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INCH-POUND
MIL-DTL-24705B(SH)
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DETAIL SPECIFICATION

PENETRATORS, MULTIPLE CABLE, ELECTRIC CABLE, GENERAL SPECIFICATION FOR

This specification is approved for use by the Naval Sea Systems Command 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 (see 6.4.5), accessories, and insert material items (see 6.4.6) for sealing electric cable passing through decks, bulkheads, and electrical equipment on Naval ships.

1.2 Classification. Penetrators are classified in accordance with 1.2.1 through 1.2.1.4.1.

1.2.1 Part or identifying number (PIN). The part number is of the following form, and is specified as part of the acquisition requirements (see 6.2):

M	24705	/3	-	B	N	4004/10(3)
Prefix for Military Specification	Specification Number	Spec Sheet Number		Item Type (see 1.2.1.2)	Item Material (see 1.2.1.3)	Item Designation (see 1.2.1.4)
Military designation (see 1.2.1.1)					Designator	

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.

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

A = Assembly, end-packing, rectangular frame, square blocks

B = Cable insert blocks (see 6.4.2) or blanking blocks

F = Frame

I = Filler inserts (see 6.4.4)

S = Stay plates (see 6.4.10)

C = Compression plates

E = Assembly, packing, round frame, square blocks

H = Assembly, packing, round frame, single cable

K = Assembly, packing, round frame, single cable with adjustable outer diameter

Comments, suggestions, or questions on this document should be addressed to: Commander, Naval Sea Systems Command, ATTN: SEA 05S, 1333 Isaac Hull Avenue, SE, Stop 5160, Washington Navy Yard DC 20376-5160 or emailed to CommandStandards@navy.mil, with the subject line "Document Comment". Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at https://assist.daps.dla.mil.

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

A = Aluminum

B = Brass

C = Corrosion-resistant steel (CRES)

G = Glass reinforced plastic (GRP)

N = Not specified

S = Steel

Z = Galvanized steel

1.2.1.4 Item designation. Item designation is as specified (see 3.1).

1.2.1.4.1 Cable insert blocks. Cable insert blocks are differentiated by an item designation consisting of the following format "xxxx/xx(x)". The first two digits indicate the exterior width of the cable insert block in millimeters (mm). The next two digits indicate the diameter of the passage of the cable insert block in mm. If the cable passage diameter is fixed, the remaining digits will not be used. If the block has an adjustable cable passage diameter, the next four digits indicate the minimum and maximum diameters in mm. When an insert block is designed to accept multiple cables, the number of cables that can be accommodated are enclosed by "( )" at the end of the item designation.

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3, 4, or 5 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents cited in sections 3, 4, or 5 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications, standards and handbooks. The following specifications, standards and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

FEDERAL SPECIFICATIONS

C-T-91	-	Tallow, Inedible

FEDERAL STANDARDS

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

DEPARTMENT OF DEFENSE SPECIFICATIONS

MIL-S-901	-	Shock Tests, H.I. (High-Impact) Shipboard Machinery, Equipment, and Systems, Requirements for
MIL-DTL-16884	-	Fuel, Naval Distillate
MIL-PRF-17331	-	Lubricating Oil, Steam Turbine and Gear, Moderate Service
MIL-DTL-24643	-	Cables and Cords, Electric, Low Smoke, for Shipboard Use, General Specification for

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MIL-DTL-24705/1	-	Penetrators, Multiple Cable, Electric Cable, Rectangular Metal Frame, Square-Faced Blocks
MIL-DTL-24705/3	-	Penetrators, Multiple Cable, Electric Cable, Round Frame, Square-Faced Blocks
MIL-DTL-24705/4	-	Penetrators, Multiple Cable, Compact Rectangular Metal Frame and Blocks, Electrical and Fiber Optic Cable

DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-167-l	-	Mechanical Vibrations of Shipboard Equipment (Type I - Environmental and Type II – Internally Excited)
MIL-STD-2003	-	Electric Plant Installation Standard Methods for Surface Ships and Submarines

DEPARTMENT OF DEFENSE HANDBOOKS

MIL-HDBK-149	-	Rubber
MIL-HDBK-454	-	General Guidelines for Electronic Equipment

(Copies of these documents are available online at https://assist.daps.dla.mil/quicksearch/ or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.2.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

NAVAL SEA SYSTEMS COMMAND (NAVSEA) PUBLICATIONS

NAVSEA S9074-AR-GIB-010/278	-	Requirements for Fabrication Welding and Inspection, and Casting Inspection and Repair for Machinery, Piping, and Pressure Vessels

(Copies of this document are available from the Naval Logistics Library, 5450 Carlisle Pike, Mechanicsburg, PA 17055 or online at https://nll.ahf.nmci.navy.mil.)

2.3 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 are those cited in the solicitation or contract.

ASME INTERNATIONAL

ASME B46.1	-	Surface Texture, Surface Roughness, Waviness, and Lay

(Copies of this document are available from ASME International, 22 Law Drive, P.O. Box 2900, Fairfield, NJ 07007-2900 or online at www.asme.org.)

ASTM INTERNATIONAL

ASTM A108	-	Standard Specification for Steel Bar, Carbon and Alloy, Cold-Finished
ASTM A131/A131M	-	Standard Specification for Structural Steel for Ships
ASTM A276	-	Standard Specification for Stainless Steel Bars and Shapes
ASTM A342/A342M	-	Standard Test Methods for Permeability of Feebly Magnetic Materials
ASTM A967	-	Standard Specification for Chemical Passivation Treatments for Stainless Steel Parts

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ASTM B21/B21M	-	Standard Specification for Naval Brass Rod, Bar, and Shapes
ASTM B117	-	Standard Practice for Operating Salt Spray (Fog) Apparatus
ASTM B209	-	Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
ASTM B221	-	Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
ASTM D395	-	Standard Test Methods for Rubber Property – Compression Set
ASTM D2240	-	Standard Test Method for Rubber Property – Durometer Hardness
ASTM D4066	-	Standard Classification System for Nylon Injection and Extrusion Materials
ASTM D5948	-	Standard Specification for Molding Compounds, Thermosetting

(Copies of these documents are available from ASTM International, 100 Barr Harbor Dr., P.O. Box C700, West Conshohocken, PA 19428-2959 or online at www.astm.org.)

2.4 Order of precedence. Unless otherwise noted herein or in the contract, in the event of a conflict between the text of this document and the references cited herein (except for related 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 4.3). Prequalification tests (see 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 the component meets the requirements of the specification.

3.3.1 Metals and alloys. Metals and alloys for frames and accessories (see 6.4.5 and 6.4.3) shall be corrosion-resistant, or be given a corrosion-resistant treatment or coating in accordance with MIL-HDBK-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-resisting and nonmagnetic metals. When nonmagnetic material or resistance to corrosion is required for structural purposes, the material shall be selected from the following:

a. Alloys, aluminum - Types 5052 or 5086 as specified in ASTM B221, or Type 5083 as specified in ASTM B209.

b. Brass - Type C46400 as specified in ASTM B21/B21M.

c. Corrosion-resistant steel (CRES) - ASTM A276 Grades 304L, 316L, 321, or 347; Condition A; passivated in accordance with ASTM A967.

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; ASTM A131, Grades A, B, or C; or ASTM A108, Grade C1018.

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3.3.13 Aluminum parts. Unless otherwise specified (see 3.1), aluminum 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-floor reinforced polyester (GRP). GRP for frames and accessories (see 3.1) shall be in accordance with ASTM D5948.

3.3.2 Dissimilar metals. Dissimilar metals shall be in accordance with MIL-HDBK-454.

3.3.3 Insert material items. Insert material items (see 6.4.6) 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 6.4.7), when specified (see 6.2), shall be in accordance with C-T-91.

3.3.5 Toxicity. When evaluated in accordance with 4.7, the penetrators shall have no adverse effect on the health of personnel when used for their intended purpose and shall not cause any environmental problems during waste disposal (see 4.7 and 6.6).

3.3.6 Hazardous material. Materials and parts containing asbestos, cadmium, lithium, mercury, polychlorinated biphenyl, polyvinyl chloride (PVC), 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 Recycled, recovered, or environmentally preferable materials. Recycled, recovered, or environmentally preferable materials should be used to the maximum extent possible, provided that the material meets or exceeds the operational and maintenance requirements, and promotes economically advantageous life cycle costs.

3.3.9 Changes in process or material composition. Prior to any changes in manufacturing processes or material composition after qualification, the manufacturer 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 (see 6.4.3), compression plate (see 6.4.3), stay plates, cable insert blocks, blanking insert blocks (see 6.4.1), and filler inserts 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 their 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 sharp edges.

3.4.7 Welding. Welding shall be in accordance with NAVSEA S9074-AR-GIB-010/278. Certification is not required unless specified in the contract or order.

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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 requirements specified herein, and on the applicable specification sheet (see 3.1). Flash shall be removed and the width of the flash edges shall not be greater than 0.8 mm (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 specified by the manufacturer of the raw materials.

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 Surface finish for metals. A maximum surface roughness of 6.35 micro meters (250 micro inches) is permissible for machined parts. Surface finish shall be in accordance with ASME B46.1.

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

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

3.4.11 Special tools and equipment. Unless approved by NAVSEA, special tools and equipment for installation, removal, or replacement of frames, or for reconfiguration of accessories and insert blocks, shall not be required. 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. Multiple cable penetrator frames, accessories, and insert material items (see 6.4.6) shall be constructed to meet the performance requirements specified herein, and on the applicable specification sheet (see 3.1).

3.5.1 Vibration. Multiple cable penetrators shall withstand the vibration test of 4.6.3.

3.5.2 High impact (HI) shock. Multiple cable penetrators shall withstand the shock test of 4.6.4.

3.5.3 Watertight. Multiple cable penetrators shall be watertight and shall exhibit leakage not greater than specified (see 4.6.5).

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 4.6.6).

3.5.5 Electromagnetic compatibility (EMC). When EMC-protected multiple cable penetrators are specified (see 6.2), they shall have effectiveness to ground when tested as specified in 4.6.7.

3.5.6 Salt spray. Multiple cable penetrators shall exhibit no corrosion or physical damage (see 4.6.8).

3.5.7 Fire stop. Multiple cable penetrators shall withstand the fire stop test of 4.6.9.

3.5.8 Durometer. Insert material shall have a Class A durometer hardness (see 4.6.10), as specified on the applicable specification sheet (see 3.1).

3.5.9 Compression. Insert material shall have a compression not greater than the value specified on the applicable specification sheet (see 3.1 and 4.6.11).

3.5.10 Expansion. Insert material shall have an expansion not more than the value specified on the applicable specification sheet (see 3.1 and 4.6.12).

3.5.11 Fluid immersion. 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 4.6.13).

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3.5.12 Infrared (IR) signature. The IR signature of the insert material shall be determined as specified in 4.6.14. 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 conformance (see 4.4.1.1.2).

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 permanently 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, and stay plate.

3.6.2 Cable insert blocks. Cable insert blocks 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.

Unless otherwise specified (see 3.1), passage diameter shall be marked in mm and inches on each end face of the cable insert block. The individual specification 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.

3.7 Workmanship. Workmanship shall he in accordance with MIL-HDBK-454.

4. VERIFICATION

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

a. Prequalification inspection (see 4.2).

b. Qualification inspection (see 4.3).

c. Conformance inspection (see 4.4).

d. Material control objective quality evidence (see 4.5).

4.1.1 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.

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4.2 Prequalification (intermixing tests). Prequalification applies only to manufacturers that are seeking qualification of multiple cable penetration (MCP) products and therefore are not listed on the Qualified Product List (QPL). Individual parts of one manufacturer shall perform satisfactorily when intermixed in a Navy standard assembly. Prior to initiating 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 is to be conducted as specified in 4.2.1 through 4.2.3. Costs of the testing shall be borne by the manufacturer. This testing is a means of determining a manufacturer's systems ability to intermix with units already installed in the Fleet before going through the expensive full qualification testing. Upon successful completion of the testing, application for qualification tests may be made.

4.2.1 Solid manufacturers' blocks (two rows of each of BN20, BN30 and BN40) in manufacturers frame.

a. Watertightness (see 4.6.5)

b. Firestop (see 4.6.9)

4.2.2 Solid blocks mixed (manufacturer and standard Navy) and arranged in a checkerboard pattern in a Navy frame.

a. Watertightness

b. Firestop

4.2.3 The IR signature (see 4.6.14) of the sample blocks provided for test shall be supplied with the blocks.

4.3 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	4.6.2
Vibration [1/]	3.5.1	4.6.3
Shock [1/]	3.5.2	4.6.4
Watertightness [1/]	3.5.3	4.6.5
Nonmagnetic [2/]	3.5.4	4.6.6
Salt [3/]	3.5.6	4.6.8
Fire stop	3.5.7	4.6.9
EMC [4/]	3.5.5	4.6.7

NOTES:

[1/] Shall be conducted on penetrator assembly having FA and FS frame designators only.

[2/] Shall be conducted on penetrator assembly having FA and FC frame designators only.

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

[4/] Conducted on penetrator assembly when specified, see 6.2.

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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	4.6.2	X	X	X	X	X
Durometer	3.5.8	4.6.10	X				
Compression	3.5.9	4.6.11		X			
Expansion	3.5.10	4.6.12			X		
Fluid immersion	3.5.11	4.6.13				X	
IR signature	3.5.12	4.6.14					X

4.3.1 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 the same processes, materials, and equipment normally used in production.

4.3.1.1 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.

4.3.1.1.1 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-DTL-24643 as specified in the applicable specification sheet (see 3.1). The specified cables shall be approximately 1 meter in length. Using the test stand specified in 4.6.1 or an approved equivalent, the cables shall be routed through the penetrator frame so that approximately 0.75 meter of cable shall extend from the side of the frame that will not be directly exposed to the fire or water during testing.

4.3.1.2 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.

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

4.3.3 Retention of qualification. Retention qualification is required on an annual basis with the initial retention qualification date established by NAVSEA or qualifying activity. NAVSEA or qualifying activity may require certification or testing or both. At a minimum, certification is required that equipment and facilities, processes, design and materials have not changed since qualification unless such change has been approved by NAVSEA. Testing shall be in accordance with conformance inspections (see table III) and Group D inspections.

4.3.4 Change approval. A change in material, production processes or production equipment used in the manufacture of multiple cable penetrators 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.

4.4 Conformance inspection. Conformance inspection shall consist of the examinations and tests described in table III.

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TABLE III. Conformance inspection.

Inspection	Requirement	Test method
Group A		
Visual and dimensional examination	3.4 and 3.6	4.6.2
Nonmagnetic [1/]	3.5.4	4.6.6
Group B		
Durometer	3.5.8	4.6.10
Compression	3.5.9	4.6.11
Group C		
Infrared (IR) signature [2/]	3.5.12	4.6.14

NOTES:

[1/] When specified (see 6.2).

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

4.4.1 Sampling for 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 4.4. 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.

4.4.1.1 Group A inspection.

4.4.1.1.1 Frames. Visual and dimensional examination shall be performed on all frames offered for delivery. The nonmagnetic inspection shall be in accordance with table IV.

4.4.1.1.2 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

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4.4.1.2 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

4.4.2 Lot. For the purpose of 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.

4.4.3 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 4.6.9. Whenever the manufacturer has had no production in the specified period, the samples shall be selected from the first production lot following this period.

4.5 Material control objective quality evidence. When specified (see 6.2), the following information shall be part of the objective quality evidence:

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.

4.6 Methods of inspection.

4.6.1 Test stand assembly. The test stand assembly used to test the multiple cable penetrator test specimen (see 4.3.1.1) shall be approved by NAVSEA.

4.6.2 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).

4.6.3 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 4.6.4 and the watertightness test specified in 4.6.5, and in that order.

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4.6.4 Shock The multiple cable penetrator test specimen shall be subjected to Grade 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 4.6.5.

4.6.5 Watertightness. The multiple cable penetrator test specimen mounted on the test plate shall be bolted to the hydro chamber so that one side of the test specimen is exposed to water, and the opposite side of the test specimen is exposed to air. The hydro chamber shall then be filled with water and pressurized to 1.9 Bars (27.5 pounds per square inch). 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 1.9 Bars.

4.6.6 Nonmagnetic. When applicable (see 3.4.10 and 3.5.4), nonmagnetic parts shall be tested with a permeability indicator in accordance with ASTM A342/A342M. Nonmagnetic parts shall meet the requirements specified in 3.5.4.

4.6.7 EMC. When applicable (see 6.2), the multiple cable penetrator test specimen shall be subjected to the EMC tests specified in the contract or purchase order. Multiple cable penetrators shall meet the requirements specified in 3.5.5.

4.6.8 Salt spray test. The multiple cable penetrator test specimen shall be tested in accordance with ASTM B117. The exposure time shall be 48 hours. Multiple cable penetrators shall meet the requirements specified in 3.5.6.

4.6.9 Fire stop test. The multiple cable penetrator test specimen shall be as specified in 4.3.1.1, except the frame shall be steel only. The test specimen shall be subjected to the fire stop test specified in 4.6.9.1 and 4.6.9.2.

4.6.9.1 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 305 mm (12 inches) from the face of the test specimen.

4.6.9.2 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 203 mm (8 inches) from the penetrator face, and one in the center of the penetrator face; six on the non-fire 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 25 mm (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 measured at the thermocouple located at the center of the cable bundle.

4.6.9.3 Rejection criteria. The multiple cable penetrator test 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 (non-fire) side of the test stand.

4.6.10 Durometer. A sample of each insert material being submitted for qualification shall be subjected to a Type A durometer test in accordance with ASTM D2240. Insert materials shall meet the requirements specified in 3.5.8.

4.6.11 Compression. A sample of each insert material being submitted for qualification shall be tested in accordance with ASTM D395. Insert materials shall meet the requirements specified in 3.5.9.

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4.6.12 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 he 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 he calculated as follows:

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

Insert material shall meet the requirements specified in 3.5.10.

4.6.13 Fluid immersion. A sample insert material shall be placed face down in a container containing approximately 13 mm (one half inch) of fluid for not less than 2 hours. The fluids and temperatures shall be as specified in table VI. The samples shall then be removed, blotted to remove excess fluid, and suspended in air at room temperature for not less than 3½, nor more than 4½ hours. Each sample shall then be tested again as specified in 4.6.10. Test shall be repeated for each specified fluid. Insert material shall meet the requirements specified in 3.5.11.

TABLE VI. Test fluids and temperatures.

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

4.6.14 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 along with the results of the examination and analysis 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. The results of subsequent inspections submitted to NAVSEA shall include a copy of the original IR signature for comparison purposes.

4.7 Toxicity. The penetrators shall be evaluated by the Navy and Marine Corps Public Health Center (NMCPHC) using the administrative Health Hazard Assessment (HHA). Sufficient data to permit an HHA of the product shall be provided by the manufacturer/distributor to the NMCPHC. To obtain current technical information requirements specified by the NMCPHC, see 6.6.

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When packaging of materiel is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the military service's system commands. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

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

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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-DTL-17, MIL-DTL-915, MIL-DTL-24640, and MIL-DTL-24643. This specification covers individual frames, accessories, and inserts. Requirements for multiples, banded frames, tandems, or open bottom frames can be found in MIL-STD-2003.

6.2 Acquisition requirements. Acquisition documents should 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. If required, the specific issue of individual documents referenced (see 2.2.1, 2.2.2, and 2.3).

d. If lubricant is required (see 3.3.4).

e. If EMC requirements are applicable, the effectiveness to ground shall be specified (see 3.5.5 and 4.6.7).

f. If nonmagnetic multiple cable penetrators are required (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. If this manufacturer is submitting their system products for prequalification tests (see 4.2), the IR signature (see 4.6.14) of the sample blocks provided for prequalification tests must be supplied with the blocks.

i. When material control objective quality evidence is required (see 4.5).

j. Packaging requirements (see 5.1).

k. If material certification from the manufacturer of the GRP material must be furnished for approval (see 6.5).

6.3 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 QPL 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 Federal Government tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. Information pertaining to qualification of products may be obtained from Commander, Naval Sea Systems Command, ATTN: SEA 05S, 1333 Isaac Hull Avenue, SE, Stop 5160, Washington Navy Yard DC 20376-5160 or emailed to commandstandards@navy.mil. An online listing of products qualified to this specification may be found in the Qualified Products Database (QPD) at https://assist.daps.dla.mil/online.

6.4 Definitions.

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

6.4.2 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.

6.4.3 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.

6.4.4 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.

6.4.5 Frame. The frame is the housing into which accessories and insert material items are assembled. When used to pass cables through bulkheads or decks, the multiple cable penetrator frame is welded to the bulkhead or deck.

6.4.6 Insert material. Insert material consists of cable insert block, blanking insert block, and filler inserts.

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

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

6.4.9 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.

6.4.10 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 GRP material certification. When required by the contract or order (see 6.2), material certification from the manufacturer of the GRP material must be furnished for approval of the contracting activity. The certification must state that the material was manufactured, sampled, tested, and inspected in accordance with ASTM D4066. Material identity, traceable to this certification, must be maintained throughout the manufacturing process.

6.6 Toxicity evaluation. The Navy and Marine Corps Public Health Center (NMCPHC) requires sufficient information to permit an HHA of the product. Any questions concerning toxicity and requests for HHA should be addressed to the Commanding Officer, Navy and Marine Corps Public Health Center (NMCPHC), ATTN: Industrial Hygiene Department, Acquisition Technical Support Division, 620 John Paul Jones Circle, Suite 1100, Portsmouth, VA 23708-2103. Upon receipt of the HHA, a copy should be provided to the Naval Sea Systems Command, ATTN: SEA 05S, 1333 Isaac Hull Avenue, SE, Stop 5160, Washington Navy Yard DC 20376-5160 or emailed to commandstandards@navy.mil.

6.7 Subject term (key word) listing.

Cable insert blocks

Frames

Plastic, glass-reinforced

Stay plates

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

Custodian:
Navy – SH

Preparing Activity:
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NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at https://assist.daps.dla.mil/online.