

**GUIDELINES FOR
CHOOSING WALL THICKNESS
FOR HDPE CONDUIT BASED ON
“MINI-HDD”
(HORIZONTAL DIRECTIONAL DRILLING):
USING THE PPI
CONDUIT DESIGN CALCULATOR**

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Foreword

This technical note was developed and published with the technical help and financial support of the members of the Plastics Pipe Institute. 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.

This technical note has been prepared to provide guidance, to those responsible for the selection and installation of HDPE conduit, on the appropriate selection of conduit based on installation considerations. This document was not intended to provide system design information. Go to the PPI website at www.plasticpipe.org for different system design documents.

This document was extensively revised in 2021 with the issuance of the PPI Conduit Design Calculator. As the calculations are now performed by the Conduit Design Calculator, the calculation methodology has been updated and moved to an appendix. The main body of the Technical Note now provides guidance and examples based on the Conduit Design Calculator.

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PPI intends to revise this report from time to time, in response to comments and suggestions from users of this note. Please send suggestions for improvements to PPI. Information on other publications can be obtained by contacting PPI directly or visiting the web site.

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GUIDELINES FOR CHOOSING WALL THICKNESS FOR HDPE CONDUIT BASED ON “MINI-HDD” (HORIZONTAL DIRECTIONAL DRILLING): USING THE PPI CONDUIT DESIGN CALCULATOR

1.0 OVERVIEW

CDC is the acronym used for the PPI *Conduit Design Calculator*, a web based interactive tool for conduit users available at www.conduitcalc.com. The CDC output assists in the selection of the appropriate conduit product by providing the user with an estimate of the Tensile Load with comparison to the Safe Pull Strength for conduits for a range of wall thicknesses, and the associated Safety Factor. The purpose of this document is to provide new CDC users guidelines on its use.

The CDC is intended for Mini-HDD (Horizontal Directional Drilling) applications with calculation limits of 1000 feet bore, depths of 15 feet and conduit diameters of 12 inches.

Note that the CDC calculation results are only one factor in product selection. Heavier wall conduit may be warranted depending on the installation environment or other operational factors, such as soil and surface loads. The appropriate wall thickness should be chosen based on the greater of the long term (such as soil loading) and short term loads associated with the Mini-HDD operations.

Following the background section, a **step-by-step guide** to using the calculator is provided. This is followed by 4 **examples** to illustrate usage. **Appendix A** provides the basis of the calculations utilized within the CDC.

2.0 BACKGROUND

The basis of the CDC is to calculate and compare the “Safe Pull Strength” of the conduit to the “Calculated Tensile Load” of the bore resulting in a pass/fail and safety factor. The Safe Pull Strength of the conduit is a straightforward calculation: It is simply the tensile strength of the HDPE raw material (directly related to the density) multiplied by the area of the conduit¹. The Calculated Tensile Load is a bit more complicated. It considers the bore length, depth, buoyant weight and drill rod diameter. Furthermore, curvature (bends) in the bore path result in friction and increased tensile load within the borehole. Both planned and unplanned bends have a significant impact on increasing tensile forces and are considered in the calculation. Calculation details are provided in **Appendix A**.

¹ See [PPI TN-63 Safe Pull Strength Calculations for Conduit: Including Derating Factors](#).

For reference, the former PPI Technical Report 46², which is the basis for the CDC, describes the design, selection considerations, and installation procedures for the placement of HDPE Conduit pipe using “Mini-HDD” equipment. “Mini-HDD” is a more conservative approach for less critical and demanding field conditions than are warranted by “Maxi-HDD” as described in ASTM F1962 *Standard Guide for Use of Maxi-Directional Drilling for Placement of Polyethylene Pipe or Conduit Under Obstacles, Including River Crossings*. For example, as part of this software, limits on the depth (15 feet), length (1,000 feet) and conduit diameter (12 inches) are incorporated into the available input choices of the CDC. Furthermore, there are choices for estimating unplanned curvature along the pathway, allowing the user to choose how much confidence they may have in their knowledge of the jobsite conditions. Maxi-HDD, on the other hand are major events such as long pulls, deep depths and large diameter. These require extensive analysis, as provided in ASTM F1962.

Note 1: PPI TR-46 (2009) was withdrawn in favor of PPI MAB-7, with the latter having its scope narrowed to PE4710 only and with a specific focus on municipal water mini-HDD installation. Nonetheless, MAB-7 remains an excellent and pertinent source of reference for mini-HDD, when the material differences between regular grade conduit and PE4710 pressure pipe are properly considered.

3.0 STEP BY STEP GUIDE

These basic job details are required to use the calculator:

- Conduit material type
- Conduit diameter type and wall thickness (i.e. DR) – best first guess
- Conduit diameter
- Bore path details
- Bore length
- Bore depth
- Drill rod diameter

Each of these inputs is discussed further below. Listed below is a step by step methodology to use the calculator along with an explanation of the various inputs.

² PPI Publications are available free of charge from www.plasticpipe.org.

3.1. Accessing the Conduit Design Calculator

The first step is accessing the software. There are several options:

- o Click on hyperlink www.conduitcalc.com or enter it into your browser directly.
- o Navigate to the PPI website (www.plasticpipe.org). From the home page, choose the “divisions” drop down and choose “Power and Communications”. Find and click on the icon shown below on any PCD page.



- o Directly type into your browser, www.plasticpipe.org/conduitcalc.

These bring you to a user agreement. Click on “agree” to use the calculator.

Regardless how you get there, **bookmark the page** so that you can find it easily next time.

3.2. Terminology & Calculator Limits

Once you are on the CDC calculator main page, you can view the basis and limits for the inputs from the typical HDD boring schematic. This schematic also shows the terminology used in the calculator. Look for the schematic button in the upper left-hand corner of the page to access the schematic shown in **Figure 1**.