbestos fiber, or of finely ground soapstone, clay, and cement well mixed and thoroughly cured. The material shall be completely free from organic and metallic substances.

3.13.2 Length. The nominal overall length of the conduit shall be 4, 5, 6, 6-1/2, 10, or 13 feet as specified (see 6.2).

3.13.3 Tolerance in length. A tolerance of ± 1 inch is permissible in the pipe length specified.

3.13.4 Thickness of wall. The minimum wall thickness of the barrel of the conduit shall be not less than indicated in table II.

TABLE II. Wall thickness, types I and II conduit.

Nominal inside diameter	Type I	Type II
	Minimum wall thickness	Minimum wall thickness
(inches)	(inch)	(inch)
3	.22	.32
3-1/2	.22	--
4	.22	.32
5	.25	.35
6	.25	.35

3.14 Flexural strength. The flexural strength of the conduit shall be such as to withstand the loads set forth in table III when the conduit is subjected to the test specified (see 4.6.4).

TABLE III. Flexural strength, types I and II conduit.

Nominal inside diameter	Free span of flexural test specimen		Minimum test load		Rate of load application pounds/minute	
	Type I	Type II	Type I	Type II	Type I	Type II
(inches)	(inches)	(inches)	(pounds)	(pounds)		
3	30	30	450	850	400	750
3-1/2	30	30	500	1100	500	750
4	42	42	700	900	500	1000
5	48	48	900	1500	500	1000
6	54	54	1300	2000	750	1000

3.15 Crushing strength. The crushing strength of the conduit shall be such as to withstand the loads set forth in table IV when the conduit is subjected to the test specified (see 4.6.5).

TABLE IV. Crushing strength, types I and II conduit.

Nominal inside diameter	Minimum crushing loads		Rate of load application pounds/minute	
	Type I	Type II	Type I	Type II
(inches)	(pounds)	(pounds)		
3	500	1200	500	500
3-1/2	500	--	500	---
4	500	1200	500	500
5	500	900	500	500
6	500	800	500	500

3.16 Identification marking. Identification shall be permanently and legibly marked directly on the conduit or fittings at the source of manufacture. Identification shall include the manufacturer's name and trademark to be readily identifiable to the manufacturer. In addition, information required by UL 651, as applicable, shall be included on the conduit or fittings.

3.17 Workmanship. The conduit bore shall have a smooth surface, and shall be straight, true, and free from obstructions. All inside edges of the conduit shall be rounded and smoothed, and all conduit edges shall be cut at right angles to the axis of the conduit.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the contractor may use his own or any other other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.1.1 Standards compliance. Proof of compliance with the standards cited in 3.3 shall be made available to the contracting officer or his authorized representative. Certification specified under 3.3.1 will be accepted as evidence of compliance.

4.2 Classification of inspection. The inspection requirements specified herein shall be classified as follows:

(a) First article inspection (see 4.2.1).
(b) Quality conformance inspection (see 4.2.2).

4.2.1 First article inspection. First article inspection shall be performed on one type and size of conduit or fitting when a first article sample is required (see 3.2 and 6.2). This inspection shall include the examination of 4.5 and the tests of 4.6. The first article may be a standard production item from the supplier's current inventory provided the conduit or fitting meets the requirements of this specification and is representative of the design, construction, and manufacturing technique applicable to the remaining type and size of conduit or fitting to be furnished under the contract.

4.2.2 Quality conformance inspection. Quality conformance inspection shall be performed on the conduit or fittings selected in accordance with 4.4. This inspection shall include the examination of 4.5 and the tests of 4.6.

4.3 Inspection lot. All units of the same type and size offered to the Government at one time shall be considered a lot for purpose of inspection. The sample unit shall be one complete conduit or fitting.

4.4 Sampling. A random sample of conduit or fittings shall be selected from each lot in accordance with MIL-STD-105.

4.4.1 Sampling for examination. Examination of the conduit or fittings shall be based on inspection level II and an Acceptable Quality Level (AQL) of 2.5 percent defective.

4.4.2 Sampling for tests. Tests of the conduit or fitting shall be based on inspection level S-3 and an AQL of 4.0 percent defective.

4.5 Examination. Each sample selected in accordance with 4.4.1 shall be examined for compliance with the requirements in section 3 of this specification. Any redesign or modification of the supplier's standard product to comply with specified requirements or any necessary redesign or modification following failure to meet specified requirements shall receive particular attention for adequacy and suitability. This inspection shall encompass all visual examination and dimensional measurements.

4.6 Tests. Each sample selected in accordance with 4.4.2 shall be tested to determine compliance with this specification. Tests shall be conducted as specified in 4.6.1 through 4.6.6. All test specimens shall be conditioned for at least 18 hours at room temperature prior to testing. The machines used for the flexural and crushing tests shall be substantial and rigid throughout, so that the distribution of the load shall not be affected appreciably by the deformation or yielding of any part of the machine.

4.6.1 Chemical properties test. Six-inch lengths shall be immersed in solutions 0.1 normal of any ground acid, alkali, or salt, such as sulfuric acid, sodium carbonate, or sodium sulfate. After 30 days the samples shall show no evidence of softening or disintegration (see 3.10).

4.6.2 Alkalinity test. A freshly broken edge of conduit shall be wetted with about two drops Malachite Green solution so that an edge area extending from face to face and about 1-inch long is covered. A strong blue stain shall be evident over the wetted area and shall persist for an interval of at least 15 minutes to indicate satisfactory performance from an alkalinity standpoint. Where the Malachite Green changes from blue-green to colorless, the conduit being tested will have a pH factor of 12 or more and as such will exceed safe requirements for the installation of lead covered cable. Note: The Malachite Green solution shall be made by dissolving 0.1 gram of Malachite Green (pH indicator grade) in 100 milliliter of water.

4.6.3 Absorption test. A specimen of 12 inches ± 1/4 inch in length shall be cut from each size conduit in the sample. The specimen shall be dried in an oven at 221° to 230° Fahrenheit (105° to 110° Celsius (C)) for 24 hours. The specimen shall then be removed, kept in room air for 2 hours and the dry weight determined within 1/4 percent. It shall then be completely immersed in water at 18° to 25° C for 24 hours. It shall then be taken from the water, the surface water removed with a damp cloth, and the sample then weighed. The difference between this weight and the dry weight, divided by the dry weight, multiplied by 100 is the percentage absorption. The conduit shall conform to the requirement of 3.12 when subjected to this test.

4.6.4 Flexural strength test. The specimen shall be mounted longitudinally on V blocks of steel, or preferably wood, 5-inches long, 120° angle of V, faces 2 X 5 inches, and the load applied through a rectangular block, 2 inches in width, at the center of the span. The spans, between faces of supporting blocks shall be as given in table III for the particular type of conduit. The breaking loads, average of at least two specimens from each length, shall not be less than those given in table III for the particular type of conduit.

4.6.5 Crushing strength test. The crushing strength shall be determined on specimens 12 inches ± 1/8 inch in length. At least two specimens shall be placed longitudinally between two rigid flat wooded parallel plates in a crush testing machine. The upper wood plate shall apply the crushing load for its entire length. The load shall be applied at a rate not to exceed that specified in table IV for the conduit. No specimen shall fail at a load less than that specified in table IV. A specimen shall be considered to have failed upon first evidence that cracking has occurred.

4.6.6 Retests. If the average strength of any two specimens from one sample for the flexural or crushing tests fails to meet the requirements specified, five additional lengths of the same size and type of conduit shall be selected from the same lot. Should the average strength of two of these additional samples fail to meet the requirements specified, this shall be cause for rejection of the entire lot of that size and type.

4.7 Preparation for delivery inspection. An examination shall be made to determine compliance with the requirements of section 5. The sample unit shall be one unitized load fully prepared for delivery. Sampling shall be in accordance with MIL-STD-105. The inspection level shall be S-2 with an AQL of 4.0 percent defective.

5. PREPARATION FOR DELIVERY

5.1 Packing. Packing shall be level A or commercial as specified (see 6.2.1).

5.1.1 Level A.

5.1.1.1 The conduits and fittings shall be bundled into a unitized load, placed on a skid or pallet base to facilitate handling by forklift truck.

5.1.1.2 Cushioning, blocks, and bracing shall be provided, as necessary, to insure physical and mechanical protection.

5.1.1.3 The weight of the unitized load shall not exceed 4,200 pounds. The height of the unitized load shall not exceed 42 inches. The maximum dimensions of the unitized load shall be the length of the pipe by 42 inches.

5.1.1.4 The unitized load shall be secured by girthwise strapping. Pipe 5 feet and under shall have a minimum of two straps. Pipe over 5 feet shall be secured with a minimum of three straps. Straps shall be secured no less than 18 inches from each end. All additional straps shall be evenly spaced between the end straps.

5.2 Commercial. The conduits and fittings shall be packed in such a manner to insure arrival at destination in a satisfactory condition. Preparation for delivery shall comply with applicable carrier rules and regulations.

5.3 Marking.

5.3.1 Civil agencies. Marking shall be as specified in the contract or order.

5.3.2 Military activities. Marking shall be in accordance with MIL-STD-129.

6. NOTES

6.1 Intended use. The conduit and fittings specified herein are used for the installation of electrical wires and cables. Both underground and exposed conduit conditions are covered for underground runs between structures.

6.2 Ordering data. Purchasers should select the preferred options permitted herein and include the following information in procurement documents.

(a) Title, number, and date of this specification.
(b) Type, size, and length of conduit or fittings required (see 1.2 and 3.13.2).
(c) When a first article sample is required (see 3.2 and 6.4).
(d) Level of packing (see 5.1).

6.3 Contract data requirements. When this specification is used in an acquisition which incorporates a DD Form 1423 and invokes the provisions of paragraph 7-104.9(n) of the Defense Acquisition Regulation (DAR), the data requirements indentified below will be developed as specified by an approved Data Item Description (DD Form 1664) and delivered in accordance with the Contract Data Requirements List (DD Form 1423) incorporated into the contract. When the provisions of DAR 7-104.9(n) are not invoked, the data specified below shall be delivered in accordance with the contract requirements. Deliverable data required by this specification is cited in the following paragraphs:

PARAGRAPH	DATA REQUIREMENTS	APPLICABLE DD-1664
3.3 and 3.3.1	Certificate of compliance	DI-E-2121

(Copies of Data Item Descriptions required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

6.4 First article. When a first article is required, it shall be tested and approved under the appropriate provisions of paragraph 7-104.55 of the DAR. The first article should be a first production item consisting of one complete conduit or fitting or it may be a standard production item from the

contractor's current inventory as specified in 4.2.1. The contracting officer should include specific instructions in all procurement documents regarding arrangement for examinations, tests, and approval of the first article.

6.5 Definitive part number, example. The Federal specification number and the SPN combine to form the DPN.

Example:

DPN W-C-571C - 01
Fed. Spec.
3-inch conduit

MILITARY CUSTODIANS:

Army - ME
Navy - YD
Air Force - 99

User activities:

Army - CE
Navy - MC

CIVIL AGENCY COORDINATING ACTIVITIES:

COMMERCE - NBS
GSA - FSS
USDA - AFS

Preparing activity:

Navy - YD

Project No. 5975-0554

Orders for this publication are to be placed with General Services Administration, acting as an agent for the Superintendent of Documents. See section 2 of this specification to obtain extra copies and other documents referenced herein.

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