NTPEP Annual Meeting
Geosynthetics (GTX/REGEO) Technical Committee
Meeting Minutes: May 19, 2014; 2:20 – 4:00 PM

1. Call to order/introductions (Tony Allen – WSDOT) – 2:20 PM
   - Tony opened the meeting. Introductions were skipped due to time constraints.
   - A total of 5 state DOT GTX/REGEO TC members were present, plus two TC industry representatives and one AASHTO Liaison.
   - Total attendance at the TC meeting was 66, of which 28 were state DOT members, 3 were AASHTO staff, and three were representing the private lab doing the testing for the TC. The rest were from industry.

2. Summary of GTX audit results and what has been learned (Joel Sprague – TRI)
   - Joel provided a review of where the GTX audit program currently stands.
   - This presentation included the following:
     i. Review of laboratory testing
     ii. How many manufacturers are participating in Program
     iii. Audit findings
     iv. Review of memo emailed in December 2013
     v. Audit findings thus far in 2014
   - Joel said it is a distinct pleasure to be invited into plants to audit, and see all the work being done to ensure quality.
   - Snapshot of things auditors are seeing:
     i. Sampling frequency biggest issue, testing fewer specimens than standard (OK, if you can justify it)
     ii. Many plants not marking, but OK, since don’t receive mark until audit complete
     iii. AOS was test most commonly done wrong (i.e., only one bead size used, when at least two bead sizes should be used to have any chance of defining the AOS value), permittivity was second-most commonly run wrong (deaired water often not used, which can affect the test result).
     iv. For discussion, one venue will be ASTM for addressing QC testing frequency, QC specimen populations, and AOS issues.
   - There are some inconsistencies and deficiencies in the frequency of testing, how a lot is defined, how the MARV is defined, and even in how many specimens are tested for each sample for each test. This detracts from the confidence the state DOT users should have in a manufacturer’s certified property values for their products.
   - Keith Gardner (Crown Resources) asked if manufacturers can be found to be compliant that aren’t printing the markings on the product. Joel indicated any product produced after Dec. 1, 2013 needs to have printing on them or the manufacturer would not be compliant. However, it is possible that the states will see product without the markings for quite
some time to come, at least until the material produced before Dec. 1, 2013, is moved out of the warehouse and used up.

- Kelly Davis (DDD Erosion) asked if a procedure has been developed for printing on converted material. Joel indicated not yet since a converter has not yet submitted an application for this Program.
- Bruce Ebersole (PENNDOT) stated it is important to consider the grip faces used when conducting the grab tensile test. PENNDOT uses steel faced grips, whereas they found out that rubberized grip faces produced higher strengths. Sam Allen mentioned that the rubberized grip faces help to provide a better measure of the real strength of the material as there are less hard points on the fabric at the grips that could cause premature failure. Sam also said that he agrees the gripping technique is important, especially when comparing test results from multiple labs, such as is the case when assessing the results from split sample testing (i.e., NTPEP and manufacturer testing) Tony Allen suggested that the grip face used in the testing should be mentioned in the audit reports, so that if there are differences between the NTPEP and manufacturer test results in the split sample testing, the reason can be more easily identified.
- See attached presentation for details.

3. Recent discussions in ASTM regarding the definition and use of a MARV, and its possible implications for the NTPEP GTX/REGEO programs (Joel Sprague - TRI)
   - Joel presented a summary of sampling and certification issues. A key issue is that the frequency of sampling and testing for QC purposes is not consistent in practice, nor is the sampling frequency adequate to statistically define a MARV (i.e., two standard deviations below the mean) – it may be easier to define a minimum value that is not statistically based. Another problem is the use of the roll as the unit of sampling.
   - See attached presentation for details.

4. GTX DataMine Issues (presented for NYDOT by Tony Allen, since NYDOT cannot be present)
   - Due to the shortness of time for the TC meeting, this presentation was not given.
   - Tony Allen indicated that most of the issues raised in this presentation will be resolved through Datamine 3.0. However, Tony said he will pass this presentation on to IEngineering (Riaz) for consideration when further developing Datamine 3.0.

5. REGEO program and new REGEO DataMine module – status (Tony Allen – WSDOT)
   - Tony briefly summarized the status of REGEO reports and recent submissions. He reported that there are 7 product lines represented in REGEO reports currently on the NTPEP website, and 3 product lines that are in the submission process, 2 of which are from India. He also
indicated that REGEO reports for some product lines have been removed from the website because the manufacturer did not submit to have the intermediate (i.e., every 3 years) QA evaluation of their product line done, nor did they respond to reminders from NTPEP. Tony emphasized the importance of completing all parts of the evaluation program to maintain a current evaluation report on the NTPEP website, and in the near future, in Datamine.

6. Moving forward from partial audit to full audit program implementation for REGEO – issues that need to be addressed (Tony Allen – WSDOT)
   - A partial audit is already being conducted for the REGEO program. In addition to what is already being done, the following would need to be done to move to a full audit program:
     i. Review of QMS
     ii. On-site evaluation of testing program
     iii. On-site evaluation of quality process
     iv. Yearly audits, or at least add an audit to the mid-term (i.e., every three years) REGEO product line QA evaluation
     v. Product markings
     vi. Handling of private labeled product lines
   - Tony Allen asked how many states present would consider a full audit program for REGEO as beneficial and would use the reports from complete audits for this type of material?
     i. 12 of the 13 states in the room who are currently using the REGEO evaluation program would see a full audit program for REGEO as beneficial.
     ii. Collin Franco (RIDOT) would like to see the REGEO audit program be useful as an acceptance program.
     iii. Chris Peoples (NCDOT) is in favor of a full audit for REGEO.
   - Regarding the requirement to do product marking for geogrids:
     i. Fred Chuck (TenCate) explained that one of the difficulties would be in printing on REGEO products (i.e., geogrids). It would be better to have tags on these products.
     ii. Lance (Strata) assured the audience that they can include labels on each of their REGEO products.
   - For follow-up on this issue:
     i. **Action Item:** Tony Allen will follow up with the TC members to see if they would want a full audit instead of a mini-audit.
     ii. **Action Item:** GMA will develop a proposed labeling procedure for REGEO, for the TC’s consideration.

7. Including biaxial geogrids (pavement base and subgrade reinforcement applications) in the REGEO program – discussion of issues to be overcome (Tony Allen – WSDOT)
   - Tony Allen briefly summarized the results of a survey done the previous year to see what states are interested in adding geosynthetic base
reinforcement to the REGEO program. These survey results are in the 2013 meeting minutes.

- John Schuler (VA DOT) is not sure what to test. Nobody really knows what makes a pavement base reinforcement grid work.
- KYDOT and IADOT would like to see junction strength be tested for this application.
- **Action Item:** The Geosynthetic Materials Association (GMA) is evaluating what tests they feel should be included in this program. A deadline to accomplish this has not yet been set. The GMA will have a deadline to accomplish this by the next quarterly conference call.
- **Action Item:** Once the TC hears back from the GMA, Tony Allen will send out a brief survey to the states with a proposed test matrix to find out if the test matrix will be satisfactory and if they will use the NTPEP results.

8. Installation damage protocol currently used for NTPEP testing (Tony Allen – WSDOT)

- Tony Allen provided summary of recent changes to the details of the REGEO installation damage exposure protocol. Tony mentioned that there have been complaints from some of the manufacturers that the new conditions are too severe and possibly unrealistic. Tony explained that the change was made a couple of years ago in response from some of the states and others that the exposure regimen was not sufficient to accurately reflect typical installation conditions.
  i. A focus of the complaint was the use of a steel plate below the geosynthetic sample with only a 6 inch lift of aggregate between the sample and the steel plate, resulting in too much compactive energy being focused on the geosynthetic.
  ii. Possible courses of action include:
    1. Conducting an offline investigation to assess the effect the installation conditions are having on the level of damage to the geosynthetic, so that any changes made to the exposure regimen can be done based on good science.
    2. Sending a brief survey to the state DOT’s to determine the range of installation conditions the states are currently using.
    3. Since the current REGEO work plan does not provide the specifics of these installation conditions (the installation conditions are only provided in very general terms), a revision to the REGEO work plan should be made to describe the agreed upon conditions in more detail.
  iii. All three courses of action may need to be taken.
  iv. This presentation is attached to these minutes.
- Lance Carter (Strata) recommended all of the manufacturers participating in the program are being tested to the same protocol, not two different protocols.
• Tony Allen agreed that all manufacturers need to be tested using the same protocol. Therefore, if any change is made to the exposure regimen in response to this concern, all the manufacturers will need to be tested (or retested) using the new exposure conditions. As it is currently, we already have some manufacturers who have not been retested as yet using the new exposure conditions because they are not due yet to be retested, considering the 6 year test cycle. This will eventually get rectified, though sooner would be better.

• Pete Kemp (WIDOT) pointed out that the current exposure regimen for installation damage should continue to be used for current and future testing until such time that it is agreed to modify the regimen, if the regimen is modified. Pete also raised the question of who pays for the offline investigation.

• **Action Item:** The GMA will discuss the issue so that they can provide the TC with a recommendation as to whether or not they wish to pursue a change in the exposure regimen, and if so, whether or not they wish to fund an offline investigation (i.e., a set of field exposure tests). They will get back to the TC on this as soon as they can, but no later than the next quarterly conference call.

• **Action Item:** Tony Allen will develop and have sent out a survey of the states on this subject to investigate what conditions the State DOT’s are seeing, to help guide the TC on the planning for this offline investigation and to determine if any changes in the exposure regimen are needed.

• **Action Item:** Tony Allen will develop some language for the modification to the REGEO work plan to better define the exposure regimen (see attached presentation for some draft language).

9. New business/Open Discussion

• GMA Concern: Some DOTs are still requiring test properties that outside of AASHTO M288, and that furthermore are out of date. These out of date tests are not included in the new audit plan, nor should they be.

• As an industry, the manufacturers are not performing tests that are not required by the NTPEP work plan or AASHTO M288.

• Pete Kemp (WI DOT) is going to still require manufacturers to do the Mullen burst test because they don’t know how to correlate the Mullen Burst values with the new test values (CBR Puncture).

• Sam Allen (TRI) is going to send Tony Allen a correlation between the CBR test and Mullen burst test. This information is included with these minutes.

• Katheryn (AASHTO) will work with Fred Chuck (TenCate) to get a list of the current test methods being completed for GTX and REGEO. This information will be sent to all state DOTs along with the correlations.

10. Adjourn – 4:00 PM
NTPEP Geotextile Testing
and
Audit Findings

May 2014

Sam Allen & Joel Sprague
TRI/Environmental

Laboratory Testing

- Mass per Unit Area (ASTM D 5261)
- Grab Tensile Properties (ASTM D 4632)
- Trapezoidal Tear Resistance (ASTM D 4533)
- CBR Puncture Strength (ASTM D 6241)
- Apparent Opening Size (ASTM D 4751)
- Permittivity / Flow Rate / Permeability (ASTM D 4491)
- UV Resistance (ASTM D 4355, 500 hrs)
Mass/Area Testing
ASTM D 5261

Sample press

Test Coupon

Calibrated Scale
Grab Tensile Properties
ASTM D 4632

Specimen
200 mm

100 mm

25 mm wide x 50 mm tall grips

ASTM D 4632 – Grab Tensile Properties (Strength and Elongation)
Trapezoidal Tear Strength  
ASTM D 4533

CBR Puncture Strength  
ASTM D 6241
Permittivity / Flow Rate / Permeability
ASTM D 4491

Apparent Opening Size
ASTM D 4751
Ultraviolet Resistance
ASTM D 4355

- assessment of UV stability of the AOs and CB
- uses a laboratory weathering meter
- Uses xenon-arc UV source
Fluorescent UV vs Xenon Arc

Sunlight compared to the QUV and the Q-Sun. The QUV provides the best available simulation of sunlight in the short-wave UV region from 365 nm down to the solar cut-off. However, it is deficient in longer wavelengths. The Q-Sun reproduces sunlight's full spectrum, which is critical for testing many products that are sensitive to long-wave UV, visible light, and infrared.
NTPEP GTX Program

To-date we have:

• **22** prime facilities (6 others not yet certified)
• 8 private label distributors
• 4 of the prime manufacturers are also certified as private label distributors.

Audit Findings
(from more than 1 or 2 audits)

• Incomplete/Inaccurate labeling
• UV testing frequency / limited product testing
• Marking not started (not treated as a deficiency)
• Fewer specimens tested than default in standard without documented justification
• Sampling frequency doesn’t satisfy D4354
• Permittivity: Water not deaired or not checked for air.
Audit Findings
(from more than 1 or 2 audits)

• AOS Testing: Single bead size tests for spec conformance only (not treated as a deficiency)
• Split sample test results from the manufacturer have not been provided

Audit Focus in 2014

• 4 complete labels on every roll (1 in core and 1 on wrap at each end). The labels must include product style, unique roll number, date of production, and M288 classification. Printing these details on the fabric may be substituted for putting labels on one end of the roll if this process is completely detailed in writing in the quality manual.
• UV testing results for at least the lightest weight product from every product line (same manufacturing process/same product composition) performed within the previous 12 mos.
• Printing (at least manufacturer’s code) on the fabric if the production date on the label is after December 1, 2013 or 6 weeks after receipt of manufacturing codes, whichever is later.
Audit Focus in 2014

• A calculation of number of specimens to test based on a reliable estimate of the coefficient of variation of previously tested samples.
• A roll list of all roll numbers produced in the production lot that includes the roll number that is the subject of traceability. The roll list will show which rolls were sampled for QC testing, and these tested rolls will represent the sampling basis for satisfying MARV (or MaxARV for AOS) certification to a 97.7% confidence limit as required in AASHTO M288. If ASTM D 4354, Table 1 for Manufacturing QC is not followed, the alternate statistical method used should be clearly described. NOTE: According to the workplan this requirement applies to all properties in M288, except UV resistance and asphalt retention.

Audit Focus in 2014

• A record of regular, frequent testing of the air content of the water used for permittivity testing.
• AOS Testing: Testing to include at least 2 bead sizes – 1 larger than $O_{95}$ and one smaller than $O_{95}$.
• Split sample test results must be submitted before an NTPEP certificate of compliance will be provided.
• Private label distributors will be subject to sampling of at least one and no more than 3 products. Sampling will be at the discretion of the auditor, but may be from inventory at the audited location; from a randomly selected construction site; from another company warehouse; or from a prime supplier prior to product being shipped.
Audit Focus in 2014


- With regards to administrative issues, the audits will continue to be announced (scheduled with 2 to 4 weeks lead time). Participating companies should be expected to be audited within the same quarter as initially audited. Companies will be prompted by NTPEP to submit for auditing during the month prior to the quarter in which the audit should be scheduled.

Audit Findings (thus far in 2014)

- Lack of annual competency evaluations. Additional training only if standards are revised.
- Product labels do not currently include M288 Class and were not included within the core on inspected products.
- D4751 - AOS being run with at least two bead sizes to bracket 95% value has not been implemented.
- Insufficient documentation of annual internal audit.
- D4491 - Recently implemented, but SOP has not been developed, dissolved oxygen is not checked, and only 2 measurements are made on each specimen.
- D6241 – Only 5 specimens are currently being tested for CBR Puncture, instead of the default 10, without a calculation of the reliable estimate based on COV.
Audit Findings (thus far in 2014)

- Training records not specific to individual employees.
- Updated test method standards and documents need to be assured.
- QC sampling frequency is not consistent with plant QA manual requirements.
- No current statistical determination of MARV.
- Private label product is being labeled by private label distributor, rather than the source manufacturer. Labels include relabeling date rather than original production date. Additionally, core labels do not contain full information.
- No UV resistance test data was available to support traceability of audited products.

Audit Findings (thus far in 2014)

- Documentation of Agreement between Source Manufacturer and Private label Company has not been provided for several companies/products.
- Private label product is being labeled by private label distributor, rather than the source manufacturer. Labels include relabeling date rather than original production date. Additionally, core labels do not contain full information.
Discussion

Thank you
Summary of Sampling/Certification Issues

• All geotextile manufacturers who certify to MARV need to comply.
• All geotextile manufacturers in the NTPEP geotextile program need to comply with M288.
• Certification of MARVs / MaxARVs (minimum and maximum average roll values) requires 97.7% confidence limit values.
• Individual test methods require that ASTM D4354 be followed.
• Can we follow D4354 and certify MARVs/MaxARVs?
  – How do we determine appropriate sample plan?
• How should we handle failing samples? D4759?
• What should a certification include/exclude?
Why is MARV Important?

• Product Certifications state compliance
• NTPEP Audits Require M288 Compliance
• Per M288:
  • 3.3 Minimum Average Roll Value (MARV) – For geosynthetics, a manufacturing quality control tool used to allow manufacturers to establish published values such that the user/purchaser will have a 97.7 percent confidence that the property in question will meet published values. For normally distributed data, “MARV” is calculated as the typical value minus two standard deviations from documented quality control test results for a defined population from one specific test method associated with one specific property.
  • 4.2 All property values, with the exception of apparent opening size (AOS), in these specifications represent minimum average roll values (MARV) in the weakest principal direction (i.e., average test results of any roll in a lot samples for conformance or quality assurance testing shall meet or exceed the minimum values provided herein). Values for AOS represent maximum average roll values.
• ASTM D4354 is not required by M288 for establishing MARVs.
Minimum Average Roll Value: MARV

The “minimum average roll value” (MARV) was developed by regulators and manufacturers during the 1980s while setting geotextile specifications. The concept is a negotiated middle ground between the customary regulatory absolute minimum values and the customary textile manufacturing average values in their respective specifications.

Customarily, the MARV is derived statistically as the average value less two standard deviations as shown in the following diagram . . .

*But this is usually a misinterpreted calculation!!! Why???
Calculating MARV . . .

• Because . . .

MARV = AVG – 2 STDDEV

really is just an approximation that assumes a large number of sample results. The more accurate equation is:

MARV = AVG – t * STDDEV

Where “t” depends on the number of samples that are the basis for the statistics.
The t-distribution

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The t-distribution

N = 61 is a large number of sample rolls to include in the lot in order to use $t = 2$ in the MARV calculation for 97.5% confidence limit!!!

T = 2.262 for example.
More Detailed Questions

Lot Definition
Is a lot a single period of production?
Can there be sub-lots, but certification is based on running lot summary?

Sampling Frequency Strategy
Waste Market – Different tests have different frequencies
Transportation Market – Governed by M288
What is the strategy/Can the same strategy be used for both?

How about those certifications.
Should all data on which the certification is based be included so the recipient can check the statistics?
How about listing all rolls (like a shipping list) and listing data with rolls that were never tested?
What if the rolls shipped are not consecutively numbered?
Have rolls been downgraded? Has the data been removed?
More Detailed Questions (continued)

What if shipments are made up of rolls from multiple “sublots”?
   How do I certify the shipment?

Can I certify select rolls from “sublots” as having higher results if the data supports the MARV calculation?

If a sample roll’s test results (or other online QC) shows a roll(s) to be out of spec, can I remove it from the lot history?

Is it time to switch from MARV to MINIMUM?
Real Production / Real World Data

• How can we interpret D4354 to better reflect real manufacturing QC? Annual or semiannual lots with sublots?
• Is QC for wovens different than for nonwovens? (i.e. beams or master rolls as basis?)
• What is a “planned production quantity”? 
Where do we go from here?

- Develop ASTM Guide?
- Add NTPEP Work Plan requirements?
- Embed explicit requirements within each test standard?
DataMine Issues
NYS DOT

Two Issues:

1. NTPEP Test Data Needs to be Exportable.

2. Data from Multiple Primes for Private Labels should be more manageable.
1. NTPEP Test Data Needs to be Exportable

**Problem**

There is no easy way to pull test data from DataMine into either a spreadsheet or database, from which States can build their Approved Lists.
How test data must be retrieved now:

Here’s a DataMine summary table of NTPEP test results. It’s nice, but you can’t select the test data *only* to copy/paste: It’s the entire table, and it doesn’t paste well into a spreadsheet (see next slide)
A great deal of manipulation is required to convert this into a usable table.
**Proposed Solution**

It is already possible to export MARVs (and MaxARVs) from DataMine.

This same capability can (hopefully) be built into DataMine to export NTPEP test data.
To retrieve MARVs in DataMine, click [EXPORT DATA] in “MY DATAMINE”

<table>
<thead>
<tr>
<th>Export Data</th>
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<tbody>
<tr>
<td>Use this page to specify filters for data export.</td>
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**Selected Attributes**

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<th>Geotextiles and Geosynthetics</th>
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<td>All</td>
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<tr>
<td>Manufacturer Name</td>
<td>Agru America</td>
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**Download File**

Use following link to download the excel file

[GTX-Agru_America-All-All-2014-5-1.xls]
These MARVs, provided by the manufacturer, are put into an Excel table by DataMine.

DataMine should be able to provide NTPEP test data in a similar manner.

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<thead>
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<th>NTPEP Number</th>
<th>Company</th>
<th>Product Name</th>
<th>Product Type</th>
<th>ASTM D4532 (Grab) MD</th>
<th>ASTM D4833 (Trap) MD</th>
<th>D4491 (Permittivity)</th>
<th>D4751 (AOS)MaxARV</th>
<th>D6241(50 mm Puncture)</th>
<th>D5261 (Mass/Area)</th>
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2. Multiple Primes for Private Labels

Private Labels can now list up to 5 Primes to associate with any one product.

Problem

States must search for the most conservative value for each test, then compare that value to M-288 requirements to determine for which applications the product will be approved.


Proposed Solution

Once again, NTPEP data needs to be exportable from DataMine. States can then at least use spreadsheets to view values from all Primes at once, and then choose the most conservative to apply to M-288.
Proposed Solution cont’d

Ideally, DataMine would automatically provide the most conservative value for each test from all Primes listed for a particular Private Label style.
REGEO Program Status/Changes/Proposals
2014 NTPEP Conference

By Tony Allen
WSDOT

REGEO Program Status

• Currently have REGEO test reports published for 7 product lines
• A new round of qualification testing and reporting for Tensar, and QA testing for Stratagrid and Synteen, are near completion and currently in final review
• Three other product lines have been submitted for product qualification testing/evaluation, two product lines (both from one manufacturer) have been submitted for QA testing/evaluation, and it is expected that they will start soon
• Submittals for new testing or new product lines are being made electronically through DataMine 2.0
The Future – Moving REGEO to a Full Audit Program

- Similar to GTX audit program
- Already doing some audit functions now
- Additional audit aspects needed
  - Review of QMS
  - On site evaluation of testing program
  - On site evaluation of quality process
  - Yearly audits
- Product marking and labeling standards
- Handling private labeled products

REGEO Mini-Audits

- First audits completed in June 2011 (Miragrid and ACE)
- Focus is on verification of continuity/consistency of product line to justify testing of only representative products in the line
- The following were evaluated:
  - Consistency of manufacturing production lines that produce product for the line, including control of additives, consistency of fiber/yarn forming process and process to form final product
  - Traceability/consistency of raw materials, additives used, etc. throughout product line
  - Manufacturer QC for raw materials used in product line
  - Manufacturer QC used to control quality/consistency of all products in line (including consistency of coating used for coated PET geogrids)
  - Adequacy of records retention and traceability
- Not a full evaluation of the manufacturer QMS (only will evaluate those aspects of QMS germane to the product line issues)
- No split sample testing/evaluation
- No evaluation of manufacturer QC testing quality and consistency
- Product marking not required
Issues and Discussion for Full Audit Program

- Need?
- Potential hurdles to overcome?
- How soon to target implementation?

Geosynthetics for Base Reinforcement

- Survey done last fall to assess desire to add geosynthetic base reinforcement to REGEO program
- 26 states responded, and of those 19 said they wanted this program added. Of the 26 respondents:
  - 15 of these states use geogrids in this application
  - 8 use them for temporary applications such as haul roads, work platforms, etc.
  - 6 use them to enhance the pavement base course properties in permanent pavement design
  - 15 use them to only enhance the soft subgrade performance in the permanent pavement design
  - 17 states use geotextiles for this pavement base reinforcement application
  - Only 13 states reported that they have specifications for this application
Geosynthetics for Base Reinforcement – What to Test?

• 20 states wanted tensile strength at 1 or 2% strain (ASTM D6637 or D4595)
  – 6 wanted 1% strain
  – 14 wanted 2% strain
• 10 states wanted creep stiffness at 1,000 hrs and 2% strain (part of AASHTO PP66-10)
• 15 states wanted geogrid aperture size
• 14 states wanted installation damage testing (part of AASHTO PP66-10)
• 2 to 6 states wanted durability index testing such as CEG, molecular weight, and oven aging (part of AASHTO PP66-10)
• 12 states wanted pullout testing (ASTM D6706)
• 10 states wanted direct shear soil-geosynthetic interface friction testing (ASTM D5321)

Geosynthetics for Base Reinforcement – Next Steps?

• Is response sufficient to warrant developing the work plan changes to add this to RE GEO?
• If so, which tests should be included in the program?
• How should product line concept be applied for this application?
• Include in current “mini-audit” to verify product line consistency?
Questions and Discussion?
REGEO Program
Status/Changes/Proposals
2014 NTPEP Conference –
Installation Damage Issues

By Tony Allen
WSDOT

Summary of Recent (Summer 2011) Changes to
Installation Damage Exposure Protocol

• Previous exposure regimen (prior to summer 2011)
  – Place steel lifting plate
  – Place and compact 8 inches of aggregate used for exposure
  – Place geosynthetic sample
  – Place and compact 8 inches of the same aggregate – place aggregate by
dropping aggregate from front end loader from low height from the side,
spreading aggregate by hand shoveling, and compact using a smaller size
single drum vibratory 10,000 lbs vibratory roller (total equipment wt.)

• Current exposure regimen
  – Place steel lifting plate
  – Place and compact 6 inches of aggregate used for exposure
  – Place geosynthetic sample
  – Place and compact 6 inches of the same aggregate – place using 15,000 lb
wheeled front end loader, spreading aggregate with wheeled loader
tracking on aggregate over the geosynthetic, and compact using single
drum 25,000 lbs vibratory roller, using the heavy compaction setting (total
equipment wt.)
The Issue

• Some of the manufacturers have complained that the new regimen is too severe and possibly unrealistic

• Possible sources of problem include:
  – Presence of steel plate, which is much stiffer than the aggregate would be, so not as much compactive energy is dissipated through the aggregate below the geosynthetic relative to typical field conditions
  – Thickness of aggregate layer between plate and geosynthetic is too small

• The detailed installation damage regimen is not described in the REGEO work plan

Possible Solutions

• Conduct mini-study on the effect of the steel plate and lift thickness above the plate on measured strength retained after exposure
  – Perform tests on several product lines using a few representative samples
  – Sampling done through NTPEP
  – Testing done at TRI so direct comparison can be made to current NTPEP test results

• Do nothing and accept current test results
• In either case, develop REGEO work plan revisions to better describe specific protocol being used
Potential Work Plan Revisions

- Under “Product Qualification Testing”, Part C, add the following:

  “To simulate typical field installation conditions, the following exposure regimen will be used:
  
  - Place steel lifting plate
  - Place and compact 6 inches of the aggregate selected for exposure
  - Place geosynthetic reinforcement sample with geosynthetic machine direction perpendicular to long direction of test bed
  - Place and spread selected aggregate (same as aggregate placed below the geosynthetic) on the geosynthetic, using a minimum 15,000 lb front end wheeled loader to place and spread the aggregate. An aggregate lift thickness of 6 inches, after compaction, shall be used.
  - Compact using a minimum 25,000 single drum vibratory roller, using the heaviest compaction setting.”
  - Under “Product Qualification Testing”, Part C, add the following:

  - This is based on our current practice – can revise this based on the mini-study, if changes are needed

Possible Survey of the States to Assess what They Consider to be Realistic Installation Conditions

- Do you use geosynthetic reinforcement in MSE walls or reinforced slopes? (yes or no)
- For MSE walls and reinforced slopes, what minimum as compacted lift thickness over the geogrid do you allow? (4, 6, or 8 inches)
- What as compacted lift thickness over the geogrid do you normally see? (6, 8, or 10 inches)
- What compactor size (total equipment weight) do you typically see for compacting MSE wall or reinforced slope backfill within the reinforced soil zone? (> 10,000 lbs, > 15,000 lbs, > 20,000 lbs, or > 25,000 lbs?)
- What is the largest likely maximum particle size, and largest likely $d_{50}$ size you typically use for MSE wall or geosynthetic reinforced slope backfill?
  - Max. particle size: < 0.75 in., 0.75 to 1.0 in., 1.0 to 2.0 in., or > 2.0 in.
  - $d_{50}$ size: < 2 mm, < 4 mm, < 6 mm, < 10 mm, or > 10 mm
Discussion
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National Transportation Product Evaluation Program 2014

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Joseph Kerstetter
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615-358-4193
### 2014 ANNUAL NTPEP MEETING
Geotextile (GTX) & Geosynthetic Soil Reinforcement (REGEO)
Technical Committee
Monday, May 19, 2014 (2:20pm-4:00pm)
Working Session #3

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<th>Member of this Technical Committee?</th>
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