
 * INCH-POUND *

 W-F-406E
 March 26, 1993

 SUPERSEDING
 W-F-406D
 August 10, 1987

FEDERAL SPECIFICATION

FITTINGS FOR CABLE, POWER, ELECTRICAL AND CONDUIT, METAL, FLEXIBLE

This specification is 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 box connectors for flexible conduit, armored cable, and nonmetallic sheathed cable, bushings for armored cable, couplings for flexible conduit, adapters for connecting flexible conduit to rigid conduit, and electrical metallic tubing, and clamps for grounding armored cable and ground wire.

1.2 Classification.

1.2.1 Types, classes, styles, and kinds. Fittings furnished under this specification shall be of the following types, classes, styles, and kinds as specified (see 6.2):

Type I - Box connector, electrical

Class 1 - Flexible steel conduit and round armored cable
 Style A - Straight connector, single attachment
 Style B - Straight connector, duplex attachment
 Style C - 45 degrees (o) angle connector
 Style D - 90o angle connector

 * Beneficial comments (recommendations, additions, deletions) and any *
 * pertinent data which may be of use in improving this document should be *
 * addressed to: Commanding Officer (Code 156), Naval Construction Battalion*
 * Center, 621 Pleasant Valley Road, Port Hueneme, CA 93043-4300, by using *
 * the Standardization Document Improvement Proposal (DD Form 1426) appearing*
 * at the end of this document or by letter. *

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Kind a - Screw-in internal
Kind b - Screw-in external
Kind c - Clamp 2-screw
Kind d - Saddle clamp 1-screw
Kind e - Set screw
Kind f - Squeeze

Class 2 - Oval (flat) armored cable
Style E - Straight connector, single attachment
Style F - Straight connector, duplex attachment
Style G - 45o angle connector
Style H - 90o angle connector

Kind g - Screw-in external
Kind h - Clamp 2-screw
Kind i - Saddle clamp 1-screw
Kind j - Set-screw
Kind k - Squeeze

Class 3 - Liquid-tight flexible metallic conduit connectors
Style I - Straight connector
Style J - 45o angle connector
Style K - 90o angle connector
Style L - Straight connector, male bushing style

Kind l - Screw-in external

Class 4 - Nonmetallic sheathed cable and service entrance cable connectors
Style M - Straight connector, single cable
Style N - Straight connector, duplex cable
Style O - 90o angle connector

Kind m - Oval cable
Kind n - Round cable

Type II - Bushing, electrical conductor, antishort, armored cable
Type III - Coupling, electrical conduit, flexible steel
Type IV - Adapter, electrical conduit

Class 5 - Flexible steel conduit or armored cable to rigid conduit
Style P - With internal threaded connection to rigid conduit
Style Q - With threadless connection to rigid conduit

Class 6 - Flexible steel conduit or armored cable to electrical metallic tubing

Type V - Clamp, electrical grounding

Class 7 - With clamping jaws to fit standard iron pipe size (IPS) pipe
Style R - For bare armored cable
Style S - For bare or insulated wires

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Class 8 - Armored cable hub for bare armored cable, with one
bolthole tongue

1.2.2 Sizes. Fittings furnished under this specification shall conform to
standard commercial sizes, as specified (see 6.2).

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications and standards. The following specifications and
standards form a part of this document to the extent specified herein. Unless
otherwise specified, the issues of these documents are those listed in the
issue of the Department of Defense Index of Specifications and Standards
(DODISS) and supplement thereto, cited in the solicitation (see 6.2).

Federal Standards

FED-STD-123 - Marking for Shipment (Civilian Agencies)
FED-STD-H28 - Screw Thread Standards for Federal Services

Military Specification

MIL-E-17555 - Electronic and Electrical Equipment, Accessories and
Provisioned Items (Repair Parts): Packaging of

Military Standards

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

(Unless otherwise indicated, copies of federal and military specifications,
standards, and handbooks are available from the Standardization Documents
Order Desk, Bldg. 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

2.2 Other publications. The following documents form a part of this
specification to the extent specified herein. Unless otherwise specified, the
issues in effect on the date of invitation for bids or request for approval
shall apply.

National Electrical Manufacturers Association (NEMA):

NEMA FB 1 - Fittings, Cast Metal Boxes and Conduit Bodies for Conduit
and Cable Assemblies

(Application for copies should be addressed to the National Electrical
Manufacturers Association, 2101 L Street, N.W., Washington, DC 20037.)

Underwriters Laboratories, Inc. (UL):

UL 467 - Standard for Safety, Grounding and Bonding Equipment
UL 514B - Standard for Safety, Fittings for Conduit and Outlet Boxes

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(Application for copies should be addressed to the Underwriters Laboratories, Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096.)

(Non-Government standards and other publications are normally available from the organizations which prepare or which distribute the documents. These documents also may be available in or through libraries or other informational services.)

2.3 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Description. Fittings covered by this specification shall be made of metal and conform to the applicable requirements of NEMA FB 1, UL 467 and UL 514B.

3.2 First article. When specified (see 6.2), the contractor shall furnish one fitting of the type, class, kind, and style as specified for the first article inspection and approval (see 4.2.1 and 6.4).

3.3 Standard commercial product. The box connectors, bushings, couplings, adapters and clamps 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 box connectors, bushings, couplings, adapters and clamps 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.

3.4 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. Unless otherwise specified, none of the above shall be interpreted to mean that the use of used or rebuilt products is allowed under this specification.

3.5 Steel fabrication. The steel used in fabrication shall be free from kinks, sharp bends, and other conditions which would be deleterious to the finished product. Manufacturing processes shall not reduce the strength of the steel to a value less than intended by the design. Manufacturing processes shall be done neatly and accurately. All bends shall be made by controlled means to ensure uniformity of size and shape.

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3.6 Codes and standards. The box connectors, bushings, couplings, adapters and clamps shall conform to the requirements of NEMA FB 1, UL 467, or UL 514B as applicable.

3.6.1 Compliance. Prior to approval of the first shipment, the contractor shall submit for the approval of the contracting officer, or his authorized representative, satisfactory evidence that the box connectors, bushings, couplings, adapters and clamps he proposes to furnish under this specification meet the requirements of NEMA FB 1, UL 467, or UL 514B as applicable (see 6.6).

3.7 Components.

3.7.1 Box connectors. Box connectors shall be provided with a clamp or means for connecting to the conduit or cable and a hub and locknut arrangement, or a UL or CSA approved equivalent, for connecting to outlet boxes through standard conduit knockouts. Connectors that have tapered threads for threaded hubs need not have locknuts. Clamps shall neither pierce the armor, damage the insulation of cables, nor distort or damage the conduit when accomplishing its normal function. Attachment means shall provide an effective electrical bond between joined metallic parts. Minimum hub size on connectors shall fit standard 1/2-inch conduit knockouts. All other connectors shall fit standard conduit knockouts. Screws shall be of the fillister head type, except where required by fitting design; roundhead or washer head type screws may be used. The clamps or clamping means for attaching flexible conduit, armored cable, and nonmetallic sheathed cable to the connector shall provide adequate opening and clamping range to fulfill holding and bending requirements as specified in UL 514B and NEMA FB 1.

3.7.2 Sleeves and bushings. Antishort sleeves and insulating bushings shall be unaffected by ordinary atmospheric conditions and be so formed that they shall not be distorted or dislodged by ordinary handling when secured in place.

3.7.3 Couplings and adapters. Couplings and adapters shall have a positive attachment means at each end and shall provide an effective electrical bond between joined metallic parts. Coupling and adapter sizes indicated by a single dimension are for use with the same size conduit on each end.

3.7.4 Grounding clamps. Ground clamps shall meet construction and test requirements of UL 467.

3.7.5 Finish. Fittings shall have surfaces which are not chipped, warped, cracked, or blistered. Surfaces which are normally in contact with conductor insulation shall be rounded to prevent abrasion or cutting of insulating material.

3.7.6 Threads. External and internal threads of IPS shall be of the straight or taper type, suitable for fitting use in accordance with FED-STD-H28.

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 purchase order, the contractor may use his own or any other

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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 Responsibility for compliance. All items must meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of assuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling in quality conformance does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to acceptance of defective material.

4.1.2 Component and material inspection. Components and materials shall be inspected in accordance with all the requirements specified herein and in applicable referenced documents.

4.2 Classification of inspections. The inspection requirements specified herein are 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. The first article inspection shall be performed on fittings when a first article is required (see 3.2 and 6.2). This inspection shall include the examination of 4.4, and the tests of 4.5, and when specified, the first article pack inspection of 4.6 (see 6.2). The first article may be either a first production item or a standard production item from the supplier's current inventory provided the item meets the requirements of the specification and is representative of the design, construction, and manufacturing technique applicable to the remaining items to be furnished under the contract.

4.2.2 Quality conformance inspection. The quality conformance inspection shall include the examination of 4.4 and the tests of 4.5. This inspection shall be performed on the samples selected in accordance with 4.3.

4.3 Sampling. Sampling and inspection procedures shall be in accordance with MIL-STD-105. The unit of product shall be one box connector, bushing, coupling, adapter and clamp. All box connectors, bushings, couplings, adapters and clamps offered for delivery at one time shall be considered a lot for the purpose of inspection.

4.3.1 Sampling for examination. Guidance for inspection level and an Acceptable Quality Level (AQL) is provided in 6.5.2.

4.3.2 Sampling for tests. Guidance for inspection level and an AQL is provided in 6.5.2.

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4.4 Examination. Each fitting shall be examined for compliance with the requirements specified in section 3 of this specification. Any redesign or modification of the contractor'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 element of inspection shall encompass all visual examinations and dimensional measurements. Noncompliance with any specified requirements or presence of one or more defects preventing or lessening maximum efficiency shall constitute cause for rejection.

4.5 Tests. Testing shall be as specified in NEMA FB 1, UL 467 or UL 514B.

4.6 Preparation for delivery inspection. The inspection of the preservation, packaging, packing, and marking shall be in accordance with the requirements of section 4 of MIL-E-17555. The inspection shall consist of the quality conformance inspection, and when specified, a first article pack shall be furnished for examination and test within the timeframe required (see 6.2).

5. PREPARATION FOR DELIVERY

5.1 Preservation, packaging and packing. Preservation, packaging and packing shall be in accordance with the requirements of MIL-E-17555 with the level of preservation, packaging and the level of packing as specified (see 6.2). Unit pack quantities shall be as specified (see 6.2).

5.2 Marking.

5.2.1 Military agencies. Shipments to military agencies shall be marked in accordance with MIL-STD-129.

5.2.2 Civil agencies. Shipments to civil agencies shall be marked in accordance with FED-STD-123.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. The fittings covered by this specification are intended for use as follows:

- Type I - For attaching cable or flexible conduit to an outlet box
- Type II - To provide protection for the cable insulation at the point on an armored cable where the armor terminates
- Type III - To couple two sections of the same size flexible conduit
- Type IV - For connecting armored cable or flexible conduit to rigid conduit or electrical metallic tubing
- Type V - To provide means for connecting a ground wire, bare armored or insulated, to a grounded piping system

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

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- a. Title, number, and date of this specification
- b. Type, class, style, kind, and size required (see 1.2.1 and 1.2.2)
- c. Issue of document required if different than as specified (see 2.1.1)
- d. When a first article inspection is required (see 3.2, 4.2.1 and 6.4)
- e. When a first article pack inspection is required and timeframe required for submission (4.2.1 and 4.6)
- f. Level of preservation, packaging, and packing required (see 5.1)
- g. Unit pack quantities required (see 5.1)

6.3 Data requirements. When this specification is used in an acquisition and data are required to be delivered, such as a certified test report, the data requirements shall be developed as specified by an approved Data Item Description (DD Form 1664) and delivered in accordance with the approved Contract Data Requirements List (CDRL, DD Form 1423), incorporated into the contract. When the provisions of DoD Federal Acquisition Regulations (FAR) Supplement, Part 27, Sub-Part 27.475-1 are invoked and the DD Form 1423 is not used, the data should be delivered by the contractor in accordance with the contract or purchase order requirements.

6.4 First article. When a first article inspection is required (see 6.2), the item will be tested and should be a first production item or it may be a standard production item from the contractor's current inventory as specified in 4.2.1. The first article should consist of one fitting of each type. The contracting officer should include specific instructions in procurement documents regarding arrangements for examination, test, and approval of the first article.

6.5 Sampling procedures.

6.5.1 Sampling for examination. Recommended inspection level is S-4 and AQL is 4.0 (see 4.3.1).

6.5.2 Sampling for tests. Recommended inspection level is S-2 and AQL is 1.5 (see 4.3.2).

6.6 UL certification. Recommended acceptable evidence of meeting the requirements of UL 467 or UL 514B shall be the UL certification symbol or label, listing in the UL electrical construction materials directory, or a certified test report (see 6.3) from a recognized independent testing laboratory indicating the box connectors, bushings, couplings, adapters and clamps have been tested and conform to UL 467 or UL 514B. Such evidence must be acceptable to the contracting officer.

6.7 Part or Identifying Number (PIN). The PIN to be used for items acquired to this specification is created as follows:

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WF406E - XXX - X - X - X
*      *      *      *      *----- Kind
*      *      *      *
*      *      *      *----- Style
*      *      *
*      *      *----- Class
*      *
*      *----- Type
*
*----- Specification Number

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6.7.1 Types, classes, styles and kinds. The types, classes, styles, and kinds of box connectors, bushings, couplings, adapters and clamps are identified by numeric and alpha characters as identified in 1.2. The following is an example of the PIN for an electrical box connector, class 2, style H, kind g:

WF406E - 00I - 2 - H - g

6.7.2 Part numbers. The PIN procedure is for Government purposes and does not constitute a requirement for the contractor.

6.8 Supersession data. This specification supersedes W-F-406D, dated August 10, 1987.

6.9 Subject term (key word) listing.

Box connector

6.10 Changes from previous issue. Asterisks are not used in this revision to identify changes with respect to the previous issue, due to the extensiveness of the changes.

MILITARY INTERESTS:

Military Coordinating Activity

Navy - YD

Custodians

Army - ER

Navy - YD

Air Force - 85

Review Activities

Air Force - 99

DLA - GS

PREPARING ACTIVITY:

Navy - YD

(Project 5975-1110)

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.