Municipal Advisory Board

Established May 1, 2008 at the University of Texas, Arlington

MAB Guidelines for HDPE Pipeline Inspection

(MAB-6 2020)

First edition, approved at MAB #25 virtual meeting, 2020

FOREWORD

This guide was developed by the Municipal Advisory Board (MAB) and published with the help of the members of the Plastics Pipe Institute, Inc. (PPI).

This publication is intended as a guide for engineers, users, contractors, code officials, and other interested parties for use in the design, construction and installation of high-density polyethylene (HDPE) pressure water piping systems. The local utility or engineer may need to modify this guide to adapt the document to local conditions, operations, and practices.

This guide has been prepared by MAB members and associates as a service to the water industry. The information in this document is offered in good faith and believed to be accurate at the time of its preparation, but is offered "as is" without express or implied warranties, including WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Any reference to a specific manufacturer's product is merely illustrative, and not intended as an endorsement of that product. Reference to or testing of a proprietary product should not be construed as an endorsement by the MAB or PPI, which do not endorse the proprietary products or processes of any manufacturer. Users are advised to consult the manufacturer for more detailed information about the specific manufacturer's products. The information in this document is offered for consideration by industry members in fulfilling their own compliance responsibilities. MAB and the PPI assume no responsibility for compliance with applicable laws and regulations.

The MAB serves as an independent, non-commercial adviser to the Municipal & Industrial (M & I) Division of the PPI. Once adopted, MAB will consider revising this guide from time to time, in response to comments and suggestions from the users. Please send suggestions of improvements to Camille George Rubeiz, PE, F. ASCE, at crubeiz@plasticpipe.org.

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INTRODUCTION

With the adoption of HDPE as a potable water distribution system material it has become increasingly important that owners of these systems ensure that the benefits associated with this material are not compromised by non-standard installation techniques. With the advent of HDPE 4710 materials, which are resistant to stress cracking, the leading cause of failure is installation error followed by third party damage. The purpose of this document is to standardize the inspection of piping installations. The HDPE Municipal Advisory Board (MAB) members identified the issue of achieving consistent inspection and created a task force to develop this document. The MAB membership consists of municipal water companies/cities staff, college researchers, contractors and designers all involved in furthering the proper adoption of HDPE potable water systems.

MAB Mission Statement: *To improve the design, installation, and operation of municipal HDPE water piping systems through the creation of partnerships among utilities, researchers, designers, contractors, and the HDPE industry.*

Project Inspectors have historically been responsible for all aspects of daily construction inspection and there are numerous documents currently available addressing all other aspects of construction inspection. The focus of this document is limited to HDPE issues only and does not attempt to address other aspects of pipeline inspection.

NOTE to OWNERS: This document is intended for water system owners adopting HDPE pipe to improve project construction success. In the event that the owner has a high level of experience with HDPE, portions of the following document may already have been incorporated in the construction process. These guidelines were prepared for water systems owners with limited HDPE experience.

MAB-6 INTRODUCTION / EXPLANATION OF APPENDICES

HDPE INCOMING MATERIAL INSPECTION/QC (Appendix A)

Inspectors should verify that all HDPE related materials comply with project specifications, are free of defects, were stored properly, manufactured within stated timelines and did not suffer handling damage. Appendix A provides sample material acceptance forms which should be utilized to document that the provided piping products are within specification, new and damage/defect free.

HDPE EQUIPMENT QUALIFICATION (Appendix B)

All tooling used in the construction of HDPE piping systems must be maintained in accordance with the manufacturer's recommended practices and the functionality of this tooling should be verified by the Inspector responsible for observing fusion. Appendix B includes sample check lists and tags which can be attached to all approved tooling. Provided tooling must cover the ranges of diameters specified for each individual project. Maintenance of this tooling during the project is critical for successful fusion fabrication. Inspectors should verify adequacy of tooling on a frequent basis by direct observation and subsequently approve replacement tooling during the duration of the project. A few examples include: verifying heating iron temperatures, cleanliness/coating condition of heating iron faces, measuring peel thickness of scrapers, working condition of all moving parts to verify alignment and free movement, type of alcohol and cloth used for surface cleaning, appearance of produced fusion beads and in some instances destructive testing of fused joints in accordance with specified ASTM standards (Appendix E).

HDPE CONNECTION INSPECTION (Appendix C)

All employees (contract or in-house) performing fusion must be qualified on a determined frequency (ex. annually). Additionally, if unacceptable (visual appearance, methodology, inappropriate or damaged tooling utilized, etc.) or failed fusion are encountered, that fusion technician must be requalified and not allowed to continue fusion until requalification has occurred. The fusion technician always has the discretion to remove questionable fusions before placing these joints into service without penalty or requalification.

The opportunity to conduct the fusion technician qualification can be achieved during the Tooling Qualification process using the configuration of tools/equipment in a "field" type setting. The "Qualifying" body (fusion equipment manufacturer or the Owner) shall have the capability to destructively test prepared joints per applicable ASTM standards (Appendix E). A joint of each type of fusion should be prepared for destructive testing and Qualification issued for each type specified (butt fusion (manual and hydraulic), socket fusion, sidewall fusion (branch and tapping tee), electro fusion (coupling, sidewall)). Fusion technicians shall only be able to fabricate the type of fusions for which they are Qualified. It is required that fusion cards be issued to these Qualified fusion technicians allowing field verification by Inspector. The Inspector should witness all fusion qualification efforts including observance of all tooling and fusion methodology to ensure compliance with established procedures.

ONLY QUALIFIED FUSION TECHNICIANS CAN PERFORM FUSION

It is recommended that all Inspectors assigned to observe HDPE fusions should also be qualified for the specific processes (butt, socket, sidewall, electro (couplings, sidewall)) being observed.

MAB-6 INTRODUCTION / EXPLANATION OF APPENDICES

Project Specifications should include detailed fusion procedures for all methods utilized in constructing HDPE piping systems or at a minimum follow ASTM standards for heat fusion and/or MAB documents for electrofusion. These detailed fusion procedures are critical for the Inspector to both qualify fusion technicians and provide reference support when observing fusion activity on the jobsite. Two different documents are provided, one for 12" and under and another for 14"-30" diameter electrofusion fittings. Both of these procedures were developed and approved by all electrofusion manufacturers offering products in the North American water market. Additional information is provided in Appendix E.

For fittings above 30", specific electrofusion manufacturer procedures, developed for their unique products, shall be used.

The leading cause of failure associated with HDPE 4710 piping systems is improper installation. It is critical that fusion methods (including all associated tooling) be followed exactly as stated with no allowance for any variation. Typical failures are related to:

- Unqualified installers
- Improper tooling/lack of tooling/non-maintained tooling/substituted non-manufacturer approved tooling
- Inadequate removal of oxidation layer
- Improper solutions used for cleaning
- Lack of adherence with fusion procedures
- Misuse/non-use of clamping/alignment devices
- Non-adherence with required cooling times
- Reliable generator output/undersized generators/lack of required power due to use of inadequate extension cords
- Inadequate pressure capabilities for in service conditions (improper pipe/fitting design),
- Installer shall mitigate adverse weather conditions (rain, snow, etc.) by using a tent or other suitable means at the joint location to avoid contamination during fusion.

It is critical that all the above listed items be addressed to produce systems that will provide predicted in service life (100+ years) associated with HDPE 4710.

Ideally each fusion performed in the field should be inspected by a HDPE qualified Inspector before burial. Forms for reporting each fusion (butt, socket, sidewall, electro (couplings, sidewall)) are provided in Appendix C. Completion of the attached forms for each fusion will provide oversight, quality control and avoid improper fusions from being placed into service.

Regular monitoring of several items will improve overall fusion quality at the jobsite including:

- Persons performing fusion are verifiably qualified.
- Tooling/machinery required for fusion has been qualified (based on presence of tags as outlined in Appendix B) and remains in good working order.
- Fittings and pipe have been quality controlled upon delivery to jobsite (Appendix A).
- For processes requiring removal of exterior wall surfaces such as, heated tool or electrofusion sidewall or couplings, a minimum removal of 0.007" thickness is required.
- Adherence to adopted fusion procedure(s).
- Proper clamping is used.

- Required cooling times are observed prior to movement, removal of clamps, tapping and pressure testing.
- Ability to determine if electrofusion process requires abandonment of fitting or if the fusion power cycle can be repeated after observance of required cooling time.
- 96% or greater isopropyl alcohol cleaning agent used with clean lint free cloth.

Fusion Technicians should always mark their name, employee number, time at end of fusion and the time when the cooling period is complete as a minimum on the pipe adjacent to each fusion/fitting with an approved marker. These markings convey "ownership" of the fusion and if photographed can be included on the appropriate fusion report. Some agencies require additional information in these markings including but not limited to service address, tap number, date of installation or other relevant information.

Additionally, both butt and electrofusion automated processes have the capability to record fusion data and in some cases Geo-positional data that will assist with mapping record creation and improve the ability to find this fusion/fitting after burial.

After installation error, the next leading cause of failure, associated with HDPE 4710, is third party damage. If excavation requires an 811 call prior to activity (most locations), it is critical that mapping records are accurate. Including a tracer wire, installed during pipe installation, is another locating tool that can be invaluable when mapping records are missing/inaccurate or surface benchmarks change over time.

HDPE PRESSURE TESTING (Appendix D)

Pressure testing can only occur after cooling times have been observed post fusion. Intermediate pressure testing during construction is suggested for all sidewall connections either fused (heat or electrofusion) or mechanical. This intermediate testing will allow the abandonment in place of failed fusion sidewall fittings before the mainline pipe is tapped and reduce the likelihood of questionable fusions being placed into service (Appendix C). Appendix D contains a form for witnessing system pressure testing before system tie-in and disinfection activities. Further information on pressure testing HDPE is available in ASTM F2164, *Standard Practice for Field Leak Testing of Polyethylene (PE) and Crosslinked Polyethylene (PEX) Pressure Piping Systems Using Hydrostatic Pressure.*

OTHER SOURCES OF INFORMATION (Appendix E)

Additional information from multiple sources related to HDPE Potable Water Systems is provided.

HDPE PIPE TABLES PER AWWA C901 & C906 (Appendix F)

Refer to tables for pipe sizes, OD, DR, wall thickness and tolerance for CTS, IPS and DIPS sizes.

PROJECT CLOSE OUT

All completed forms should be collected and scanned into the electronic project file. Fusion records should also be downloaded and associated with these forms. Electrofusion power supplies typically house a USB connection that downloads onto a thumb drive in a spreadsheet format. Automated heat fusion equipment also provides data download capabilities including cloud storage.

MAB-6 APPENDIX A: HDPE INCOMING MATERIAL INSPECTION/QC FORM

Project Name: _____ Project Number: _____
Inspector Name: _____ Employee Number: _____
Date: _____

PIPE

All of the following data is available in the print line of the pipe. (One form should be completed for each pipe OD delivered)

Pipe Supplier/Vendor Name: _____

Manufacturer Name: _____ Manufacturer Date: _____

Manufacturing Standard: □ C906 (AWWA) □ C901 (AWWA) □ Other (ex. ASTM F714)

Material Certification: □ NSF 61 □ Other _____

Type of HDPE Material: □ PE4710 □ Other _____

Diameter Sizing: □ CTS □ DIPS □ IPS □ Other _____

Pipe OD: ____inches

Pipe Pressure Class (PSI)/SDR: □ 250/9.0 □200/11.0 □160/13.5 □125/17 □Other ____

See Appendix F for pipe dimension standards.

Pipe Packaging: □ Coil Length of coil _____

□ Straight Lengths- Individual Length: □ 40ft □50 ft □Other _____

Total Length Delivered: _____ ft

Damage:

Manufacturing Defect: □Out of tolerance OD

□Out of tolerance ID

□Charred material in pipe

□Voids/ Inclusions/ Non-uniformity/ inconsistent pigmentation

□Mismarking

□Other: _____

Handling/Shipping: □Scratching/ Gouging/ Other defects

□Strapping (band damage)

□Lifting equipment damage

□Missing end caps

Amount of Pipe Rejected: _____ ft

Amount of Pipe Accepted: _____ ft

MAB-6 APPENDIX A: HDPE INCOMING MATERIAL INSPECTION/QC FORM

Project Name: _____ Project Number: _____
Inspector Name: _____ Employee Number: _____
Date: _____

BUTT END FITTINGS

All supplied fittings should either have indentation or stickers indicating the following. (One form should be completed for each fitting OD and type delivered)

Fitting Supplier/Vendor Name: _____

Manufacturer Name: _____

Manufacturing Standard: _____

Type of HDPE Material: □ PE4710 □Other: _____

Material Certification: □ NSF 61 □Other: _____

Diameter Sizing: □ CTS □ DIPS □ IPS □ Other _____

Fitting OD: _____inches

Pressure Class (PSI): □250 □200 □160 □125

Type Fitting: □Elbow □Tee □Reducer □Other_____

Typically, dependent on size, fittings are stored indoors and/or in boxes to prevent outside element damage (sun, excessive heat, flooding, etc.) and manufacturing date may be unknown. Specifications may state maximum duration from manufacture to delivery date.

Damage: Manufacturing Defect: □Out of tolerance OD

□Out of tolerance ID

□Inadequate OD controlled pup lengths

□Mismarking

□Other: _____

Handling/Shipping: □Weathering (not stored indoors)

□Visible damage

Total number of fittings delivered: _____

Number of fittings rejected: _____

Number of fittings accepted: _____

MAB-6 APPENDIX A: HDPE INCOMING MATERIAL INSPECTION/QC FORM

Project Name: _____ Project Number: _____
Inspector Name: _____ Employee Number: _____
Date: _____

SIDEWALL FITTINGS

All supplied fittings should either have indentation or stickers indicating the following. (One form should be completed for each fitting OD and type delivered)

Fitting Supplier/Vendor Name: _____

Manufacturer Name: _____

Manufacturing Standard: _____

Type of HDPE Material: □ PE4710 □Other: _____

Material Certification: □ NSF 61 □Other: _____

Main Diameter Sizing: □ IPS □DIPS □ Other _____

Main Diameter: _____ inches

Outlet Diameter Sizing: □CTS □IPS □DIPS □Other: _____

Outlet Fitting OD: □ ¾" □ 1" □1-1/4" □2" □3" □4" □6" □8" □10"
□12" □14" □16" □18" □20"

Type of Outlet: □Socket □Butt □Mechanical/Insertion □Other: _____

Pressure Class (PSI): □250 □200 □160 □125

Type Fitting: □Tapping Tee □Branch Tee Other: _____

Typically, dependent on size, fittings are stored indoors and/or in boxes to prevent outside element damage (sun, excessive heat, flooding, etc.) and manufacturing date maybe unknown. Specifications may state maximum duration from manufacture to delivery date.

Damage: Manufacturing Defect: □ Non-approved Manufacturer
□Out of tolerance ID (outlet)
□Wrong Main Diameter
□Mismarking
□Other: _____

Handling/Shipping: □Weathering (not stored indoors)
□Visible damage

Total number of fittings delivered: _____

Number of fittings rejected: _____

Number of fittings accepted: _____

MAB-6 APPENDIX A: HDPE INCOMING MATERIAL INSPECTION/QC FORM

Project Name: _____ Project Number: _____
Inspector Name: _____ Employee Number: _____
Date: _____

SOCKET END FITTINGS

All supplied fittings should either have indentation or stickers indicating the following. (One form should be completed for each fitting size and type delivered)

Fitting Supplier/Vendor Name: _____

Manufacturer Name: _____

Manufacturing Standard: _____

Type of HDPE Material: □ PE4710 □ Other: _____

Material Certification: □ NSF 61 □ Other: _____

Diameter Sizing: □ CTS □ IPS □ Other _____

Fitting Size: □ ¾" □ 1" □1-1/4" □2" □3" □4"

Pressure Class (PSI): □335 □250 □200 □160 □125

Type Fitting: □Ell □Tee □Reducer □ Coupling □ Cap

Typically, dependent on size, fittings are stored indoors and/or in boxes to prevent outside element damage (sun, excessive heat, flooding, etc.) and manufacturing date maybe unknown. Specifications may state maximum duration from manufacture to delivery date.

Damage: Manufacturing Defect: □Out of tolerance ID

□Mismarking

□Other: _____

Handling/Shipping: □Weathering (not stored indoors)

□Visible damage

Total number of fittings delivered: _____

Number of fittings rejected: _____

Number of fittings accepted: _____

MAB-6 APPENDIX A: HDPE INCOMING MATERIAL INSPECTION/QC FORM

Project Name: _____ Project Number: _____
Inspector Name: _____ Employee Number: _____
Date: _____

FABRICATED FITTINGS

All supplied fittings should either have indentation or stickers indicating the following. (One form should be completed for each fitting OD and type delivered)

Fitting Supplier/Vendor Name: _____

Fitting Manufacturer Name: _____ Manufacturing Standard: _____

PIPE USED FOR FABRICATION:

Manufacturer Name: _____ Manufacturing Standard: _____

Type of HDPE Material: □ PE4710 □ Other: _____

Material Certification: □ NSF 61 □ Other: _____

Diameter Sizing: □ DIPS □ IPS □ Other _____

Fitting OD: _____ inches

Pressure Class (PSI): □250 □200 □160 □125

Type Fitting: □ Elbow □ Tee □ Reducer □ Cross □ Other: _____

Typically, fittings are stored indoors to prevent outside element damage (sun, excessive heat, flooding, etc.) and manufacturing date maybe unknown. Specifications may state maximum duration from manufacture to delivery date.

Damage:

Manufacturing Defect: □Non-approved fabrication manufacturer per Specifications
□Non-approved pipe manufacturer per Specifications
□Out of tolerance OD
□Out of tolerance ID
□Inadequate SDR for required Pressure Class
□Mismarking
□Inadequate number of segments
□Appearance of butt fusion beads
□Other: _____

Handling/Shipping: □Weathering (not stored indoors)
□Visible damage

Total number of fittings delivered: _____

Number of fittings rejected: _____

MAB-6 APPENDIX A: HDPE INCOMING MATERIAL INSPECTION/QC FORM

Project Name: _____ Project Number: _____
Inspector Name: _____ Employee Number: _____
Date: _____
Number of fittings accepted: _____

ELECTROFUSION FITTINGS

All supplied fittings should either have indentation or stickers indicating the following. (One form should be completed for each fitting OD and type delivered)

Fitting Supplier/Vendor Name: _____

Manufacturer Name: _____

Manufacturing Standard: _____

Type of HDPE Material: □ PE4710 □ Other: _____

Material Certification: □ NSF 61 □ Other: _____

Diameter Sizing: □ CTS □ IPS □DIPS □ Other _____

Fitting OD: _____inches

Pressure Class (PSI): □250 □200 □160 □125

Type Fitting: □Coupling □Tapping Tee □Branch Saddle □Corp Saddle
□Elbow □Tee □Reducer □Other: _____

Typically, dependent on size, fittings are stored in doors and/or in boxes to prevent outside element damage (sun, excessive heat, flooding, etc.) and manufacturing date is unknown. Specifications may state maximum duration from manufacture to delivery date.

Damage:

Manufacturing Defect: □Out of tolerance ID
□Mismarking
□Wrong Diameter Sizing (ex. IPS when DIPS specified)
□Wrong outlet size
□Wrong backing strap diameter
□Other: _____

Handling/Shipping: □Not in protective package/damaged protective package
□Weathering (not stored indoors)
□Visible damage

Total number of fittings delivered: _____

Number of fittings rejected: _____

Number of fittings accepted: _____

MAB-6 APPENDIX A: HDPE INCOMING MATERIAL INSPECTION/QC FORM

Project Name: _____ Project Number: _____
Inspector Name: _____ Employee Number: _____
Date: _____

MECHANICAL FITTINGS

All supplied fittings should either have stickers or other documentation indicating the following. (One form should be completed for each fitting OD/type delivered)

Fitting Supplier/Vendor Name: _____

Manufacturer Name: _____

Manufacturing Standard: _____ Material Certification: □ NSF 61 □Other_____

Diameter Sizing: □ CTS □ IPS □DIPS □ Other _____

Fitting ID: _____ inches Pressure Class (PSI): □250 □200 □160 □125

Type Fitting: □ Coupling □ Elbow □ Flanged Coupling Adapter □ Reducer
□ Repair Clamp □ Repair Fitting □Restrainer □ Service Saddle
□ Stiffener □Tapping Sleeve □ Tee Valves □Other: _____

Damage:

Manufacturing Defect:
- □ Out of tolerance ID
- □ Wrong fitting model number
- □ Mismarked
- □ Wrong diameter sizing (ex. IPS when DIPS specified)
- □ Wrong outlet size (ex. 1” CTS when 1-1/4” specified)
- □ Wrong outlet configuration (NTP when Corp threads specified)
- □ Wrong gasket material
- □ Wrong stiffener material (stainless vs coated carbon steel)
- □ Improperly sized stiffener (OD and DR)
- □ Wrong bolts (carbon when stainless steel specified)
- □ Missing components (gasket, bolts stiffeners, etc.)
- □ Wrong base material (carbon when stainless steel specified)
- □ Coating holidays
- □ Other: _____

Handling/Shipping:
- □ Visible damage to coating
- □ Visible mechanical damage (bent, dented, oval, etc.)
- □ Weathering (not stored indoors)

Total number of fittings delivered: _____

Number of fittings rejected: _____

Number of fittings accepted: _____

MAB-6 APPENDIX B: HDPE EQUIPMENT QUALIFICATION

Project Name: _____ Project Number: _____
Inspector Name: _____ Employee Number: _____
Contractor Name:_____ Contractor Contact/ #: _____
Date: _____

GENERATOR

Make/ Manufacturer: _____ Model: _____ Serial Number: _____

Output Capacity: _____ Last Recorded Maintenance Date: _____

Verification Method of Output: _____ Date: _____

Caution: Welding generators are not recommended as power supply for fusion.

Does the generator meet the minimum requirements of the equipment to be powered?

□ Yes □ No

The following Tag should be attached to all generators used to power HDPE fusion equipment for field employees/inspectors to verify qualification for the specific generator in use. Consideration should be used for the Tag material which will last for the duration of the project (plastic coated, plastic, water proof).

Sample Tag

Qualified Generator
(Company/Owner Name Here)
Make: _____ Model: _____
Serial Number: _____
Qualification Number: _____
Qualification Date: _____
Employee Issuing Qualification: _____
Employee Number: _____

○ (hole for zip tie attachment)

There are multiple sources of generator testing equipment available; one source is: https://www.sotcher.com/Load_Bank_Generator_Test_Sets/

MAB-6 APPENDIX B: HDPE EQUIPMENT QUALIFICATION

Project Name: _____ Project Number: _____
Inspector Name: _____ Employee Number: _____
Contractor Name:_____ Contractor Contact/ #: _____
Date: _____

BUTT FUSION

Make/ Manufacturer: _____ Model: _____ Serial Number: _____

Type Machine: □Manual □Hydraulic Assist □Other: _____

Pipe Diameter Range: ____ Smallest Diameter _____Largest Diameter

Required minimum power supply (watts) (external generators only): _____

Last inspection date of machine: _____ Inspected by: _____

If a rental machine:

Name of Rental Agency:_____ Contact at Rental Agency (Name): _____

Rental Agency Phone Number: _____

Has operator/rental agency maintained equipment used in joining HDPE pipe in accordance with the manufacturer's recommended practices or with written procedures that have been proven by test and experience to produce acceptable joints? □Yes □No

Observation of Butt Fusion Machine

Carriage slides freely?	□Yes	□No
Carriage Aligned?	□Yes	□No
Are all inserts present for diameters specified?	□Yes	□No
Are scraper/facer blades sharp?	□Yes	□No
Does energized heating iron achieve specified temperature?	□Yes	□No
Method of iron temperature verification:	□Pyrometer	□Other _____
Is there any coating damage on heating iron face?	□Yes	□No
Do pipe clamps securely hold pipe without slipping?	□Yes	□No
Are pipe support spools/rollers present?	□Yes	□No
General condition of machine: □New □Like New □Well Maintained	□Other: _____	
Is Data logger present?	□Yes	□No

Data Logger Model Number _____ Last DL Calibration Date _____
Where is data stored? _____

It is recommended that this specific machine along with the previously qualified generator be used to qualify Fusion Personnel in a “field” type setting. Preparing joints with this specific machine that are subsequently destructively tested per ASTM F2620 to qualify the Fusion personnel, can also be used to qualify this machine.

It is recommended that Butt Fusion equipment be inspected annually at a minimum.

The following Tag should be attached to the carriage of the butt fusion machine and remain in place during the entire project for field employees/inspectors to verify qualification for the specific butt fusion machine in use. Consideration should be used for the Tag material which will last for the duration of the project (plastic coated, plastic, water proof).

Sample Tag

Qualified Butt Fusion Machine
(Company/Owner Name Here)
Make: _____ Model: _____
Serial Number: _____
Qualification Number: _____
Qualification Date: _____
Employee Issuing Qualification: _____
Employee Number: _____

○ (hole for zip tie attachment

MAB-6 APPENDIX B: HDPE EQUIPMENT QUALIFICATION

Project Name: _____ Project Number: _____
Inspector Name: _____ Employee Number: _____
Contractor Name:_____ Contractor Contact/ #: _____
Date: _____

ELECTROFUSION PROCESSOR

Make/ Manufacturer: _____ Model: _____ Serial Number:_____

Last calibration date for machine: _____

If a rental machine:

Name of Rental Agency: _____ Contact at Rental Agency (Name): _____

Rental Agency Phone Number: _____

Is Rental Agency certified by machine manufacturer to provide equipment maintenance / calibration? □Yes □No

Observation of Electrofusion Power Supply

General condition of machine: □New □Like New □Well Maintained □Other: _____

When powered does the machine provide menu commands? □Yes □No

Is the display screen readable? □Yes □No

Are any of the cables damaged? □Yes □No

Are cable tips correct diameter for specified fittings? □Yes □No

Does the optical reader correctly identify fitting? □Yes □No

Does power supply download fusion data? □Yes □No

It is recommended that this specific power supply along with the previously qualified generator be used to qualify Fusion Personnel in a "field" type setting. Preparing joints with this specific power supply that are subsequently destructively tested per MAB 1 & MAB 2 to qualify the fusion personnel, can also be used to qualify this machine.

The following Tag should be attached to the power supply box protective enclosure and remain in place during the entire project for field employees/inspectors to verify qualification for this specific power supply in use. Consideration should be used for the Tag material which will last for the duration of the project (plastic coated, plastic, water proof).

Sample Tag

Qualified Electrofusion Power Supply
(Company/Owner Name Here)
Make: _____ Model: _____
Serial Number: _____
Qualification Number: _____
Qualification Date: _____
Employee Issuing Qualification: _____
Employee Number: _____

○ (hole for zip tie attachment)

MAB-6 APPENDIX B: HDPE EQUIPMENT QUALIFICATION

Project Name: _____ Project Number: _____
Inspector Name: _____ Employee Number: _____
Contractor Name:_____ Contractor Contact/ #: _____
Date: _____

SOCKET FUSION IRON AND CLAMPS

Make/ Manufacturer: _____ Model: _____ Serial Number: _____

Last inspection date of machine: _____ Inspected by: _____

If a rental machine:

Name of Rental Agency: _____ Contact at Rental Agency (Name): _____

Rental Agency Phone Number: _____

Has operator/rental agency maintained equipment used in joining HDPE pipe in accordance with the manufacturer's recommended practices or with written procedures that have been proven by test and experience to produce acceptable joints? □Yes □No

Observation of Socket Fusion Iron and Clamps

Do provided iron faces cover specified diameters? □Yes □No

Is there any damage on coatings of all heater face diameters? □Yes □No

Does heating iron achieve specified fusion temperature? □Yes □No

Are clamps present for all specified diameters? □Yes □No

It is recommended that this specific socket fusion iron and clamps along with the previously qualified generator be used to qualify Fusion Personnel in a “field” type setting. Preparing joints with this specific socket heating iron and clamps that are subsequently destructively tested per ASTM F2620 be used to qualify the fusion personnel, can also be used to qualify this specific socket fusion iron and clamp combination.

It is recommended that socket fusion equipment be inspected annually at a minimum.

The following Tag should be attached to the socket fusion iron and remain in place during the entire project for field employees/inspectors to verify qualification for this specific socket fusion iron in use. Consideration should be used for the Tag material which will last for the duration of the project (plastic coated, plastic, water proof).

Sample Tag

Qualified Socket Fusion Iron
(Company/Owner Name Here)
Make: _____ Model: _____
Serial Number: _____
Qualification Number: _____
Qualification Date: _____
Employee Issuing Qualification: _____
Employee Number: _____

○ (hole for zip tie attachment)

MAB-6 APPENDIX B: HDPE EQUIPMENT QUALIFICATION

Project Name: _____ Project Number: _____
Inspector Name: _____ Employee Number: _____
Contractor Name:_____ Contractor Contact/ #: _____
Date: _____

SIDEWALL FUSION IRON AND ALIGNMENT CARRIAGE

Make/ Manufacturer: _____ Model: _____ Serial Number: _____

Last inspection date of machine: _____ Inspected by: _____

If a rental machine:

Name of Rental Agency: _____ Contact at Rental Agency (Name): _____

Rental Agency Phone Number: _____

Has operator/rental agency maintained equipment used in joining HDPE pipe in accordance with the manufacturer's recommended practices or with written procedures that have been proven by test and experience to produce acceptable joints? □Yes □No

Observation of Sidewall Fusion Iron and Alignment Carriage

Do provided iron faces cover specified diameters?	□Yes	□No
Is there any damage on coatings of all heater face diameters?	□Yes	□No
Does heating iron achieve specified fusion temperature?	□Yes	□No
Does the fusion carriage have correct outlet clamps for diameters specified?	□Yes	□No
Are carriage guide rods aligned and allow free movement?	□Yes	□No
Are strapping chains lengths adequate for main sizes specified?	□Yes	□No
Is pressure gauge accurate?	□Yes	□No

It is recommended that this specific sidewall fusion iron and carriage along with the previously qualified generator be used to qualify Fusion Personnel in a “field” type setting. Preparing joints with this specific sidewall heating iron and carriage that are subsequently destructively tested per ASTM F2620 be used to qualify the fusion personnel, can also be used to qualify this specific sidewall fusion iron and carriage combination.

It is recommended that sidewall fusion equipment be inspected annually at a minimum.

The following Tag should be attached to the sidewall fusion carriage and remain in place during the entire project for field employees/inspectors to verify qualification for this specific sidewall fusion carriage in use. Consideration should be used for the Tag material which will last for the duration of the project (plastic coated, plastic, water proof).

Sample Tag

Qualified Sidewall Fusion Iron
(Company/Owner Name Here)
Make: _____ Model: _____
Serial Number: _____
Qualification Number: _____
Qualification Date: _____
Employee Issuing Qualification:_____
Employee Number: _____

○ (hole for zip tie attachment)

MAB-6 APPENDIX B: HDPE EQUIPMENT QUALIFICATION

Project Name: _____ Project Number: _____
Inspector Name: _____ Employee Number: _____
Contractor Name:_____ Contractor Contact/ #: _____
Date: _____

ANCILLARY TOOLING

Several other tools are required for successful fusion of HDPE and should be checked/qualified before fusion is allowed.

Peeler

Rotary peelers are the preferred tooling for removing oxidation from the exterior pipe wall.

Does provided peeler move freely around pipe surface? □Yes □No

Is peeler clean, free of damage, and moving parts operate freely? □Yes □No

Does peeler blade remove a min 0.007" of material in a continuous peel? □Yes □No

Does peeler blade remove a max 0.015" of material in a continuous peel? □Yes □No

Does provided peeler cover all diameters specified? □Yes □No

Does peel path overlap with each revolution on pipe leaving no space between revolutions? □Yes □No

Alignment Clamps

Are provided alignment clamps intended for HDPE fusion? □Yes □No

Are clamps and moving parts free of damage? □Yes □No

Do provided clamps cover all diameters specified? □Yes □No

Extension Cords (between generator and fusion machine/power supply)

Is 25 foot extension cord a minimum of #10/3 conductor? □Yes □No

Is 50 foot extension cord a minimum of #8/3 conductor? □Yes □No

Surface Cleaning

Is provided isopropyl alcohol 96% (minimum) alcohol? □Yes □No

Are provided wipes/towels/rags lint free and in original packaging? □Yes □No

Are pipe markers petroleum-free? □Yes □No

Torque Wrenches

Is there a proof of annual and current calibration? □Yes □No

Last calibration date _____

Pipe Rollers/Support Stands

Do support rollers move freely? □Yes □No

MAB-6 APPENDIX C: HDPE CONNECTION INSPECTION FORM

Project Name: _____

Project Number: _____

Inspector Name: _____Employee Number: _____

Contractor Name: _____ Contractor Contact#: _____

ELECTROFUSION SIDEWALL

Address/Street: _____ Pipeline Station# _____ Date/Time: _____

Fusion Technician: _____ Company: _____ Employee #: _____

Qualification Issued by: _____ Qualification Issue Date: _____ Qualified Pipe Size(s): _____

Pipe Manufacturer: _____ Manufacture Date: _____ Material Type: _____

Pipe Size: _____ Pipe DR: _____

EF Saddle Manufacturer: _____ Part #: _____ Description: _____

EF Processor Model: _____ Serial Number: _____

Generator Make & Model: _____ Serial Number: _____ Rated Capacity: _____

Ambient/Processor Temperature:_____ Weather: _____ Trench Conditions: _____

General:		
Inspect the equipment for cleanliness and proper operation.		
Verify that the generator / power source is adequately sized for saddle being fused.		
Fitting still in undamaged packaging (Inspect the fitting for damage through original packaging. Fitting to remain in original packaging until instalation).		
Let the EF processor acclimate to the jobsite weather conditions for a minimum period of 15 minutes before		
Service/branch saddles:		
Clean the pipe of dirt and debris prior to scraping.		
Mark the bounds of area to be fused with an approved non-petroleum based marker.		
Scrape the area to be fused with an approved pipe preparation tool.		
Clean the area to be fused with 96% (or higher) solution isopropyl alcohol & lint-free rag.		
Clean the fitting to be fused with 96% (or higher) solution isopropyl alcohol & lint-free rag.		
Secure the saddle to the pipe with the manufacturer recommended clamping mechanism.		
Scan the numerical barcode on the fitting using the reader wand on the processor.		
Verify that the fitting was read correctly and initiate the fusion cycle.		
Verify that the EF processor indicated a complete fusion cycle.		
Did the EF processor indicate a cycle failure? If yes, continue to next step below. If no, see. (C) below	Yes	No
Was the failure due to an input power interruption? If yes, see (A) below. If no, see (B) below.	Yes	No
(A) If failure was due to an input power interruption, the saddle must be re-fused.		
(B) Abandon saddle that faults for any other reason and install new saddle.		
(C) Mark on the pipe the fusion cycle end time: _____ Time at end of cooling period _____ Fusion # _____		
Mark the pipe with the house # / tap # and technician name.		
Do not remove saddle clamp or rough handle pipe until the proper cooling time (CT) is completed. Rough handling includes moving, backfilling, or pressure testing		
Perform hydrostatic test after proper cooling time is completed. Test saddle at 200 psi for 5		

Was this saddle accepted?	Yes ☐	No ☐

Comments: _____

Inspector Company: _____ Fusion Qualification Date: _____

Qualification issued by:_____ Inspector Signature _____

MAB-6 APPENDIX C: HDPE CONNECTION INSPECTION FORM

Project Name: _____

Project Number: _____

Inspector Name: _____Employee Number: _____

Contractor Name: _____ Contractor Contact#: _____

ELECTROFUSION COUPLINGS

Address/Street: _____	Pipeline Station# _____	Date/Time: _____
Fusion Technician: _____	Company: _____	Employee #: _____
Qualification Issued by: _____	Qualification Issue Date: _____	Qualified Pipe Size(s): _____
Pipe Manufacturer: _____	Manufacture Date: _____	Material Type: _____
Pipe Size: _____	Pipe DR: _____	
EF Coupling Manufacturer: _____	Part #: _____	Description: _____
EF Processor Model: _____	Serial Number: _____	Fusion Number: _____
Generator Make & Model: _____	Serial Number: _____	Rated Capacity: _____
Ambient/Processor Temperature:_____	Weather: _____	Trench Conditions: _____

General:		
Inspect the equipment for cleanliness and proper operation.		
Verify that the generator / power source is adequately sized for coupling being fused.		
Fitting still in undamaged packaging (Inspect the ftting for damage through original packaging. Fitting to remain in original packaging until instalation).		
Let the EF processor acclimate to the jobsite weather conditions for a minimum period of 15 minutes before beginning the fusion process.		
Couplings:		
Cut pipe ends squarely and evenly (+/- 3 degrees).		
Clean pipe ends of dirt and debris prior to scraping.		
Measure and mark one of the pipe ends for the full length of the coupling. Measure and mark the other pipe end for half the coupling length. Mark the entire pipe area to be scraped with an approved non-petroleum based marker.		
Mount the scraper over the area to be scraped. Scrape the outside of the pipe to remove the surface layer and expose clean virgin pipe beneath. Remark stab depths after scraping		
Clean surfaces with 96% (or higher) solution isopropyl alcohol & lint-free rag.		
Insert the pipe ends to the stab depth marks. If necessary, a block of wood can be placed over the coupling end and a hammer can be used to drive the coupling onto the pipe. Leave plastic bag over coupler to prevent contamination and debris from entering the open end. Use caution not to damage internal wire or terminal pins.		
Secure assembly with an alignment clamp, with coupling centered between stab depth marks.		
Connect the control box leads to the fitting. Scan the numerical barcode on the fitting using the reader wand on the processor.		
Verify that the fitting was read correctly and initiate the fusion cycle.		
Verify that the EF processor indicated a complete fusion cycle.		
Did the EF processor indicate a cycle failure? If yes, see * below. If no, see ** below.	Yes	No
*Was the failure due to an input power interruption? If yes, see (A) below. If no, see (B) below. Input power interruption examples include the following: (i) fusion leads were detached during fusion, (ii) generator ran out of gas, or (iii) other circumstances that resulted in processor input power interruption.	Yes	No
(A) If failure was due to an input power interruption, the coupling must be re-fused. 1. Coupling should remain in restrained position. 2. Allow the coupling to cool to ambient temperature. 3. Reconnect coupling to the processor. Completely refuse coupling for the entire fusion time.		
(B) Remove coupling that faults for any other reason and install new coupling.		
** Mark on the pipe the fusion cycle end time: _--___ Time at end of cooling period _____ Fusion # _____		
Mark the pipe with the station # and technician name.		
Do not remove aligment clamp or rough handle pipe until the proper cooling time (CT) is complete. Rough handling includes moving, backfilling, or pressure testing		
Was this coupling accepted?	Yes □	No □

Comments: _____

Inspector Company: _____ Fusion Qualification Date: _____

Qualification issued by: _____ Inspector Signature _____

MAB-6 APPENDIX C: HDPE CONNECTION INSPECTION FORM

Project Name: _____

Project Number: _____

Inspector Name: _____Employee Number: _____

Contractor Name: _____ Contractor Contact#: _____

MANUAL BUTT FUSION

Did the operator complete an inspection of equipment for cleanliness and proper operation?	Yes	No
Did the operator clean pipe ends?	Yes	No
Were the pipe ends faced to the facer stops?	Yes	No
Did the facer stop rotating before the jaws were opened?	Yes	No
Were shavings and chips removed after facing pipe?	Yes	No
When pipe ends were brought together under facing pressure, were visual gaps observed?	Yes	No
Did the operator check alignment of pipe ends?	Yes	No
Was the operation checked for pipe slippage at fusion pressure and pipe ends kept closed?	Yes	No
Was a torque wrench adaptor and torque wrench used?	Yes	No
What was the calculated pressure?		
What was the applied torque?		
Was the heater cleaned and the surface temperature checked with a pyrometer?	Yes	No
What was the observed pyrometer temperature reading?		
Was the pipe seated against the heater properly?	Yes	No
Was pressure relieved for the heat soak time?	Yes	No
Was the carriage lock engaged?	Yes	No
Did the bead size against the heater meet the standard before heater removal?	Yes	No
Was the pipe interfacial area inspected for complete melt after heater removal?	Yes	No
Did the pipe Interfacial area appear flat and smooth with no un-melted areas?	Yes	No
Was the heater removal time acceptable in accordance with the Standard?	Yes	No
Is the finished bead size uniform and acceptable in accordance with the Standard?	Yes	No
Completed cooling cycle time (under fusion pressure)	Minutes Seconds	
Was this manual butt fusion joint fabricated with adopted fusion procedure?	Yes	No
Was this manual butt fusion joint accepted?	Yes	No

Installer Name: _____ Installer Qualification Date: _____

Qualification Issued By: _____

Inspector Company: _____ Fusion Qualification Date: _____

Qualification issued by: _____

Inspector Signature _____ Date: _____

Comments……

……

MAB-6 APPENDIX C: HDPE CONNECTION INSPECTION FORM

Project Name: _____

Project Number: _____

Inspector Name: _____Employee Number: _____

Contractor Name: _____ Contractor Contact#: _____

HYDRAULIC BUTT FUSION

Did the operator complete an inspection of equipment for cleanliness and proper operation?	Yes	No
Did the operator clean pipe ends?	Yes	No
Were the pipe ends faced to the facer stops?	Yes	No
Were shavings and chips removed after facing pipe?	Yes	No
Did the facer stop rotating before the jaws were opened?	Yes	No
When pipe ends were brought together under facing pressure, were visual gaps observed?	Yes	No
Did the operator check alignment of pipe ends?	Yes	No
Was the operation checked for pipe slippage at fusion pressure and pipe ends kept closed?	Yes	No
Were hydraulic extension hoses used?	Yes	No
Was drag pressure verified? Yes __ No __	Drag Pressure observed (psi)	
How was Theoretical Fusion Pressure Calculated?		
☐ Data logger device		
☐ Fusion Pressure Calculator — Theoretical pressure (psi)		(psi)
☐ Equipment manufacturer's calculator		
☐ Formula		
What was the observed gauge pressure (Theoretical Fusion Pressure +Drag) that was used to fuse the pipe?		(psi)
Was the heater cleaned and the surface temperature checked with a pyrometer?	Yes	No
What was the observed pyrometer temperature reading? (°F)		
Recommended shift sequence followed?	Yes	No
Did the bead size against the heater meet the standard before heater removal?	Yes	No
Was the pipe interfacial area inspected for complete melt after heater removal?	Yes	No
Did the pipe Interfacial area appear flat and smooth with no un-melted areas?	Yes	No
Was the heater removal time acceptable in accordance with the Standard?	Yes	No
Is the finished bead size uniform and acceptable in accordance with the Standard?	Yes	No
Completed cooling cycle time (under fusion pressure)	Minutes Seconds	
If used, is the Operator proficient with Data logger setup and operation	Yes	No
Was this hydraulic butt fusion joint fabricated with adopted fusion procedure?	Yes	No
Was this hydraulic butt fusion joint accepted?	Yes	No

Installer Name: _____Installer Qualification Date: _____

Qualification Issued By: _____

Inspector Company: _____ Fusion Qualification Date: _____

Qualification issued by: _____

Inspector Signature _____ Date _____

Comments……

……

MAB-6 APPENDIX C: HDPE CONNECTION INSPECTION FORM

Project Name: _____

Project Number: _____

Inspector Name: _____Employee Number: _____

Contractor Name: _____ Contractor Contact#: _____

SOCKET FUSION

Heater and facer power cords inspected?	Yes	No
Heater adapters clean, non-stick coating intact?	Yes	No
Pipe and socket fitting surface cleaned?	Yes	No
Pipe chamfered and cold ring used for proper stab depth?	Yes	No
Correct heater adapters for pipe and fitting?	Yes	No
What was the measured heater surface temperature?		
Pipe is gripped properly? (do not use cold ring as a handle)	Yes	No
Pipe and fitting alignment correct?	Yes	No
Pipe and fitting pressed into and removed from heater adapter without twisting?	Yes	No
How long was pipe and fitting heated?	_____ seconds	
How long was fusion joint cooled?	_____ minutes _____ seconds	
Fusion procedures properly followed?	Yes	No
Visible cold ring impression?	Yes	No
No gaps or voids in fusion joint?	Yes	No
Pipe is aligned properly?	Yes	No
Was this socket fusion joint fabricated with adopted fusion procedure?	Yes	No
Was this socket fusion joint accepted?	Yes	No

Installer Name: _____Installer Qualification Date: _____

Qualification Issued By: _____

Inspector Company: _____ Fusion Qualification Date: _____

Qualification issued by: _____

Inspector Signature _____ Date _____

Comments……

……

MAB-6 APPENDIX C: HDPE CONNECTION INSPECTION FORM

Project Name: _____

Project Number: _____

Inspector Name: _____Employee Number: _____

Contractor Name: _____ Contractor Contact#: _____

SIDEWALL FUSION

Did the operator complete an inspection of equipment for cleanliness, correct inserts and heater adapters, and proper operation?	Yes	No
Did the operator clean the complete fusion area?	Yes	No
Did the operator abrade the complete fusion area of the pipe and fitting with 50-60 grit utility cloth or peeler?	Yes	No
Were shavings and chips removed after abrading fusion area of the pipe and fitting?	Yes	No
Did the operator seat the fitting under pressure and check fit between the fitting and pipe?	Yes	No
How were Bead-up and Fusion Pressures Calculated? ☐ Fitting label ☐ Data Logger ☐ Formula		
Was the heater cleaned and the surface temperature checked with a pyrometer?	Yes	No
What was the observed pyrometer temperature reading?		
What was the observed bead-up pressure?		
What was the observed soak pressure?		
Was there a slight indication of melt visible before entering soak mode?	Yes	No
Did the bead size against the heater meet the standard before heater removal?	Yes	No
Was the pipe interfacial area inspected for complete melt after heater removal?	Yes	No
Do pipe main and fitting have a complete and even melt pattern (no un-heated areas)?	Yes	No
What was the observed fusion pressure?		
Is the finished triple bead formation uniform and acceptable in accordance with the Standard?	Yes	No
Completed cooling cycle time (under fusion pressure)		
Was this sidewall fusion joint fabricated with adopted fusion procedure?	Yes	No
Was this sidewall fusion joint accepted?	Yes	No

Installer Name: _____Installer Qualification Date: _____

Qualification Issued By: _____

Inspector Company: _____ Fusion Qualification Date: _____

Qualification issued by: _____

Inspector Signature _____ Date _____

Comments……

……

MAB-6 APPENDIX C: HDPE CONNECTION INSPECTION FORM

Project Name: _____

Project Number: _____

Inspector Name: _____Employee Number: _____

Contractor Name: _____ Contractor Contact#: _____

MECHANICAL FITTINGS
COUPLINGS / FLANGED COUPLING ADAPTERS

Did installer check and verify all dimensions prior to beginning the installation?	Yes	No
Did installer completely read the manufacturer's installation sheet and have all of the required tools and materials on hand prior to the installation?	Yes	No
Did installer clean and check the pipe to make certain that the sealing surfaces are adequate to allow the gasket(s) to properly seal?	Yes	No
Did installer use a torque wrench when tightening bolts at the specified torque levels?	Yes	No
Did installer place all recommended reference marks on the pipe?	Yes	No
Did installer check and make certain that any deflection and offset is within allowable tolerances?	Yes	No
Did installer insert pipe stiffeners into each end of HDPE pipe to be connected?	Yes	No
Did installer follow the installation recommendations of the manufacturer? Make certain to check bolting torques and seals at final inspection?	Yes	No
Did installer make certain pipe support and alignment is correct?	Yes	No
Did installer make certain that restraint is working, if possible? Check all alignments?	Yes	No
Did installer finish by cleaning up, then wrapping and taping the fitting installation to protect it from soil contact?	Yes	No
Did installer make certain backfill and compaction is done to specification?	Yes	No
Was this coupling/flanged coupling adapter installation acceptable?	Yes	No

Installer Name: _____ Employee # _____

Inspector Company: _____

Inspector Signature _____ Date _____

Comments……

……

MAB-6 APPENDIX C: HDPE CONNECTION INSPECTION FORM

Project Name: _____

Project Number: _____

Inspector Name: _____Employee Number: _____

Contractor Name: _____ Contractor Contact#: _____

MECHANICAL FITTINGS
SERVICE SADDLES

Did installer check and verify all dimensions prior to beginning the installation?	Yes	No
Did installer completely read the manufacturer's installation sheet and have all of the required tools and materials on hand prior to the installation?	Yes	No
Did installer clean and check the pipe to make certain that the sealing surfaces are adequate to allow the gasket(s) to properly seal?	Yes	No
Did installer attach corporation stop in service saddle with thread sealer?	Yes	No
Did installer fasten saddle on pipe with proper alignment and strap torque?	Yes	No
Did installer pressure test saddle prior to tapping?	Yes	No
Did installer tap pipe using the proper cutter and remove all pipe tailings from outlet?	Yes	No
Did installer attach service line and check for any leakage?	Yes	No
Did installer finish by cleaning up, then wrapping and taping the fitting installation to protect it from soil contact?	Yes	No
Did installer make certain backfill and compaction is done to specification?	Yes	No
Was this service saddle installation acceptable?	Yes	No

Installer Name: _____ Employee #: _____

Inspector Company: _____

Inspector Signature: _____ Date _____

Comments……

……

MAB-6 APPENDIX C: HDPE CONNECTION INSPECTION FORM

Project Name: _____

Project Number: _____

Inspector Name: _____Employee Number: _____

Contractor Name: _____ Contractor Contact#: _____

MECHANICAL FITTINGS
TAPPING SLEEVE

Did installer check and verify all dimensions prior to beginning the installation.	Yes	No
Did installer completely read the manufacturer's installation sheet and have all of the required tools and materials on hand prior to the installation?	Yes	No
Did installer clean and check the pipe to make certain that the sealing surfaces are adequate to allow the gasket(s) to properly seal?	Yes	No
Did installer attach tapping sleeve to pipe following the manufacturer's instructions and torque levels and check to make certain gasket is properly sealed and not protruding into the outlet?	Yes	No
Did installer attach tapping valve? Allow the sleeve to set for 15 – 30 minutes and then check all bolt torque levels on sleeve?	Yes	No
Did installer make certain that the pipe and valve are properly supported?	Yes	No
Did installer pressure test the installation using the test port on the sleeve or through the tapping machine? Test with water, not air for safety and accuracy purposes?	Yes	No
Did installer tap pipe using the proper cutter?	Yes	No
Did installer attach service line and check for any leakage?	Yes	No
Did installer finish by cleaning up, then wrapping and taping the fitting installation to protect it from soil	Yes	No
Did installer make certain backfill and compaction is done to specification?	Yes	No
Was this tapping sleeve installation acceptable?	Yes	No

Installer Name: _____ Employee # _____

Inspector Company: _____

Inspector Signature_____ Date _____

Comments……

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MAB-6 APPENDIX D: HDPE PRESSURE TESTING FORM

Project Name: _____

Project Number: _____Inspector Name: _____

Employee Number: _____Date: _____

1. Testing medium (usually water): □ Water □ Other _____ ___
2. Test procedure used: □ ASTM F2164 □ Other _____
3. Test Pressure (psig): _____
4. Test Duration (hours): _____
5. Was all air vented from pipe before testing? □ Yes □ No
6. Pressure recording chart or pressure log (monitor pressure during expansion and test phases at 15-minute intervals minimum): Time of Day: _____ Pressure (PSIG) _____
7. Pressure versus makeup water chart (time of day, measure pressure (PSIG), amount of makeup water (gallons):

   Time of Day: _____ Pressure (PSIG) _____ Makeup Water (gallons) _____
8. Pressure at highest location (psig): _____ Pressure at lowest elevation (psig): _____
9. Elevation at point test pressure is measured (ft): _____
10. Ambient Temperature (°F): _____ Weather Conditions: _____
11. Pipe Manufacturers: _____ Valve Manufacturers: _____
12. Pipe specifications and/or standards (ASTM, AWWA, etc.): _____
13. Test Section Diameter: _____ Test Section Length: _____

    Location:_____ Tested components: _____
14. Were all joints exposed? □ Yes □ No
15. Description of any leaks, failures, and their repair/disposition:

    _____
16. Did pressure change less than 5% during test period? □ Yes □ No
17. Person or Contractor (name) performing test: _____
18. Test start time: _____ Test completion time: _____ Date of test: _____

(Modified from AWWA M55, 1st Ed., Hydrotesting and Commissioning, Chapter 9, Page 130 and input from the City of Ft. Wayne “Test Procedures for HDPE Pressure Pipe”)

MAB-6 APPENDIX E: OTHER SOURCES OF INFORMATION

American Water Works Association, AWWA www.awwa.org

1. ANSI/AWWA C901 Polyethylene (PE) Pressure Pipe and Tubing, ¾ In. (19 mm) Through 3 In. (76 mm) for Water Service
2. ANSI/AWWA C906 Polyethylene (PE) Pressure Pipe and Fittings, 4 In. Through 65 In. (100 mm Through 1,650 mm), for Waterworks
3. AWWA M55 PE Pipe–Design and Installation

Plastics Pipe Institute, PPI www.plasticpipe.org

1. PPI Handbook of Polyethylene Pipe
2. PPI Polyethylene Piping Systems Field Manual for Municipal Water
3. PPI Position Paper on HDPE (PE4710) Distribution Potable Water Pipe Sizes and Pressure Classes
4. PPI TR-4 PPI Listing of Hydrostatic Design Basis (HDB), Hydrostatic Design Stress (HDS), Strength Design Basis (SDB), Pressure Design Basis (PDB) and Minimum Required Strength (MRS) Ratings For Thermoplastic Piping Materials or Pipe
5. PPI TR-41 Generic Saddle Fusion Joining Procedure for Polyethylene Gas Piping
6. PPI TN-13 General Guidelines for Butt, Saddle and Socket Fusion of Unlike Pipes and Fittings
7. PPI TN-38 Bolt Torque For Polyethylene Flanged Joints
8. PPI TN-46 Guidance for Field Hydrostatic Testing of High Density Polyethylene Pressure Pipelines: Owner's Consideration, Planning, Procedures, and Checklists

Municipal Advisory Board, MAB www.plasticpipe.org/municipal_pipe/advisory/

1. MAB-1, MAB Generic Electrofusion Procedure for Field Joining of 12 Inch and Smaller Polyethylene (PE) Pipe
2. MAB-2, MAB Generic Electrofusion Procedure for Field Joining of 14 Inch to 30 Inch Polyethylene (PE) Pipe
3. MAB-3, MAB Model Specifications for PE 4710 Buried Potable Water Service, Distribution and Transmission Pipes and Fittings
4. MAB-4, MAB Basic HDPE Repair Options
5. MAB-5, MAB Guidelines for PE4710 Pipe Bursting of Potable Water Mains.
6. MAB-6, MAB Guidelines for HDPE Pipeline Inspection

NSF International www.nsf.org

- NSF/ANSI 61 Drinking Water System Components–Health Effects

ASTM International www.astm.org

1. ASTM D2321 Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
2. ASTM D2683 Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing
3. ASTM D2774 Standard Practice for Underground Installation of Thermoplastic Pressure Piping
4. ASTM D3261 Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing
5. ASTM D3350 Standard Specification for Polyethylene Plastics Pipe and Fittings Materials
6. ASTM F905 Standard Practice for Qualification of Polyethylene Saddle-Fused Joints
7. ASTM F1041 Standard Guide for Squeeze-off of Polyolefin Gas Pressure Pipe and Tubing
8. ASTM F1055 Standard Specification for Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene Pipe and Tubing
9. ASTM F1290 Standard Practice for Electrofusion Joining Polyolefin Pipe and Fittings
10. ASTM F1563 Standard Specification for Tools to Squeeze-off Polyethylene (PE) Gas Pipe or Tubing
11. ASTM F1668 Standard Guide for Construction Procedures for Buried Plastic Pipe
12. ASTM F2164 Standard Practice for Field Leak Testing of Polyethylene (PE) Pressure Piping Systems Using Hydrostatic Pressure
13. ASTM F2206 Standard Specification for Fabricated Fittings of Butt-Fused Polyethylene (PE) Plastic Pipe, Fittings, Sheet Stock, Plate Stock, or Block Stock
14. ASTM F2620 Standard Practice for Heat Fusion Joining of Polyethylene Pipe and Fittings
15. ASTM F2786, Standard Practice for Field Leak Testing of Polyethylene (PE) Pressure Piping Systems Using Gaseous Testing Media Under Pressure (Pneumatic Leak Testing)
16. ASTM F2880 Standard Specification for Lap-Joint Type Flange Adapters for Polyethylene Pressure Pipe in Nominal Pipe Sizes 3/4 in. to 65 in.
17. ASTM F3124 Standard Practice for Data Recording the Procedure used to Produce Heat Butt Fusion Joints in Plastic Piping Systems or Fittings
18. ASTM F3183 Standard Practice for Guided Side Bend Evaluation of Polyethylene Pipe Butt Fusion Joint
19. ASTM F3190 Standard Practice for Heat Fusion Equipment (HFE) Operator Qualification on Polyethylene (PE) and Polyamide (PA) Pipe and Fittings

MAB-6 APPENDIX F: HDPE PIPE TABLES PER AWWA C901 & C906

Table F-1: HDPE Size, Outside Diameter (OD), and Tolerance for IPS and DIOD (DIPS) Pipe

Nominal Pipe Size *in.*	IPS	DIOD (DIPS)
	Average OD ±Tolerance	
	in.	
4.0	4.500 ±0.020	4.800 ±0.022
6.0	6.625 ±0.030	6.900 ±0.031
8.0	8.625 ±0.039	9.050 ±0.041
10.0	10.750 ±0.048	11.100 ±0.050
12.0	12.750 ±0.057	13.200 ±0.059
14.0	14.000 ±0.063	15.300 ±0.069
16.0	16.000 ±0.072	17.400 ±0.078
18.0	18.000 ±0.081	19.500 ±0.088
20.0	20.000 ±0.090	21.600 ±0.097
22.0	22.000 ±0.099	-
24.0	24.000 ±0.108	25.800 ±0.116
26.0	26.000 ±0.117	-
28.0	28.000 ±0.126	-
30.0	30.000 ±0.135	32.000 ±0.144
32.0	32.000 ±0.144	-
34.0	34.000 ±0.153	-
36.0	36.000 ±0.162	38.300 ±0.172
42.0	42.000 ±0.189	44.500 ±0.200
48.0	48.000 ±0.216	50.800 ±0.229
54.0	54.000 ±0.243	57.560 ±0.259
60.0	60.000 ±0.270	61.610 ±0.277
63.0	63.000 ±0.284	-
65.0	65.000 ±0.293	-

MAB-6 APPENDIX F: HDPE PIPE TABLES PER AWWA C901 & C906

Table F-2: HDPE Minimum Wall Thickness (T, inches)
for IPS Pipe with Standard Dimension Ratio (SDR)

Nominal Pipe Size, in.	**T** (SDR 17)	**T** (SDR 13.5)	**T** (SDR 11)	**T** (SDR 9)
4	0.265	0.333	0.409	0.500
6	0.390	0.491	0.602	0.736
8	0.507	0.639	0.784	0.958
10	0.632	0.796	0.977	1.194
12	0.750	0.944	1.159	1.417
14	0.824	1.037	1.273	1.556
16	0.941	1.185	1.455	1.778
18	1.059	1.333	1.636	2.000
20	1.176	1.481	1.818	2.222
22	1.294	1.630	2.000	2.444
24	1.412	1.778	2.182	2.667
26	1.529	1.926	2.364	2.889
28	1.647	2.074	2.545	3.111
30	1.765	2.222	2.727	3.333
32	1.882	2.370	2.909	3.556
34	2.000	2.519	3.091	3.778
36	2.118	2.667	3.273	
42	2.471	3.111	3.818	
48	2.824	3.556		
54	3.176			
60	3.529			
63	3.706			
65	3.824			

Consult pipe manufacturer for availability of wall thickness greater than 3”

MAB-6 APPENDIX F: HDPE PIPE TABLES PER AWWA C901 & C906

Table F-3: HDPE Minimum Wall Thickness (T, inches)
for DIOD (DIPS) Pipe with Standard Dimension Ratio (SDR)

Nominal Pipe Size in.	**T** (SDR 17)	**T** (SDR 13.5)	**T** (SDR 11)	**T** (SDR 9)
4	0.282	0.356	0.436	0.533
6	0.406	0.511	0.627	0.767
8	0.532	0.670	0.823	1.006
10	0.653	0.822	1.009	1.233
12	0.776	0.978	1.200	1.467
14	0.900	1.133	1.391	1.700
16	1.024	1.289	1.582	1.933
18	1.147	1.444	1.773	2.167
20	1.271	1.600	1.964	2.400
24	1.518	1.911	2.345	2.867
30	1.882	2.370	2.909	3.556
36	2.253	2.837	3.482	
42	2.618	3.296		
48	2.988	3.763		
54	3.386			
60	3.624			

Consult pipe manufacturer for availability of wall thickness greater than 3”

MAB-6 APPENDIX F: HDPE PIPE TABLES PER AWWA C901 & C906

Table F-4: HDPE Outside Diameter (OD), Tolerance, Minimum Wall Thickness for CTS Pipe

Nominal Pipe Size in.	Pipe OD and Tolerance in.	Min. Wall Thickness and Tolerance for SDR 9 in.
¾	0.875 ± 0.004	0.097 + 0.010
1	1.125 ± 0.005	0.125 + 0.012
1 ¼	1.375 ± 0.005	0.153 + 0.015
1 ½	1.625 ± 0.006	0.181 + 0.018
2	2.125 ± 0.006	0.236 + 0.024

Table F-5: HDPE Outside Diameter (OD), Tolerance, Minimum Wall Thickness for IPS Pipe

Nominal Pipe Size in.	Pipe OD and Tolerance in.	Min. Wall Thickness and Tolerance for SDR 9 in.
¾	1.050 + 0.004	0.117 + 0.020
1	1.315 + 0.005	0.146 + 0.020
1 ¼	1.660 + 0.005	0.184 + 0.022
1 ½	1.900 + 0.006	0.211 + 0.025
2	2.375 + 0.006	0.264 + 0.032
3	3.500 + 0.008	0.389 + 0.047