

WATER FLOW CHARACTERISTICS OF THERMOPLASTIC PIPE

Foreword

This software was developed and published with the technical help and financial support of the members of the Plastics Pipe Institute (PPI). The members have shown their interest in quality products by assisting independent standard-making and user organizations in the development of standards, and also by developing reports on an industry-wide basis to help engineers, code officials, specifying groups, and users.

The purpose of this software is to provide essential information on the water flow characteristics or properties of thermoplastic pipe. The term pipe as used in this report also includes tubing.

This software has been prepared by the Plastics Pipe Institute as a service to the industry. The information in this software is offered in good faith and believed to be accurate at the time of its preparation, but is offered without any warranty, expressed or implied. Additional information may be needed in some areas, especially with regard to unusual or special applications. Consult the manufacturer or material supplier for more detailed information. A list of member manufacturers is available from PPI. PPI does not endorse the proprietary products or processes of any manufacturer and assume no responsibility for compliance with applicable laws and regulations.

The Plastics Pipe Institute intends to revise this software from time to time, in response to comments and suggestions from users of the software. Please send suggestions or improvements to the following address:

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A literature list that includes all Technical Reports, Technical Notes, brochures, films, slide presentations, and other available information, may be obtained from the Plastics Pipe Institute.

This software was first issued in March, 1971, as a written Technical Report , and was revised in June, 1992. In April, 2000 , the written report was adapted to create this software program and accompanying online documentation.

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1. INTRODUCTION

During the past 30 years, the use of thermoplastic piping in water and sewer systems has increased significantly. There are many reasons for this wide acceptance, but one of the primary characteristics which makes thermoplastic piping attractive to designers is the low resistance to flow that this piping offers.

This report gives information on the range of pipe sizes commonly used in water and sewer systems. The tables contained in the appendices give the flow capacities of standard sizes of thermoplastic pipe in terms of velocity and head loss due to friction in pressure piping systems. Similarly, tables are presented that demonstrate the relationship of slope to flow velocity for thermoplastic pipe used in gravity flow applications.

The information in this report applies to all types of thermoplastic materials used for water and sewer systems. These pipes are made by the same basic extrusion technique, which results in smooth inside surfaces.

2. HEAD LOSS IN PRESSURE PIPES

A number of empirical formulae have been developed to solve problems involving positive pressure flow in pipes. All of these depend, to some extent, on experimentally determined coefficients. The most commonly accepted approximations for pressurized flow applications are the Darcy-Weisbach Formula and the Hazen-Williams Equation.

2.1. Darcy-Weisbach Formula

The Darcy-Weisbach Formula for head loss in a circular pipe is:

$$HL = f \times \frac{L}{D} \times \frac{V^2}{2g}$$

Where:

- HL = Head Loss in feet
- f = Darcy-Weisbach friction factor (approximated from Moody Diagram)
- L = Length of pipe in feet
- D = Inside diameter in feet
- V = Average flow velocity in feet per second
- g = Gravitational constant = 32.2 feet/second/second

As indicated above, the Darcy-Weisbach friction factor is a function of the Reynolds Number for the piping system under consideration. The Reynolds Number is a