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Polyethylene Joining Procedures



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CHAPTER 6

POLYETHYLENE JOINING PROCEDURES

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FOREWORD

Polyethylene Joining Procedures is one of the chapters being prepared for inclusion in the Plastics Pipe Institute's *PPI Handbook of Polyethylene Piping*, which will be issued as a complete volume in the future. Other topics to be addressed in the handbook will include design of polyethylene piping systems, joining procedures, engineering properties, relevant codes and standards, and a variety of related information.

PPI is a division of The Society of the Plastics Industry, Inc. (SPI), and the major U.S. trade association representing all segments of the plastics industry.

The *Municipal and Industrial (M&I) Division of PPI* are producing the *PPI Handbook of Polyethylene Piping*. M&I membership consist of major North American manufacturers of polyethylene (PE) pipe and fittings, PE piping materials, machinery, and equipment used for joining and installing PE piping, related test laboratories, and professional organizations.

PPI maintains additional groups that address other applications such as gas distribution. PPI provides technical and promotional support for the effective use and continued application of thermoplastics pipe and related products, consistent with the best public interest. PPI membership also includes producers of polyvinyl chloride (PVC), chlorinated polyvinyl chloride (CPVC), polybutylene (PB), and crosslinked PE (PEX) piping products and materials.

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The Plastics Pipe Institute, a Division of
The Society of the Plastics Industry, Inc.
1801 K St. N. W., Suite 600K
Washington, D.C. 20006
Toll Free: (888) 314-6774
Phone: (202) 974-5318
Fax: (202) 293-0048
<http://www.plasticpipe.org>

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CHAPTER 6

POLYETHYLENE JOINING PROCEDURES

INTRODUCTION

This Chapter of the manual has been prepared for the benefit of producers, users, engineers, code officials, contractors, installers, and others interested in plastic piping. It is a discussion of the recommended procedures for the most common methods of joining polyethylene pipe and fittings. While reasonable efforts have been made by The Plastics Pipe Institute, the members of its technical groups, and its technical staff to provide reliable information in this report, it is recognized that the information may be incomplete. However, it is often possible to obtain more detailed information on joining plastic pipe or fitting materials from manufacturers. Safety considerations are very important when joining polyethylene materials, but they are not a part of this document; the user of this joining information must consult and follow appropriate safety instructions, which are available from manufacturers.

An integral part of any pipe system is the method used to join the system components. Proper engineering design of a system will take into consideration the type and effectiveness of the techniques used to join the piping components and appurtenances as well as the durability of the resulting joints. The integrity and versatility of the joining techniques used for polyethylene pipe allow the designer to take advantage of the performance benefits of polyethylene in a wide variety of applications.

GENERAL PROVISIONS

Polyethylene pipe or fittings are joined to each other by heat fusion or with mechanical fittings. Plastics may be joined to other materials by means of compression fittings, flanges, or other qualified types of manufactured transition fittings. There are many types and styles of fittings available from which the user may choose. Each offers its particular advantages and limitations for each joining situation the user may encounter. Contact with the various manufacturers is advisable for guidance in proper applications and styles available for joining as described in this document. There will be joining methods discussed in this document covering both large and small diameter pipe. Those persons who are involved in joining gas piping systems must note certain qualification requirements of the U.S. Department of Transportation Pipeline Safety Regulations ⁽¹⁾.

HEAT FUSION

Introduction

There are three types of heat fusion joints currently used in the industry; Butt, Saddle, and Socket Fusion. Additionally, there are two methods for producing the socket and saddle heat fusion joints.

The principle of heat fusion is to heat two surfaces to a designated temperature, then fuse them together by application of a sufficient force. This force causes the melted materials to flow and mix, thereby resulting in fusion. When fused according to the pipe and/or fitting manufacturers' procedures, the joint area becomes as strong as or stronger than the pipe itself in both tensile and pressure properties. As soon as the joint cools to near ambient temperature, it is ready for handling. The following sections of this chapter provide a general procedural guideline for each of these heat fusion methods.

NOTE: This is a general discussion. Pipe and fitting manufacturers have established qualified fusion procedures⁽⁹⁾ which should be followed precisely when using their specific products.

One method, used for all three types of joints, uses special heating tools for heating the parts to be joined. The other method, 'electrofusion', is used only for socket and saddle-type joints. Heat is generated by inducing electric current into a wire coil that is a part of the fitting.

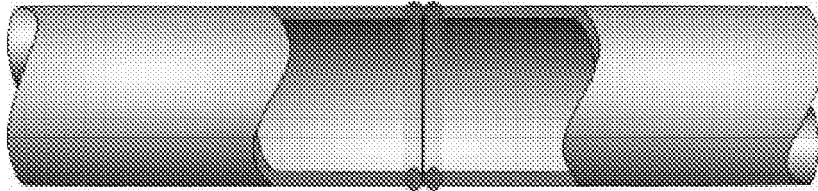


Figure 1 Standard Butt Fusion Joint

Butt Fusion

The most widely used method for joining individual lengths of large diameter polyethylene pipe is by heat fusion of the pipe butt ends as illustrated in Figure 6.1. This technique, which precludes the need for specially modified pipe ends or couplings, produces a permanent, economical and flow-efficient connection. Field-site butt fusions may be made readily by trained operators using specially developed butt fusion machines (see Figure 6.2) that secure and precisely align the pipe ends for the fusion process.

The six steps involved in making a butt fusion joint are:

1. Securely fasten the components to be joined
2. Face the pipe ends
3. Align the pipe profile
4. Melt the pipe interfaces
5. Join the two profiles together
6. Hold under pressure