

**American Association of State Highway and Transportation Officials  
(AASHTO)**

**National Transportation Product Evaluation Program (NTPEP)**

**Project Work Plan for Evaluation of  
GEOTEXTILE MATERIALS FOR HIGHWAY APPLICATIONS**

**Introduction and Purpose:**

The purpose of AASHTO's NTPEP work plan for geotextiles is to establish a list of manufacturing plants, private label companies, and their associated geotextile products that conform to the quality control and product testing requirements of this work plan. AASHTO member departments can then use this information in their quality assurance program for geotextiles. This may include utilizing this information to establish a qualified supplier list and/or a qualified products list. By participating in this program, the participant agrees to produce geotextiles that meet or exceed the requirements in AASHTO M288 and follow the minimum quality control provisions of the program. NTPEP validates this agreement through testing the geotextile product(s) to verify compliance with the applicable standard and auditing the participant's quality system. The manufacturer or private label company 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 work plan and the applicable AASHTO Specification. If compliance is demonstrated, the NTPEP will list the product(s) and facilities conforming to this work plan.

**Definitions:**

*NTPEP Auditor* – An individual retained by NTPEP to review submittals, coordinate auditing and testing, and report audit findings and resin and geotextile split sample test results.

*Annual NTPEP Audits* – Audits of a manufacturer's plant and associated internal test facilities by a NTPEP auditor and any AASHTO member department co-auditor that wishes to participate.

*Audit Supervisor*- The individual responsible for administering and managing the audit program.

*Deficiency, Major* - A procedure missing from the quality system: nonconformance that results in the probable shipment of nonconforming product.

*Deficiency, Minor* – Quality issue that does not result in the breakdown of the quality system, failure in part of the documented system.

*Independent Laboratory Acceptable to NTPEP* – a laboratory that is qualified to perform the specific tests as outlined in the work plan and has on site qualified technicians and equipment necessary to perform the tests per ASTM and AASHTO standards.

*Initial Audit*- The first NTPEP audit conducted at a manufacturing plant.

*Periodic Testing*- Additional testing completed on specimens collected aside from what is tested during the annual on-site audit.

*Manufacturer*- the total amount of producing plants and testing laboratories a manufacturer owns and operates.

*MARV* – The minimum average roll value for the geosynthetic, defined as described in ASTM D4439. From the user's point of view, the average test result for the roll sampled shall meet or exceed the published MARV.

*MaxARV* – The maximum average roll value for the geosynthetic, defined as described in ASTM D4439. From the user’s point of view, the average test result for the roll sampled shall meet or be less than the published MaxARV.

*MD* – Machine direction of the geotextile

*XD* – Cross-Machine direction of the geotextile

*NTPEP Manager*- The individual responsible for overseeing all areas of the program are being run according to what is noted in this Work Plan.

*NTPEP Geosynthetics Technical Committee Chairman* – The individual responsible for overseeing all technical aspects of the work plan. Together with the NTPEP manager, resolves any conflicts that may arise.

*NTPEP Split Sample Testing* – a specimen selected from the manufacturing line or stockyard to be tested by both the manufacturer and NTPEP designated third party test laboratory.

*Private Label Products* – Private label products are typically those manufactured by one company, then offered for sale under another company's brand.

*QMS Desk Top Audit* – a complete review of a participant’s Quality Management System (QMS) and the corresponding documentation by NTPEP or its designee.

*Geotextile Lot* – The amount of geotextile produced per style type per machine per production run.

*Plant*- An individual geotextile manufacturing facility.

*Product Line* - A series of products manufactured using the same polymer in which the polymer for all products in the line comes from the same source, the manufacturing process is the same for all products in the line, the stabilization package is the same for all products in the product line, and the only difference is in the product weight/unit area or number of fibers contained in each yarn.

*Product Style* – The proprietary name/number used as a designation for a specific product.

*Production Unit* – With regard to a geotextile lot, a production unit shall be defined as a product roll.

*Quality Management System (QMS)* – The system by which a manufacturer controls and documents the quality of the products it produces. The producing plant shall maintain documentation of their quality system by use of a Quality Manual (QM) and corresponding documentation.

*Raw Materials* – materials acquired by a geosynthetic manufacturer that the geosynthetic manufacturer uses in a production line to create a finished geosynthetic product, such as raw polymer/resin, fibers (including slit film fibers), or yarns and polymeric additives (e.g., antioxidants, carbon black, fillers, other polymers to create polymer blends, dyes, and reworked material). However, unfinished or partially finished fabrics, felts, etc., shall not be considered raw materials.

*Raw Material Lot* – A lot of raw material for a geotextile manufacturing facility is a railcar or truckload, hopper truckload, or truckload of boxes, but no larger than the lot of raw material as defined by the raw material supplier.

*Recycled Plastic* – Post Consumer (example: detergent bottles, etc) Recycled polymer used to produce geotextile for non DOT jobs.

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

*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 M288.

*Source Manufacturer* – The manufacturer that functions as the source for a finished product that is sold under a private label by another company.

*Surveillance Audit*- An audit conducted at a plant when major deficiencies are noted during a previous onsite audit. If a local DOT performs a plant audit, which is not the annual inspection by NTPEP, and finds major non-compliance issues, then a follow up NTPEP audit will be performed at the manufacturer's expense. Surveillance audits may not necessarily be announced and will proceed regardless of the availability of key QC staff.

### **Overview of the NTPEP Geotextile Program:**

The NTPEP Geotextile Program assesses the conformance of both manufacturing plants and products, and those who provide products manufactured by others (i.e., private label products). The program includes the following:

1. Desk Top Audit of the participant's Quality Management System (once every three years)
2. Initial and Annual on-site NTPEP Audits
3. Split Sample Testing of Geotextile (manufacturers only)
4. Identification of each roll of geotextile product produced (marking)
5. A NTPEP website with the following information:
  - a) A listing of geotextile products, by manufacturer or private label company and style, tested and found to conform to the requirements of the AASHTO M288 Material Specifications.
  - b) A listing of participating plants and private label companies with a quality management system found to conform to this work plan.
  - c) A document library containing this work plan and a secure area where AASHTO member departments can view manufacturers' QMS documents and split sample test results for M 288 geotextile materials.

### **Tests/Practices to be Included (most current versions):**

ASTM D276 – Standard Test Methods for Identification of Fibers in Textiles (melting point)

ASTM D4354 - Standard Practice for Sampling of Geosynthetics for Testing

ASTM D4355 - Standard Test Method for Deterioration of Geotextiles from Exposure to Ultraviolet Light and Water (Xenon-Arc Type Apparatus)

ASTM D4491 - Standard Test Methods for Water Permeability of Geotextiles by Permittivity

ASTM D4533 - Standard Test Method for Trapezoid Tearing Strength of Geotextiles

ASTM D4632 - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles

ASTM D4751 - Standard Test Method for Determining Apparent Opening Size of a Geotextile

ASTM D4873 - Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples

ASTM D5261 - Standard Test Method for Measuring Mass per Unit Area of Geotextiles

ASTM D6140 - Standard Test Method to Determine Asphalt Retention of Paving Fabrics Used in Asphalt Paving for Full-Width Applications

ASTM D6241 - Standard Test Method for the Static Puncture Strength of Geotextiles and Geotextile-Related Products Using a 50-mm Probe

AASHTO M288 – Standard Specification for Geotextile Specification for Highway Applications

**Note 1** - All ASTM test methods referenced herein are copyrighted by ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, Pennsylvania, USA 19428- 2959. All AASHTO specifications referenced herein are copyrighted by American Association of State Highway and Transportation Officials, 444 North Capitol Street N.W., Suite 249, Washington, D.C. 20001.

**Participation:**

Any manufacturer of geotextiles as defined in AASHTO M288 and private label companies who sell geotextiles manufactured by others under their own brand may participate in the program. All costs for participation in the program, including sample shipping and testing and other NTPEP auditing and administrative fees are to be borne by the manufacturers, or for private label companies, the private label company, except for those costs associated with member department co-auditors. All fees must be received by AASHTO from the manufacturer/supplier within 30 days of completion of the audit and sampling process.

For companies that distribute geotextile products under a private label and that wish to have those products included in the NTPEP program, the manufacturers that produce those products must participate in and conform to this NTPEP work plan.

The participation process is summarized as follows:

- 1.) The participant must make a formal request through the NTPEP website to participate in the program. The request must list the plants (or private label company) and products to be evaluated and describe the participant's Quality Management System (QMS).
- 2.) Once the QMS is found to conform, the plant and all associated internal testing facilities the manufacturer desires to qualify (or private label company) will be audited. This shall constitute the initial audit. Geotextile samples will be taken for testing in accordance with the appropriate AASHTO specification and this NTPEP work plan. For the initial audit, the required minimum number of products tested during the initial audit will depend on the current status of the product testing cycle for the participant, However, the participant may request up to 100% of their products be tested as part of the initial audit.
- 3.) An on-site audit will be scheduled approximately 4 weeks in advance. The plant will receive an Announcement Letter from AASHTO.
- 4.) Each unique geotextile product requested for inclusion into the program will be separately tested once every 3 years. For private labeled products, since the products that are private labeled must be from a source manufacturer who has been audited by NTPEP and found compliant, only a limited check testing program on representative products within the private label company's product line will be conducted.
- 5.) Audit reports are released to the NTPEP website and are able to be viewed by all AASHTO Member Departments and the personnel from the plant or private label company the audit was conducted at. A hard copy of the draft summary is also left with the plant personnel at the completion of the on-site audit.
- 6.) Each plant or private label company is also listed on the NTPEP website, showing if they are compliant with the program.

*Note 2: If major deficiencies are noted during an on-site audit, a surveillance audit will be required to be completed. Surveillance audits may not necessarily be announced and will proceed regardless of the availability of key QC staff.*

### **Annual Manufacturing Plant Audits:**

Once initial plant QMS and product conformance is established as described in the Participation Section above, annual NTPEP auditing and testing will be required for a manufacturer's plant to remain on the NTPEP list of compliant plants. The annual audits will be announced to the manufacturer in advance to make sure the manufacturer's key quality and manufacturing personnel are available during the audit. Audits will not occur on weekends or national holidays.

Annual plant audits will include the following:

- 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.
- 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 inspect product marking and identify samples of geotextile to be collected for split-sample testing purposes. For those geotextile properties that are tested on a product line basis (i.e., only products representative of the line are actually tested), the consistency of the manufacturing process and materials used for all products considered to be in the product line will be verified by the auditor. This will include verification that the same base polymer and yarn is used in all products included in the product line, verification of polymer source(s) used and consistency of the polymer property standards for the sources used, and verification in the consistency of the manufacturing process.
- 3. Sampling and Testing** – Audits will include the sampling of geotextile from current production to be submitted to the NTPEP designated independent third party laboratory for evaluation and current geotextile production will be measured/evaluated on-site for compliance with AASHTO specifications. If current production geotextile is not available, samples will be randomly selected from inventory. NOTE: all geotextile samples selected over a three year period at each plant during the annual audit shall collectively represent all unique geotextile products requested for inclusion into the NTPEP program. Thus each unique geotextile product included in the NTPEP program will have been tested at least once during the three year period.
- 4. Inventory Inspection** - The auditor(s) will inspect the condition of AASHTO M 288 geotextile in the plant's inventory storage facility. Additionally, the auditor(s) will select various product styles of AASHTO M 288 geotextile and verify that roll test results, raw material lot test results, and a test report associated with each lot representing the geotextile selected are available for the samples of geotextile selected.
- 5. Quality Control Testing Evaluation** - Each manufacturer will be asked to demonstrate the quality control tests they perform on a regular basis. While performing each test, the most current AASHTO or ASTM test methods may be referenced if needed. The equipment used for each test will be examined and applicable records will be reviewed.
- 6. The NTPEP Audit Team** - The NTPEP auditor (AASHTO employee or designated subcontracted auditor) and an AASHTO member department co-auditor(s) from any state that wishes to participate. The Auditor will produce a single audit report, which will include findings from both the Auditor and AASHTO Member Department co-auditor(s), if present.
- 7. Inspection Visits and Testing** - AASHTO member departments using the NTPEP listing have the right to conduct inspection visits and audit any manufacturer's plant and associated laboratory included in the program to determine compliance with the program requirements. . These visits may not necessarily be specifically scheduled. Unscheduled inspection visits will be announced to the manufacturing plant by pre-announcing a window of a minimum two weeks of time for the audit to take place. They may also randomly select samples of product in production for confirmation testing.

**8. Proprietary Information** - The manufacturer may reserve the right to require NTPEP Audit Team and/or AASHTO members to sign confidentiality agreements prior to visiting plants or facilities to protect information the manufacturer considers to be proprietary. The confidentiality agreement shall not restrict the ability of NTPEP to distribute information in the final audit report necessary to understand the audit findings to the NTPEP membership. However, NTPEP members shall not distribute such information to anyone outside of their organizations.

**Note 3** - *Inspection visits may result in the need for an additional NTPEP surveillance audit.*

For manufacturers that have multiple plants, an audit will need to be conducted in each plant with regard to the geotextile products produced in each of the respective plants submitted for NTPEP evaluation. For materials defined as raw materials, the producer of the raw materials does not need to be audited; however, traceability and quality control/quality assurance procedures and documentation used/obtained by the geotextile manufacturer will be evaluated as part of the geotextile manufacturer audit.

**Annual Private Label Company Audits:**

An annual audit will be required of companies that private label products produced by others. The focus of the audit is to establish traceability of the private labeled products to an audited geosynthetic manufacturing plant that is in compliance with this work plan. The private label company audit will include documentation review as applicable to records traceability and retention, and QC/QA procedures used by the private label company to assure the quality of the products they purchase, private label and sell, inventory/warehouse inspection to evaluate the condition of the private-labeled rolls and product marking, and sampling and testing of randomly selected rolls of product. The annual audits will be announced to the manufacturer in advance to make sure the manufacturer's key quality and manufacturing personnel are available during the audit. Audits will not occur on weekends or national holidays.

AASHTO member departments using the NTPEP listing have the right to conduct inspection visits and audit any private label company included in the program to determine compliance with the program requirements. These visits may not necessarily be specifically scheduled. Unscheduled inspection visits will be announced to the private label company by pre-announcing a window of a minimum two weeks of time for the audit to take place. They may also randomly select samples of product for confirmation testing.

**Quality Management System (QMS) Requirements for Manufacturers:**

NTPEP Audits will be based on a manufacturer following a quality control program at the plant that provides the following information: assurance that the products produced meet the requirements of the AASHTO Materials Specification and that these products conform to this NTPEP work plan. The Manufacturer will implement a documented Quality Management System (QMS). Each manufacturer shall include elements that it considers necessary to assure that products meet M288 requirements, but as a minimum, for geosynthetic manufacturers, the QMS shall include or address the following:

1. Organization and Organizational Policies
2. Product Marking and Labeling
3. Manufacturing Process and Documentation Control
4. Quality Control of Raw Materials
5. Quality Control Inspection, Measurement, and Testing for Geotextile Products
6. Quality Control Personnel - Training and Competency Evaluation
7. Statistical Analysis of Test Results
8. Resolution of Non-Conforming Product or Test Results
9. Retention of Test Results and Product Traceability
10. Quality Control Testing Facilities
11. Marking, Storage, Shipping, and Handling of Finished Geotextile
12. Internal Quality Audits of Each Plant Producing Product
13. A List of Plants and Quality Control Testing Facilities

The following sections provide more information about each of the 14 elements identified above.

1) **Organization and Organizational Policies** - The QMS shall 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.

2) **Product Marking and Labeling** – Each unique geotextile manufactured for AASHTO M288 qualification and NTPEP program participation shall be marked with a clearly legible print showing, as a minimum, the manufacturing plant (or manufacturing plant ID code numbers). This marking shall be located on the roll edge of the product in the selvage at a frequency of once per 5 meters (16.4 ft). The marking shall be unique for each manufacturer and manufacturing plant facility. The mark will be established by NTPEP during the application process for the initial audit. Once the unique manufacturer mark has been established, it shall not be changed.

In addition, labels shall be affixed by the product manufacturer to both ends the outside of the geotextile roll and both ends of the inside of the geotextile roll core where they are easily visible for inspection, and shall be attached in a manner that would make the label difficult to remove or replace. This is in addition to any labeling affixed to the outer wrapping for the roll. As a minimum, the label shall contain the following additional information about the product and its production: the roll number, its production date, AASHTO M288 class(es) the product meets, and the product name (if the manufacturer is supplying the product to a private label company, the product name is the one that will be used by the private label company).

**Manufacturing Process and Documentation Control** – Each manufacturer shall establish, document, and maintain a quality management system (QMS) available for review by the NTPEP Audit Team, similar to the QMS documentation required for a certificate of registration from the International Organization for Standardization (ISO) 9001:2008 quality management system. If a manufacturer owns multiple geotextile manufacturing plants, each plant shall have its own QMS.

3) **Quality Control of Raw Materials** – The QMS shall include requirements for evaluating the quality of incoming resins, yarns, fibers, and other raw materials. The manufacturer shall do, as a minimum, the following:

- Establish specifications to be used for procuring raw materials used in the manufacture of geotextile products, and confirm that Certificates of Analysis (COA) demonstrate compliance with those specifications.
- COA's are provided with each raw material shipment (if shipment contains more than one lot as defined by the raw materials supplier lot definition, COAs shall be provided for each raw material lot).
- If more than one raw material supplier lot is used in a single lot of geosynthetic product, the geotextile manufacturer shall have specified maximum variances of COA properties allowed in a single geotextile product lot.
- Raw material COAs shall be based on a frequency of testing conducted by the raw materials supplier that as a minimum satisfies ASTM D 4354 (Table 1).
- If geotextile manufacturer conducts raw materials QA testing to verify the COA provided by a supplier, those QA test results are traceable to the COA's and raw materials lot numbers.
- Geotextile manufacturer maintains records of raw materials such that COAs, showing raw material suppliers' lot numbers, are traceable to final geotextile product on a roll/geotextile lot specific 1 basis.

#### 6) **Quality Control Inspection, Measurement and Testing for Geotextile Products**

a. The QMS shall describe the geotextile manufacturer's geotextile visual inspection and production monitoring procedures. As a minimum the procedure shall require the manufacturer to conduct visual inspections continuously during production of the final product for the following:

1. Holes,
2. Damage,
3. Thin spots,
4. Other workmanship items as described in AASHTO M288,
5. Proper product marking and labeling, and

The QMS shall also describe production equipment operational indicators to assure consistency in the operation of the production line. Examples include temperature sensors, pressure sensors, industrial sized magnet and metal detectors to locate any broken needles in needle-punched geotextiles, and any other indicators that can be used to quickly assess malfunctions. These operational indicators shall alert the production staff of the problem in a timely manner so that production can be immediately stopped to address the issue.

b. The QMS shall define the quality control tests, the method for random sampling, the size of the sample, and the lot size for production facility quality control sampling and testing. The QMS shall also include an example of a quality control test report form. The QMS shall reference applicable AASHTO and ASTM procedures. The QMS shall also describe any company procedures used.

c. The QMS shall require that the manufacturer perform and record the results of QC tests at the frequencies summarized in Table 1.

**Table 1: Geotextile Manufacturer QC Test Requirements**

<b>Test</b>	<b>Minimum MQC Frequency</b>	<b>Notes</b>
Mass per Unit Area	Per ASTM D 4354, Table 1	All M288 products
Permittivity	Per ASTM D 4354, Table 1	All M288 products
Apparent Opening Size	AOS Per (ASTM D 4354), Table 1	All M288 products
Grab Tensile Properties	Per ASTM D 4354, Table 1	All M288 products, in both the machine and cross-machine directions
Trapezoidal Tear Strength	Per ASTM D 4354, Table 1	All M288 products, in both the machine and cross-machine directions
Puncture Strength	Per ASTM D 4354, Table 1	All M288 products
Asphalt Retention and melting point	Annually	Applicable M288 products targeted for paving applications
UV Resistance	Annually, per product line	At least on lightest weight M288 products having unique manufacturer or formulation within the product line

d. The QMS shall ensure that:

- each sample selected for quality control inspection and testing is designated with a product ID, sample control number for record keeping and traceability
- the test report for each sample identifies the product, plant, date, shift of manufacture, production line, and lot designation for the raw materials, and that quality control test reports (not samples) are maintained and available for review for 3 years, and may be in electronic form (i.e., paper copies not required).

**7) Quality Control Personnel - Training and Competency Evaluation**

a. The QMS shall ensure that:

- the manufacturer’s QC manager meets the requirements established by the manufacturer;
- the QC manager qualifies technicians performing QC testing;



- QC personnel are familiar with the tests they perform, and that
  - QC personnel have sufficient authority to assure that corrective actions are carried out when necessary.
- b. The QMS shall describe the manufacturer's QC technician qualification program. As a minimum the program shall include:
- training in the AASHTO, ASTM, or Company test procedures, operation of equipment, the procedures to be used, calculations required, and reporting;
  - demonstration of competency for each required test;
  - demonstration of ability to properly document test results;
  - annual auditing of each technician's ability to satisfactorily perform the required tests;
  - retraining when a test method is revised
- c. Training and competency reviews shall 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 shall 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 shall be retained, for a minimum period of 5 years, at each facility where quality control testing occurs, and shall be made available to NTPEP for review upon request.

**8) Statistical Analysis of Test Results** - The QMS shall include a description of the manufacturer's approach using quality control data to monitor production and initiate changes or improvements in production as needed to maintain consistent quality.

**9) Resolution of Non-Conforming Product or Test Results** – The QMS shall include a procedure for resolving non-conforming product or test results. The procedure shall specify that:

1. test reports clearly identify the deficiencies relative to targeted minimum property values;
2. all product produced subsequent to the previous testing be identified and quarantined pending investigation of the failure;
3. investigations include obtaining and testing check samples, unless the manufacturer decides to only investigate manufacturing contributing factors based on observations and production monitoring records per Section 6(a) of this work plan and dispose of the quarantined material without further testing;
4. if the first check sample meets requirements, the manufacturer shall document the reasons for the original failure and may release the quarantined material, with the exception of the roll of material from which the failing sample was obtained, and resume normal production and testing;
5. if the first check sample fails, the manufacturer shall take corrective action to bring the product into conformance, shall note the corrective action on the test report, and shall continue QC testing to verify the deficiency has been corrected;
6. if additional QC testing also fails, the manufacturer shall repeat the process until the deficiency is corrected, and that,
7. all non-conforming material shall be segregated in the inventory. This segregated inventory shall be handled using one of the following options:
  1. Re-worked to manufacture new product;
  2. Scrapped, or
  3. Downgraded. If downgraded to a lower specification class because segregated inventory did not meet the minimum requirements for the intended class and are intended to be sold as NTPEP evaluated and marked geosynthetic, the cause of not meeting the intended specifications shall be evaluated and documented by the manufacturer, and that documentation maintained with the QC test results as part of their records retention program,

**10) Retention of Records and Test Results, and Product Traceability** - The QMS shall describe in detail the process for storing and the location of stored quality control test reports, and how traceability of retained information from raw materials to final products is maintained. The maintained records may be stored in electronic form (i.e., long-term storage of paper copies is not required). The QMS shall ensure that:

- a. Test reports are retained for at least 3 years and are available to the NTPEP upon request;
- b. Product and product test reports are identified in such a way that the test results for any geotextile and raw material used to manufacture the geotextile can be located;
- c. Documentation that indicates the action taken to resolve raw material or product failures, and that
- d. The manufacturer retains a copy of the NTPEP audit documentation for a facility and actions taken to resolve any noted deficiencies on file at the facility for a period of 5 years.
- e. Raw material test reports and the raw material manufacturer's certificate of analysis (COA), and any raw material testing conducted by the geotextile manufacturer are traceable to the final product and can be retrieved upon request,
- f. The manufacturer maintains a record of QC technician training and competency review documentation,
- g. The manufacturer maintains a record of equipment maintenance activities,
- h. The manufacturer maintains a record of all calibration activities, including the person doing the work and the date the calibration activities were performed.

#### 11) **Quality Control Testing Facilities**

**Note 4** – *QC testing may be performed at a location separate from the geotextile manufacturing facility.*

- a. The QC testing facility shall:
  - i. maintain current versions of all AASHTO, ASTM, and Company test procedures for all tests performed and a current version of the Company's QMS documentation;
  - ii. adequately house and allow proper operation of all required testing equipment; and
  - iii. maintain records of all NTPEP reviews and actions taken to resolve any noted deficiencies.
- b. The QMS shall describe in detail the requirements for the QC test facility(ies) and include, as a minimum, a description of how the following requirements are met:
  - i. The plant shall cover QC responsibilities at all times, including when the QC Manager is away from the plant for any reason.
  - ii. The manufacturer's QC manager shall 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.
  - iii. QC testing equipment shall be calibrated/verified in accordance with the equipment manufacturer's recommendations at least once every 12 months by personnel qualified for such work.
  - iv. QC testing equipment shall be properly maintained.

#### 12) **Marking, Storage, Shipping, and Handling of Finished Geotextile Product** - The QMS shall:

- a. describe the manufacturer's method for permanently marking the geotextile in accordance with the minimum requirements of this Program;
- b. detail and explain any coding used to mark the geotextile; and
- c. describe the procedures used to ensure that product handling, storage, and shipping processes will not adversely affect the material composition, characteristics, or product quality.

#### 13) **Internal Quality Audits of Each Plant**

- a. The QMS shall include a description of the procedures used to conduct internal audits. The manufacturer, or an independent auditor hired by the manufacturer, shall 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 audits shall include the following as a minimum:
  - Evaluation of plant inspection,
  - Inspection of testing equipment and calibrations,

- Observation of raw material sampling and lot control procedures,
  - Observation of final 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.
- b. The QMS shall ensure that:
- audit findings are discussed with plant management and testing technicians and documented in a report;
  - corrective actions are taken as necessary and documented in the report, and that
  - the most recent report is included in QMS documentation submissions.

**14) Lists of Plants, Quality Control Testing Facilities, and Technicians** - The QMS shall include the address and telephone numbers of all plants and QC testing facilities for which the manufacturer desires NTPEP qualification. The QMS shall also identify the QC contact for each facility with contact information and lines of responsibility.

### **Quality Management System (QMS) Requirements for Private Label**

#### **Companies:**

Companies that distribute products manufactured by others under a private label, shall establish a QMS documenting the procedures used to maintain traceability of the products to the prime source manufacturer source, how they maintain quality control of their private label products, requirements for warehousing and storage of the geotextile products, how they maintain records or quick access to records of the product they purchase and re-sell (including current manufacturer QC data for those products), and that the records retention requirements in this work plan are met. Private label suppliers will be required to participate in and conform to an annual audit of their QMS. Private label products will be subject to sampling/testing at the warehousing location during the annual QMS audit or at DOT customer project sites to verify compliance with these quality requirements. Conformance testing shall be completed per the requirements of the “Product Conformance Testing - Sampling and Testing for Products Distributed/Sold under a Private Label” section of this document.

The private label company QMS shall include or address the following:

1. Organization and Organizational Policies, including locations of all warehousing facilities
2. the company’s source manufacturer qualification and quality review requirements
3. Requirements for visual inspection of each product, verifying the as-manufactured product marking/labeling, manufacturer supplied certifications, and lot specific source manufacturer QC/QA data
4. How the private label company verifies incoming shipments of geosynthetic materials are compliant with the requirements established in the company’s quality policies document, including private label product specifications.
5. Resolution of Non-Conforming Product or Test Results, including how geosynthetic products that are determined to not meet specification requirements are identified, traced, and quarantined
6. How source manufacturer certifications and QC Test Results are retained or quickly accessed, and private label product traceability to the source manufacturer product data maintained
7. Marking, Storage, Shipping, and Handling of Finished Geotextile

#### **Product Conformance Testing (NTPEP Split Sample Testing)**

The NTPEP Geotextile Program requires that geotextile be sampled and tested to determine conformance with the AASHTO Materials Specifications.

#### **Sampling and Testing for Manufacturing Plants**

Once initial product evaluation has been established, an AASHTO or DOT Auditor will sample geotextile during each plant audit. At a minimum, all unique geotextile styles must be sampled and tested within a 3-year period. At least 1 geotextile sample will be taken during each audit.

The AASHTO or DOT Auditor will randomly select the product roll from which the samples will be taken, and oversee the specific product samples taken. Each sample will be split, with the manufacturer retaining one set of samples for in-house testing and the auditor retaining the other set of samples split from the overall sample taken for AASHTO NTPEP testing. If the geotextile manufacturer does not have capability to perform a particular test as specified in M288, the split samples may be tested at a laboratory accredited by the Geosynthetics Accreditation Institute (i.e., GAI-LAP) to perform this testing. Each set of samples shall consist of a minimum of six laboratory samples measuring 3 feet in length by the width of the roll, shall be obtained from the single roll selected by the auditor. The samples shall not include the outer wrap of the roll. For rolls less than 12 feet wide, the length of the sample shall yield a minimum area of 36 square feet for each sample. The AASHTO or DOT auditor will label all samples to be tested.

The AASHTO/DOT auditor shall complete an identification label, and attach it to each sample (an example of the label is shown below). The completed label shall identify the NTPEP designation number, manufacturer, style, roll number, lot number, the AASHTO or DOT auditor's name, date sampled, and date shipped. The sample shall be clearly marked to indicate the machine direction (MD) along the outer edge of the sample.

The sample shall be rolled (not folded) for shipment to the AASHTO NTPEP designated testing facility. It shall be placed inside, or around, a rigid core to prevent bending and folding during shipment. The package shall be wrapped with a protective cover. In addition, an "In-Plant Sampling Report" must be completed by the sampler. One copy of this report must accompany the samples. An example of this report is included in this work plan.

<b>AASHTO-NTPEP TEST SAMPLE</b>	
<b>NTPEP DESIGNATION GTX</b>	
<b>MANUFACTURER</b>	_____
<b>PRODUCT STYLE</b>	_____
<b>ROLL NO.</b>	_____ <b>LOT/BATCH NO.</b> _____
<b>WHERE SAMPLED</b>	_____
<b>SAMPLED BY</b>	_____
<b>NTPEP REPRESENTATIVE</b>	_____
<b>DATE SAMPLED</b>	_____
<b>DATE SHIPPED</b>	_____

**Figure 1. Example geotextile product sample identification label.**

All tests identified in "Quality Control Inspection, Measurement and Testing" in this work plan shall be conducted. Within 45 days after the sample is taken, the manufacturer shall submit their split sample test results to the NTPEP Audit Program Supervisor. Once the NTPEP laboratory results are available and submitted to the NTPEP Audit Program Supervisor, the NTPEP Audit Program Supervisor will compare the test results and determine if both sets of test results are in compliance with the NTPEP work plan. If any of the test results are not in compliance, the NTPEP Audit Program Supervisor will request from the manufacturer an explanation of any noncompliant test results, including any corrective actions found necessary in the manufacturing process or testing procedures. The NTPEP Audit Program Supervisor will post the comparison of the split sample results and the corrective action taken in the secure area of the NTPEP website, available only to AASHTO member departments and the manufacturer for whom the testing was conducted, and annually evaluate the split sample results and report on testing proficiency. The test results for a product will be considered to be in compliance with this NTPEP work plan if:

- the test results meet or exceed all of the M288 specification requirements for the intended M288 class for the product, and
- the test results meet or exceed the manufacturer's MARV's or MaxARV's for the product established based on the QMS evaluated as part of this audit program (and considered compliant).

#### **Sampling and Testing for Products Distributed/Sold under a Private Label**

A reduced sampling and testing program will be conducted for NTPEP quality assurance (QA) purposes

for companies that market and distribute products manufactured by others to confirm consistency between the product testing conducted by the prime source manufacturer and NTPEP on the manufacturer's products as described in the previous section, and the products distributed and sold under a private label.

"Consistency" is defined as meeting or exceeding the same AASHTO M288 class specification as the source manufacturer's audit results demonstrated and that they also meet or exceed the source manufacturer's MARV or MaxARV for the source product which is based on the source manufacturer's QC test results conducted in conformance with the source manufacturer audit. Sampling shall be conducted in a manner that is consistent with the sampling protocol and documentation process as defined in the previous section for testing to evaluate conformance of the manufacturer to this audit work plan.

As a minimum, tests conducted on the private labeled products shall include:

- Apparent Opening Size (AOS) – ASTM D4751
- Grab Strength – ASTM D4632
- Mass/Unit Area – ASTM D5261
- UV Resistance – ASTM D4355

Testing will be conducted on a product line basis. For the first three tests, generally, only the lightest weight product, plus two others within the product line, at the discretion of the auditor, will be tested. For the UV resistance, only one of the products tested as part of the manufacturer's audit program NTPEP testing will be tested. Testing will be conducted on a three year cycle.

#### **Resolution of Audit or Testing Failures and Disputes:**

Inevitably, there are times when the sampled geotextile fails to meet one or more of the M288 specification requirements, or the manufacturer's MARV or MaxARV for the product established based on the QMS evaluated as part of this audit program, when tested by NTPEP, or when the manufacturer is found, during an audit, to have neglected one or more aspects of the governing QMS during manufacturing. While the manufacturer may request a retest, if sufficient sample is available, the burden will be on the manufacturer to identify the cause, document the resolution, and revise his QC plan to assure future conformance. All results will be reported. Any retesting or re-auditing will be at the discretion of NTPEP and the associated costs will be borne by the manufacturer.

**1. Disagreements with NTPEP** - Disagreements with NTPEP regarding test results will be handled as follows:

- a) The manufacturer should verify that his/her manufacturing process is operating correctly, that test equipment is calibrated, and that test procedures are correct. If these conditions are met, a set of three samples shall be obtained by an AASHTO representative per the "Annual Product Conformance Testing" above, as appropriate, from the same lot as the failing test. The samples shall be taken from one of the originally sampled geotextile rolls or from another geotextile roll of the same lot made during the same shift.
- b) The manufacturer will test one of the samples, and if the results pass the AASHTO M-288 specifications and the MARV or MaxARV for the product as determined based on the manufacturer's QC test results, the AASHTO representative will send one sample of the same product to a third party independent laboratory acceptable to NTPEP and a second sample to NTPEP and request that the product be tested. NTPEP will consider the dispute resolved if the manufacturer's test results are in conformance with this work plan and conform with at least one of the other testing facility results (i.e., the manufacturer's test results and either the third party or NTPEP laboratory test results are determined to be in compliance with this work plan as specified in "**Product Conformance Testing (NTPEP Split Sample Testing)**"). If this is not the case, the manufacturer should repeat the process of checking the manufacturing process, the equipment calibration and the test procedures until satisfactory agreement with interlaboratory testing is accomplished.

**2. Disagreements with the NTPEP auditor or audit team** - Disagreements with the NTPEP auditor or designate regarding procedural issues will be handled as follows:

- a) The manufacturer will notify the NTPEP Program Manager and the Geosynthetic Technical Committee Chairman in writing of the dispute, providing appropriate documentation for the Geosynthetic Technical Committee to fully understand the controversy, and request a resolution.
- b) If the dispute is not resolved to the manufacturer's satisfaction, the dispute will be raised to the NTPEP Executive Committee Chairman for resolution by the NTPEP Appeals Board. The decision by the Appeals Board shall be considered final.

**3. Withdrawal from Program** - A written request to withdraw the audit request must be received by the NTPEP Manager at least five business days before the auditing/sampling is to begin. A handling fee of ten (10) percent of the auditing fee will be charged in this event. Fees will not be refunded after this deadline. If the request to withdraw is made after that point in time, no refund of testing/auditing fees will be provided.

**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. To this end the program will provide for public notice of companies, plants, and M288 products found to conform with the provisions of this work plan via website postings, with official electronic reports issued to AASHTO member departments.

**Modification of Qualified Products (Retest Requirements):**

Product design may change over time as manufacturers improve their products and optimize their manufacturing processes. When a design change is made in a NTPEP listed product, the Manufacturer shall notify the NTPEP of the change and submit samples for re-consideration of conformance with this work plan. Any changes in a manufacturing method, product weight, or geotextile manufacturing process shall be considered design changes.

**Implementation Sequence for this Work Plan**

Due to the need for the industry to make preparations to become compliant with this work plan, the following sequence of events is anticipated:

1. Manufacturers review their QMS documents to align their quality system with this work plan.
2. Manufacturers obtain and implement the marking and labeling equipment needed to produce the mark and labels as described in this work plan.
3. The manufacturers make arrangements with NTPEP to have their initial audits conducted, and take the corrective action needed to become compliant. NTPEP will provide a grace period for each manufacturer to become compliant with the features of this work plan that are new to the industry (e.g., product marking).
4. All testing conducted as part of this work plan will comply with the previously established testing cycle.
5. Compliance with this work plan regarding the warehouse/inventory inspection of geotextile will not be required until existing inventory has had time to be used up. It will only be noted as being in process with regard to compliance.
6. After a period during which all interested manufacturers have had an opportunity to have their initial audit conducted, private label companies will be invited to begin participating in the audit program.



**IN-PLANT SAMPLING REPORT**

**NTPEP Program: GTX**  
**NTPEP Number: (20\_\_)-0\_\_**

**Manufacturer Name:** \_\_\_\_\_

**Type of Facility where Sampling Conducted:**

\_\_\_\_ Manufacturing (production line); Describe \_\_\_\_\_

\_\_\_\_ Warehouse (storage of finished product); Describe \_\_\_\_\_

**Location of Facility where Sampling Conducted:** \_\_\_\_\_

**Location within Production Line/Process where Sampling Conducted:** \_\_\_\_\_

**Date Material(s) Sampled:** \_\_\_\_\_

**Manufacturer Representative(s) Present:** \_\_\_\_\_

**Pre-arrangements Made with Manufacturer to Sample:**

\_\_\_\_ Surprise inspection \_\_\_\_ Advance warning given (\_\_\_\_ days) but not specific sampling appointment date

**Material(s) Sampled and Description:** \_\_\_\_\_

*(Please specify product designation and structure (IE. NP-NW, HB-NW, MF-W, etc for each style submitted below:))*

Sample \_\_\_\_\_: \_\_\_\_\_

Roll No. \_\_\_\_\_

Lot/Batch No. \_\_\_\_\_

Sample \_\_\_\_\_: \_\_\_\_\_

Roll No. \_\_\_\_\_

Lot/Batch No. \_\_\_\_\_

Sample \_\_\_\_\_: \_\_\_\_\_

Roll No. \_\_\_\_\_

Lot/Batch No. \_\_\_\_\_

Sample \_\_\_\_\_: \_\_\_\_\_

Roll No. \_\_\_\_\_

Lot/Batch No. \_\_\_\_\_

Sample \_\_\_\_\_: \_\_\_\_\_

Roll No. \_\_\_\_\_

Lot/Batch No. \_\_\_\_\_

Sample \_\_\_\_\_: \_\_\_\_\_

Roll No. \_\_\_\_\_

Lot/Batch No. \_\_\_\_\_

Sample \_\_\_\_\_: \_\_\_\_\_

Roll No. \_\_\_\_\_

Lot/Batch No. \_\_\_\_\_

**Sampling Event Notes:**

*(plant condition, roll storage/inventory, traceability of raw materials to products, sampling issues, etc.)*

**Sample Shipment Preparation Observations:**

*(sample identification approach, sample placement in the shipping container, who did shipment preparation, how shipped, etc.)*

**Sampler Name and Affiliation: (please print):** \_\_\_\_\_

Signature

Date

Include a copy of this sampling report with samples. \_\_\_\_\_