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.
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.
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”
CONTENTS

TITLE PAGE ........................................................................................................................................ i
DISCLAIMER & COPYRIGHT .............................................................................................................. ii
FOREWORD ......................................................................................................................................... iii
CONTENTS ........................................................................................................................................ iv
INTRODUCTION .............................................................................................................................. ix

CHAPTER I. PLASTIC PIPING MATERIALS ......................................................................................... 1
PRIMARY CHARACTERISTICS ........................................................................................................... 1
KINDS OF PLASTIC GAS PIPING MATERIALS .............................................................................. 2
DESCRIPTION OF PIPING MATERIALS ......................................................................................... 5
CLASSIFICATION OF POLYETHYLENE MATERIALS ................................................................... 6
CLASSIFICATION OF POLYAMIDE MATERIALS ........................................................................... 9
POLY (VINYL CHLORIDE) (PVC) ................................................................................................. 11
REINFORCED EPOXY RESIN PIPE ............................................................................................ 12
CROSSLINKED POLYETHYLENE (PEX) PIPE ............................................................................. 13
NEW PLASTIC MATERIALS FOR PIPING AND MOLDED FITTINGS ........................................... 13
FACTORS AFFECTING THE PERFORMANCE OF PLASTIC PIPING MATERIALS........................ 15
ENGINEERING PROPERTIES OF PLASTIC .................................................................................. 15
FORECASTING THE LONG-TERM STRENGTH OF PE FITTINGS AND JOINTS ......................... 23
RAPID CRACK PROPAGATION ...................................................................................................... 27
END NOTES ...................................................................................................................................... 29

TABLES
TABLE I-1. Typical Physical Properties of Plastic Piping Compounds ........................................ 4
TABLE I-2. Hydrostatic Design Basis (Strength Categories) and Hydrostatic Design Stresses (HDS) for Thermoplastic Pipe Materials for Water Service at 23°C (73.4°F) .................................................................................. 8
TABLE I-3. Classification of Polyethylene Materials ....................................................................... 10
TABLE I-4. Classification Example for ASTM D 3350 for PE 233464E Material .................................. 11
TABLE I-5. Typical Properties of PA 11 Based on Testing of 2” IPS SDR 11 Pipe ................................ 12
TABLE I-6. Factors Affecting Overall Performance of Plastic Materials in Gas Applications ............. 14
TABLE I-7. Derating Factors for Exposure to Liquid Hydrocarbons .............................................. 26

PHOTOS
PHOTO I-1. Thermoplastic Pipes – Typical Pipes Installed over the Past 40 Years ................................. 2
PHOTO I-2. Fiber Reinforced Epoxy Pipe ......................................................................................... 3
PHOTO I-3. PE Pellets- Natural and Color concentrates .................................................................... 5
PHOTO I-4. PE Pellets- Salt & Pepper Blend ................................................................................... 5
PHOTO I-5. Long Term Hydrostatic Test Equipment ....................................................................... 23
CHAPTER II. ENGINEERING CONSIDERATIONS FOR PLASTIC PIPE UTILIZATION

INTRODUCTION ................................................................................................................... 30
PLASTIC PIPING SYSTEMS ................................................................................................. 31
US FEDERAL DEPARTMENT OF TRANSPORTATION REGULATIONS ....................... 32
CALCULATION OF DESIGN PRESSURE ........................................................................... 32
DESIGN FACTOR .................................................................................................................. 35
INFLUENCE OF TEMPERATURE ON PLASTIC SYSTEMS ............................................ 37
INFLUENCE OF OTHER STRESSES ON PLASTIC SYSTEMS ........................................ 39
DIMENSIONS ......................................................................................................................... 39
JOINTS .................................................................................................................................... 40
PERMEABILITY OF POLYETHYLENE AND PA-11 PIPE ............................................... 40
FLOW OF NATURAL GAS IN PLASTIC PIPE ................................................................... 41
END NOTES ........................................................................................................................... 43

TABLES
TABLE II-1. Part 192 Summary of Standards applicable to Plastic Pipe ......................... 33
TABLE II-2. Effects of Temperature on Long-term Strength of PE 2406 ......................... 34
TABLE II-3. Elevated Temperature HDB and Flow Rate Marking Code for Thermoplastic Pipe in Accordance with ASTM D2513-03a ............................................... 36
TABLE II-4. Typical HDBs for ASTM D 2513 thermoplastic Materials at Various Design Temperatures ................................................................. 36
TABLE II-5. Pressure Rating of Dimension Ratio Thermoplastic Pipe as a Function of Material Hydrostatic Design Basis (HDB) Design Pressure Rating, PSIG ................................................................. 37
TABLE II-6. Minimum Wall Thickness by Pipe Size and Dimension Ratio for Thermoplastic Pipe ......................................................................................................................... 39
TABLE II-7. Typical Maximum Flow Rates Experienced in 60 PSIG Natural Gas Distribution Systems ...................................................................................................................... 42

FIGURES
FIGURE II-1. Stress Rupture, Time Plots for Polyethylene Pipe Materials Showing Influence of Temperature ........................................................................................................ 31
FIGURE II-2. Applicability of Partially or Fully Turbulent Flow Formulas ....................... 43
CHAPTER III. PROCUREMENT CONSIDERATIONS, ACCEPTANCE TESTS AND SUPPLIER SELF-CERTIFICATION FOR THERMOPLASTIC PIPE, TUBING AND FITTINGS ................................................................................................................................. 44
MODEL SPECIFICATION................................................................................................................................. 44
SELECTION OF VENDOR................................................................................................................................. 44
ASTM STANDARDS AND TEST METHODS.................................................................................................. 44
PROCUREMENT CONTROL............................................................................................................................. 48
USER QUALIFICATION AND ACCEPTANCE TESTING.................................................................................. 49
MONITORING FIELD PERFORMANCE........................................................................................................ 57
MANUFACTURER SELF CERTIFICATION.................................................................................................... 57

PHOTOS
PHOTO III-1. Six Inch Polyethylene Gas Pipe ............................................................................................ 46
PHOTO III-2. Six Inch PE Pipe on Uncoler/ Rerounder ............................................................................ 46
PHOTO III-3. Rerounding of PA-11 Pipe at Installation ............................................................................ 47
PHOTO III-4. Typical Printline on 2 inch Coiled PE pipe ......................................................................... 47
PHOTO III-5. Notch Tensile Test Apparatus .............................................................................................. 48
PHOTO III-6. Quality Measuring Tools ...................................................................................................... 52
PHOTO III-7. Bend Back Test for PE .......................................................................................................... 53
PHOTO III-8. Typical Acceptance PE Ductile Failure ............................................................................. 53
PHOTO III-9. Ring Tensile Test ................................................................................................................... 54
PHOTO III-10. Melt Index Measurement Apparatus .................................................................................. 55
PHOTO III-11. Density Measurement Apparatus ....................................................................................... 55
PHOTO III-12. Elevated Temperature Sustained Pressure Test ................................................................. 56

FIGURES
FIGURE III-1. Suggested Company Acceptance Plant to Obtain Quality Plastic Piping .................... 50
FIGURE III-2. Suggested Manufacturer Self-Certification Plan to Obtain Quality Plastic Piping Material ................................................................................................................................. 51

CHAPTER IV. INSTALLATION OF PLASTIC PIPE .................................................................................. 59
SHIPPING, HANDLING AND STORAGE ................................................................................................... 59
CUTTING........................................................................................................................................................... 60
COLD WEATHER HANDLING.................................................................................................................... 60
PLASTIC JOINING REQUIREMENTS........................................................................................................ 61
PROVISION FOR VALVES........................................................................................................................... 79
BENDS AND BRANCHES............................................................................................................................ 81
EXTERNAL STRESSES................................................................................................................................. 81
ALLOWANCE FOR LINEAR THERMAL EXPANSION AND CONTRACTION ........................................ 81
TRENCHING AND BACKFILLING ................................................................................................................ 82
PIPE PLACEMENT IN TRENCHES................................................................................................................ 82
PLOWING TECHNIQUES............................................................................................................................ 83
TRENCHLESS INSTALLATIONS.................................................................................................................. 84
DIRECT-BURIAL REQUIREMENTS WITH PLASTICS .............................................................................. 85
PLASTIC INSERTION IN MAINS AND SERVICES.................................................................................... 86
PHOTOS
PHOTO IV-1. Uncoiling and Rerounding of PA-11 Pipe .......................................................... 61
PHOTO IV-2. Large Diameter Coiled PE pipe ........................................................................ 61
PHOTO IV-3. Hydraulic Combination Fusion Machine, 2” – 8” .............................................. 63
PHOTO IV-4. Butt Fusion Machine......................................................................................... 64
PHOTO IV-5. Butt Fusion of PA-11 Gas Pipe ......................................................................... 64
PHOTO IV-6. Butt Fusion of Large Diameter PE Gas Pipe ................................................... 65
PHOTO IV-7. Saddle Fusion Machine ...................................................................................... 66
PHOTO IV-8. Saddle Fusion of PE Gas Pipe .......................................................................... 67
PHOTO IV-9. Completed PE Saddle Fusion ......................................................................... 67
PHOTO IV-10. Socket Fusion of PE Gas Pipe ......................................................................... 68
PHOTO IV-11. Typical Butt, Saddle and Socket Fusion Joints in PE ...................................... 68
PHOTO IV-12. Heating Coils in Electrofusion Saddle ............................................................ 69
PHOTO IV-13. Schematic of EF Coupler Showing Heating Coils ........................................... 69
PHOTO IV-14. Completed PE Electrofusion Joint ................................................................... 71
PHOTO IV-15. Mechanical Couplings – Steel Bolted (Typical 1-1/4” and Larger) ................ 73
PHOTO IV-16. Mechanical Couplings – Plastic Bolted on 4” PA-11 Pipe .............................. 73
PHOTO IV-17. Mechanical Couplings – Inserting “loose” Stiffener ........................................ 74
PHOTO IV-18. Mechanical Couplings – Nut Follower Design ............................................... 74
PHOTO IV-19. Mechanical Couplings – Nut Follower Cut Away .......................................... 74
PHOTO IV-20. Mechanical Couplings – Marking Stab Depth ............................................... 75
PHOTO IV-21. Mechanical Couplings – Stab Coupling Cut Away ........................................ 75
PHOTO IV-22. Transition from Steel to PE – with Flange Adapter ......................................... 76
PHOTO IV-23. Transition from Steel to PE – Metal Mechanical Coupling ............................. 76
PHOTO IV-24. Saddle Fusion Tapping Tee – PE ................................................................. 77
PHOTO IV-25. Electrofusion Tapping Tee – PE with Clamping Fixture ................................. 78
PHOTO IV-26. Mechanical Tapping Tee – PA-11 with Mechanical Coupling Service Outlet for PE .................................................................................................................. 78
PHOTO IV-27. Risers – Variety of Designs .............................................................................. 79
PHOTO IV-28. Valves – Small Diameter PE ......................................................................... 79
PHOTO IV-29. Valves – Large Diameter PE ........................................................................ 80
PHOTO IV-30. EFVs – Typical Installation in Service Outlet .................................................. 81
PHOTO IV-31. Installation – Direct Burial of PE Pipe .............................................................. 83
PHOTO IV-32. Installation – Plowing in PE w/ Tracer Wire and Warning Tape ..................... 83
PHOTO IV-33. Installation – Directional Drilling ..................................................................... 85
PHOTO IV-34. Installation – Insertion ..................................................................................... 85

TABLES
TABLE IV-1. Joining Methods for Plastics ........................................................................... 62

CHAPTER V. PERSONNEL TRAINING, FIELD INSPECTION, AND PRESSURE TESTING ........................................................................................................... 89
PERSONNEL TRAINING........................................................................................................ 89
FIELD INSPECTION................................................................................................................ 91
INSPECTION OF FIELD JOINTS ...................................................................................... 92
PRESSURE TESTING............................................................................................................. 92
PRECAUTIONS IN TESTING .............................................................................................. 93
CHAPTER VI. MAINTENANCE, OPERATION, AND EMERGENCY CONTROL PROCEDURES ................................................................. 95
PERFORMANCE OF PLASTIC PIPING SYSTEMS ................................................................. 95
COLLECTION OF PLASTIC PIPE FAILURE DATA ........................................................... 95
COLLECTION OF PLASTIC PIPE FAILURE DATA FOR THE VOLUNTARY PPDC COMMITTEE ................................................................. 96
PLASTIC PIPING SYSTEM SURVEILLANCE .................................................................. 96
OPERATING AND MAINTENANCE CODE REQUIREMENTS ......................................... 96
EMERGENCY ISOLATION ............................................................................................... 97
STATIC ELECTRICITY ...................................................................................................... 98
LEAKAGE SURVEYS ........................................................................................................ 99
PIPE LOCATING .............................................................................................................. 99
CRITERIA FOR USE ......................................................................................................... 100
CHEMICAL ENVIRONMENTS ...................................................................................... 100
RODENT DAMAGE .......................................................................................................... 100
REPAIRS .......................................................................................................................... 101
EXCESS FLOW VALVES ................................................................................................. 101
IMPORTANT OPERATING PRECAUTIONS ................................................................. 101

PHOTOS
PHOTO VI-1. Squeeze Off Flow Control in PE Pipe .......................................................................................................................... 98
PHOTO VI-2. Use of a Wet Tape to Dissipate Static .......................................................................................................................... 99

APPENDIX A. SPECIFICATIONS, TEST METHODS AND PRACTICES FOR PLASTIC PIPES .................................................................................................................. 103

APPENDIX B. GLOSSARY ............................................................................................. 108

APPENDIX C. OTHER SOURCES OF INFORMATION ...................................................... 115

APPENDIX D. PLASTICS PIPE INSTITUTE MODEL SPECIFICATION MS-2/2000 ................................................................................................................................. 119

APPENDIX E. PLASTIC FAILURE REPORT ...................................................................... 122

APPENDIX F. FUSION MACHINE QUALITY ASSURANCE CHECKLIST ......................... 126

APPENDIX G. NEW PLASTIC MATERIAL/PRODUCT EVALUATION CHECKLIST ................................................................................................................................. 128

APPENDIX H. REQUIREMENTS FOR THE USE OF REWORK MATERIALS IN MANUFACTURING OF POLYETHYLENE GAS PIPE TN-30/2006 ........................................ 133

Index ............................................................................................................................... 140

Change Suggestion Form ............................................................................................... 147
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...