

**Chapter**  
**8**

**Quality Control**  
**and**  
**Quality Assurance**

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## **QUALITY CONTROL AND QUALITY ASSURANCE**

Control of the quality of the raw material to be used in the production of pipe is the first essential and necessary condition for compliance with the specified requirements of the finished product. HDPE resins used to produce corrugated polyethylene pipe must be sampled, tested and approved for use to assure compliance with AASHTO and ASTM cell classification requirements. A resin vendor's certification characterizing the material (e.g.; virgin material, etc.) and stating compliance with all requirements must accompany all raw material resins used in the manufacture of the pipe. The pipe manufacturer's responsibility includes testing, randomly selected samples from each lot for verification of density (ASTM D 1505) and melt index (ASTM D 1238), tensile strength (ASTM D 638) and environmental stress crack resistance (ASTM D 1693, ASTM D 5397 or ASTM F 2136). For reference and manufacturing process control purposes, accepted material lots should be assigned identifying numbers. Permanent records should be kept.

Control of the quality of the pipe manufacturing process is the next essential and necessary condition for compliance. A competent quality control program for manufacturing includes the following:

- continuous inspection of each step using visual and/or automated inspection procedures
- testing samples of the finished pipe, selected at a predetermined frequency

In addition to records of the above items, and to insure traceability of the manufactured pipe, quality control reports must record the plant, date and shift of manufacture, production line and resin lot designations.

All conforming products must be identified with permanent markings indicating the manufacturer, manufacturing plant, date of manufacture, applicable specification designation and the pipe's nominal diameter.

A well-designed QA/QC program will include periodic audits of the efficacy of the program itself. Such audits will generally address:

- evaluation of manufactured pipe and fittings in inventory
- inspection and recalibration (if necessary) of QC testing equipment
- QC inspection and reporting procedures
- raw material sampling, testing and lot control procedures
- product certification procedures
- processing of customer complaints; corrective actions
- processing of recommendations from plant personnel

## **Manufacturing Processes**

Resins used in the manufacture of corrugated HDPE profile wall drainage pipe are most often supplied as small cylindrical pellets in a natural white color. The pipe manufacturer must add color and UV inhibitor to the resin. Carbon black, highly absorbent of degrading ultra-violet radiation, is the most effective, most cost-effective and common pigment used. Studies on UV exposure indicate carbon black pigment effectively protects HDPE from UV degradation. A minimum 1% carbon black has been shown to eliminate tensile strength loss for HDPE for sufficient time (3 years) until the pipe can be installed. For some corrugated pipe applications, 1% carbon black provides sufficient UV resistance. Other, more rigorous applications may require greater UV resistance. Increasing the carbon black level is one way to obtain the resistance. However, colors with UV stabilizers other than black may be just as effective in inhibiting UV degradation. Also, some manufacturers use a colored stripe or a colored liner for identification purposes. These modifications are typically minor and should not affect the UV resistance of the remaining black corrugated pipe. All finished pipe should comply with the requirements of ASTM D 3350.

Resins may also include stabilizers (antioxidants) added to prevent oxidation of the free radical molecules of the polyethylene chain. Unless inhibited, oxidation may result in a degradation of physical properties during the manufacturing process and over time. High temperatures required for extrusion of the resin encourage the formation of free radicals. A balance exists between the amount and type of stabilizers added to the resin and the time-temperature requirements of the manufacturing processes.

AASHTO requires the certification of properties and qualities of drainage pipe resins, including density, melt index, flexural modulus, tensile strength, ESCR and/or SP-NCLS tests. See Section 5.0 of the included Plastic Pipe Institute's *Protocol for Third Party Validation of Manufacturer's Certification* for details of certification of proprietary formulations of blended virgin resins.

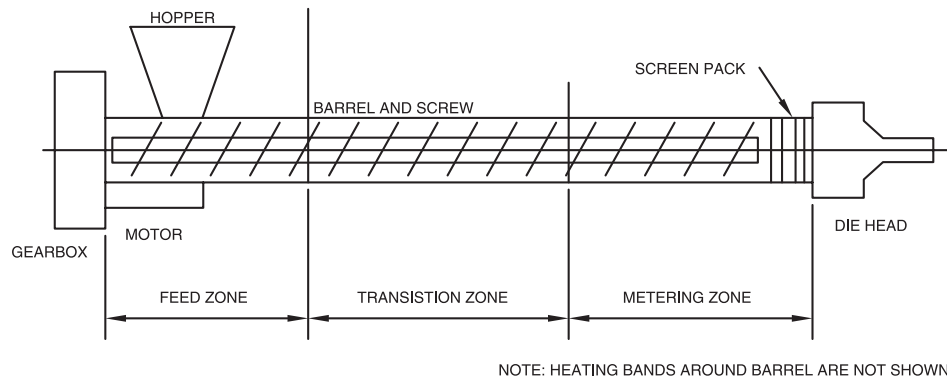
Profile wall corrugated HDPE pipe is generally produced with one or more variations of a vacuum forming process or an extrusion process. Fittings are generally produced utilizing a blow, vacuum, injection or a rotationally molding process. The principles, and some important details of each of these processes, follow.

## **The Extrusion Process for HDPE Profile Wall Pipes**

Proper control and execution of the extrusion process is critical to the success of the manufacture of corrugated HDPE pipes. Extrusion is a continuous process wherein previously dried polymer in pellet form is heated to a melt and, after mixing and

the application of pressure, extrudate is forced through a die and assumes a desired shape. See Figure 8.1 for a schematic of the extrusion process. Cold pellets are fed to the barrel through a hopper and then from the feed zone they are driven forward by the screw. The feed rate and the temperatures of the barrel, screw and die control the quality of the outcome of the process. It is in the metering zone where the pressure necessary to force the material through the die, generally less than 5000 psi, is developed. Venting with applied vacuum is necessary to remove gases trapped in approximately 190°C (375°F) melt, which otherwise may degrade the strength and appearance of the extruded HDPE. Motors in the range of 300 HP drive the process.

**Figure 8-1**



**Figure 8-1: Extrusion Process**

Single screw extruders are selected for manufacture of HDPE pipe because they have adequate mixing capabilities; they also have the ability to overcome the considerable shear resistance of the molten resin at lower melt temperatures (than is the case for twin screw machines, also used for extrusion of plastics). Running between 75 and 150 rpm, outputs are in excess of 1500 lb/hr for the most common profiles. Single-screw extruders used in profile extrusion typically range from 1 to 6 inch diameters. The viscosity, melting point, thermal sensitivity and shear heating qualities of the molten resin all affect the quality of the extrudate. On leaving the die, the hot and flexible extrudate is shaped and cooled. Uniform and gradual cooling with air and chilled water inhibits unwanted variations in wall thickness and warpage of the end product.

Various forming techniques are available. Vacuum forming to an external mold creates the corrugated profile. Sectional breakaway clamshell molds riding on a closed loop track provide the means for manufacture of a continuous run of pipe.

To manufacture dual wall profiles with smooth interiors and corrugated exteriors, a thin wall cylindrical tube is extruded into the interior of the simultaneously vacuum formed corrugated exterior shell and, with air pressure, thermally welded to the outer shell.

Pipes with smooth interiors and smooth exteriors (honeycomb profiles) are manufactured by a continuous process whereby a complex ribbon is extruded, the cross-sectional geometry being that of the finished wall. The ribbon is comprised of a flat top surface, a flat bottom surface, and a web pattern of shear transfer elements between the two. The pipe barrel is created by winding the extruded ribbon around forming rollers and thermally welding the mating helically positioned edges. Immediately after being formed, proper cooling and annealing of the pipe will permit the pipe to maintain its shape and minimize residual stresses. Immersion of smaller pipes and spraying of larger pipes are designed to reduce the temperature of the pipe below 85°C (185°F), necessary for cutting and subsequent handling at the end of the production process.

## **Fittings**

*Injection Molded Fittings:* For elbows, tees, couplings, reducers, caps and other common fittings for application to pipes generally of size 12 in. (300 mm) or less, injection molding is a common method of manufacture. HDPE material is injected into a shaped cavity of a breakaway mold (for purposes of removal of the finished fitting). Pressure then forces the material to assume the shape of the cavity. Cooling then permits the ejection of the fitting from the opened mold. Appropriate tests and inspections must validate strength, absence of voids and fidelity of dimensions.

*Fabricated Fittings:* For pipe fittings as above to pipes generally larger than 12 in. (300 mm) and for non-standard configurations of pipes of all sizes. Parts are thermally joined by heat fusion, extrusion welding or hot gas welding. Heat fusion is preferred for pressure applications.

*Thermoformed Fittings:* For sweep elbows, swaged reducers and forged stub ends, sections of pipe are heated in a bath, reshaped and cooled.

## **Quality Control and Quality Assurance Programs**

The corrugated polyethylene pipe industry has developed an industry QC/QA program. This program is designed to give producers the responsibility for controlling the quality of product produced, and to use the quality control information generated to receive certification from specifying agencies. It requires pipe producers to perform

quality control sampling, testing and record keeping on their products. It allows specifying agencies to perform quality assurance sampling, testing and record keeping to confirm the performance of the producer's quality plan as set forth herein.

The industry has also implemented a third party product certification program for products that meet or exceed the requirements in AASHTO M294 and MP7 for HDPE resins and pipes. (See the included *Protocol for Third Party Validation of Manufacturer's Certification*.) The main features of the Protocol may be summarized as follows: Manufacturer enters into licensing agreements with PPI and an Administrator. Using AASHTO M 294/MP7 requirements, the Administrator tests the Manufacturer's product to verify compliance with the applicable standard. The Manufacturer will provide copies of test reports and other relevant information to the Administrator for review and verification of completeness and accuracy. Assuming that compliance with the Protocol requirement is demonstrated, the Administrator will so notify the Manufacturer. PPI will list the Manufacturer in a directory of participating Manufacturers. The Manufacturer is then eligible to use the Program Marks for his Administrator-validated Product. The Administrator will periodically inspect the applicant's place of manufacture to determine continuing compliance with the requirements of the program and the functioning of applicant's quality program.

In addition, AASHTO sponsors the National Transportation Product Evaluation Program (NTPEP). The NTPEP provides a complete set of test data that can be compared directly with the AASHTO specification requirements or the specific requirements of any agency for corrugated polyethylene pipe. The NTPEP requires that the manufacturer submit their quality assurance/quality control plan for review by the participating agencies. Under the NTPEP, State DOTs may inspect production facilities at any time to assure that they are complying with the requirements of the AASHTO specifications and their own QA/QC plan.

Both the PPI Third Party Certification Program and the AASHTO NTPEP are voluntary, although agencies and consultants have the right to require or specify participation in one or both plans as a prerequisite to providing pipe on their projects.

## **PPI's QC/QA Program**

### **General Description**

The Plastic Pipe Institute's Corrugated Polyethylene Pipe Quality Assurance/Quality Control Program is designed to give producers the responsibility for controlling the quality of product and to use the quality control information generated in the process of receiving certification from specifying agencies. It requires producers to

perform quality control sampling, testing and record keeping on the product. It allows specifying agencies to perform quality assurance sampling, testing and record keeping to confirm the performance of the producer's quality plan as set forth herein. It is the intent of the program that acceptance or rejection of product be based on the producer's total quality program.

## **QA/QC Program Requirements**

### **Basic Requirement**

Each plant shall have a program with three basic elements:

### **QA/QC Plan**

The producer will prepare a written quality control plan. The plan may be generic but must be site-specific. The plan will describe in detail how the producer proposes to control the equipment, materials and production methods to insure that the specified products are obtained. The plan will list the personnel responsible for production and quality control at the site. The following specific information will also be included in the plan:

- Identification of the physical location the plant, to include a description of the property site and references to the nearest identifiable points such as highways and towns.
- The method of identification of each lot of product during manufacturing, testing storage and shipment. Some specifying agencies may require special means of identifying and segregating product.
- The method of sampling, conditioning and testing of raw materials and finished product including lot sizes and type of tests performed as well as a description of equipment used to perform the tests. This plan will also include a method to trace the raw material lot to the finished product.
- A plan for dealing with quality control sample failures. This plan will include how the producer plans to initiate an immediate investigation and implement corrective actions to remedy the cause of the problem. This plan will also include the tests performed, the methods used to determine what tests are performed, and the person responsible for making the determination
- A loading and shipping control plan which includes a description of the methods by which the products are to be loaded and shipped. The plan will also include methods of ensuring that all products are properly identified.

### **Approved Laboratories**

The program requires all tests to be conducted at laboratories qualified to perform the required tests. Each producer may establish and maintain it's own laboratory

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for the specific performance of quality control testing. The producer will identify the location(s) of the testing laboratories. The equipment required for a qualified laboratory shall be capable of performing the required tests referenced by the applicable product specifications and industry standards such as AASHTO M252 and M294. Records on equipment calibration and maintenance and sample collection and analysis must be maintained at the laboratory.

#### **Quality Control Technician(s)**

The Quality Control Technician(s) shall report to the Plant Manager and have overall responsibility for implementing the Quality Control Program at the plant. All samples must be taken and tested by the Quality Control Technician, designated by the producer.

### **Interface between Producer and Specifying Agency**

#### **Scope**

The producer has total responsibility for establishing, maintaining and operating the QA/QC Program. The producer's QA/QC Program shall comply with the requirements outlined in this guideline. The Specifying Agency is responsible for monitoring the producer's implementation of the QA/QC Program to the extent that the Agency deems necessary.

In addition to complying with the requirements of this QA/QC Program, the producer's facility QA/QC Program shall comply with applicable national specifications and any additional requirements of the Specifying Agency.

If required as part of the monitoring activity, the Specifying Agency may perform sampling, testing and inspection activities at the producer's facilities. The Specifying Agency may take samples of the product at the producer's distribution yards.

#### **Annual Guarantee and Registration**

If required by the Specifying Agency, the producer will provide an Annual Guarantee and Registration in accordance with the requirements of the Agency.

### **Certification of Facility QA/QC Program**

#### **Basic Requirements**

The Specifying Agency may take the actions necessary to verify the producer's compliance with this QA/QC Program and Agency requirements. Verifying producer compliance with this program may involve monitoring basic elements.



**Facility QA/QC Program**

As part of the facility certification procedure, the Specifying Agency may review the facility QA/QC Program to verify compliance with the program outlined herein. The Specifying Agency may perform sampling and testing in accordance with applicable national specification and any supplemental requirements of that Agency.

**Laboratories and Sampling Areas**

The Specifying Agency may inspect all portions of the facility that perform sampling or testing activities for the purpose of verifying raw material and/or product compliance. The Agency may review test procedures, test and equipment records, and inspect testing equipment for compliance with Program and Agency requirements.

**Technician Qualifications and Performance**

The Specifying Agency may review the qualification of technicians involved with raw material or product sampling and testing to verify compliance with requirements of the QA/QC Program. In addition, the Agency may observe the technician's performance of sampling and testing procedures to verify compliance with the QA/QC Program.

**Raw Material and Product Quality**

To evaluate raw material and product quality, the Specifying Agency may require that comparable samples be taken and tested by both producer and Agency for the purpose of correlation testing. The results of this evaluation may be used by the Agency to establish a reference point for future correlation with the producer's raw material or product quality.

**Facility Certification**

If the Agency verifies the facility's compliance with Program and Agency requirements, the Agency may issue a Facility Certification. Each year, the Agency may perform any of the above evaluations deemed necessary and, if all the Evaluations verify compliance with program and Agency requirements, the Agency may renew the Facility Certification or approval.

**Agency Inspections**

Scheduled and random inspections by the Specifying Agency may be conducted at any time to verify facility compliance with Program and Agency requirements. During scheduled and random facility inspections, the Agency may take samples of raw materials and product for evaluation. If any portion of the Facility QA/QC

Program is determined to not be in compliance with Program and Agency requirements, the producer and Agency will work jointly to eliminate the deficiency and re-certify the facility.

### **Correlation Testing**

The specifying Agency may take samples of raw materials or product for correlation testing during any inspection of the facility. Product samples may be taken during visits to distribution yards or Agency maintenance or project sites. The raw material and product samples may be tested for the following physical properties:

## **Plant**

### **Material (Polyethylene)**

A Specifying Agency may sample incoming raw material during plant visits in order to evaluate polyethylene resins used for the production of pipe. The material sampled does not have to be the material that is to be used to produce pipe produced for that Agency. The evaluations conducted on samples from a lot of polyethylene resin may include:

- density
- melt index
- SP-NCLS

### **Product (Polyethylene Pipe and Fittings)**

Specifying Agency may sample pipe during plant visits. The evaluations conducted on pipe samples taken from pipe may include:

- pipe stiffness
- pipe flattening
- brittleness
- joint integrity

### **Other Locations**

The Specifying Agency may take pipe samples from distribution yards that may be tested for:

- brittleness
- pipe flexibility
- pipe stiffness
- pipe flattening

**Lot Sizes**

Quality assurance lot sizes for pipe 12 in. (300 mm) in diameter and smaller will be a minimum of 20,000 lineal feet (7000 m). Lot sizes for quality control samples for pipe larger than 12 in. (300 mm) in diameter will be a minimum of 5000 lineal feet (1500 m). The minimum lot quantities are applicable for sampling conducted at the producer's facility.

**Sample Identification and Record Keeping**

For sampling and testing performed by the Specifying Agency, it is critical that care be taken to properly identify samples and record test data accurately. Samples will be identified by a unique identification system that allows correlation with comparable samples taken by the producer. Quality Control test reports prepared on the samples taken at the producer's facilities shall include identification of the producer's production lot and QC tests.

**Evaluation of Test Results**

The results of the Agency's correlation testing will be used to evaluate the producer's laboratory and procedures. Material or product will not be rejected solely on the basis of testing by the Agency. If testing by the producer and Agency do not correlate, the producer and Agency will work jointly to identify the source of any significant variations in test results. The producer will record the results of all evaluations.

If the Agency's evaluation of the producer's QA/QC Program demonstrates non-compliance with the Agency requirements, the Agency and producer will perform additional tests on the questionable raw material or product. If Agency tests demonstrate that the raw material or product is non-compliant, the Resolution System defined in this program will be employed.

**Sampling and Testing Producers****Producer's Quality Control**

The producer's Quality Control (QC) samples are used by the producer to monitor the quality of product being produced and shipped.

**Standard Specifications**

The producer is responsible for all sampling and testing in accordance with these guidelines, applicable national specifications and supplemental requirements by Specifying Agencies.

**Raw Materials**

- Incoming raw material evaluations will be performed on all polyethylene resin used for the production of pipe. The incoming raw material evaluations will consist of a density and melt index test on each lot of polyethylene resin.
- A lot is defined as a collection of units of product manufactured under conditions of productions that are considered uniform. For each raw material shipment, the lot size will be defined by the resin supplier.
- A method of tracing the raw material lot to the raw material supplier will be provided.

**Finished Product (In-Plant)**

- Unit weight will be performed a minimum of one time per shift, per diameter, per machine.
- Wall thickness measurements for uniformity will be performed at the same frequency as the unit weight. Measurements will be performed with an approved measuring device such as calipers or micrometers in accordance with ASTM 2122.
- The producer will conduct continuous visual inspections on the exterior and interior wall for uniform production quality and workmanship.
- A method of tracing the finished product to the raw material will be provided.

**Referee Samples**

If the test result for a sample indicates the raw material or pipe does not comply with specification requirements, a referee sample will be immediately obtained by the producer. Referee samples are to be the same size, and taken in the same manner as the original sample. If the referee sample indicates the raw material or pipe complies with the specification requirements, the producer is to identify and record the reason for the original failure and then may resume normal testing procedures. If the referee sample indicates the raw material or pipe does not comply with the specification requirements, the producer will initiate an investigation to determine the cause of the failure.

The investigation will include the material, sampling and test procedures, equipment used in the production and testing of the material. If the cause can be attributed to any of the above categories, the producer will take corrective action to bring the raw material, procedure or equipment into compliance.

The producer will then record the corrective action on the test report, and take another referee sample for verification testing. If the second referee sample indicates the raw material or pipe meets the specification requirements, the producer will resume normal testing procedures.

## **Notification of Non-Compliant Product**

- The producer will immediately notify the Specifying Agency of any test failures on pipe shipped to or in transit to the Agency project or facility or to a location not under the producer's control.
- The producer will identify, segregate and dispose of any remaining inventory under his control that does not comply with applicable specifications.
- The producer will maintain records regarding disposition of non-compliant product.

## **Sample Identification and Record Keeping**

- Sample identification and record keeping are critical.
- Care must be taken to properly identify samples and record test data accurately.
- Producer's Quality Control samples will be uniquely identified to provide traceability.
- Quality Control and Quality Assurance records will be retained by the producer for a minimum of two years, and made available to the Specifying Agency upon request.
- Quality Control test reports will include the lot identification.
- Test reports will indicate the action taken to resolve non-compliant raw material or product.

## **Correlation and Resolution System**

### **Correlation**

The producer's Quality Control test results and the corresponding Specifying Agency test results will be evaluated to correlate the performance of the sampling and testing procedures and results. If the results of the Correlation tests are not in agreement, an investigation will be made to determine the source of the difference. The investigation will include a review of the sampling and testing procedures and testing equipment of the producer and the Specifying Agency. The results of the investigation will be recorded on the appropriate Plant Quality Assurance form.

### **Resolution System**

If any pipe, fitting or coupling fails to conform with the applicable specifications, it may be re-tested to establish conformity. Individual test results will be used to determine conformity. The purchase agreement between the purchaser and producer of the product and the requirements of the Specifying Agency will determine the methods utilized to resolve product quality concerns.

## **Appendix A**

### **Quality Control Test Forms**

Each plant will submit copies of all final quality control test report forms used with the plant's quality control plan. Test reports shall contain the following information:

- Name and address of the testing laboratory and appropriate individual.
- Identification of the report and the date issued.
- Identification of the lot represented by the sample.
- Description, identification and conditions of the test sample.
- Date of receipt of the test sample.
- Date(s) of test performed.
- Identification of the standard test method used and a notation of all known deviations from the test method.
- Test results and other pertinent data required by the standard test method.
- Identification of any test results obtained by a subcontractor.

## **Appendix B**

### **Sampling and Test Procedures**

The following is a partial list of common test names used in Specifying Agency manuals and corresponding ASTM or AASHTO designations. This list is not intended to be all inclusive, nor is it intended to be a list of all tests required for certification of the products and raw materials covered by this program.

### **Quality Control Tests**

- Raw Materials
  - Density (ASTM D 1505)
  - Met Index (ASTM D 1238)
  - SP-NCLS (ASTM F 2136)
- Pipe
  - Brittleness (ASTM D 2444)
  - Flexibility – Pipe 10 in. (250 mm) in diameter or smaller (AASHTO 252)  
Type C/CP
  - Elongation (AASHTO M252)
  - Stiffness (ASTM D 2412)
  - Flattening (ASTM D 2412)
  - Dimensions (ASTM D 2122)
  - Perforations (AASHTO M252)
  - Unit Weight

# **PLASTICS PIPE INSTITUTE THIRD PARTY PRODUCT CERTIFICATION PROGRAM**

## **PROTOCOL FOR THIRD PARTY VALIDATION OF MANUFACTURER'S CERTIFICATION**

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### **1.0 Introduction**

This Certification Protocol is part of a third party certification program for HDPE virgin resin and HDPE corrugated pipe sponsored by Corrugated Polyethylene Pipe Association (CPPA), a division of the Plastics Pipe Institute, Inc., (PPI). This Certification Protocol constitutes part of the Agreements entered into by the Manufacturer, PPI, and the Administrator.

Under this program, a Manufacturer certifies that corrugated polyethylene pipe it produces under this program meets or exceeds the requirements in AASHTO M 294/MP7 (the Standard). The Administrator validates the Manufacturer's certification through appropriate testing and inspection of Manufacturer's virgin HDPE resin and HDPE corrugated pipe, and review of Manufacturer's QC program.

### **2.0 Definitions**

- 2.1 Administrator:** A third party agency designated and authorized by PPI to validate Manufacturer's certification on behalf of PPI in accordance with this certification protocol.

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- 2.2 Conformance:** Compliance with specified requirements.
- 2.3 Control:** To exercise authority over and regulate.
- 2.4 Corrective Action:** Measures taken to rectify conditions adverse to quality and to eliminate or prevent recurrence.
- 2.5 Day or Days:** In measuring time, the term “day” or “days”, as used in this Certification Protocol, refers to calendar and not business days.
- 2.6 Documentation:** Recorded information.
- 2.7 Manufacturer:** Any organization producing products or materials for certification under this third party certification protocol. For purposes of this protocol Manufacturers shall be either pipe producers or resin producers.
- a. Pipe producer – An applicant who makes corrugated polyethylene pipe as specified by AASHTO M 294, Standard Specification for Corrugated Polyethylene Pipe, 300- to 1200- mm Diameter, or AASHTO MP7, Standard Specification for Corrugated Polyethylene Pipe, 1350 and 1500 mm Diameter.
  - b. Resin producer – An applicant who makes HDPE virgin resin in accordance with the requirements of AASHTO M 294, Standard Specification for Corrugated Polyethylene Pipe, 300- to 1200- mm Diameter, or AASHTO MP7, Standard Specification for Corrugated Polyethylene Pipe, 1350 and 1500 mm Diameter.
- 2.8 Product:** Corrugated polyethylene pipe as defined in Section 4.2. Product types are corrugated (C), smooth (S) and profile (D). Perforated classes are Class II, Class I and non-perforated.
- 2.9 Program Mark:** As used in this Certification Protocol, the term “Program Mark” refers to a permanent affixation or printing on a pipe, or labeling of a resin box, indicating that the resin or pipe is certified under this Protocol. The Program Mark may also be used in promotional literature as defined in Section 3.8. The PPI Certification Oversight Committee (PPI staff and selected members of PPI) determines the design and information in the Program Mark.



- 2.10 **Quality Assurance:** Those planned, systematic, and preventive actions that are required to ensure materials and Products will meet specified requirements.
- 2.11 **Quality Control:** Inspection, testing, or examination to ensure materials and Products were produced to conform to specified requirements.
- 2.12 **Quality Program:** An established, documented system to ensure quality.
- 2.13 **Validation:** The process by which a separate determination is made by the Administrator that Manufacturer's certification is in accordance with the Protocol requirements.
- 2.14 **Verify:** Determine that an activity or condition conforms to specified requirements.

### 3.0 General

- 3.1 **Overview of Program:** The main features of the Protocol may be summarized as follows. Manufacturer enters into licensing agreements with PPI and the Administrator. Using AASHTO M 294/MP7 requirements, Administrator tests Manufacturer's Product to verify compliance with the applicable Standard. Manufacturer will provide copies of test reports and other relevant information to the Administrator for review and verification of completeness and accuracy. Assuming that compliance with the Protocol requirement is demonstrated, Administrator will so notify Manufacturer. PPI will list Manufacturer in a directory of participating Manufacturers. The Manufacturer is then eligible to use Program Marks for his Administrator-validated Product. Administrator will periodically inspect the applicant's place of manufacture to determine continuing compliance with the requirements of the program and the functioning of applicant's quality program. Administrator and PPI both agree to protect the confidentiality of information they receive as detailed in the agreement with Manufacturer.
- 3.2 **Participation:** Any Manufacturer of HDPE resin or HDPE corrugated polyethylene pipe as defined in AASHTO M 294/MP7 may participate in the program to certify one or more Products under this program. Applicants must enter into an Agreement with the Administrator and PPI. For a pipe Manufacturer having more than one facility, each facility producing certified Product(s) must participate in the program. As described elsewhere in this Certification Protocol, each participating facility is subject to inspection for the certified Product(s) produced on site.

### 3.3 PPI Functions:

- a. The PPI Certification Oversight Committee guides PPI activity in connection with the Protocol subject to the approval of the PPI Board of Directors, President, and legal counsel.
- b. PPI will license the Manufacturer to use the certification Mark on certified Product provided the Manufacturer complies with all the requirements set forth in the licensing Agreements with both PPI and the Administrator as well as this Certification Protocol.
- c. A diligent effort has been made to select appropriate standards and conduct a reliable program. However, PPI makes no representation, warranty or guarantee in connection with the standard or the program and expressly disclaims any liability or responsibility for loss or damage resulting from participation, for any violation of federal, state, or municipal regulation with which the underlying AASHTO standard may conflict, or for the infringement of any patent resulting from the use of the AASHTO standard. PPI shall maintain a current list of certified HDPE resins and notify participating Manufacturers when changes are made. PPI shall also maintain a list of Manufacturers' certified Products. PPI shall promptly advise the Administrator and all participating Manufacturers when revisions or changes have been made to the Standard, and the effective date of implementation under this Protocol. The PPI Certification Oversight Committee shall review the Certification Protocol on an annual basis. The PPI Certification Oversight Committee shall designate the Administrator.

- 3.4 Administrator Functions:** The Administrator shall perform the administration, testing and validation functions under the Protocol. Administrator will conduct in-plant inspections, sample and test pipe and virgin HDPE resin (or confirm resin certification) to validate Manufacturer's certification, develop and review test data and perform other administrative services. Administrator shall verify that an applicant has a functioning quality program. Administrator will notify program participants promptly as to how it will manage re-testing of certified Product(s) and validation of new Product(s).

### **3.5 Applicable Standards:**

- a. The Standards designated for this Protocol are AASHTO M 294 and MP7. The requirements from these Standards are outlined in Section 4.2.
- b. Questions as to the applicability of the designated Standard to Manufacturer's Products are to be determined by Administrator. Administrator validation applies to the criteria as defined in AASHTO M 294/MP7; Administrator will disregard internal company criteria.

### **3.6 Revisions to Standard:**

- a. When AASHTO revises the Standard, the Administrator, consistent with this Certification Protocol, shall notify program participants of how they will handle testing and validation of Products.
- b. When a revised Standard is published, a phase-in period as defined in Section 3.6 (c) will be allowed to accommodate compliance with any revision to the Standard. For the purposes of this Certification Protocol, a revision to the Standard shall be considered published when it is printed in its final form and generally available to the public through AASHTO.
- c. Testing will be consistent with the revised Standard upon its publication. Testing to the previous specifications or most recent prior revision will be accepted for a period of ninety (90) days after publication of the revision. All certifying Products must be produced in compliance with the latest revision of the Standard within six (6) months of the publication of the revision unless the Administrator notifies participants that a longer period is needed for testing. The Administrator can waive re-testing under the revised Standard when previous test results adequately demonstrate compliance with the revised Standard or if the revised Standard establishes less stringent criteria.

### **3.7 Program Mark:**

- a. By affixing the Program Mark, the resin or pipe Manufacturer is certifying that its products (resin or pipe) have been manufactured, sampled, and tested in accordance with this Protocol and comply with its requirements. In addition, the use of the Program Mark indicates that resin or pipe Manufacturer has obtained approval from PPI to use the Program Mark.

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- b. The Program Mark represents that the resin or pipe Manufacturer is producing a product that is a faithful representation of the tested and certified product in design, construction and fabrication. Neither PPI nor Administrator represents, warrants or guarantees that products bearing the Program Mark do in fact conform to AASHTO M 294/MP7 requirements.
- c. Program Marks are to be printed on or affixed to each length of pipe for Manufacturer-certified Products. Manufacturer shall comply with applicable AASHTO marking requirements
- d. The Program Mark must be used and may not be modified. The Program Mark shall not be used or placed in such a manner as to imply any other endorsements or certifications by PPI or the Administrator.
- e. The Resin or pipe Manufacturer shall not knowingly release a product for sale with the Program Mark affixed to a product that does not meet the requirements of AASHTO M 294/MP7. If a resin or pipe Manufacturer knowingly releases such products for sale that do not comply with the requirements of AASHTO M 294/MP7, all previously certified product in the non-compliant facility will be automatically de-listed pending inspection and re-certification under Sections 5.5 or 7.5.

### **3.8 Manufacturer Literature:**

- a. Resin or pipe Manufacturers are permitted to use the Program Mark in their promotional materials and literature only after an appropriate agreement between the resin or pipe Manufacturer, PPI, and the Administrator is executed and the resin or pipe are certified under this Protocol.
- b. To avoid misunderstanding, references to certification in resin or pipe Manufacturer literature must specify the particular products that are certified, unless all of the products mentioned in the literature or advertising are certified under this Protocol.
- c. Participating resin or pipe Manufacturers shall provide PPI with copies of current literature and promotional materials that refer to this Certification Protocol. PPI shall review this resin or pipe Manufacturer literature and determine Protocol compliance.

## 4.0 Pipe Product Certification

4.1 **Manufacturer's Request:** Manufacturer will contact Administrator to coordinate pipe Product testing for initial Product certification. The PPI designated Administrator and Manufacturer execute a valid licensing Agreement under this Protocol in order to conduct testing. A copy of the Manufacturer's quality control program complying with the Protocol Appendix I shall be provided to the Administrator at the time initial certification is sought, and shall be available for Administrator review during plant inspections or as requested by the Administrator.

### 4.2 Product Certification Requirements and Product Attribute Groupings:

- a. Product requirements are in AASHTO M 294 and MP7. Pipe inside diameter requirements are for the minimum inside diameter.
- b. Each unique corrugated polyethylene pipe Product that a Manufacturer desires to be certified under this Protocol should be separately tested. For initial certification, and for future plant audits, Administrator will test every pipe diameter. Within each pipe diameter, each product type – corrugated (C), smooth (S) and profile (D) – must be tested. For initial certification only, within each product type, see table below to determine priority for testing perforated classes. When one perforated class passes, no further testing is required within that product type: Priority Perforated class
  - (1) Class II Perforated
  - (2) Class I Perforated
  - (3) Non Perforated
- c. For initial Product certification purposes, it does not matter at which of the Manufacturer's plants the Product is made, provided that the Manufacturer provides an assurance that each of the facilities that produce such Products use the same or similar manufacturing procedures.
- d. Products with similar attributes that can logically be placed in a Product attribute group may be certified based on the testing of a representative Product or Products from the Product attribute grouping. Because it is not practical to define the term Product attribute grouping precisely and because the logical grouping of Products may vary based on the characteristic being assessed, Manufacturers should contact the Administrator to discuss and agree upon the propriety of the Manufacturer's definition of a particular Product attribute group and the necessary associated testing.

**4.3 Samples:** Pipe samples must be submitted to Administrator in a sufficient quantity to conduct all testing, with:

- a. Information showing Manufacturer's name and description of Product.
- b. Information demonstrating that the HDPE resin used to fabricate the Product has been certified in accordance with this Protocol.

**4.4 Product Test Report:** The Product test report will include the following information:

- a. Manufacturer's Name and Address
- b. Product Identification
  - (1) Product name,
  - (2) Product series or model number
- c. Product Description
  - (1) Product Type
  - (2) Product dimensions (minimum inside diameter, mm; wall thickness, mm; length, m)
  - (3) Perforation Class (if applicable)
- d. Test Results
  - (1) For each test contained in the specification, the specification paragraph number, the test description, the reference paragraph number, the reference test method, the applicable criteria measurement for the specification, and the test results are to be listed.
  - (2) The following is the list of properties to be tested. The test report shall verify compliance achieved (pass/fail), or that the test was not performed where the laboratory does not complete the test. (Parenthetical references are to the relevant sections of AASHTO M 294/MP7).
    - (a) Minimum inside diameter (7.2.3)
    - (b) Liner thickness (7.2.2)
    - (c) Length (7.2.4)
    - (d) Perforations (7.3)
    - (e) Pipe stiffness (7.4)
    - (f) Pipe flattening (7.5)
    - (g) Environmental stress cracking (7.6)
    - (h) Brittleness (7.7)
    - (i) Joint integrity (9.6) (for fittings)

- e. Related documentation submitted by Manufacturer.
- f. An authorized laboratory representative signature.
- g. Each test report and its related documentation constitute the basic reference material for validation by the Administrator, through in-plant inspection of subsequent manufacture of the Product, that such production is a faithful reproduction in all respects of the certifying specimen and in compliance with the applicable specifications.

#### **4.5 Notice of Product Certification:**

- a. A notice will be sent to Manufacturer stating the date on which certification has been granted and the Product designation.
- b. The Notice of Product Certification shall contain the following information:
  - (1) Manufacturer's name, pipe diameter, pipe type and all appropriate classes as described in Section 4.2;
  - (2) Report number and date.
  - (3) A statement that the quality control program is satisfactory and meets minimum requirements.

#### **4.6 Notice of Product Failure to Certify:**

- a. If the tested Product does not comply with all the requirements of the Standard, a notice will be sent to Manufacturer by certified mail, return receipt requested, stating that its Product(s) did not certify under the Protocol. De-certification based on unsatisfactory inspection is addressed separately in Section 7.0.
- b. The notice will include:
  - (1) Manufacturer's name, pipe diameter, pipe type and all appropriate classes;
  - (2) Report number and date; and
  - (3) The specific test failure or failures on which non-compliance is based.

#### **4.7 Modification of Certified Products:**

- a. When design changes are made in a certified Product and Manufacturer believes that this change will still result in a Product equivalent to the certified Product, Manufacturer shall notify the Administrator. Manufacturer shall submit a summary of properties in Section 4.2 to the Administrator to demonstrate compliance.
- b. This process also applies to changes in Product formulation (raw materials), except that substitution of PPI listed resins from different suppliers is not considered a change in the Product. Equivalency can be established by supplier technical data, pipe producer testing, or generally recognized industry practices.
- c. The legal responsibility for the authenticity of submitted data rests on the Manufacturer. This procedure is only intended for use in cases of design changes or Product formulation changes deemed not to affect compliance.

#### **4.8 Recognition of Prior Tests:**

- a. At the discretion of Administrator, results from tests conducted before this Protocol became effective, or tests conducted before a revision to AASHTO M 294/MP7 is published, may be deemed to satisfy the applicable testing requirement provided that:
  - (1) The tests and reports fully comply with the Product Certification Requirements of Section 4.2 and provide the information needed by Administrator to validate Manufacturer's certification under AASHTO M 294/MP7;
  - (2) Administrator deems the testing laboratory to be certified to perform the tests conducted; and
  - (3) Manufacturer certifies that there has been no change in the Product or production processes that would affect the Product's compliance. The Administrator may request additional information or evidence supporting the request for recognition of prior test results.

### **5.0 Resin Certification**

#### **5.1 Initial certification:**

- a. Resin Manufacturer contacts the Administrator to request that their HDPE resin be listed by PPI as a certified resin.



- b. Administrator conducts material testing per AASHTO M 294/MP7, Section 6.1 to assure compliance with these requirements. In addition, Administrator conducts SP-NCTL testing to assure resin meets the 15% yield stress/24 hour requirement.
- c. Administrator notifies resin Manufacturer and PPI that all requirements have been met. PPI will then include the resin on the certified HDPE resin list. A corrugated pipe Manufacturer must use a resin(s) that is on the PPI certified resin list.
- d. The corrugated pipe Manufacturer may also independently request PPI listing of their private formulation made by in-plant dry blending two or more virgin PE resins. The pipe Manufacturer must reveal to the Administrator and to PPI the specific resin components and their ratio for this formulation. Administrator tests a melt blend of the formulation to assure that all material requirements of AASHTO M 294/MP7 Section 6.1 have been met (while the individual components may not meet the AASHTO requirements, a melt blend of the components must meet the requirements). Administrator notifies pipe Manufacturer and PPI that all requirements have been met. PPI will then include this material formulation in the certified HDPE resin list. Only the pipe Manufacturer that owns this private formulation may use it for corrugated pipe production. The PPI listing is for this formulation only. A change in either of the HDPE resins, or the supplier used in the blend, would require another listing.

**5.2 Non-compliance:** If any listed HDPE resin fails to comply with the requirements of the specification when tested by the Administrator during a pipe plant audit, the following provisions will apply:

- a. Administrator will report this to the resin Manufacturer and the pipe Manufacturer and identify the part of the specification the HDPE resin does not comply with.
- b. Resin Manufacturer must take corrective action as soon as possible and reply with an action plan within fourteen (14) days of notification that the corrective action has or will be taken.
- c. A retest for the HDPE resin that was not in compliance will be scheduled as soon as reasonably possible after corrective action is taken, but no longer than thirty (30) days after the corrective action.

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- d. If the resin Manufacturer and Administrator do not agree on the retest results, PPI may select another laboratory to conduct the test on the suspect HDPE resin – see Section 8. PPI will make the final decision on these discrepancies. Any issues related to rounding will follow the guidelines of ASTM E 29. If the HDPE resin is determined to be in non-compliance, PPI will remove that resin from the certified list. PPI will notify all pipe Manufacturers in the program that this resin is no longer certified. The Administrator and pipe Manufacturer shall determine the extent of non-compliance for affected Product in inventory and determine what action, if any, should be taken with respect to its disposition.
- e. For the resin Manufacturer to be reinstated on the PPI certified list with the resin deemed to be in non-compliance, that resin is treated as if it were a new product.

## **6.0 Administrator Inspection of Pipe Manufacturing Facilities**

**6.1 Frequency:** Administrator will conduct its first pipe plant inspection within ninety (90) days after the pipe Manufacturer has been certified. Each year including the first year Administrator will perform a minimum of one (1) in-plant inspection per Manufacturer. Administrator shall inspect each Manufacturer's pipe plant at least once during a five-year period. If the Manufacturer has more than four plants, the Administrator shall not inspect more than 25% of the Manufacturer's plants in a given year (rounded up to higher whole number). If a plant has not been audited in a given calendar year, they shall submit either an internal audit summary or results of another 3rd party audit to the Administrator by April 1 of the following year to demonstrate that plant's conformance to the PPI Protocol. The Administrator shall test each Manufacturer's Product at least once in a five-year period. If the Manufacturer has more than four Products, the Administrator shall not test more than 25% of the Manufacturer's Product line in a given year (rounded up to higher whole number). A Product is defined as each pipe diameter and each pipe type (C, S and D). At least one Product shall be tested each plant audit, regardless of the 25% limit. These inspections will be unannounced visits made during normal business hours. Manufacturer will provide Administrator with a schedule of normal business hours and holidays, along with Product size range produced at each plant. In the event that Administrator makes an unannounced visit for the purposes of this program during normal business hours, and the pipe plant is closed, Manufacturer will be billed, at the discretion of Administrator, for the visit and revisit.

**6.2 Scope:** Administrator's representative will be equipped with copies of the current AASHTO M 294/MP7, other standards or references referred to by AASHTO M 294/MP7, this Certification Protocol, test reports, documentation and other data on Manufacturer's certified Products and any other necessary materials. An integral part of each in-plant inspection will be an examination of Manufacturer's in-house quality program and records. It is the responsibility of Manufacturer to maintain an in-house quality program as outlined in Section 9.0 and Appendix I of this Certification Protocol.

**6.3 Inspection Testing:**

- a. Inspection testing will be performed on a sample or samples selected at random by Administrator from the Product line either in production (with corresponding resin) or in inventory at pipe Manufacturer's facility (with corresponding production records). Administrator's inspector will select test samples, appropriately mark them, and see that they are prepared for testing without alteration.
- b. Administrator shall use the criteria specified in Sections 4.4.d.2 and 5.2 to verify compliance.
- c. The Product samples selected may be transported to the Administrator's laboratory. If Manufacturer has its own test facilities that are acceptable to Administrator, testing of Manufacturer's own pipe in its own facility is permissible provided that Administrator's inspector or representative witnesses it.
- d. The cost of these inspection tests will be borne by Manufacturer.

**6.4 Immediate Corrective Action:** If the Administrator determines that a Product is not in compliance during a plant inspection, the pipe Manufacturer will be given the opportunity to correct it immediately. The pipe Manufacturer must take immediate corrective action, and must formally inform the Administrator within seven (7) days from the date of the receipt of a notice of non-compliance (date of plant inspection) of the immediate remedy. If the Administrator approves this immediate remedy, the Manufacturer may continue marking the Product as certified. If the Administrator does not approve the immediate remedy, or if the Manufacturer does not notify the Administrator within seven (7) days, the Administrator will send a notice of de-certification consistent with Section 4.6 and/or 7.0 to the Manufacturer with a copy to PPI.

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## 6.5 Inspection Reports:

- a. Administrator will communicate with Manufacturer regarding any matters requiring clarification or other action on the part of Manufacturer. Administrator will discuss its findings with Manufacturer's personnel at the time of the on-site inspection; this is normally done at a closing conference. All official comments or decisions with respect to compliance or non-compliance of a certified Product will be confirmed in writing from the Administrator within thirty (30) days of the site visit.
- b. The inspection report is confidential and is mailed only to the pipe Manufacturer or designated representative, with the exception that a copy will be made available to the appropriate PPI staff or counsel upon request.

## 7.0 De-certification after Administrator Inspection and Re-certification

**7.1 Administrator's Notice of Non-Compliance:** If the Administrator finds a Product to be in non-compliance after a pipe plant inspection, the Administrator will report this to the pipe Manufacturer via certified mail, return receipt requested with a copy to PPI, within ten (10) days after the determination of the non-compliance. Examples of non-compliance include failure to; (1) make faithful reproductions of tested Products, (2) follow this Certification Protocol or the underlying agreements, (3) meet the performance criteria in AASHTO M 294/MP7, or (4) maintain a QA/QC program. Administrator will completely describe the reasons for non-compliance of the Product and inform the Manufacturer of the problem and of the corrective action required. If the Manufacturer and Administrator do not agree on the test results, PPI may select another laboratory to conduct the test on the suspected Product – see Section 8. PPI will make the final decision on these discrepancies. Any issues related to rounding will follow the guidelines of ASTM E 29.

**7.2 Manufacturer Notice of Corrective Action:** Upon formal receipt of a notice of non-compliance, the pipe Manufacturer must cease applying Program Marks to the Product listed in the notice of non-compliance. The Administrator and Manufacturer shall determine the extent of non-compliance for this Product in inventory and determine what action, if any, should be taken with respect to its disposition. To resume participation in the program, the Manufacturer must take corrective action as soon as possible and reply within fourteen (14) days that the corrective action has been taken.

In addition, a retest for this Product deemed to be in non-compliance must be scheduled within thirty (30) days after first receiving formal notification of this non-compliance. All costs for this extra Product testing will be borne by the Manufacturer. The Manufacturer may not resume marking the Product as certified under this Protocol until the Administrator approves the corrective action and the retest is in compliance; any Product manufactured before this occurs shall not be marked as certified. If the Administrator does not approve the immediate remedy or if the retest still results in non-compliance, the Administrator will inform the Manufacturer with a copy to PPI and the de-certification notice will be consistent with Section 4.6. If the Product is determined to be in non-compliance, PPI will remove that Product from the certified Product list.

**7.3 Administrator's Notice of Intentional Non-Compliance:** This paragraph addresses findings of intentional non-compliance, which leads to immediate de-certification of all Products found to be intentionally non-compliant. Examples of intentional non-compliance are:

- a. use of a non-PPI listed HDPE resin,
- b. repeated non-compliance by the Manufacturer, or
- c. falsification of records.

The Administrator will report these findings via certified mail to the Manufacturer, return receipt requested, with a copy to PPI within twenty-four (24) hours after a determination of intentional non-compliance. The Administrator will outline the specifics of the findings of intentional non-compliance in the certified letter. Upon receipt of a Notice of Intentional Non-Compliance, the Manufacturer must cease applying Program Marks to all Products found intentionally non-compliant, and make a good-faith effort to recall all non-compliant Products. In addition, all intentionally non-compliant Products in the care and custody of the Manufacturer must have the Program Marks removed or obliterated. PPI will immediately remove all intentionally non-compliant Products from the list of certified Products.

**7.4 Suspension of Manufacturer Literature:** A final determination of intentional non-compliance will require suspension of the use of Manufacturer literature that represents the intentionally non-compliant Product as certified under this Protocol. Manufacturer will discontinue distribution or use of the literature and remove or obliterate all inappropriate references from literature in the Manufacturer's care, custody, and control.

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**7.5 Requalification:** To re-certify the excluded Product following intentional non-compliance, the Manufacturer must reapply and submit the same full testing and inspection data that apply to new Products. In the event of an intentional non-compliance, the manufacturer's certification under this protocol shall be suspended for a period of six months. Upon conclusion of the six month suspension, the manufacturer may apply for product certification under this protocol through the submittal of testing and inspection data as required for newly certified products.”

## **8.0 Manufacturer-Administrator Disagreements**

A thorough understanding of this Certification Protocol and proper operation of the program should minimize any disputes or disagreements. If, however, a disagreement or dispute arises between a resin or pipe Manufacturer and Administrator concerning the certification of a Product or other aspects of this program, the resin or pipe Manufacturer may request that the PPI Executive Director review the Administrator's determination.

**8.1 Procedure and Timing of Review:** Manufacturer-Administrator disagreements shall be handled as follows:

- a. On receipt of written notice of de-certification, the pipe or resin Manufacturer has seven (7) days to notify PPI and the Administrator that Manufacturer is seeking review of the Administrator's determination. The resin or pipe Manufacturer's notice must be in writing and contain sufficient information to accurately identify the factual background, the nature of the dispute, and the decision or action sought.
- b. After receipt of Manufacturer's notice, Administrator has seven (7) days to submit materials to PPI supporting the Administrator's determination.
- c. Within fourteen (14) days of receiving resin or pipe Manufacturer's notice, PPI will form a review panel, whose members shall include the PPI Executive Director, PPI Counsel, and other neutral qualified individuals with pertinent laboratory, technical, or industry experience. The PPI Executive Director shall chair the review panel and determine the panel's composition in consultation with PPI Counsel.

- d. The review panel may, at its discretion, hold hearing(s) on the issues raised in Manufacturer's notice. The PPI review panel will promptly inform the PPI Certification Oversight Committee of the disagreement, and seek any guidance or comments that the PPI Certification Oversight Committee might wish to make. The review panel will strive to reach a determination within thirty (30) days after receipt of Manufacturer's notice.
- e. If the review panel has not reached a determination within thirty (30) days after receipt of Manufacturer's notice, the PPI Executive Director shall so inform the President of PPI.
- f. If the review panel has not reached a determination within forty-five (45) days after receipt of Manufacturer's notice, the PPI Executive Director, with advice of PPI Counsel, shall render a final determination on Manufacturer's request. In the event that the PPI Executive Director is unavailable or incapacitated, the person empowered to act as President will make a final determination, provided that person has no conflicting commercial interest, such as being employed by a competing company or being a past employee of the contesting Manufacturer. In this case, the Vice President will make the final determination.

**8.2 Marking During Review Process:** Except when it appears to the PPI Review Panel that the alleged defect or other deficiency may have a significant adverse effect on the quality or performance of the pipe in question, the resin or pipe Manufacturer may continue to mark the Product in question during the review process. If de-certification is sustained by PPI, Manufacturer will cease marking the de-certified product. Any master list of certified products will be changed promptly if de-certification is upheld.

## **9.0 Quality Program**

Manufacturer shall prepare and maintain a written (hard copy or electronic) QA/QC program to ensure that the quality of Products is in accordance with the requirements of the underlying agreements, this Certification Protocol Appendix I and AASHTO M 294/MP7. When establishing its quality program, each Manufacturer should include elements that it considers

necessary to assure that Products meet the requirements of the standard and other quality criteria. The Manufacturer shall also provide information that demonstrates tracability of the pipe to the certified resin. A copy of the quality program shall be provided to the Administrator at the time initial certification is sought and shall be available for Administrator review during plant inspections or as requested by the Administrator.

## **10.0 Miscellaneous**

- 10.1 Public Statements and Confidentiality:** PPI and the Administrator will not make any public comments on the status of a particular Manufacturer's Products or test results except to note whether Manufacturer's Products appear in the program directory of certified Manufacturers. Special care must be taken to ensure that no comments are made concerning the status of any Manufacturer's Product during the testing and certification period. At no time shall public comments be made concerning Manufacturers who chose not to participate in this program. As used here, "public comments" include statements at PPI meetings. PPI and Administrator are obliged to maintain the confidentiality of proprietary information received from participating companies. This obligation is detailed in the formal agreement between PPI and the Administrator, and in the individual agreement between Manufacturer and the Administrator and PPI.
- 10.2 Directory:** Administrator will report monthly to PPI on companies and Products certifying under the program as well as changes or de-certifications. PPI will prepare a list or directory of certified HDPE resins and Manufacturers whose Products are certified under the program. The directory will be revised periodically to add newly certified Products or Manufacturers and delete discontinued Products or decertified Manufacturers.
- 10.3 Use of Non-participating Products:** This program is not intended in any way to inhibit the purchase or use of Products from companies not approved to use the Program Mark.
- 10.4 Patent Rights:** Nothing contained in this program is to be construed as granting any rights, by implication or otherwise, for the manufacture, sale, or use in connection with any method, apparatus, or Product covered by patents, nor as insuring anyone against liability for infringement of patents.
- 10.5 Fees:** Manufacturer is required to pay promptly any applicable fees due to PPI or the Administrator, or other costs as described in the underlying



Agreement or this Certification Protocol. Failure to pay fees per invoice terms will subject Manufacturer to de-certification or exclusion from the program.

**10.6 Modification of Guidelines:** The PPI Board of Directors will approve all revisions to this Certification Program

## **11.0 Appendix I**

### **11.1 Quality Control Plan:**

- a. It is the responsibility of the Manufacturer to control the quality of the Products produced and to provide the quality control information needed for acceptance by the buyer/user. The Manufacturer is required to perform quality control sampling, testing and record keeping on all products they produce. All Products produced by the Manufacturer must meet all the requirements of the standard specifications, which for corrugated polyethylene pipe are AASHTO M294/MP7. Since each Manufacturer is knowledgeable about their manufacturing process and Product's history, each Manufacturer determines their appropriate quality control testing frequency. Suggested minimum frequencies for tests outlined in Section 4.4.d.(2) are:
  - (1) Minimum inside diameter once per week
  - (2) Liner thickness once per week
  - (3) Length once per day
  - (4) Perforations once per week
  - (5) Pipe stiffness three times per week
  - (6) Pipe flattening three times per week
  - (7) Environmental stress cracking once per production run
  - (8) Brittleness three times per week
  - (9) Joint integrity (for fittings) once per production run
  
- b. The Manufacturer must supply to the Administrator a written quality control plan that details how the Manufacturer will control the equipment materials, and production methods to insure that the specified products meet the requirements of AASHTO M294/MP7. The following information must be included in this quality control plan:
  - (1) Provide a list of manufacturing facilities and location of plants.
  - (2) Provide a list of the applicable Products produced at each plant.

- (3) Provide the name and title of the individual responsible for the quality control program at each plant.
- (4) Identify the method of sampling and testing of raw materials and Product including the lot size and tests performed.
- (5) Designate the frequency for each test conducted by the Manufacturer.
- (6) Designate the methods used to identify each lot of material during manufacturing, testing, storage and shipment.
- (7) Identify program for handling nonconforming product (resin or pipe) and investigation and corrective action procedures to remedy the problem.

### **11.2 Annual Update**

- a. An annual update is required for all plants that were not subject to an Administrator audit during the calendar year. This update will assure the Administrator that all requirements of AASHTO M 294/MP7 were met for all the certified Products by summarizing results of QC tests in accordance with the Manufacturer's QC plan.
- b. The Manufacturer must submit this annual update to the Administrator by April 1 of the following year.
- c. The Administrator will review the Manufacturer's annual update to verify that the quality control plan has been implemented and is being followed.

### **11.3 Sampling and Testing**

- a. The quality control plan approved for each Manufacturer and/or Manufacturer's location shall detail the methods and frequency of sampling and testing for all raw materials and products purchased or manufactured at that location. All testing shall be in accordance with current specifications and procedures referenced in AASHTO M294/MP7.
- b. Samples of materials and pipe may be taken by the specifying agency.
- c. Specifying agency may require annual third party independent assurance tests.
- d. Samples must be identified for record keeping.

- e. Manufacturer's Quality Control samples are to be uniquely identified by producing plant.
- f. Quality Control and Quality Assurance data are to be retained by the Manufacturer for two years and made available to the specifying agency upon request.
- g. Quality Control test reports shall include the lot identification.
- h. Unless requested at the time of ordering, test reports do not have to be filed for specific projects.
- i. Reports shall indicate the action taken to resolve non-conforming product.