Standard Practice for

NTPEP Evaluation of HDPE (High Density Polyethylene) Thermoplastic Pipe

AASHTO Designation: [Number]
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1. SCOPE

1.1 This standard practice covers the requirements, auditing and testing criteria for the National Transportation Product Evaluation Program (NTPEP) evaluation of HDPE (High Density Polyethylene) Thermoplastic Pipe Manufacturers. The National Transportation Product Evaluation Program (NTPEP) serves the transportation agencies of the American Association of State Highway and Transportation Officials (AASHTO).

1.2 The purpose of the program is to establish a list of Manufacturers and products that conform to the quality control and product testing requirements of this program. AASHTO transportation agencies can then use this information in their quality assurance program for Manufacturer/product acceptance. This may include utilizing this information to establish a qualified Manufacturer list, a qualified products list, or both. By participating in this program, the Manufacturer agrees to produce product that meets or exceeds the requirements in AASHTO M294 or M252 Specification(s) and follow the minimum quality control provisions of their Quality Program.

1.3 NTPEP validates this program through testing the Manufacturer’s product(s) to verify compliance with the applicable standard and auditing the Manufacturer’s in-plant quality control facilities and procedures. The Manufacturer agrees that NTPEP may use the test results and audit reports along with other relevant information for review and verification of compliance with this NTPEP program and the applicable AASHTO Specification(s).

1.4 This standard practice may involve hazardous materials, operations, and equipment. It does not purport to address all safety problems associated with its use. It is the responsibility of the user of this standard practice to establish the appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

2. REFERENCED DOCUMENTS

2.1 AASHTO/ASTM Standards:

- AASHTO M252 Standard Specification for Corrugated Polyethylene Drainage Pipe
- AASHTO M294 Standard Specification for Corrugated Polyethylene Pipe, 300- to 1500-mm Diameter
- ASTM D 792 Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement
- ASTM D 1238 Standard Test Method for Melt Flow Rates of Thermoplastics by Extrusion Plastometer
3. **TERMINOLOGY**

3.1 *Auditor* – A NTPEP representative to review submittals, coordinates auditing and testing, and report audit findings.

3.2 *Audits* – Documented reviews of a Manufacturer’s plant and associated test facilities by a NTPEP Auditor and any AASHTO transportation agency co-auditor that wishes to participate.

3.3 *Blowout* – A void or hole in the finished pipe.

3.4 *Bonding* – How the inner liner and outer liner stick together. Lack of bonding would cause delaminating.

3.5 *Independent Laboratory* – An outside laboratory that performs raw material or finished product tests for the Manufacturer. NTPEP reserves the right to audit the independent laboratory for the tests that are being performed for the Manufacturer.

3.6 *Initial Audit* - The first audit conducted at a Manufacturer, which has not had an audit conducted by another independent agency.

3.7 *Manufacturer* - An individual producer of HDPE (High Density Polyethylene) Thermoplastic pipe. The corporate name (actual location) will be included in the NTPEP program.

3.8 *NTPEP* - The entity responsible for overseeing all areas of the program are being run according to what is noted in this Standard Practice as well as assisting in the resolution of any conflicts which may arise.

3.9 *NTPEP Designated Laboratory* – A laboratory qualified by NTPEP to perform the specific tests as outlined in the Standard Practice and has on site qualified technicians and equipment necessary to
perform the tests per ASTM and AASHTO standards.

3.10 **NTPEP Follow-Up Audit** - An audit of a Manufacturer’s location and associated laboratory which are included in the program. These audits are conducted by NTPEP and/or an AASHTO transportation agency to determine compliance with the program requirements. These audits may be performed due to: an incomplete initial/annual audit where nonconformance is found, reports of noncompliant product from an AASHTO transportation agency, or any other reason deemed significant to NTPEP.

3.11 **NTPEP HDPE Thermoplastic Pipe Technical Committee** – The NTPEP Technical Committee that includes transportation agencies of the AASHTO and members of Industry. The members are volunteers who are interested in the advancement of the product. The Technical Committee appoints a Chairman and a Co-Chairman.

3.12 **NTPEP Split Sample Comparison Testing** – Sample(s) selected from the manufacturing line or stockyard to be tested by the Manufacturer and the NTPEP designated laboratory. The results of both testing locations are then compared.

3.13 **QMS Desktop Audit** – Complete review of a Manufacturer’s Quality Management System (QMS) and the corresponding documentation by NTPEP or its designee.

3.14 **Quality Management System (QMS)** – The documented process used by the Manufacturer for quality control/quality assurance.

3.15 **Resin Lot** – A lot of resin for a pipe manufacturing facility is a railcar or truckload, hopper truckload, or truckload of boxes.

3.16 **Recycled Plastic** – Post Consumer (detergent bottles, etc.) or Post Industrial recycled HDPE used to produce pipe.

3.17 **Resin Blend** – A resin blend is a blend of two or more virgin resins. A resin blend may include carbon black pellets and reworked material in accordance with the provisions of AASHTO M252 and M294.

3.18 **Reworked Material** – A plastic from a Manufacturer’s own production that has been reground, pelletized, or solvated after having been previously processed by molding, extrusion, etc. (ASTM D 883).

3.19 **Single-Stream Resin** – A single stream resin is a feed of one virgin resin. A single stream resin may include carbon black pellets and reworked material in accordance with the provisions of AASHTO M252 and M294.

3.20 **Split Sample** – A split sample consists of pipe taken directly from the manufacturing line or in the yard during an on-site audit. The resin used to produce the pipe is sampled during the audit. The pipe is cut into specified lengths. Half of the pipe samples are sent (along with the resin) to a NTPEP designated laboratory for testing. The other half of the pipe and resin samples are tested internally by plant’s lab personnel. An additional stick of pipe is set aside from this lot for the manufacturer to retain in case restesting needs to be done.

3.21 **Surveillance Audit** – An audit of any Manufacturer’s plant and associated laboratory included in the program by AASHTO transportation agencies to determine compliance with the program requirements.

3.22 Additional terminology can be found in applicable AASHTO and ASTM Standards.
4. **OVERVIEW OF THE PROGRAM**

The program for HDPE Thermoplastic Pipe assesses the conformance of both manufacturing and products with this practice and includes the following:

4.1 Manufacturer’s Quality Management System Desk Top Audit:

4.1.1 A complete review of the Manufacturer’s Quality Management System (QMS) written procedures is performed by NTPEP prior to the on-site audit. The requirements for this document are referenced in Section 6.

4.2 Initial and Annual NTPEP Audits:

4.2.1 NTPEP will perform initial and annual quality control audits of each facility that a Manufacturer desires to be included in the program. These audits will include evaluation of production and testing associated with the product along with review of the following documents: Quality Management System (QMS) implementation, test reports, equipment calibration, verification of results, and check records. The Qualification Agency will conduct these audits assisted by co-auditor(s) from any AASHTO transportation agency(s) that want to participate.

4.3 Split Sample Comparison Testing of HDPE Thermoplastic Pipe Samples:

4.3.1 Samples of component material and finished product will be taken from production and/or stock and tested, in accordance with the appropriate AASHTO/ASTM specifications, at the Manufacturer’s testing facility.

4.3.2 Companion samples will also be obtained for testing by the NTPEP designated laboratory.

4.4 The NTPEP Website Listing:

4.4.1 A listing of HDPE thermoplastic pipe unique corrugated or profile wall products tested and found to conform to the requirements of the this Standard Practice

4.4.2 A listing of every Manufacturer with a QMS found to be compliant to this Standard Practice.

4.4.3 A document library containing this Standard Practice and a secure area where AASHTO transportation agency can view the Manufacturer’s: QMS, audit results, and all sample test results.

5. **APPLICATION FOR AUDIT AND PRODUCT TESTING**

5.1 Any Manufacturer of HDPE (High Density Polyethylene) Thermoplastic Pipe may participate in the program. All costs for participation in the program, including sample shipping, testing and other NTPEP auditing and administrative fees, are to be borne by the Manufacturer. Any testing above and beyond the basic NTPEP program requirements will be at the expense of the state DOT/transportation agency or as provided in its specifications.

5.2 The Manufacturer will make a formal request through the NTPEP website to participate in the program. The request will list the Manufacturer’s location(s) and products to be evaluated and describe the Manufacturer’s Quality Management System (QMS).

5.3 Log onto the NTPEP website, http://www.ntpep.org/Pages/NTPEPAuditDocuments.aspx to review and download the following documents:

- Pre-Audit Application
- Audit Worksheet
5.4 Once the QMS is found to conform, the Manufacturer and all associated testing facilities the Manufacturer desires to qualify will be scheduled for audit.

5.5 The on-site audit will be scheduled approximately 4 weeks in advance of the actual audit. The Manufacturer will receive an Announcement Letter from NTPEP showing the anticipated date of the audit.

6. QUALITY MANAGEMENT SYSTEM (QMS) REQUIREMENTS

6.1 NTPEP Audits will be based on the Manufacturer following an established quality control program that provides assurance that the products produced meet the requirements of the AASHTO/ASTM Materials Specifications and that these products conform to this NTPEP Standard Practice. The Manufacturer will implement a documented Quality Management System (QMS). Each Manufacturer will include elements that it considers necessary to assure that products meet AASHTO M 252 or M 294 requirements, but as a minimum the QMS will include or address the following:

- Organization and Organizational Policies
- Quality Mission Statement
- Position Descriptions
- Quality Control Personnel Training and Competency Evaluation
- Contract Review
- Customer Feedback
- Internal Quality Audits of Each Facility Producing Product
- Management Reviews of Each Facility Producing Product
- Corrective Action Procedures
- Sampling Plan for Quality Control and Quality Assurance
- Testing Plan for Quality Control and Quality Assurance
- Retesting Plan for Quality Control and Quality Assurance
- A List of Physical and Chemical Test Equipment
- Lab Equipment Plan for Calibrating and Standardizing Equipment
- Recording and Maintaining Product Information and Test Results
- Handling Raw Material and Finished Product for Transportation Agency Products
- Quality Control Inspection
- Labeling and Storage of Finished Product
- Control of Nonconforming Product

6.1.1 Organization and Organizational Policies – The QMS will indicate the line of authority from the QC testing technicians to the QC manager, ensure that QC testing technicians have the authority to require corrective action, and ensure that the QC manager is independent of production management and of equal status.

6.1.2 Quality Mission Statement - The quality mission statement will describe the Manufacturer’s mission and be endorsed by the Manufacturer’s Chief Executive Officer. It will also be made available to all employees.

6.1.3 Position Descriptions - The QMS will describe the duties associated with each position included on the organization chart. These descriptions will also include the required skills, education, and experience associated with each specific position and indicate the supervision exercised and received.

6.1.4 Quality Control Personnel Training and Competency Evaluation -

6.1.4.1 The QMS will ensure that:
- Manufacturer’s QC manager meets the requirements established by the Manufacturer;
- QC manager qualifies technicians performing QC testing;
QC personnel are familiar with the tests they perform; and
QC personnel have sufficient authority to assure that corrective actions are carried out when necessary.

6.1.4.2 The QMS will describe the Manufacturer’s QC technician qualification program. As a minimum the program will include:

- Training in the AASHTO, ASTM, or Manufacturer test procedures, operation of equipment, the procedures to be used, calculations required, and reporting;
- Demonstration of competency in each required test;
- Demonstration of ability to properly document test results;
- Annual auditing of each technician’s ability to satisfactorily perform the required tests; and
- Retraining when a test method is revised.

Training and competency reviews will be documented in such a way that compliance with the requirements for the initial and updated training and the initial and annual competency reviews can be demonstrated for each technician and for each test the technician performs. The documentation will include the date of the training or competency review and contain the hand written signature or initials of the trainer/reviewer and the technician. This documentation will be retained, for a minimum period of 7 years, at each location where quality control testing occurs, and will be made available to NTPEP for review upon request.

6.1.5 Contract Review - The QMS will include a procedure for processing HDPE thermoplastic pipe orders and the review of contracts for producing HDPE thermoplastic pipe. This procedure will ensure that:

- The requirements are adequately defined, documented and understood
- Records of contract reviews are maintained
- The client will be informed of any deviations from the contract

6.1.6 Customer Feedback - The QMS will include a procedure describing the customer feedback system. This procedure will indicate the following:

- What position(s) or employee(s) are responsible for customer feedback
- Methods used to solicit, evaluate and respond to customer feedback
- Conditions under which corrective action will be implemented

6.1.7 Internal Quality Audits of Each Facility Producing Product -

6.1.7.1 The QMS will include a description of the procedures used to conduct internal audits. The Manufacturer, or an independent auditor hired by the Manufacturer, will perform these audits at least annually unless problems in the quality control program or with the quality of the product indicate more frequent audits are necessary. The internal audit procedures will include the following as a minimum:

- What position(s) or employee(s) are responsible for ensuring the internal audits are performed;
- Frequency, scope, and criteria used for performing the audits;
- Conditions under which corrective action will be implemented;
- Evaluation of plant inspection;
- Inspection of testing equipment and calibrations;
- Observation of resin sampling and lot control procedures;
- Observation of product sampling and testing procedures;
- Review of product certification procedures;
- Review of inspection and testing report documentation; and
- Review of nonconforming product documentation and actions taken.

6.1.7.2 The QMS will ensure that:
• Audit findings are discussed with management and testing technicians and documented in a report;
• Corrective actions are taken as necessary and documented in the report; and
• Most recent report is included in QMS documentation submissions.

6.1.8 Management Reviews of Each Facility Producing Product - The QMS will include written procedures for performing management reviews. The procedures will indicate the following:
• What positions(s) or employee(s) are responsible for ensuring that management reviews are performed;
• The frequency, scope and criteria used for performing the management review(s); and
• Conditions under which corrective action will be implemented.

6.1.9 Corrective Action Procedures - The QMS will include procedures describing the actions taken when failures or nonconformities exist in any of the following areas: product, equipment, customer feedback, internal and external audits, and management reviews. These procedures will indicate what position(s) or employee(s) are responsible for implementing corrective action and the methods used to identify and implement corrective action(s).

6.1.10 Sampling Plan for Quality Control and Quality Assurance - The QMS will include procedures describing sampling for quality control and quality assurance. These procedures will include the following details:
• Number and frequency of samples taken;
• Sample selection process, including sampling required for retesting;
• The position(s) or employee(s) responsible for sampling; and
• Required sample preparation.

6.1.11 Testing Plan for Quality Control and Quality Assurance - The QMS will include procedures describing testing for quality control and quality assurance. These procedures will include the following details:
• Number of samples required for testing;
• Tests required to be performed;
• The position(s) or employee(s) responsible for testing;
• How test results are interpreted;
• The position(s) or employee(s) responsible for approving test results; and
• Criteria and procedures for retesting.

6.1.12 Retesting Plan for Quality Control and Quality Assurance - The QMS will include procedures describing retesting for quality control and quality assurance. These procedures will include the following details:
• When retesting is performed;
• Retest sampling requirements;
• Special retesting conditions;
• Criteria for acceptance of test results; and
• Instructions for reporting original test results and retest results.

6.1.13 A List of Physical and Chemical Test Equipment - The QMS will include a list(s) giving a general description of physical and chemical test equipment requiring standardization or checks. The following information will be included for each piece of equipment:
• Interval between standardization or check;
• Reference to standardization or check procedure; and
• Location of standardization or check record.
6.1.14 *Lab Equipment Plan for Calibrating and Standardizing Equipment* - The QMS will include written procedures for ensuring that equipment standardizations and checks are performed for all required equipment at specified intervals. These procedures will indicate the following:

- Position(s) or employee(s) responsible for standardization and check activities;
- How to handle equipment which is newly acquired, removed from service, or does not meet accuracy requirements;
- In-house equipment standardization and check procedures, when they cannot be referenced in applicable standards; and
- Certificates or other documents that establish traceability of in-house equipment or reference standards used for standardization and checks.

6.1.15 *Recording and Maintaining Product Information and Test Results* - The QMS will include written procedures used to produce, check and amend test reports. These procedures will include the following details:

- Identify position(s) or employee(s) responsible for maintaining test reports;
- Describe distribution of test reports;
- Identify location of test reports;
- Retention of resin test reports and the resin Manufacturer’s lot specific density and melt index data, certificate of analysis (C of A), and supporting test reports for every lot of resin; and
- Process for maintaining the above referenced information for a minimum period of 7 years and how they are made available to NTPEP for review.

6.1.16 *Handling Raw Materials and Finished Product for DOT Products* - The QMS will include a written procedure for handling raw materials and finished product.

6.1.16.1 Raw Materials - The pipe Manufacturer will test the polyethylene resins as specified in AASHTO M 252 and M 294, or have it tested at an independent laboratory acceptable to NTPEP, as specified in Table 1. For every lot of resin, the pipe Manufacturer will maintain, for a minimum period of 7 years, resin test reports and the resin Manufacturer’s lot specific density and melt index data, certificate of analysis (C of A), and supporting test reports. The pipe Manufacturer will establish a lot number for each lot of resin and carry it through to the finished product. The QMS will include the location and method for sampling resin.

<table>
<thead>
<tr>
<th>Test Property</th>
<th>Test Performed On</th>
<th>Test Designation</th>
<th>Test Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density</td>
<td>virgin resins and blends</td>
<td>ASTM D1505 or ASTM D792 or ASTM D 4883</td>
<td>one test per lot of resin</td>
</tr>
<tr>
<td>Melt Index</td>
<td>virgin resins and blends</td>
<td>ASTM D1238</td>
<td>one test per lot of resin</td>
</tr>
<tr>
<td>Notched Constant Ligament-Stress (NCLS)</td>
<td>M294 product, resin blends only</td>
<td>AASHTO M 294 &amp; ASTM F 2136</td>
<td>once on initial use of a resin blend and then quarterly with continued use of the blend</td>
</tr>
</tbody>
</table>

6.1.16.1.1 Note 1: ASTM D1505, ASTM D 792, or ASTM D 4883 are permitted, but ASTM D1505 will be considered the definitive test in case of a conflict or dispute.

6.1.16.1.2 Single-Stream Resin - If reworked material is added to a single-stream resin, it will have been produced from products meeting or exceeding the resin cell class requirements of the new product being produced. **Recycled plastic is not allowed.**
6.1.16.3 **Resin Blend** - If reworked material is added to a resin blend, it will have been produced from products meeting or exceeding the resin cell class requirements of the new product being produced. **Recycled plastic is not allowed.**

6.1.16.4 **Additional Resin Requirements for M252 Products:**

- If produced from a single stream resin there will be a C of A indicating the virgin resin meets the melt index and density requirements of M252. The resin may be used before testing, but the pipe Manufacturer will verify the melt index and density for each lot by subsequent testing.
- If produced from a resin blend the pipe Manufacturer will test the melt index and density of each component resin. The pipe Manufacturer’s test results will be used to determine the blend ratios. Each blend of resin components establishes a lot, and a new lot is established each time a component resin or a component ratio changes more than allowed by the blend tolerances (±1.5%). The final blend must meet M252 cell class requirements.

6.1.16.5 **Additional Resin Requirements for M294 Products:**

- Resin blends used to produce M294 products will meet the requirements of M294, either through the PPI listing or independent laboratory testing, with component variations limited to ± 1.5% of the certified blend components.
- Follow-up testing for melt index and density will be done for each lot to verify the certification matches the resin received by the pipe Manufacturer. Testing can be completed through in-house testing capability or testing at an independent laboratory acceptable to the NTPEP.
- When PPI listed resins are not used, the full cell classification testing including the NCLS test will be performed with the initial use of any lot and then quarterly with continued use.
- Each resin component for a PPI or independent laboratory approved blend will be provided to the NTPEP auditor so that it can be verified it is an approved blend being used to produce the M294 product.

6.1.16.6 **M252 and M294 Fittings and Coupling Resin Requirements:**

- The QMS will document where fittings and couplings are manufactured, the source of the components, and the fabrication process used.
- All (blow-molded and fabricated) fittings will include indelible markings with the designation number of the specification, M294 or M252, and with the Manufacturer’s identification symbol. This procedure will also be included in the QMS.
- The QMS will also document the process used to assure that all resins used to manufacture fittings and couplings meet the material requirements of M252 and M294, including those components purchased from another party.
- The QMS will require that the plant maintain records establishing traceability from the fitting or coupling back to the resin lot used to manufacture the fitting or coupling. Documentation establishing traceability will be maintained along with the inventory.

6.1.16.2 **Finished Product** - As a minimum the QMS will describe the Manufacturer’s inspection process to conduct visual inspections of: the exterior and interior walls for bonding, blowouts, and workmanship items as described in AASHTO M 252 and M 294, during production. The procedure will require the Manufacturer to monitor the process and finished product and perform and record the results of the following inspections at the minimum frequency indicated:

<table>
<thead>
<tr>
<th>Inspection</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workmanship (per AASHTO M 252 and M 294)</td>
<td>continuous, recorded at least once per shift</td>
</tr>
<tr>
<td>Marking (per AASHTO M 252 and M 294)</td>
<td>one per shift</td>
</tr>
</tbody>
</table>

6.1.17 **Quality Control Inspection** - The QMS will include an example of a quality control test report form. The QMS will reference the AASHTO, ASTM, or in house procedures and calibrations. The QMS will describe any Manufacturer procedure used.
Note 2: The Manufacturer’s procedures are subject to approval. The Manufacturer’s test procedures which pertain to the tests providing useful information to evaluate the product are included in this requirement.

6.1.17.1 The QMS will include a description of the Manufacturer’s statistical process control plan. The plan will use methods such as statistical control charts to monitor production facility quality control test results for the purpose of identifying trends and being able to make production adjustments as necessary. The plan will monitor each production plant separately and total Manufacturer product quality trends.

6.1.17.2 The QMS will require that the Manufacturer perform and record the results of at least the following quality control measurements and tests, at the minimum frequency indicated on each production run of each pipe diameter, type and machine:

<table>
<thead>
<tr>
<th>Measurements and Tests</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Unit Weight</td>
<td>two per work shift</td>
</tr>
<tr>
<td>• Wall Thickness (Type “S” and “SP”) (See Appendix X1)</td>
<td>two per work shift</td>
</tr>
<tr>
<td>• Carbon Black Content (ASTM D3350)</td>
<td>one per day</td>
</tr>
<tr>
<td>** The carbon black content shall meet a minimum of 2.00% but not exceed 5.00%.</td>
<td></td>
</tr>
<tr>
<td>• Inside Diameter</td>
<td>one per work shift</td>
</tr>
<tr>
<td>• Pipe Length</td>
<td>one per work shift</td>
</tr>
<tr>
<td>• Perforation Locations and Dimensions (Type “CP” and “SP”)</td>
<td>one per work shift</td>
</tr>
<tr>
<td>• Water Inlet Area (Type “CP” and “SP”)</td>
<td>one per work shift</td>
</tr>
<tr>
<td>• Pipe Stiffness</td>
<td>two per week</td>
</tr>
<tr>
<td>• Pipe Flattening</td>
<td>two per week</td>
</tr>
<tr>
<td>• Brittleness</td>
<td>two per week</td>
</tr>
<tr>
<td>• Joint Integrity (welded bell/spigot)</td>
<td>one per week</td>
</tr>
<tr>
<td>• Stub Compression (AASHTO M 294 only)</td>
<td>Once per mold in compliance with Section 13*</td>
</tr>
<tr>
<td>• NCLS, Finished Product (AASHTO M 294 only)</td>
<td>quarterly</td>
</tr>
</tbody>
</table>

- The stub compression test report needs to be presented during each desktop review every 5 years. Please refer to Section 13 for the procedure to follow if a design change occurs.

6.1.17.3 The QMS will ensure that:
- Each sample selected for quality control inspection and testing is designated with a sample control number for record keeping and traceability;
- The test report for each sample identifies the plant, date, shift of manufacture, production line, and lot designation for the polyethylene resin; and that
- Quality control test reports (not samples) are maintained and available for review for 7 years.

6.1.17.4 The Manufacturer’s QC manager will be responsible for QC testing at all facilities and assure that all sampling and testing is done by technicians meeting the requirements of the Manufacturer’s technician qualification program. In the event the Manufacturer utilizes an independent laboratory for testing, the independent laboratory will be NTPEP compliant.

6.1.18 Labeling and Storage of Finished Product - The QMS will include a written procedure describing how finished product is labeled, packaged and stored to include:
• The Manufacturer’s method for permanently marking the pipe in accordance with the minimum requirements of AASHTO M 252 and/or M 294;
• Detailed explanation of any coding used to mark the pipe; and
• The procedures used to ensure that product handling, storage, and shipping processes will not adversely affect the material composition, characteristics, or product quality.

6.1.19 Control of Nonconforming Product - The QMS will include written procedures describing the actions to take when product does not conform to the specification requirements. These procedures should include the following details:
• What position(s) or employee(s) is responsible for making decisions related to non-conforming product;
• How nonconforming product is identified, and labeled.
• What happens in the event it is shipped;
• What is done with the nonconforming product;
• Who is responsible for taking corrective action;
• How test reports clearly identify the deficiencies;
• How products produced subsequent to the previous testing, are identified and quarantined pending investigation of the failure; and
• The process for obtaining and testing check samples.

6.2 In the event the Manufacturer utilizes an independent laboratory for testing and the results are utilized in the generation of the test report, then the independent laboratory location will meet all requirements listed above. The QMS will also contain the required information for the independent laboratory location.

6.3 After the initial audit, a complete thorough desktop review will be performed every 5 years. Updates made to the QMS within the previous 12 months will be required to be sent to AASHTO annually.

7. NTPEP ON-SITE AUDITS

7.1 The NTPEP Audit Team - The NTPEP audit team will consist of a NTPEP Auditor and an AASHTO transportation agency co-auditor(s) from any state invited to participate in the on-site audit. The NTPEP Auditor will produce a single audit report, which will include findings from both the NTPEP Auditor and AASHTO Transportation Agency co-auditor(s), if present.

7.2 Initial/Annual Audit - Once the QMS is found to conform, the specific location the Manufacturer desires to qualify will be audited. The on-site audits include the following:

7.2.1 Documentation Review - The auditor(s) will check the availability of the most current AASHTO and ASTM standards, review training and competency records, and evaluate the most current Quality Manual documentation and equipment records to verify implementation of the plant’s QMS.

7.2.2 Production Line Inspection - During the production line inspection, the auditor(s) will walk through the manufacturing process to observe the conditions of the lines. During this process, the auditor will identify samples to be collected for split-sample testing purposes.

7.2.3 Storage Yard Inspection - The auditor(s) will inspect the condition of product in the Manufacturer’s yard. The auditor(s) will select three specimens of pipe for each specification manufactured at the facility for documentation and traceability review. These specimens will include a variety of dates, shifts and sizes. Additionally, the auditor(s) may select various samples from the storage yard for testing in accordance with Section 7.2.5.
7.2.4 Quality Control Testing Evaluation - Each Manufacturer will be asked to demonstrate the quality control tests they perform as stated in their QMS. While performing each test, the most current AASHTO or ASTM test methods will be referenced. The equipment used for each test will be examined and applicable records will be reviewed. The auditor will also select three random weeks (within the previous 12 months) of test reports for resin and pipe produced in accordance with AASHTO M294 and M252 to review.

7.2.5 Split Samples for Comparison Testing – The auditor(s) will select samples of HDPE thermoplastic pipe available at the time of the audit for testing in accordance with Section 8.2. The auditor(s) may select pipe from the production line or from the yard in order to comply with Section 8.4.3. All sampling and testing will be in accordance with the appropriate AASHTO/ASTM specifications. The split samples will be for testing at the Manufacturer’s testing facility and NTPEP’s designated laboratory. Manufacturer samples tested during the audit will be observed by the auditor(s).

7.2.6 If major deficiencies are noted during an on-site audit, a follow-up audit will be required to be completed.

7.3 NTPEP Follow-Up Visits and Testing – NTPEP follow-up visits and audits to a Manufacturer’s location and associated laboratory (if applicable) included in the program, may be conducted to determine compliance with the program requirements. These visits may not necessarily be announced. They may also randomly select samples of product and the resin or resin blend being used in production to be tested in accordance with AASHTO and ASTM specifications.

7.4 AASHTO Transportation Agency Surveillance Visits and Testing - AASHTO transportation agency using the NTPEP listing have the right to conduct their own surveillance visits and audit any Manufacturer and associated laboratory included in the program to determine compliance with the program requirements. These visits may not necessarily be announced. They may also randomly select samples of product to be tested in accordance with AASHTO and ASTM specifications. Any additional testing (above and beyond what is required by the basic NTPEP program requirements) or costs will be at the AASHTO transportation agency’s expense or as provided for in its specifications. If major deficiencies are noted during a surveillance audit, the results of the audit will be forwarded to NTPEP.

8. ANNUAL PRODUCT CONFORMANCE TESTING

8.1 The NTPEP program requires that pipe and resin samples be tested to determine conformance with the appropriate AASHTO/ASTM Materials Specifications.

8.2 The NTPEP Auditor will select three sets of samples (Ref.: Section 9) in accordance with Section 7.2.5 during each annual Manufacturer audit (one set to be tested by the Manufacturer, one set to be tested by the NTPEP designated laboratory, and one for retesting as required in Section 8.7). All samples will be from the same lot of material.

8.3 Note: The manufacturer must have resin available for all AASHTO pipe stored in their yard. The manufacturer must retain the following amounts of resin: 0.5 lbs. for PPI resin, 1.0 lbs. for pre-extruded blends, and 2 lbs. for dry blends. These retain samples will be sent to the NTPEP designated laboratory.

8.4 Manufacturer Samples:

8.4.1 M252 Products - Once initial product evaluation has been established, a NTPEP Auditor will sample pipe and resin during each annual plant audit. At a minimum, all pipe styles and sizes will be sampled and tested in accordance with Section 8.4.3 with at least 1 pipe and resin sample being taken during each plant audit. The NTPEP or Transportation Agency Auditor will select and label the samples to be tested.
8.4.2 M294 Products - Once initial product evaluation has been established, a NTPEP Auditor will sample pipe and resin during each plant audit. At a minimum, all pipe styles and sizes will be sampled and tested in accordance with Section 8.4.3 with at least 1 pipe and 1 resin sample being taken during each audit.

8.4.3 If the Manufacturer’s facility produces both AASHTO M 252 and M 294 pipe, then all diameters shall be tested prior to having an AASHTO M252 or AASHTO M294 diameter tested a second time.

8.4.4 If the pipe Manufacturer does not have capability to perform the cell class and NCLS testing as specified in M294, the resin split samples may be tested at an independent laboratory, preferably not at the same laboratory testing the NTPEP portion of the split sample. If requested, a Transportation Agency testing facility can be included in the split sampling process.

8.4.5 The Manufacturer will report the results from their testing using the standard format provided by NTPEP within 30 days of their on-site audit being completed.

8.5 NTPEP Designated Laboratory Samples:

8.5.1 The NTPEP Auditor will instruct the Manufacturer on the proper labeling of the NTPEP designated laboratory samples. These samples will be located adjacent to the previous (Manufacturer) samples and from the same lot(s) and in the same quantities as obtained in Section 8.3. “Manufacturer Samples”. The Manufacturer will send (freight paid by the Manufacturer) the companion samples to the NTPEP designated laboratory for testing (Ref.: Section 9).

8.6 Once the NTPEP Project Engineer sends the Manufacturer the results from the NTPEP designated laboratory testing, the Manufacturer has the opportunity to provide an explanation of any significant differences between the NTPEP designated laboratory and Manufacturer sample test results, including any corrective actions found necessary in the manufacturing process or testing procedures within 15 days of receiving the test results.

8.7 Retest Samples:

8.7.1 Additional material (one additional set of samples) will be obtained from the same lot and kept at the Manufacturer’s location in the event the NTPEP designated laboratory sample fails. The auditor will sign the retained sample. This sample will be tested as directed by NTPEP.

8.8 Testing for product conformance performed by an independent laboratory will be witnessed as part of the audit. All conformance testing will be in accordance with this Section.

8.9 If during the testing portion of the audit or during NTPEP designated laboratory testing at least one tested sample fails to meet specification requirements or when the Manufacturer is found during an audit to have neglected one or more aspects of the governing QMS during manufacturing, the nonconformance will be addressed as outlined in Section 10 of this Standard Practice.

9. SPLIT SAMPLE COMPARISON TESTING

The NTPEP program utilizes a NTPEP designated laboratory testing to validate the consistency of the testing results for samples tested at the Manufacturer’s laboratory. The split sample and corresponding test results are used as both a (1) random quality control check of the AASHTO pipe being produced at this plant and (2) a comparison between the NTPEP designated laboratory and the manufacturer’s internal laboratory.

9.1 The comparative results of the NTPEP designated laboratory testing will be posted in the secure area of the NTPEP website, available only to AASHTO transportation agencies and the personnel
of the Manufacturer where the samples were tested.

9.2 These results will be used by NTPEP to determine if further action needs to take place prior to the determination of whether the Manufacturer is “Compliant” with the program. Nonconformances will require resolution in accordance with Section 10.

*Note 3 - Any inconsistency in results may result in the need for a NTPEP follow-up audit.*

### 10. RESOLUTION OF TESTING/AUDIT NONCONFORMANCES AND DISPUTES

10.1 When a designated sample does not meet one or more of the specification requirements when tested or when the Manufacturer is found during an audit to not conform with one or more aspects of the governing QMS, then the burden is on the Manufacturer to identify the cause, correct the issue, document the resolution, and revise the QC plan to assure future conformance. All testing and audit results are reported, along with any corrective actions, to NTPEP.

10.1.1 Samples, tested at the Manufacturer, that do not meet one or more of the specification requirements are handled as follows:

10.1.1.1 The Manufacturer should verify that the manufacturing process is operating correctly, that test equipment is calibrated and operating correctly, and that test procedures are correct. This investigation will be documented and the results sent to NTPEP. The NTPEP designated laboratory is required to verify their test equipment is calibrated and operating correctly. In addition, they must assure their test procedure is completed according to the current AASHTO/ASTM specification.

10.1.1.2 In addition, the Manufacturer will test another sample from the same lot as the nonconforming test. The results of the testing, along with a companion sample for NTPEP designated laboratory testing, will be sent to the NTPEP designated laboratory.

10.1.1.3 If the Manufacturer’s and the NTPEP designated laboratory’s test results on the second sample are satisfactory, NTPEP will consider the dispute resolved. If this is not the case, the Manufacturer will investigate the cause of the nonconforming test, report the findings and test another sample. The results of the investigation and test results will be sent to the NTPEP liaison for distribution to the committee chair and vice chair for review. Upon a satisfactory review, the results of the testing, along with another companion sample for NTPEP designated laboratory testing, will be sent to the NTPEP designated laboratory.

10.1.1.4 Additional retesting or re-auditing will be at the discretion of the NTPEP and the associated costs will be borne by the Manufacturer. All results will be posted in the secure area of the NTPEP website, available only to AASHTO transportation agencies and the Manufacturer’s personnel of the location where the samples were tested.

10.1.2 When a nonconformance is found during an audit, the burden will be on the Manufacturer to identify the cause; develop, implement and document the resolution; and revise his QC plan to assure future conformance. When the Manufacturer is found to not conform with one or more aspects of the governing QMS, handle it as follows:

10.1.2.1 The NTPEP Auditor notifies the Manufacturer of the issue(s).

10.1.2.2 The Manufacturer furnishes a Corrective Action Report (CAR) to AASHTO (within 15 business days of the final NTPEP Audit report) to the NTPEP Auditor. The CAR is to contain: the issue being addressed, the course(s) of action to be taken and a timeline showing when these actions will be taken. There should be sufficient detail to adequately explain the processes to be followed.
10.1.2.3 If the CAR is not received within 15 business days, NTPEP notifies the Manufacturer that their facility is classified as “non-compliant” with AASHTO’s NTPEP Audit Program. The audit is considered completed and all fees paid will not be refunded.

10.1.2.4 If the Manufacturer still requests to participate in the program, they will need to reapply (Ref.: Section 5).

10.2 When the Manufacturer has a dispute with NTPEP regarding procedural issues, it is handled as follows:

10.2.1 The Manufacturer notifies NTPEP in writing of the dispute, providing appropriate documentation for the committee to fully understand the controversy, and requests a resolution. Copies of the dispute and documentation are forwarded by NTPEP to the Technical Committee Chairman and Vice-Chairman and to the NTPEP Technical Committee Liaison. The Technical Committee, less industry representatives, will convene to discuss the dispute and render a decision on the appropriate resolution. Quorum for the purposes of this decision will be either the Chairman or Vice-Chairman, the NTPEP liaison or his/her designee, and one other Technical Committee member. The Chairman or Vice-Chairman will communicate the resolution to the Manufacturer in writing through NTPEP.

10.2.2 The Manufacturer may appeal within 30 days of the date of the resolution. If the dispute is not resolved to the Manufacturer’s satisfaction, the dispute can be raised to the NTPEP Executive Committee Chairman for resolution by the NTPEP Appeals Board. The decision by the Appeals Board is final.

11. REPORTING OF DATA

11.1 NTPEP maintains the results of the audit and testing on their website (http://data.ntpep.org). NTPEP will also publish a list showing which Manufacturer locations and product are compliant with the requirements of this Standard Practice. Each Transportation Agency then determines whether the Manufacturers are approved or not based upon their established criteria (Ref.: the particular Transportation Agency’s specification).

11.2 NTPEP will also post the HDPE thermoplastic pipe test results in the secure area of the NTPEP website, available only to AASHTO transportation agencies and the personnel of the Manufacturer where the samples were tested.

11.3 Public Notice - One of the primary reasons for a quality control program is to instill confidence in the end-user and the general public that the materials being used for infrastructure construction are of sufficient quality and to facilitate use of products that have proven to be of sufficient quality. The program will provide for public notice of Manufacturers found to conform with the provisions of this Standard Practice via website postings.

12. MANUFACTURER DISQUALIFICATION

12.1 Manufacturers will ensure all participating locations, associated quality control testing facilities, personnel, and sampling and testing activities are in continuous conformance with the NTPEP requirements.

12.2 NTPEP, based on results of their audits or the acceptance or other testing done by individual states, may rescind a Manufacturer’s listing if a facility is determined not to comply with the NTPEP requirements.

12.3 The NTPEP Auditor will forward a letter of explanation to the affected Manufacturer and all AASHTO transportation agencies detailing the reason(s) for revocation of the qualification. The NTPEP Auditor will handle appeals of such revocation.
13. RESUBMITAL TESTING FREQUENCY

13.1 Product design may change over time as Manufacturers improve their products and optimize their manufacturing processes. When a design change is made in an NTPEP listed product, the Manufacturer will notify the NTPEP of the change and submit samples for re-consideration of conformance with this Standard Practice. Any changes in a manufacturing method, product weight, or pipe wall design will be considered design changes.

14. KEYWORDS

14.1 NTPEP; HDPE thermoplastic pipe; Manufacturer
A. PROCEDURE FOR LINER NCLS TESTING

A.1.1 Liner NCLS test specimens will be sampled and conditioned as stated below and tested in accordance with ASTM F2136.

A.1.2 Specimens will be punched longitudinally from a location 45 degrees from the seam and notched on the outside of the liner; such that the notch is perpendicular to the direction of flow (see Figure F-1, below).

A.1.3 Additionally, specimens will be placed in the NCLS tester within one hour of notching.

Figure F-1. NCLS test specimens from pipe liner.
APPENDIXES (NONMANDATORY INFORMATION)

X1. APPROVED ALTERNATIVE TESTING PROCEDURE FOR WALL THICKNESS

X1.1. The NTPEP thermoplastic pipe program permits the use of ultrasonic thickness gauges for measuring wall (liner) thickness if the following equipment requirements are met and the procedure below is followed:

X1.1.1. Equipment Requirements:

X1.1.1.1. Each gauge and transducer is identified and calibrated.

X1.1.1.2. Records of all calibration activities, including the person doing the work and the date the calibration activities were performed will be maintained for at least 7 years.

X1.1.1.3. The NTPEP auditor is permitted to witness the calibration of an instrument used and sign the calibration verification form. A copy will be included with the NTPEP audit forms.

X1.1.1.4. When a new transducer is placed in service, it is identified and calibrated with the ultrasonic gauge.

X1.1.1.5. Gauge calibration blocks are maintained at the plants.

X1.1.2. Procedure:

X1.1.2.1. Record two sets of liner thickness readings comprised of at least eight (8) readings per set per work shift.

X1.1.2.2. Take one set of readings using a micrometer in accordance with ASTM D2122 and take the other set of readings using a calibrated ultrasonic gauge transducer.

X1.1.2.3. Indicate which measuring device was used on the calibration record.

X2. NTPEP QA PROGRAM FOR HDPE THERMOPLASTIC PIPE - PARTICIPANT RESPONSIBILITIES

X2.1. Background: This section summarizes the responsibilities for the different parties, which can be found in more detail in the following sections titled, “Operating Procedures” and “Quality Control Requirements for HDPE Thermoplastic Pipe Manufacturers”.

X2.2. Manufacturers' Responsibilities: Participating Manufacturers will develop and implement a Quality Management System (QMS) outlining their quality control testing program for production of HDPE Thermoplastic Pipe. In addition, the manual will address the following general program, testing facilities, personnel qualification, and record keeping requirements:

X2.2.1. General Requirements:

X2.2.1.1. Each Manufacturer will be prepared to accommodate Manufacturer and testing facility audits (scheduled and follow-up) by NTPEP representatives when submitting its initial Quality Management System (QMS), or updated QMS in the case of the annual re-evaluation, to NTPEP.
X2.2.1.2. Each Manufacturer’s facility is responsible for ensuring continuous compliance with all NTPEP quality control requirements. Failure to do so may result in revocation of the listing on the NTPEP website.

X2.2.2. **Testing Facilities:**

X2.2.2.1. The Manufacturer’s quality control manager will be responsible for quality control testing at all facilities and will assure that all sampling and testing is done by qualified technicians.

X2.2.2.2. The testing facilities will maintain current versions of all AASHTO, ASTM, and Manufacturer test procedures for all tests performed and a current version of the Manufacturer’s QMS.

X2.2.2.3. The facilities will adequately house and allow proper operation of all required testing equipment.

X2.2.2.4. The testing equipment will be calibrated/verified/checked in accordance with the Manufacturer’s recommendations at least once every 12 months by personnel customarily involved in such work as documented in the QMS.

X2.2.2.5. The testing facilities will maintain records of all test results and all NTPEP reviews and actions taken to resolve any noted deficiencies.

X2.2.2.6. Records of equipment calibration and verification will be maintained and available to NTPEP and AASHTO transportation agencies upon request.

X2.2.3. **Testing Personnel:**

X2.2.3.1. The Manufacturer’s quality control manager will meet the requirements established by the Manufacturer for the position.

X2.2.3.2. Documentation will show that the technician has been trained in the test procedures to be performed.

X2.2.3.3. Documentation will show that the technician has satisfactorily demonstrated competency to perform the required testing and that this demonstration is repeated annually.

X2.2.3.4. Documentation will show that technician training has been updated when revisions in test methods occur.

X2.2.3.5. Review of reports will show the technician can properly perform test procedure calculations and properly record information.

X2.2.3.6. Technicians-in-training may perform sampling and testing at qualified facilities provided they are working under the direct supervision of a technician fully qualified under NTPEP requirements.

X2.2.3.7. If requested, technicians will perform sampling and testing for NTPEP observers.

X2.2.4. **Testing Documentation**

X2.2.4.1. All quality control test results for HDPE Thermoplastic Pipe will be documented in reports of the same format as the sample forms submitted in the QMS and will be kept for a minimum of seven years.

X2.2.4.2. The reports will document the actions taken in the event of product test failures.

X2.2.4.3. The reports will show the manufacture location, date of manufacture, physical and chemical test results. Identification will be such that the test reports for any product can be located.
X3. AUDIT AGENDA

On-Site Pipe Audit

Opening Meeting
- Introductions
- Address Any Safety or Security Concerns
- Address Confidentiality
- Questions, Comments, or Concerns?

Summary of Desktop Review
- Resolved Findings
- Unresolved Findings
- Most Current Quality Manual

Yard Walk Through
- Inspect Pipe, Fittings, and Couplings
- Record Product Information for Traceability Purposes

Manufacturing Line Walk Through
- Process and Conditions
- Collect Pipe and Resin Samples for Split-Sample Testing

Review of Documentation
- Review and Collect Certificates of Analysis
- AASHTO and ASTM Standards
- Training and Competency Evaluations
- Internal Audits
- Management Reviews
- Equipment Records

Quality Control Testing
- Demonstration of In-House Testing Methods
- Inspection of Equipment

Audit Summary Close-Out Meeting
- Review of Audit Findings
- Questions/Concerns?
- Closing Remarks