MODEL SPECIFICATION FOR POLYPROPYLENE (PP-R & PP-RCT) PRESSURE PIPE SYSTEMS FOR PLUMBING & MECHANICAL APPLICATIONS

PPI MS-8

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Plastics Pipe Institute
The Voice of an Industry.

105 Decker Court • Suite 825 • Irving, Texas 75062 • 469.499.1044 • www.plasticpipe.org

Foreword

This model specification was developed and published with the technical help and financial support of the members of the Plastics Pipe Institute (PPI). These members have shown their commitment to developing and improving quality products by assisting standards development organizations in the development of standards, and by developing design aids and reports to help engineers, code officials, specifying groups, contractors, and users.

The purpose of this model specification is to support designers and specifiers using polypropylene piping systems for plumbing and mechanical piping applications with language about pipes, fittings, joining, installation, and testing.

The PPI has prepared this model specification as a service to the industry. The information in this document is offered in good faith and believed to be accurate at the time of its preparation but is offered “as is” without any express or implied warranty, including WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Additional information may be needed in some areas, especially with regards to unusual or special applications. Consult the manufacturer or material supplier for more detailed information. A list of member manufacturers is available on the PPI website. PPI does not endorse the proprietary products or processes of any manufacturer and assumes no responsibility for compliance with applicable laws and regulations.

PPI intends to revise this model specification within 5 years or sooner if required, from the date of its publication, in response to comments and suggestions from users of the document. Please send suggestions for improvements to the address below. Information on other publications can be obtained by contacting PPI directly or visiting our website.

For further information, contact: The Plastics Pipe Institute
105 Decker Court
Suite 825
Irving, Texas, 75062
469.499.1044
www.plasticpipe.org

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Table of Contents

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INTRODUCTION

This model specification applies to polypropylene (PP) pressure pipe material types PP-R & PP-RCT and provides the material requirements, handling, storage, joining, and installation of polypropylene pressure pipe, fittings, and valves to be used for hot- and cold-water plumbing distribution, chilled water, cooling/condenser water, make-up water, and hydronic heating and cooling distribution piping systems, including district energy.

This publication is intended for use as a guide to support designers and specifiers of plumbing and mechanical piping systems, but it should not be used in lieu of the advice of a professional engineer. In all cases, plumbing and mechanical piping systems must be installed, tested, and operated in accordance with local regulations which may include the mechanical code that is enforced at the project location or other codes or regulations.

The Plastics Pipe Institute has made every reasonable effort to ensure the accuracy of this publication, but it may not provide all necessary information, particularly with respect to special or unusual applications.

This publication may be changed without notice. Visit https://www.plasticpipe.org for the most current edition.

Note 1: The user may choose to adopt part or all of this Model Specification. However, users should ensure all parts used are appropriate for the intended purpose.

1.0 GENERAL

1.1. Scope

This model specification applies to polypropylene (PP) pressure pipes, fittings, and valves to be used for hot- and cold-water plumbing distribution systems, chilled water, cooling/condenser water, make-up water, and hydronic heating and cooling distribution piping systems, including district energy.

1.2. Definitions, Acronyms and Symbols

Definitions, acronyms, and symbols pertaining to polypropylene pipe as used in this specification shall be in accordance with ASTM F2389, CSA B137.11 and local regulations.

- **Heat fusion:** a method of joining two similar materials (such as PP-R to PP-R or PP-R to PP-RCT) by the application of heat to melt the mating surfaces and then pressing them together with sufficient force to become one monolithic piece

- **PP:** polypropylene (piping material) in one of two types known as PP-R and PP-RCT

- **PP-R:** polypropylene random copolymer

- **PP-RCT**: polypropylene random copolymer with modified crystallinity & temperature resistance

1.3. Referenced Standards

Where all or part of a national or international standard specification by standards development organizations such as ASTM, CSA, or NSF is incorporated by reference in this Specification, the reference standard shall be the latest edition and revision.

- ASTM F2389 *Standard Specification for Pressure-rated Polypropylene (PP) Piping Systems*

- ASTM D2774 *Standard Practice for Underground Installation of Thermoplastic Pressure Piping*

- CSA B137.11 *Polypropylene (PP-R & PP-RCT) Pipe and Fitting for Pressure Applications*

- NSF/ANSI 14 *Plastic Piping System Components and Related Materials*

- NSF/ANSI/CAN 61 *Drinking Water Systems Components – Health Effects*

- ANSI/AWWA C651 *Disinfecting Water Mains*

1.4. Engineered and Approved Plans

When required by regulations and codes, piping installation and construction shall be performed in accordance with engineered construction plans for the work prepared under the direction of a professional engineer.

1.5. Licenses and Permits

A licensed and bonded contractor shall perform all piping construction work. The contractor shall secure all necessary permits before commencing construction.

1.6. Inspections

All work shall be inspected by an authorized representative of the owner who shall have the authority to halt construction if, in the representative's opinion, these specifications, local regulations, or standard construction practices are not being followed. Whenever any portion of these specifications is violated, the project engineer or his authorized representative shall, by written notice, order further construction to cease until all deficiencies are corrected.

1.7. Pipe Warranty

The pipe manufacturer shall provide a written warranty on the pipe as agreed upon between the manufacturer and the owner.

1.8. Submittals

1.8.1. Documentation

The vendor shall submit technical documentation verifying compliance to this specification and the engineered plans, drawings and installation requirements as provided by the owner or owner's authorized representative.

1.8.2. Exceptions and/or exclusions

Exceptions and/or exclusions to this specification or the owner's engineered plans, drawings and installation requirements shall be clearly noted for review by the owner or owner's authorized representative.

1.9. Quality Assurance - Standards and Compliance

Pipe, fittings, and valves furnished in accordance with the specification shall be listed to comply with the requirements of NSF/ANSI 14, NSF/ANSI/CAN 61, ASTM F2389 and (where applicable) CSA B137.11. Exceptions or exclusions to this requirement shall be communicated to and approved by the owner or owner's authorized representative.

2.0 POLYPROPYLENE PIPE PRODUCTS

2.1. Polypropylene Materials

2.1.1. Pipe, fitting, and valve compounds

Polypropylene pipe, fittings, and valves shall be manufactured from PP-R or PP-RCT compounds that meet or exceed the requirements of ASTM F2389 or CSA B137.11.

2.1.2. Listings for compounds

Polypropylene pipe, fittings, and valves to be supplied under the terms of this specification shall be manufactured using polypropylene compounds that are listed to comply with NSF/ANSI 14 and PPI TR-4.

2.1.3. Potable water listings

Polypropylene pipe, fittings, and valves intended for use in potable water applications shall be listed to comply with NSF/ANSI/CAN 61.

2.2. Polypropylene Pipe

2.2.1. Pipe requirements – compliance with standards

Polypropylene pipe supplied under the terms of this specification shall comply with the requirements of ASTM F2389 or CSA B137.11.

2.2.2. Alternate diameter or wall thickness

Alternate diameters or wall thicknesses may be supplied in accordance with this specification when agreed upon between owner and manufacturer in accordance with Section 7 of ASTM F2389 provided all other requirements of ASTM F2389 are met.

2.2.3. Solid-wall and multilayer pipes

Polypropylene pipe may be extruded as one uniform, homogeneous wall thickness of PP. Alternatively, PP pipe may be extruded with intermediate layer(s) of glass fiber reinforced PP of the same type and quality as the non-reinforced PP layers.

2.2.4. Color and striping

Polypropylene pipe shall be uniformly pigmented in accordance with the manufacturer's specifications and may contain contrasting colored striping for identification purposes. The color striping compounds used shall be of the same base resin as the compound from which the remainder of the pipe is produced.

2.2.5. Pipe markings

Polypropylene pipe shall be clearly and indelibly marked in accordance with the requirements of ASTM F2389 or CSA B137.11.

2.2.6. Pipe listings

Polypropylene pipe shall be listed to comply with the requirements of NSF/ANSI 14 and ASTM F2389 or CSA B137.11.

2.2.7. Potable water listings - pipes

Polypropylene pipe intended for use in potable water applications shall be listed to comply with with NSF/ANSI/CAN 61.

2.3. Polypropylene Fittings and Valves

2.3.1. Fitting requirements – compliance with standards

Polypropylene fittings and valves may be of the socket, butt, or electrofusion variety and shall comply with the requirements of ASTM F2389 or CSA B137.11.

2.3.2. Fitting markings

Polypropylene fittings shall be clearly marked and comply with the labeling requirements of ASTM F2389 or CSA B137.11.

2.3.3. Fabricated fittings

Fabricated fittings (those fittings produced by fusion joining sections of pipe) shall be produced using fusion joining techniques qualified by the manufacturer from PP pipe meeting the requirements of ASTM F2389.

2.3.4. Fitting listings

All fittings shall be listed to comply with the requirements of NSF/ANSI 14 and ASTM F2389 or CSA B137.11.

2.3.5. Potable water listings - fittings

Polypropylene fittings and valves intended for use in potable water applications shall be listed to comply with NSF/ANSI/CAN 61.

2.4. Flame and Smoke Ratings

Where required per local regulations and codes, the piping system manufacturer shall provide a third-party listed solution that meets the requirements of CAN/ULC-S102.2, ASTM E84, UL 723, or UL 2846, as applicable.

See manufacturer’s listing for allowable applications that may include fiberglass or mineral wool pipe insulation that is field installed.

2.5. Sunlight/UV Protection

Where indicated on the plans or drawings that the pipe system will be exposed to direct sunlight for more than 30 days, pipes, fittings, and valves shall be protected from ultraviolet (UV) exposure in accordance with the manufacturer’s requirements.

2.6. Thermal and Vapor Barriers

2.6.1. Thermal and vapor barrier insulation

Where pipe insulation is required on the drawings or in the specifications, the contractor shall provide a thermal (radiant, conductive, and convective) and vapor barrier insulation. The insulation products shall be provided in appropriate thickness or as indicated on the drawings or elsewhere in the project specifications.

2.6.2. Prevention of condensation

For domestic cold water or chilled water systems, the entire piping system should be wrapped or insulated to prevent condensation.

3.0 POLYPROPYLENE PIPING INSTALLATION

3.1. Delivery, Handling and Storage

3.1.1. Delivery, handling, and storage

Polypropylene pipes, fittings, and valves shall be delivered, handled, and stored in accordance with the manufacturer's recommendations.

3.1.2. Protection from ultraviolet (UV)

Polypropylene pipe, fittings, and valves that will be stored or installed outdoors with direct exposure to sunlight shall be suitably protected from UV damage in accordance with manufacturer's recommendation.

3.2. Joining

3.2.1. Joining using heat fusion methods

Polypropylene pipe and fittings shall be joined by heat fusion methods such as socket fusion, butt fusion, or electrofusion by properly trained and qualified fusion equipment operators using well-maintained fusion equipment specifically designed for that purpose. The heat fusion procedure shall be conducted in accordance with the pipe and/or fitting manufacturer's recommendations.

3.2.2. Joining using mechanical methods

Where necessary or as recommended by the pipe and/or fitting manufacturer, polypropylene pipe may be joined by mechanical means such as flange adapter and back-up rings, compression fittings, or other means as approved and recommended by the pipe and/or fitting manufacturer.

3.3. Installation – Above ground

3.3.1. Operating pressure and temperature

Polypropylene pipe, fittings, and valves installed above ground shall be selected based on the required system operating pressure and temperature in accordance with manufacturer's instructions and ASTM F2389 or CSA B137.11.

3.3.2. Hangers and supports

Install hangers and supports at intervals specified in the applicable code and as recommended by the manufacturer. Hangers and supports shall be located within one foot (30 cm) of any change in direction and within one foot (30 cm) of any fittings or valves.

3.3.3. Vertical piping support

Support vertical piping at each floor and as specified in the applicable code. Vertical piping with a nominal diameter of 2 inch (63 mm) or smaller shall be installed with mid-story guides.

3.3.4. Fire stopping

Fire stopping that is compatible with the PP piping material, tested and listed as a system, and meets the requirements of ASTM E814 *Standard Test Method for Fire Tests of Penetration Firestop Systems* or ULC S115 *Fire Tests of Through-Penetration Firestops,* shall be installed at required penetrations per applicable code and in accordance with firestopping manufacturer's recommendations.

3.3.5. Heat tracing

If heat tracing is specified for the piping, it should be installed on the pipe exterior. It must be suitable for use with plastic piping and be self-regulating type, set to a temperature to ensure freeze protection and will limit the surface temperature of the pipe to no more than 150°F (66°C).

3.3.6. Protection against excessive UV exposure

Polypropylene pipes installed above ground with direct exposure to sunlight shall be installed in accordance with manufacturer's recommendations to provide suitable protection from UV degradation. UV protection may take the form of insulation, protective coverings or other means as specified in the contract documents, plans, or drawings or as recommended by the pipe manufacturer.

3.4. Installation – Underground/Buried

Polypropylene pipe to be installed underground in buried applications shall be installed per manufacturer's recommendations and in accordance with ASTM D2774 *Standard Practice for Underground Installation of Thermoplastic Pressure Piping*.

3.5. Valve Installation

Valves shall be installed in accordance with the manufacturer's recommendations for support, stabilizing, and operation or as specified in the contract documents. Valves shall be accessible.

4.0 COMMISSIONING

4.1. Inspection

While still accessible, all piping components and joints shall be inspected for compliance with the contract documents and manufacturer's recommendations.

4.2. Pressure Testing

While still accessible, all piping components and joints shall be pressure tested in accordance with the contract documents, the manufacturer's recommendations, and the applicable code. The test pressure shall be as indicated in the contract documents or as recommended by the manufacturer. Any leaks detected shall be repaired by removing the leaking part and replacing with new parts. Leaking fusion joints or mechanical connections shall be repaired in accordance with the manufacturer's recommendation. Once the appropriate repairs are made, the system shall be re-tested for leaks using the same pressure testing procedure.

4.3. Flushing and Purging

Upon successful completion of the pressure test and in accordance with the contract specifications, the system shall be flushed with water until the water runs clear of debris, dirt, or other installation residue.

4.4. Disinfection of Potable Water Piping

In the case of a potable water system, the system shall be disinfected in accordance with contract specifications, local regulations, applicable code, ANSI/AWWA C651, or manufacturer's recommended disinfection procedures.

4.5. Completion

Upon satisfactory completion of pressure testing and disinfection (where required), the system shall be considered commissioned, and the owner or owner's authorized representative shall provide an "Owner's Release" to the contractor advising satisfactory completion of the project in accordance with this specification.