

METRIC

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 19 July 1992
 SUPERSEDING
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 7 June 1990
 (See 6.9)

MILITARY SPECIFICATION

PENETRATORS, MULTIPLE CABLE, FOR ELECTRIC CABLES, GENERAL SPECIFICATION FOR

This specification is approved for use by the Naval Sea Systems Command, Department of the Navy, and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers multiple cable penetrator frames, accessories, and insert material items for sealing electric cable passing through decks, bulkheads, and electrical equipment on Naval ships.

1.2 Classification. Penetrators shall be classified in accordance with 1.2.1 through 1.2.1.4.7.

1.2.1 Part or identifying number (PIN). The part number shall be of the following form, as specified (see 6.2):

<u>M24705/2</u>	<u>B</u>	<u>N</u>	<u>2006</u>
(see 1.2.1.1)	(see 1.2.1.2)	(see 1.2.1.3)	(see 1.2.1.4)

1.2.1.1 Military designation. The Military designation consists of a prefix M, which indicates a Military specification item, the specification number, and the specification sheet number.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Naval Sea Systems Command, SEA 55Z3, Department of the Navy, Washington, DC 20362-5101 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.
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AMSC N/A

FSC 5975

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1.2.1.2 Item type. Items shall be designated by a single letter specified as follows:

- A = Assembly, end packing
- B = Cable insert blocks or blanking blocks
- F = Frame
- I = Filler inserts
- P = Cable sealing plug
- R = Reducers
- S = Stay plates
- C = Compression plates

1.2.1.3 Item material. Item material shall be as specified (see 3.1) with the item material designated by a single letter specified as follows:

- A = Aluminum
- B = Brass
- C = Corrosion-resistant (CRES) steel
- G = Glass reinforced plastic (GRP)
- N = Not specified
- S = Steel

1.2.1.4 Item designation. Item designation shall be as specified in 1.2.1.4.1 through 1.2.1.4.7.

1.2.1.4.1 Cable insert blocks. Unless otherwise specified (see 3.1), cable insert blocks shall be differentiated by an item designation consisting of four consecutive digits. The first two digits shall indicate the exterior width of the cable insert block in millimeters (mm). The last two digits shall indicate the diameter of the passage of the cable insert block in mm.

1.2.1.4.2 End packing assemblies. Unless otherwise specified (see 3.1), end packing assemblies shall be differentiated by an item designation consisting of a single digit corresponding to a particular style.

1.2.1.4.3 Frames. Unless otherwise specified (see 3.1), frames shall be differentiated by an item designation consisting of a single digit corresponding to a particular size.

1.2.1.4.4 Filler inserts. The item designation for filler inserts shall be as specified on the applicable specification sheet (see 3.1).

1.2.1.4.5 Cable sealing plugs. Unless otherwise specified (see 3.1), cable sealing plugs shall be differentiated by an item designation consisting of five consecutive digits. The first digit shall indicate the number of passages through the cable sealing plug. The second and third digits shall indicate the exterior diameter of the cable sealing plug in mm. The fourth and fifth digits shall indicate the diameter of each passage of the cable sealing plug in mm.

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1.2.1.4.6 Reducers. The item designation for reducers shall consist of the three consecutive digits as specified (see 3.1) which correspond to the item designation of the multiple passage rectangular-faced cable insert block for which the reducer is associated.

1.2.1.4.7 Stay plates. The item designation for stay plates shall be as specified in the applicable specification sheet (see 3.1).

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).

SPECIFICATIONS

FEDERAL

C-T-91	Tallow, Inedible
QQ-P-35	Passivation Treatments for Corrosion Resisting Steel
PPP-F-320	Fiberboard; Corrugated and Solid, Sheet Stock (Container Grade), and Cut Shapes

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MIL-M-14	Molding Compounds, Thermosetting
MIL-S-901	Shock Tests, HI (High Impact); Shipboard Machinery, Equipment and Systems, Requirements for
MIL-F-16884	Fuel, Naval Distillate
MIL-I-17214	Indicator, Permeability; Low-Mu (GO-NO GO)
MIL-L-17331	Lubricating Oil, Steam Turbine and Gear, Moderate Service
MIL-E-17555	Electronic and Electrical Equipment, Accessories, and Provisioned Items (Repair Parts): Packaging of
MIL-L-19140	Lumber and Plywood, Fire-Retardant Treated
MIL-C-24643	Cable and Cord, Electrical, Low Smoke, for Shipboard Use, General Specification for
MIL-P-24705/1	Penetrators, Multiple Cable, for Electric Cables, Rectangular Metal Frame, for Square-Faced Blocks

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MIL-P-24705/2	Penetrators, Multiple Cable, for Electric Cables, Notched Rectangular Metal Frame, for Rectangular- Faced Blocks
MIL-P-24705/3	Penetrators, Multiple Cable, For Electric Cables, Round Frame, For Square-Faced Blocks

STANDARDS

FEDERAL

FED-STD-H28	Screw-Thread Standards for Federal Services
FED-STD-H28/2	Screw-Thread Standards for Federal Services, Section 2, Unified Inch Screw Threads-UN and UNR Thread Forms

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MIL-STD-167-1	Mechanical Vibrations of Shipboard Equipment (Type I - Environmental and Type II - Internally Excited)
MIL-STD-278	Welding and Casting Standard
MIL-STD-454	Standard General Requirements for Electronic Equipment

HANDBOOK

MILITARY

MIL-HDBK-149	Rubber
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(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

2.2 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DOD adopted are those listed in the issue of the DODISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS are the issues of the documents cited in the solicitation (see 6.2).

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

B46.1	Surface Texture (Surface Roughness, Waviness, and Lay); (DOD adopted)
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(Application for copies should be addressed to the American National Standards Institute, 1430 Broadway, New York, NY 10018.)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

A 27	Standard Specification for Steel Castings, Carbon, for General Application; (DOD adopted)
A 47	Standard Specification for Ferritic Malleable Iron Castings; (DOD adopted)
A 108	Standard Specification for Steel Bars, Carbon, Cold-Finished Standard Quality; (DOD adopted)
A 131	Standard Specification for Structural Steel for Ships
A 276	Standard Specification for Stainless and Heat-Resisting Steel Bars and Shapes; (DOD adopted)
A 366	Standard Specification for Steel, Sheet, Carbon, Cold-Rolled, Commercial Quality; (DOD adopted)
A 536	Standard Specification for Ductile Iron Castings; (DOD adopted)
A 569	Standard Specification for Steel, Carbon (0.15 Maximum, Percent), Hot-Rolled Sheet and Strip Commercial Quality; (DOD adopted)
B 21	Standard Specification for Naval Brass Rod, Bar, and Shapes; (DOD adopted)
B 117	Standard Method of Salt Spray (Fog) Testing; (DOD adopted)
B 209	Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; (DOD adopted)
B 211	Standard Specification for Aluminum-Alloy Bar, Rod, and Wire; (DOD adopted)
B 221	Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes; (DOD adopted)
D 395	Standard Test Methods for Rubber Property - Compression Set; (DOD adopted)
D 2240	Standard Test Method for Rubber Property - Durometer Hardness; (DOD adopted)

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(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.)

(Non-Government standards and other publications are normally available from the organizations that prepare or 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 (except for specification sheets), 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 Specification sheets. The individual item requirements shall be as specified herein and in accordance with the applicable specification sheet. In the event of any conflict between the requirements of this specification and the specification sheet, the latter shall govern.

3.2 Qualification. Multiple cable penetrator frames, accessories, and insert items furnished under this specification shall be products which are authorized by the qualifying activity for listing on the applicable qualified products list at the time of award of contract (see 4.4). Intermixing tests (see 6.4.2) shall be conducted prior to qualification.

3.3 Materials. Materials shall be as specified (see 3.1). When not specified, the contractor may select any material that will satisfactorily perform the intended function of the component in the equipment assembly, provided it meets the requirements of the specification.

3.3.1 Metals and alloys. Metals and alloys for frames and accessories (see 6.5.1 and 6.5.2) shall be corrosion-resistant, or be given a corrosion-resistant treatment or coating in accordance with requirement 15 of MIL-STD-454 where non-corrosion-resistant steel is used for a frame that is to be welded to a bulkhead or other partition. The metal shall be cleaned and receive a gray paint primer. Metals and alloys not covered in this specification shall be approved by the Naval Sea Systems Command (NAVSEA) before use in a multiple cable penetrator.

3.3.1.1 Corrosion-resistant and nonmagnetic metals. The following are considered corrosion-resistant for structural purposes, and are nonmagnetic:

- a. Alloys, aluminum - types 5052 or 5086 as specified in ASTM B 221, or type 5083 as specified in ASTM B 209
- b. Brass - type C46400 as specified in ASTM B 21
- c. Steel, CRES - grades 304L, 316L, 321, and 347 (condition A for all) as specified in ASTM A 276. (Passivation in accordance with QQ-P-35 shall be required.)

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3.3.1.2 Steel parts. Unless otherwise specified (see 3.1), steel for frames and accessories shall be as specified in 3.3.1.1(c) or ASTM A 131, grades A, B, or C or ASTM A 108, grade C1018.

3.3.1.3 Aluminum parts. Unless otherwise specified (see 3.1), aluminum for frames and accessories shall be as specified in 3.3.1.1(a).

3.3.1.4 Brass parts. Brass for frames and accessories shall be as specified in 3.3.1.1(b).

3.3.1.5 Glass-fiber reinforced polyester (GRP). GRP for frames and accessories (see 3.1) shall be in accordance with MIL-M-14/4 (MAJ-60).

3.3.2 Dissimilar metals. Dissimilar metals shall be in accordance with requirement 16 of MIL-STD-454.

3.3.3 Insert material items. Insert material items (see 6.5.2) shall be constructed of material which shall meet the requirements specified herein and on the applicable specification sheet (see 3.1).

3.3.4 Lubricant. Lubricant (see 3.1 and 6.5.2.11), when specified (see 6.2), shall be in accordance with C-T-91.

3.3.5 Toxicity. The material shall have no adverse effect on the health of personnel when correctly used for its intended purpose. Questions pertinent to this effect shall be referred by the contracting activity to the Naval Medical Command (NAVMEDCOM) who will act as an advisor to the contracting agency.

3.3.6 Hazardous material. Materials and parts containing asbestos, cadmium, lithium, mercury, polychlorinated biphenyl, radioactive materials, chromates, or materials giving off toxic fumes under operation or casualty conditions, shall not be used. Mercury and its compounds shall not be used during processing, handling, and packaging of material and parts.

3.3.7 Material compatibility. Materials which (through outgassing or other physical phenomena) cause deterioration of other materials or degradation of equipment performance shall not be used.

3.3.8 Recovered materials. Unless otherwise specified herein, all equipment, material, and articles incorporated in the products covered by this specification shall be new and may be fabricated using materials produced from recovered materials to the maximum extent practicable 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 is allowed under this specification unless otherwise specifically specified.

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3.3.9 Changes in material. Prior to any changes if the manufacturer desires to change his process or the composition of his material after qualification (see 6.4), he shall submit to the qualifying activity a statement to that effect which must be approved. The statement shall describe the proposed change, together with evidence to substantiate his claim that such change can be achieved. At the discretion of NAVSEA, test specimens may be required to prove the suitability of the proposed changes.

3.4 Construction.

3.4.1 General. The multiple cable penetrator frame, end packing assembly, compression plate, stay plates, keeper bars, cable insert blocks, blanking insert blocks, filler inserts, reducers, cable sealing plugs and blanking sealing plugs shall be of the design, construction and physical dimensions as specified in the specification sheet.

3.4.2 Small miscellaneous hardware. Self-tapping screws or other self-tapping devices shall not be used in any assembled multiple cable penetrator.

3.4.3 Threads. Threads shall be unified form (UN), class 2A or 2B, in accordance with FED-STD-H28 and FED-STD-H28/2. The nominal size and thread per inch shall be as specified on the applicable specification sheet (see 3.1).

3.4.4 Castings. Cast components shall be free from cold shuts, blow holes, or cracks that may in any way affect the strength or serviceability of the casting. Fins or burrs on casting surfaces shall be removed.

3.4.5 Forming and machining operations. Forming and machining operations shall be completed before any specified plating or finish is applied.

3.4.6 Sharp edges. There shall be no external sharp edges.

3.4.7 Welding. Welding shall be in accordance with MIL-STD-278. Certification is not required unless specified in the contract.

3.4.8 Molded parts. Molded parts shall be free of flash, blow holes, or cracks. Small gas bubbles that form on the face and top surface shall not be cause for rejection provided the molded parts are in accordance with the rest of the requirements specified herein, and on the applicable specification sheet (see 3.1). Flash shall be removed and the width of the flash edges shall be not greater than 1/32 inch.

3.4.8.1 Stress relief. Measures shall be taken in molding or processing GRP to ensure that stress buildup does not occur; or, the items shall be satisfactorily treated to relieve these stresses to prevent deterioration or failure of a part or assembly. The stress-relieving process shall be as required by the technical data provided by the manufacturer of the raw materials.

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3.4.9 Surface finish. Surface finishes for metals and GRP shall be as specified in 3.4.9.1 and 3.4.9.2, respectively.

3.4.9.1 Metals. A maximum surface roughness of 250 microinches is permissible for machined parts. Surface finish shall be in accordance with ANSI B46.1.

3.4.9.2 GRP. There shall be no evidence of air or gas pockets, resin pockets, solvent areas, areas lacking resin, uncured areas, decontaminations, or soft spots in GRP used as structural parts.

3.4.10 Nonmagnetic inboard penetrations. Inboard penetrations, when specified to be nonmagnetic (see 6.2), shall meet the nonmagnetic requirements of 3.5.4.

3.4.11 Special tools and equipment. Where required, special tools and equipment for installation, removal, or replacement of frames, or for reconfiguration of accessories and insert blocks, shall be provided by the contractor. Special tools are defined as tools not listed in the Federal Supply Catalog (copies of this catalog may be consulted in the office of the Defense Contract Administration Services Management Area (DCASMA)).

3.5 Performance. The multiple cable penetrator frames, accessories, and insert material items shall be constructed to meet the performance requirements specified herein, and on the applicable specification sheet (see 3.1).

3.5.1 Vibration. The multiple cable penetrator shall withstand the vibration test of 4.7.3.

3.5.2 High impact (HI) shock. The multiple cable penetrator shall withstand the shock test of 4.7.4.

3.5.3 Watertight. The multiple cable penetrator shall be watertight and shall exhibit leakage not greater than specified (see 4.7.5).

3.5.4 Nonmagnetic. When nonmagnetic, multiple cable penetrators are specified (see 3.4.10 and 6.2), the metal parts shall indicate a permeability level of less than 2.0 (see 4.7.6).

3.5.5 Electromagnetic compatibility (EMC). When EMC protected multiple cable penetrators are specified (see 6.2), they shall have an effectiveness to ground as specified in the contract or purchase order (see 4.7.7).

3.5.6 Salt spray. The multiple cable penetrator shall exhibit no corrosion or physical damage (see 4.7.8).

3.5.7 Fire stop. The multiple cable penetrator shall withstand the fire stop test of 4.7.9.

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3.5.8 Durometer. The insert material shall have a class A durometer hardness (see 4.7.10), as specified on the applicable specification sheet (see 3.1).

3.5.9 Compression. The insert material shall have a compression not greater than the value specified on the applicable specification sheet (see 3.1 and 4.7.11).

3.5.10 Expansion. The insert material shall have an expansion not more than the value specified on the applicable specification sheet (see 3.1 and 4.7.12).

3.5.11 Fluid immersion. The insert material shall exhibit no apparent *physical change*, and the *durometer hardness* shall be not greater than the value specified on the applicable specification sheet (see 3.1 and 4.7.13).

3.5.12 Infrared (IR) signature. The IR signature of the insert material shall be determined as specified in 4.7.14. At the time of qualification, this signature shall be marked for identification by the *Government inspector* and shall be retained by the manufacturer as standard for the purpose of determining quality conformance (see 4.5.1.1.2).

3.6 Marking. Marking shall be as specified in 3.6.1 and 3.6.2.

3.6.1 Frames and accessories. Unless otherwise specified (see 6.2), frames and accessories shall be marked by ink, stamping, molding, casting, or be engraved with the following:

- a. Military part number (see 3.1)
- b. Manufacturer's name or logo.

Identification marking shall be at a location that will be clearly visible once the multiple cable penetrator has been assembled. Printed characters shall be approximately 3 mm high or larger, and shall be clear, complete, and legible to the naked eye.

3.6.1.1 Accessories. Accessories consist of end packing assembly, compression plate, stay plate, and keeper bar.

3.6.2 Cable insert blocks and cable sealing plugs. Cable insert blocks and cable sealing plugs shall be permanently marked by molding, engraving, or indelible stamping with the following:

- a. Exterior width and passage diameter in mm (see 3.1)
- b. Passage diameter in inches (see 3.1)
- c. *Manufacturer's name or logo.*

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Passage diameter shall be marked in mm and inches on each end face of the cable insert block and cable sealing plug unless otherwise specified (see 3.1). The individual detail sheets shall specify the marking required for small block sizes or for blocks with large passage diameters that restrict marking space availability. Location of other required identification marking shall be at the option of the manufacturer. Printed characters shall be complete and legible to the naked eye.

3.6.2.2 Insert material. Insert material consists of cable insert block, blanking insert block, filler inserts, reducers, cable sealing plug, and blanking sealing plug.

3.7 Workmanship. Workmanship shall be in accordance with requirement 9 of MIL-STD-454.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order (see 6.2), the contractor is responsible for the performance of all inspection requirements (examination and tests) as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any 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 ensure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items shall 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 ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of the manufacturing operations, is an acceptable practice to ascertain conformance to requirements, however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

4.2 Classification of inspections. The inspection requirements specified herein are classified as follows:

- a. Qualification (see 4.4)
- b. Quality conformance (see 4.5)
- c. Material control objective quality evidence (see 4.6).

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4.3 Inspection conditions. Unless otherwise specified herein, all measurements shall be made within the following ambient conditions:

- a. Temperature: 15 to 35 degrees Celsius (°C)
- b. Atmospheric pressure: 550 to 800 mm of mercury (Hg)
- c. Relative humidity (RH): 20 to 80 percent.

4.4 Qualification inspection. Qualification inspection shall consist of the examination and tests in the order shown, as specified in tables I and II, and in accordance with the applicable specification sheet (see 3.1).

TABLE I. *Qualification inspection multiple cable penetrator assembly.*

Inspection	Requirement	Test method
Visual and dimensional examination	3.4 and 3.6	4.7.2
Vibration ¹	3.5.1	4.7.3
Shock ¹	3.5.2	4.7.4
Watertightness ¹	3.5.3	4.7.5
Nonmagnetic ²	3.5.4	4.7.6
Salt spray ₃	3.5.6	4.7.8
Fire stop	3.5.7	4.7.9

¹Shall be conducted on penetrator assemblies having FA and FS frame designators only.

²Shall be conducted on penetrator assemblies having FA and FC frame designators only.

³Shall be conducted on penetrator assemblies having FS frame designators only.

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TABLE II. *Qualification inspection - insert material.*

Inspection	Requirement	Test method	Sample specimens				
			1	2	3	4	5
Visual and dimensional examination	3.4 and 3.6	4.7.2	X	X	X	X	X
Durometer	3.5.8	4.7.10	X				
Compression	3.5.9	4.7.11		X			
Expansion	3.5.10	4.7.12			X		
Fluid immersion	3.5.11	4.7.13				X	
IR signature	3.5.12	4.7.14					X

4.4.1 Qualification samples. A manufacturer seeking qualification shall manufacture and test the required samples (see 3.1) for which qualification is sought. The samples to be tested shall be produced with equipment and procedures normally used in production.

4.4.1.1 Multiple cable penetrator test specimens. The number of multiple cable penetrator test specimens (see 3.1) of each frame material for which qualification is sought, shall be tested as specified in table I. If a manufacturer produces only insert material items (for assembly in a frame produced by others) they shall be assembled in a frame and tested as specified in table I.

4.4.1.1.1 Test specimen configuration. The test specimen shall consist of a multiple cable penetrator frame, the appropriate insert material items and accessories, loaded with cables conforming to MIL-C-24643 as specified in the applicable specification sheet (see 3.1). The specified cables shall be approximately 1 meter length. Using the test stand specified in 4.7.1 or an approved equivalent, the cables shall be routed through the penetrator frame so that approximately .75 meter of cable shall extend from the side of the frame that will not be directly exposed to the fire or water during testing.

4.4.1.2 Insert material sample. The sample insert material for which qualification is sought, and the quantity of samples required, shall be as specified herein, and on the applicable specification sheet (see 3.1). The insert material shall be tested as specified in table II.

4.4.2 Failure. Failure of any sample to meet the requirements specified herein shall be cause for refusal to grant qualification.

4.4.3 Retention of qualification. To retain qualification the contractor shall forward an annual report to the qualifying activity. The initial reporting date shall be established by the qualifying activity. The report shall contain a summary of the results of tests performed for inspection of the product for delivery. As a minimum, the report shall indicate the number of lots of each item that

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have passed, the number of lots of each item that have failed, and the reasons for failure. Group B, C and D test reports shall be forwarded to the qualifying activity and shall include copies of the original data sheets. Each summary and test report shall be validated by the Government quality assurance representative. Failure to submit the report within 90 days of the due date may result in the loss of qualification. In the event that no production occurred during the reporting period, a report shall be submitted certifying that the contractor still has the capabilities and facilities necessary to produce the item and design and materials are unchanged since qualification testing.

4.4.3.1 Testing requirements. Testing requirements for retention of qualification are quality conformance inspection (see table III) and group D inspection. Changes in material, construction, or both which have been qualified shall require written approval of NAVSEA. Incorporation of any changes which have not been so approved shall require requalification of frame, accessory, or insert material item in question.

4.5 Quality conformance inspection. Quality conformance inspection shall consist of the examinations and tests described in table III.

TABLE III. *Quality conformance inspection.*

Inspection	Requirement	Test method
Group A		
Visual and dimensional examination	3.4 and 3.6	4.7.2
Nonmagnetic ¹	3.5.4	4.7.6
Group B		
Durometer	3.5.8	4.7.10
Compression	3.5.9	4.7.11
Group C		
Infrared (IR) signature ²	3.5.12	4.7.14

¹When specified (see 6.2).

²One sample for IR testing shall be selected every 3 months from a batch of material used to manufacture insert blocks.

4.5.1 Sampling for quality conformance inspection. As a minimum, the contractor shall randomly select a sample quantity from each lot of completed penetrator frames, accessories, or insert material items in accordance with tables IV and V and inspect them in accordance with 4.5. If one or more defects are found in any sample, the entire lot shall be rejected. The contractor has the option of screening the lot 100 percent for the defective characteristic(s) or providing a new lot which shall be inspected in accordance with sampling plan contained herein. The contractor shall maintain for a period of three years after contract completion records of inspections, tests, and any resulting rejections.

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4.5.1.1 **Group A inspection.**

4.5.1.1.1 **Frames.** Visual and dimensional examination shall be done on all frames offered for delivery. The non-magnetic inspection when specified shall be in accordance with table IV.

4.5.1.1.2 **All other parts.** Samples of all other parts offered for inspection shall be selected from each lot in accordance with table IV.

TABLE IV. Group A inspection sampling plan.

Lot size	Sample size	Accept
3 to 50	5	0
51 to 90	7	0
91 to 150	11	0
151 to 280	13	0
281 to 500	16	0
501 to 1200	19	0
1201 to 3200	23	0
3201 to 10,000	29	0
10,001 and over	35	0

4.5.1.2 **Group B inspection.** Samples for Group B inspection shall be selected from inspection lots that have passed group A inspection. The number of samples selected shall be in accordance with table V.

TABLE V. Group B inspection sampling plan.

Lot size	Sample size	Accept
2 to 15	2	0
16 to 25	3	0
26 to 90	5	0
91 to 150	6	0
151 to 280	7	0
281 to 500	9	0
501 to 1200	11	0
1201 to 3200	13	0
3201 and over	15	0

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4.5.2 Lot. For the purpose of quality conformance inspection and test sampling, a lot is defined as all the penetrator frames, accessories, or insert material items of one type and material produced in one facility, using the same materials and production processes, and being offered for delivery at one time.

4.5.3 Group D inspection. At 3 year intervals following qualification approval, test samples selected from inspection lots which have passed group B inspections shall be subjected to the fire stop test specified in 3.5.7 and 4.7.9. Whenever the manufacturer has had no production in the specified period, the samples shall be selected from the first production lot following this period.

4.6 Material control objective quality evidence. The following information shall be part of the objective evidence (see 6.3):

- a. Contract or order identification
- b. Contractor's identity
- c. Material certification with a statement to the effect that objective evidence is on file in support of material identification
- d. Signature or symbol of contractor's inspection.

4.7 Methods of inspection.

4.7.1 Test stand assembly. The test stand assembly (see figure 1) or approved equivalent shall be used to test the multiple cable penetrator test specimen (see 4.4.1.1).

4.7.2 Visual and dimensional examination. Multiple cable penetrator frames, accessories, and insert material items shall be visually and dimensionally examined to verify that the design, construction, physical dimensions, and marking are as specified in the applicable requirements (see 3.4 and 3.6).

4.7.3 Vibration. The multiple cable penetrator test specimen shall be subjected to the type I vibration test in accordance with MIL-STD-167-1. Following the test, the multiple cable penetrator test specimen shall meet the acceptability requirements of MIL-STD-167-1, and shall pass the HI shock test specified in 4.7.4 and the watertightness test specified in 4.7.5.

4.7.4 Shock. The multiple cable penetrator test specimen shall be subjected to group A, class I, type A shock test in accordance with MIL-S-901. The mounting fixture shall be type 4A for the lightweight shock machine or standard deck and bulkhead mounting on the medium weight shock machine. Following the test, the multiple cable penetrator shall meet the acceptability requirements of MIL-S-901 and shall pass the watertightness test specified in 4.7.5.

4.7.5 Watertightness. The multiple cable penetrator test specimen mounted on the test plate shall be bolted to the hydro chamber (see figure 1) so that one side of the test specimen is exposed to water, and the opposite side of the test specimen is exposed to air (see figure 1). The hydro chamber shall then be filled with water and pressurized to 25.0 pounds per square inch

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(lb/in²). This pressure shall be maintained for a minimum of 10 minutes unless specimen failure occurs sooner. The test specimen shall be considered as having failed the watertightness test if, after 10 minutes, the water pressure has decreased to less than 25.0 lb/in².

4.7.6 Nonmagnetic. When applicable (see 3.4.10 and 3.5.4), nonmagnetic parts shall be tested with a permeability indicator in accordance with MIL-I-17214. Nonmagnetic parts shall meet the requirements specified in 3.5.4.

4.7.7 EMC. When applicable (see 3.5.5), the multiple cable penetrator test specimen shall be subjected to the EMP tests specified in the contract or purchase order. Multiple cable penetrators shall meet the requirements specified in 3.5.5.

4.7.8 Salt spray test. When applicable (see 3.3.1.2), the multiple cable penetrator test specimen shall be tested in accordance with ASTM B 117. Multiple cable penetrators shall meet the requirements specified in 3.5.6. The exposure time shall be 48 hours.

4.7.9 Fire stop test. The multiple cable penetrator test specimen shall be as specified in 4.4.1.1, except the frame shall be steel only. The test specimen shall be subjected to the fire stop test specified in 4.7.9.1 and 4.7.9.2.

4.7.9.1 Test equipment. The fire stop test equipment shall consist of a test stand with a fire chamber, an exhaust and vacuum chamber, eight thermocouples, and a 500,000 British thermal unit (Btu) propane burner. The propane burner shall be mounted in the fire chamber so that it will be 12 inches from the face of the test specimen.

4.7.9.2 Test procedure. The multiple cable penetrator test specimen shall be mounted on the test plate bolted to the test stand. Thermocouples shall be placed on both sides of the test specimen at the following locations: two on the fire side; one 8 inches from the penetrator face and one in the center of the penetrator face; six on the nonfire side; three on the vertical centerline at the top, center, and bottom of the insert material; two opposing corners on the insert material; and one on the metal bulkhead 1 inch above the penetrator. The flame shall be applied to the test specimen for not less than 1 hour at a temperature of 1093 °C (see figure 2) measured at the thermocouple located at the center of the cable bundle.

4.7.9.3 Rejection criteria. The multiple cable penetrator specimen shall be considered as having failed the fire stop test if, at the end of 1 hour, the fire has spread through the test specimen to the cables on the unexposed (nonfire) side of the test stand.

4.7.10 Durometer. A sample of each sealing item shall be subjected to a type A durometer test in accordance with ASTM D 2240.

4.7.11 Compression. A sample of each sealing item shall be tested in accordance with ASTM D 395.

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4.7.12 Expansion. A sample of the insert material (see 3.1) shall be placed into an oven with the temperature held constant at 80 to 85 °C for not less than 1 hour. Before the test, the sample shall be measured for its actual dimensions. After the test, the sample dimensions shall be measured after the sample has been cooled to ambient temperature. The percentage change in volume shall be calculated as follows:

$$\text{Expansion percentage} = \frac{(\text{Volume after test}) - (\text{Volume before test})}{(\text{Volume before test})} \times 100$$

4.7.13 Fluid immersion. A sample insert material shall be placed face down in a container containing approximately 1/2 inch of fluid for not less than 2 hours. The fluids and temperatures shall be as specified in table IV. The samples shall then be removed, blotted to remove excess fluid, and suspended in air at room temperature for not less than 3-1/2, nor more than 4-1/2 hours. Each sample shall then be tested again as specified in 4.7.10. Failure to meet the requirements of this test shall be basis for rejection. Test shall be repeated for each specified fluid.

TABLE IV. *Test fluids and temperatures.*

Fluid	Test temperatures
Fuel oil (as specified in MIL-F-16884)	Ambient
Hydraulic fluid (as specified in MIL-L-17331)	Ambient
Coolant (Monsanto Coolanol 25, or equal)	20 to 25 °C

4.7.14 IR signature. A sample of the insert material (see 3.1) shall be examined and analyzed to determine its IR signature. The procedure used shall be of a type normally used by commercial test laboratories and shall be included in the test report. A copy of the IR record shall be kept by the manufacturer for comparison against results of subsequent inspection (group C) tests.

4.8 Inspection of packaging. Sample packages and the inspection of the packaging (preservation, packing and marking) for shipment, stowage and storage shall be in accordance with the requirements of section 5 and the documents specified therein.

5. PACKAGING

(The packaging requirements specified herein apply only for direct Government acquisition. For the extent of applicability of the packaging or preparation for delivery requirements of referenced documents listed in section 2, see 6.6.)

5.1 Packaging requirements. Multiple cable frames, accessories and insert material items shall be preserved level A, C, or commercial, packed level A, B, C or commercial, as specified (see 6.2) and marked in accordance with MIL-E-17555 and applicable packaging acquisition options therein as specified (see 6.2). In addition, for Navy acquisitions, the following applies:

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a. Navy fire-retardant requirements:

- (1) *Lumber and plywood.* Unless otherwise specified (see 6.2), all lumber and plywood including laminated veneer material used in shipping container construction members, blocking, bracing, and reinforcing shall be fire-retardant treated material conforming to MIL-L-19140 as follows:

Levels A and B - Type II - weather resistant
Category 1 - general use

Level C - Type I - non-weather resistant
Category 1 - general use.

- (2) *Fiberboard.* Fiberboard used in the construction of interior (unit and intermediate) and exterior fiberboard boxes including interior packaging forms shall conform to the class domestic/fire retardant or class-weather resistant/fire retardant material requirements as specified (see 6.2) of PPP-F-320.

6. NOTES

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

6.1 Intended use. Multiple cable penetrators are intended for use in maintaining watertight, airtight, fumetight, and firetight integrity of electric cable penetrations through decks and bulkheads of surface ships and electric equipment enclosures for both surface ships and submarines. Multiple cable penetrators are intended to be used primarily with cables specified in MIL-C-17, MIL-C-915, MIL-C-24640, and MIL-C-24643. This specification covers individual frames, accessories and inserts. Requirements for multiples, banded frames, tandems or open bottom frames can be found in DOD-STD-2003.

6.2 Acquisition requirements. Acquisition documents must specify the following:

- a. Title, number, and date of this specification
- b. Title, number, and date of the applicable specification sheet and the Military part number (see 1.2.1)
- c. Issue of DODISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.1.1 and 2.2)
- d. If lubricant is required (see 3.3.4)
- e. If nonmagnetic and EMP requirements are applicable (see 3.4.10)

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- f. When nonmagnetic multiple cable penetrators are specified (see 3.5.4, table I and table III)
- g. If marking for frames and accessories is other than specified (see 3.6.1)
- h. Level of preservation and packing required (see 5.1)
- i. When Navy fire-retardant requirements are not required (see 5.1(a))
- j. Applicable packaging options required (see 5.1).

6.3 Consideration of data requirements. The following data requirements should be considered when this specification is applied on a contract. The applicable Data Item Descriptions (DIDs) should be reviewed in conjunction with the specific acquisition to ensure that only essential data are requested/ provided and that the DIDs are tailored to reflect the requirements of the specific acquisition. To ensure correct contractual application of the data requirements, a Contract Data Requirements List (DD Form 1423) must be prepared to obtain the data, except where DOD FAR Supplement 27.475-1 exempts the requirement for a DD Form 1423.

Reference Paragraph	DID Number	DID Title	Suggested Tailoring
4.6 and 6.7	DI-MISC-80678	Certification data/ report	—

The above DIDs were those cleared as of the date of this specification. The current issue of DOD 5010.12-L, Acquisition Management Systems and Data Requirements Control List (AMSDL), must be researched to ensure that only current, cleared DIDs are cited on the DD Form 1423.

6.4 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time of award of contract, qualified for inclusion in Qualified Products List No. 24705 whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Government tested for qualification in order that they may be eligible to be awarded contracts or purchase orders for the products covered by this specification. The activity responsible for the Qualified Products List is the Naval Sea Systems Command, SEA 51222, Department of the Navy, Washington, DC 20362-5101 and information pertaining to qualification of products may be obtained from that activity. Application for qualification tests must be made in accordance with "Provisions Governing Qualification SD-6" (see 6.4.1).

6.4.1 Copies of "Provisions Governing Qualification SD-6" may be obtained upon application to Commanding Officer, Standardization Documents Order Desk, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

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6.4.2 Intermixing tests. Individual parts of one manufacturer shall perform satisfactorily when intermixed in a Navy standard assembly. Prior to initiating the actual qualification testing, the manufacturer shall submit two sets of blocks and two complete frame assemblies (including end packing and compression plate, stay plates, solid blocks, hardware, and so forth), size 6, to the Naval Surface Warfare Center (NSWC), Carderock Division for intermixing tests. Testing to be conducted is as follows:

1. Solid manufacturers blocks (two rows each of BN20, BN30 and BN40) in manufacturers frame:
 - a. Watertightness (see 4.7.5)
 - b. Firestop (see 4.7.9)
2. Solid blocks mixed (manufacturer and standard Navy), arranged in a checkerboard pattern in a Navy frame.
 - a. Watertightness
 - b. Firestop

The IR signature (see 4.7.14) of the sample blocks provided for test shall be supplied with the blocks. Costs of the testing will be borne by the manufacturer. This, however, is a means of determining a manufacturer's systems ability to intermix with units already installed in the Fleet before he goes through the expensive full qualification testing. Upon successful completion of the above testing, application for qualification tests can be made.

6.5 Definitions.

6.5.1 Frame. The frame is the housing into which accessories and insert material items are assembled.

6.5.2 End packing assembly and compression plate. The end packing compression assembly is a component consisting of insert material sandwiched between metallic plates. It is used in conjunction with the compression plate to apply compression on all internal parts and to fill the void between the top row of insert blocks and the frame.

6.5.2.1 Stay plate. The stay plate is a component that distributes compression forces and keeps all cable insert blocks, blanking insert blocks, and filler inserts in position when installed in a multiple cable penetrator assembly.

6.5.2.2 Keeper bar. The keeper bar is a piece of angled metal joined to the exterior of the frame so that it performs the same function as a stay plate.

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6.5.2.3 Cable insert block. The cable insert block is a one- or two-piece block with single or multiple passages to accommodate a cable or cables. The block fits around the cable or cables to form an airtight, flametight, watertight, and firetight seal when installed in a multiple cable penetrator assembly.

6.5.2.4 Rectangular-faced block. The rectangular-faced block is a two-piece cable insert block which has a rectangular shaped face with multiple passages.

6.5.2.5 Square-face block. The square-faced block is a one- or two-piece cable insert block which has a square shaped face with a single passage.

6.5.2.6 Blanking insert block. The blanking insert block is a solid cable insert block with no passages.

6.5.2.7 Filler inserts. Filler inserts are rectangular or specially-shaped components provided in multiple units or single pieces which are used to fill void spaces in rectangular-faced blocks or multiple cable penetrator assemblies.

6.5.2.8 Reducers. Reducers are components that reduce the passage diameter in rectangular-faced blocks to accommodate cables with smaller outside diameters than the passage diameter.

6.5.2.9 Cable sealing plug. The cable sealing plug is a two-piece or multiple-piece round plug with single or multiple passages to accommodate a cable or cables. The matched pieces fit around the cable or cables to form an airtight, flametight, watertight, and firetight seal when installed in a multiple cable penetrator assembly.

6.5.2.10 Blanking sealing plug. The blanking sealing plug is a solid cable sealing plug with no passages.

6.5.2.11 Lubricant. Lubricant is a substance which allows for ease of installation of insert material items during assembly of multiple cable penetrators.

6.6 Sub-contracted material and parts. The packaging or preparation for delivery requirements of referenced documents listed in section 2 do not apply when material and parts are acquired by the contractor for incorporation into the equipment and lose their separate identity when the equipment is shipped.

6.7 GRP material certification. When required by the contract or order, material certification from the manufacturer of the GRP material must be furnished for approval of the contracting activity. The certification shall state that the material was manufactured, sampled, tested, and inspected in accordance with ASTM D 4066. Material identity, traceable to this certification shall be maintained throughout the manufacturing process.

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6.8 Subject term (key word) listing.

Cable insert blocks
Cable sealing plugs
Frames
Keeper bar
Plastic, glass-reinforced
Reducers
Stay plates

6.9 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

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