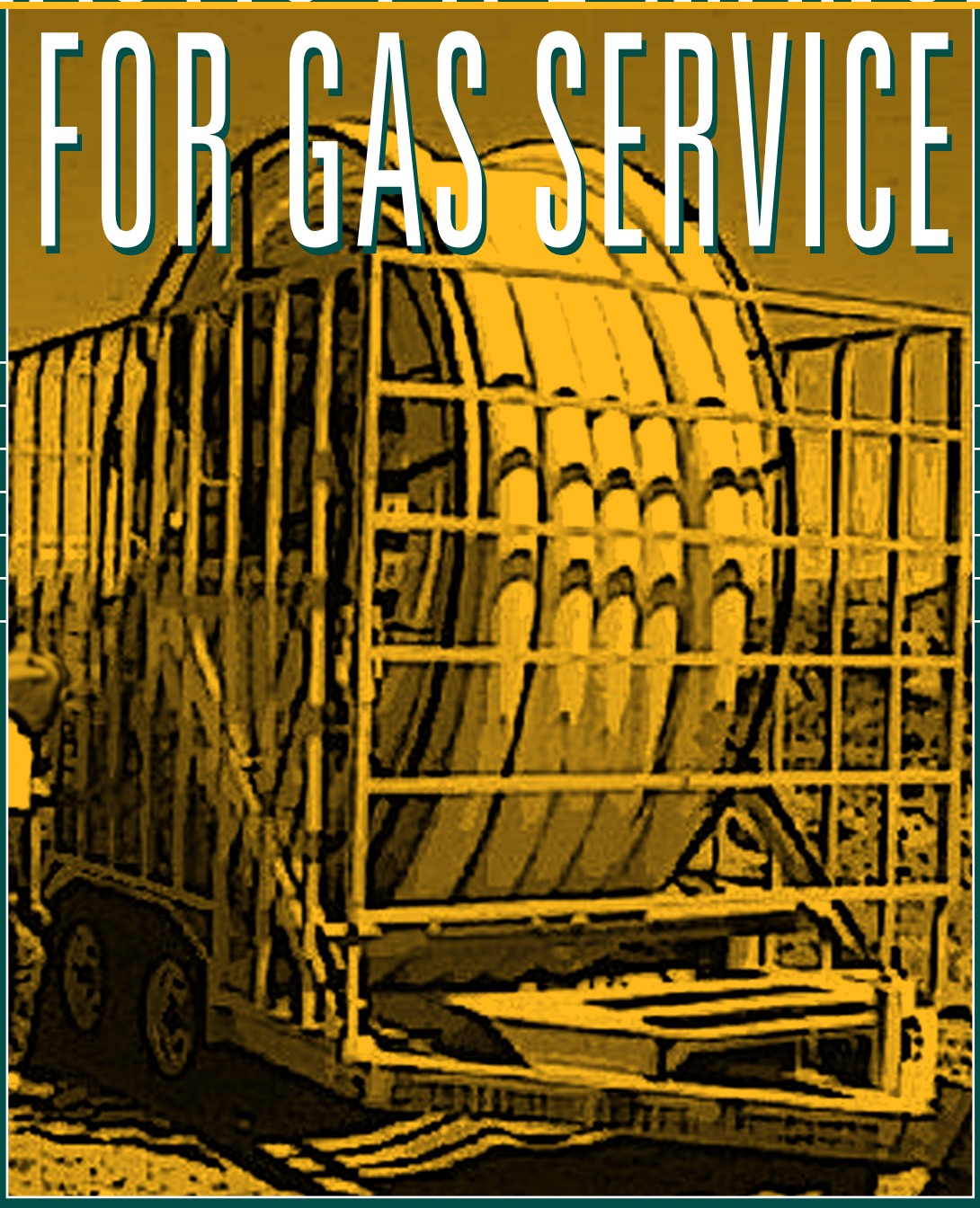
PLASTIC PIPE MANUAL FOR GAS SERVICE



AGA
American Gas Association

Eighth Edition

AGA

PLASTIC PIPE

MANUAL

FOR GAS SERVICE

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FOREWORD

In addition to adding color photos throughout, the following revisions were made in the 2006 edition of the *Manual*.

Chapter I. Plastic Piping Materials

1. Addressed reprocessed/rework materials.
2. Discussed higher performance polyethylenes, e.g. PE 4710.
3. Added new developments in PE resins.
4. Expanded section on Polyamide-11 (PA-11) piping materials and installations.
5. Revised ASTM D 3350 PE callouts.
6. Added PEX fusion joining information.
7. Revised the PE slow crack growth sections.
8. Revised the chemical resistance and weathering sections.
9. Added additional RCP information.
10. Added note that PVC piping is only permitted in repair applications.
11. Deleted HDS column “For Fuel Gas” in Table I-2.

Chapter II. Engineering Considerations for Plastic Pipe Utilization

1. Revised slow crack growth resistance (SCG) language.
2. Resistance to Rapid Crack propagation (RCP).
3. Expanded discussion of hydrostatic design basis (HDB) including elevated temperature HDBs.
4. Inclusion of references to PA-11.
5. Expanded notes about joining including electrofusion joining and Generic Fusion Procedures.
6. Advice concerning design for high temperature environments and pressures above 100 psi.

Chapter IV. Installation of Plastic Pipe

1. Format was changed for easier reading.
2. Added information about Cold Weather Handling.
3. Added color photos.
4. Added information to be considered when installing Category 2, full seal only fittings.
5. Updated old Standards references.
6. Modified trenching and backfilling section.
7. Added reference to ASTM design standard for Weak Links.

Chapter V. Personnel Training, Field Inspection, and Pressure Testing

1. General revision and rewrite of Typical Outline for Training.
2. Revisions to Pressure Testing sections.
3. Added Project Investigations section.

Chapter VI. Maintenance, Operation, and Emergency Control Procedures

1. Added sections on the Plastic Pipe Data Collection Committee (PPDC).
2. Revised the Static Electricity section.
3. Revised the Pipe Locating section.
4. Added additional guidance to the Repair section.

Added new Appendix H

1. PPI TN-30/2006 “Requirements for the Use of Rework Materials in Manufacturing of Polyethylene Gas Pipe”

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INTRODUCTION

This Manual is the **eighth edition** and is an updating of the issue published in 2001. Information is presented on those plastic materials, piping components, and design and installation procedures currently covered in codes and standards concerned with piping systems for natural gas distribution. It presents and summarizes data from manufacturers, users, trade associations and research organizations. The Manual has been prepared for use with the referenced ASTM standards and Part 192 of the Title 49, Code of Federal Regulations, which contains the Minimum Federal Safety Standards for the transportation of gas and for pipeline facilities. The Code hereafter will be referred to as 49 CFR 192, Federal Code or Minimum Federal Safety Standards. When a Code section is referenced it is designated 49 CFR 192.XXX unless it is clear from context the reference is to Part 192 of Title 49.

The Plastic Pipe Manual Task Group recognizes that the data and information presented in this Manual could not include the complete details of the available information on plastic gas pipe. New knowledge and developments continually tend to supplement or make obsolete some of the present manual material. Some of the codes and standards quoted or cited as references also are undergoing continual modernization and must of necessity be consulted to determine applicability. State and local codes may specify additional requirements or restrictions. The Engineer should consult all applicable codes. It is, however, the hope of the AGA Plastic Materials Committee that this Manual will be acceptable to both users and suppliers as a prime reference on the subject of plastic gas piping.

In view of the rapid progress of technology in this field, it is recommended that this Manual be used in conjunction with a current copy of the Minimum Federal Safety Standards, 49 CFR 192, and the ASTM Book of Standards, Volumes 8.01 through 8.04 Plastics.

The latest information, as issued by the manufacturers of resins, pipe, piping components or tools, will contain in more detail, special or specific properties and recommendations related to their product. Unavoidably, the publications of the Gas Piping Technology Committee (GPTC) will, in part, parallel this Manual on many items as they specifically relate to the requirements of the Minimum Federal Safety Standards. Users are encouraged to reference the additional information provided by these sources.

Modern methods of physical and chemical analysis started to uncover the principles that govern the properties of natural polymers in 1920. Polymer compounds such as poly (vinyl chloride) were developed in 1931. But it took the shortages of copper and steel during World War II to start the use of plastic pipe in natural gas distribution.

The gas industry recognized the potential of plastic pipe after limited installation by a few companies in the late 1940s. Beginning in the early 1950s many companies were evaluating plastic pipe performance and developing know-how on an experimental basis. In 1953 the AGA Distribution Committee formed a subcommittee on Plastic Pipe Standards. The objective was to compile the physical and chemical data on specific types and formulations of plastic materials. In cooperation with the membership of the Society of the Plastic Industry, and through AGA sponsored research at the Battelle Memorial Institute, the gas industry proceeded with the development of such data. In a meeting of the Subcommittee in 1954, a special committee of the Thermoplastic Pipe Division of SPI recommended the first three thermoplastic materials for natural gas distribution pipe.

After the mid 1950s the installation of plastic pipe on an operational basis grew rapidly. Annual installations rose from approximately 100 miles to over 1,700 miles in 1965 and 2,600 miles in 1966.

Operational data, together with field data from experimental installations, was gathered by gas utilities and the material, pipe and fitting manufacturers for many years leading to the development of gas pipe standards. This work was supported by the American Gas Association (AGA), the Plastics Pipe Institute (PPI) (a Division of the Society of the Plastic Industry), the American Society of Testing and Materials (ASTM), and the American Society of Mechanical Engineers (ASME). Results of the research were incorporated in 1966 into the ASTM Standards D 2513 “Specification for Thermoplastic Gas Pressure Pipe, Tubing and Fittings” and D 2517, “Specification for Reinforced Thermosetting Resin Plastic Gas Pressure Pipe and Fittings.” These, in turn, provided the basis for acceptance and inclusion of plastic piping into the USAS B31.8 1967, “Pressure Piping Code for Gas Transmission and Distribution Piping Systems.”

In 1967, with formal acceptance by code groups, the door was opened for general use of plastic pipe. The cumulative miles of plastic pipe in use grew from 9,200 miles in 1965 to over 45,800 miles at the end of 1970, an increase of almost 500%. Annual plastic installations increased by over 500% in the five year period to 10,600 miles in 1970.

Extensive use of plastic for main and service installations has continued in the United States. In 1996 a magazine survey noted its respondents installed over 32,000 miles of polyethylene mains and services annually for