



## Marine Safety Center Technical Note

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MTN 01-10, CH-2  
16703/Plastic Pipe  
July 8, 2024

Subj: MARINE SAFETY CENTER REVIEW OF SYSTEMS CONTAINING PLASTIC PIPE

- Ref:
- (a) Title 46 CFR Subchapter F – Marine Engineering
  - (b) Title 46 CFR Subchapter K – Small Passenger Vessels (More than 150 Passengers)
  - (c) IMO Resolution A.753(18) – Guidelines for the Application of Plastic Pipes on Ships
  - (d) MSC.399(95) – Amendments to the Guidelines for the Application of Plastic Pipes on Ships (Resolution A.753(18)), as amended by Resolution MSC.313(88)
  - (e) PFM 1-98 – Policy File Memorandum on the Fire Performance Requirements for Plastic Pipe per IMO A.753(18)
  - (f) IMO resolution MSC.307(88) – Adoption of the International Code for Application of Fire Test Procedures, 2010 (2010 FTP Code)
  - (g) ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials
  - (h) UL 723 – Test for Surface Burning Characteristics of Building Materials

1. Purpose: This Marine Technical Note (MTN) provides guidance for industry design and Marine Safety Center (MSC) review of rigid nonmetallic (plastic) piping intended for installation on vessels subject to reference (a) or (b). Plastic piping may be required to undergo various fire testing procedures contained in references (c) through (h) depending on the piping system and installation location; however, these requirements are not concisely discussed in any one document. As such, the guidelines contained herein consolidate and clarify existing regulatory requirements for plastic piping installations and identify acceptability criteria. Change 2 of this MTN reflects the addition of electrical conductivity guidance in Enclosure (1).

2. Applicability: This MTN applies to plans containing rigid nonmetallic piping intended for installation on vessels subject to reference (a) or (b). These guidelines are directed toward plastic piping such as polyvinyl chloride (PVC) and chlorinated polyvinyl chloride (CPVC), but also apply to reinforced thermosetting resin pipe (RTRP) such as glass fiber-reinforced plastic (GRP) or fiber-reinforced plastic (FRP) pipe.

3. Discussion:

- a. Weight savings, corrosion resistance, space constraints, and material costs are all factors which cause designers to select plastic in lieu of metallic piping in shipboard machinery systems. However, plastic piping is more susceptible to heat and flame damage. Furthermore, reaction to heat and flame varies greatly depending on the exact chemical composition of the plastic pipe. Accordingly, plastic pipe is subject to limited shipboard

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use, with stringent fire protection standards to provide a level of safety equivalent to that of metallic piping materials.

- b. This guidance augments 46 CFR 56.60-25 by clarifying the regulatory intent and prescriptive requirements governing the use of plastic pipe on USCG certificated vessels. These guidelines do not preclude the OCMI from applying additional requirements or restrictions which may be deemed appropriate and necessary.
- c. In addition to meeting the prescriptive requirements discussed in sections 2.1.1 through 2.1.11 of reference (c), the materials used in plastic pipe shall also comply with ASTM specifications or an appropriate alternative industry accepted standard.

4. Definitions: The following definitions are provided to clarify terms that are not consistently defined between the federal regulations and IMO resolutions:

- a. **Plastic(s)**: Both thermoplastic and thermosetting plastic materials, with or without reinforcement, such as PVC, CPVC and glass fiber-reinforced plastic (GRP) or fiber-reinforced plastic (FRP).
- b. **Piping**: Includes the pipe, fittings, system joints, method of joining and any internal or external liners, coverings and coatings required to comply with the performance criteria. For example, if the basic material needs a fire-protective coating to comply with the fire endurance requirements, then the piping should be manufactured and tested with both the basic material and the coating attached.
- c. **Void Space**: A void space is a space completely encapsulated by “A” class divisions and not intended for carriage of liquids, cargos or other materials/equipment.
- d. **Duct**: A duct means a pipe trunk and should not be confused with ventilation ducts.
- e. **Vital System**: Those systems vital to the survivability and safety of the vessel, including: fuel and lube oil, firemain, fixed firefighting, cargo, bilge, ballast, steering, propulsion and its necessary auxiliaries and controls, generator auxiliaries, and other systems deemed by the Coast Guard crucial to the survival or protection of the vessel.

5. Action: Plastic pipe installations submitted to the MSC will be reviewed to the guidelines contained in Enclosure (1) of this MTN.

6. Disclaimer: While the guidance contained in this document may assist the industry, the public, the Coast Guard, and other Federal and State agencies in applying statutory and regulatory requirements, this guidance is not a substitute for the applicable legal requirements, nor is it in

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itself a regulation. It is not intended to, nor does it impose legally binding requirements on any party, including the Coast Guard, other Federal agencies, the States, or the regulated community.

D. H. COST

Enclosure: (1) MSC Review of Systems Containing Plastic Pipe

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## **Enclosure (1) to MTN 01-10, CH-2: MSC Review of Systems Containing Plastic Pipe**

### **1. Submission of Plans to MSC:**

- a. Plastic pipe installations must be in accordance with references (c) and (d), as incorporated by 46 CFR 56.60-25. Where approval is required, plastic pipe and associated fittings shall be approved to approval series 164.141; the type approval will specify flame spread testing results, fire endurance testing results, and acceptability for use in accommodation, service or control spaces. Plan review submittals should include the manufacturer's approval number and certificate, and should readily demonstrate compliance with the manufacturer's installation manual.
- b. MSC will review all requests for the use of plastic piping that does not meet the fire endurance testing as indicated in Appendix 4 of reference (c), subject to the restrictions in 46 CFR 56.60-25(a)(3). Manufacturer data sheets must be submitted with the plans to verify the standards to which the pipe is fabricated.
- c. Piping plans must include all details indicating compliance with the installation and design requirements of Subchapter F and clearly indicate the locations through which piping runs will be installed.

### **2. Plastic Pipe Fire Testing Applicability:**

- a. Piping is subject to fire endurance, flame spread, smoke generation, and toxicity based upon its service and/or location, per reference (c), section 2.2, as follows:
  - i. **Fire Endurance:** Fire endurance requirements are defined for each service and location as shown in the matrix within Appendix 4. There are three levels of fire endurance testing, based upon the risk associated with pipe failure. A notation of '0' in the matrix signifies no test is required, while 'NA' indicates plastic piping is not authorized for that application, regardless of fire endurance rating. Plastic pipe used outboard of the required metallic shell valve in any piping system penetrating the vessel's shell must provide at least an equivalent fire endurance rating as the metallic shell valve.
  - ii. **Flame Spread:** All piping, except piping fitted on open decks, within cofferdams, void spaces, or ducts, must exhibit low flame spread characteristics.
  - iii. **Smoke Generation and Toxicity:** Piping within accommodation, service, and control spaces must be tested and approved for these locations and listed on the type approval certificate. Alternatively, plastic pipe that has not been approved for use in accommodation, service and control spaces is permitted provided the criteria of 46 CFR 56.60-25(a)(2) are met.

### **3. Plastic Pipe Electrical Conductivity: Electrostatic charges can be generated on the inside and outside of plastic pipes. The resulting sparks can create punctures through pipe walls leading to leakage of pipe contents or can ignite surrounding explosive atmospheres. Piping is subject to electrostatic charge accumulation considerations, based upon its service and/or location, per reference (c), section 2.2.5, as follows:**

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- a. Fluids with a conductivity less than 1,000 pico siemens per meter (pS/m) are non-conductive and therefore pose an electrostatic charge threat which must be mitigated through electrically conductive piping. Piping plans must indicate the working fluid and include documentation on the conductivity of atypical fluids.
- b. Regardless of the fluid being conveyed, plastic piping must be electrically conductive if the piping passes through a hazardous area.
- c. Where conductive piping is required, the resistance per unit length of the pipe, bends, elbows, fabricated branch pieces, etc., should not exceed  $1 \times 10^5$  Ohm/m and the resistance to earth from any point in the piping system should not exceed  $1 \times 10^6$  Ohm. After installation, the resistance to earth should be verified.
- d. The conductivity of piping approved to series 164.141 should be indicated on the Type Approval Certificate. Pipes and fittings having conductive layers may be accepted subject to satisfactory arrangements displaying resistance to spark damage on the pipe wall. Additionally, conductive coatings will be reviewed on a case-by-case basis and should be submitted with proper documentation and justification.

### 4. System Design & Piping Installation:

- a. System Design: A minimum 4 to 1 safety factor, not to exceed the manufacturer's rating, must be applied to the internal design pressure as defined by 104.1.2 of ASME B31.1 and required by 46 CFR 56.07-10(a). Piping subject to external pressure (such as deep tank installations) must be designed for an external pressure not less than the sum of the maximum potential head of liquid outside the pipe, plus full vacuum (14.5 psi). The nominal external pressure for a pipe should be determined by dividing the collapse test pressure by a safety factor of 3, as described in Section 2.1.3 of reference (c).
- b. Joining/Welding: Plastic pipe joining techniques must follow the manufacturer's installation guidelines. Procedure specifications should detail materials, tools, environmental requirements, joint preparation, fit-up/alignment, tolerances, cure time and temperature, tests, exams, acceptance criteria, and required binder certifications.
- c. Bulkhead and Shell Penetrations: Bulkhead and shell penetrations must comply with the applicable CFR requirements and reference (c). As stated in 46 CFR 56.60-25(a)(6), piping outboard of the metallic sea valve required by 46 CFR 56.50-95(f) must have the same fire endurance as the metallic valve. Penetrations of watertight bulkheads and decks must maintain the fire and watertight integrity of the bulkhead and comply with the applicable remote operating capabilities, per reference (c), sections 4.6 and 4.7.
- d. Potable water: Piping used for potable water must be certificated by an ANSI-accredited third-party laboratory.

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- e. Testing requirements: Systems identified by 46 CFR 56.97-40 that contain plastic piping must be tested to 1.5 times the maximum allowable working pressure.
5. Exceptions:
- a. Subchapter L (Domestic Routes): Class II vital piping systems installed on vessels certificated under Subchapter L should meet the guidelines of this MTN or demonstrate an equivalent level of safety to be acceptable. Installations in Class II non-vital systems need not comply with this MTN with regard to pressure design and materials; however, documentation indicating compliance with 46 CFR 128.220(c) and (d) and 128.230 must be submitted to MSC with the plans. Subchapter L vessels less than 6,000 GT ITC (500 GRT) need not request plan approval or submit documentation per 46 CFR 128.110.
  - b. Subchapter K: Title 46 CFR 116.405(f) permits non-vital, nonmetallic piping of any length to be installed within a concealed space in a control space, accommodation space, or service space. In lieu of meeting the requirements of references (c) and (d), materials exhibiting a flame spread rating of not more than 20 and a smoke developed rating of not more than 10, are deemed acceptable when tested in accordance with reference (g) or (h) by an independent laboratory.