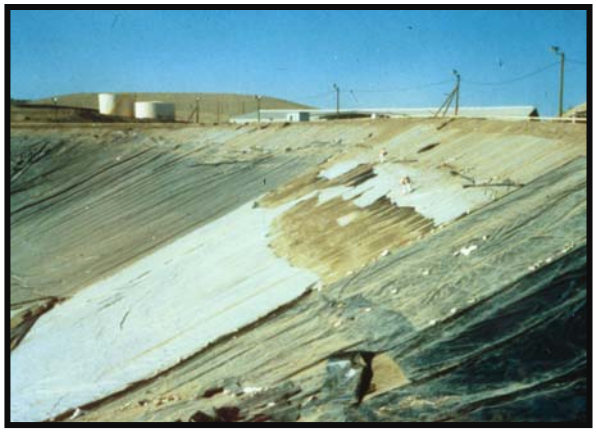
# Two 2-Day Short Courses

*Accredited Geosynthetics Laboratories*
*Accreditation Designation # GAI-LAP-95-01*

AASHTO R18



## Designing with Geosynthetics
**And**
## CQA/CQC of Geosynthetic Installations

**Monday, May 2, 2011**
STRUCTURE & DRAINAGE DESIGN WITH GEOSYNTHETIC DRAINS

**Tuesday, May 3, 2011**
INTERFACE FRICTION EVALUATIONS & SLOPE STABILITY ISSUES

**Wednesday, May 4, 2011**
CQA OF GEOSYNTHETIC INSTALLATIONS

**Thursday, May 5, 2011**
CQA OF CCL AND GCL INSTALLATIONS

**Friday, May 6, 2011**
GCI CQA INSPECTOR CERTIFICATION EXAM

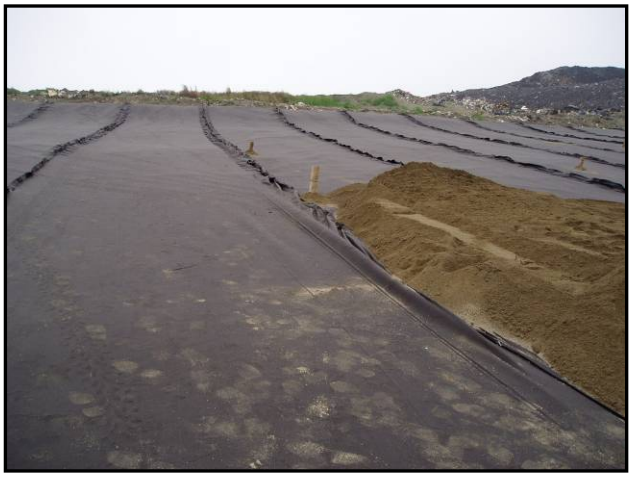
# Attend and learn about....

- **How to ensure structural stability of geocomposite cores for landfill life**
- **Understanding ASTM D 4716 – transmissivity testing**
- **How to determine and use shear strength**
- **Understanding ASTM D 5321 and D 6243 – friction tests**
- **How to specify and review results of friction tests**
- **How to avoid writing problem specifications**
- **Specifications: case histories of litigations related to poor specifications**
- **How to avoid failure - lessons learned**
- **Construction Quality Assurance of Landfill Construction Materials**

## Place: TRI/Environmental, Inc.

9063 Bee Caves Road
Austin, TX 78733 USA

## Design – Performance Measurement Courses



The stability of geosynthetic installations is becoming more important with each new project failure and the increasingly difficult terrain of some sites. Shear strength and drainage related stability of geosynthetic interfaces is one of the primary, and more contentious, variables used in stability analysis. The continued growth of the geosynthetics industry has led to a constant influx of professionals working in waste facility design and slope stability evaluation for the first time. These engineers, together with geomembrane and geosynthetic clay liner (GCL) manufacturers, have long complained of the difficulty in achieving good, reliable performance parameters.

The standard test methods for the evaluation of geosynthetic performance are ASTM D 5321, large scale direct shear test for geosynthetics, and ASTM D 6243 for GCLs, and ASTM D 4716 for flow testing. While these tests are simple in concept, the generated test results are significantly affected by the test parameters defined and the procedures used. As a result, understanding the specification of interface friction and transmissivity testing and how to interpret and use generated test results has become a crucial part of an engineer's job. In fact, the cost for not understanding these tests and test data can be enormous. Unfortunately, the waste industry has several examples of this cost. These courses had been specifically targeted to those persons who have a need to understand and specify performance, and use generated results in subsequent design.

# CQA Courses

Finally, all of these issues are compromised further by poor installation practice. The CQA courses will follow the reviewed design concepts to better understand standard of practice and resulting quality issues of installation.

The CQA Course is presented in two parts, each complementing the other to provide maximum benefit. The first day focuses on installation of geomembranes, geotextiles, geocomposites, geogrids and geoapertenance, and includes a geomembrane seaming demonstration with a detailed explanation & demonstration of seam peel and shear testing. The second day focuses on the installation of compacted clay and compacted clay and geosynthetic clay liner (GCLs). Special emphasis will be given to establishing rationale and standard operating procedures for field inspections, documentation of test and visual observations and implementation of CQA plans. A broad based appreciation for the manufacturing and installation of waste containment facility materials will be provided. A tour of TRI's Geosynthetic Testing and Research Laboratories will be provided with test demonstrations, explanation of some TRI internal R&D projects, etc. and other relevant topics, all supporting class curriculum.

***This CQA course is ideal preparation for the Geosynthetic Certification Institute's certification exam** and will provide a comprehensive understanding to those professionals who are: preparing CQC/CQA plans, reviewing CQC/CQA plans, performing CQC/CQA observations and tests, and reviewing field CQC/CQA procedures.*

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## Professionals who will benefit from these courses include

- Specifying/Certifying Engineers
- Construction/Quality Assurance
- Design Engineers/Proj. Managers
- Installers/Contractors
- Third Party Inspectors
- Regulators

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# GCI CQA Certification Exam (May 6, 2011)

Each CQA course student will be allowed to sit for the ***Construction Quality Assurance-Inspectors Certification Program (CQA-ICP)*** exams immediately following the CQA courses. The GCI exam itself is part of the GCI CQA technician certification program. Thus, students MUST REGISTER with the Geosynthetic Institute (GSI) and pay their required certification fee in order to take this exam. TRI does NOT collect this fee as it must be paid directly to GSI (GSI phone: 610-522-8440).

## Course Schedule:
## STRUCTURE & DRAINAGE DESIGN WITH GEOSYNTHETIC DRAINS

Monday, May 2, 2011:

| | | |
|---|---|---|
| 7:30-8:00 am | Registration | |
| 8:00-8:05 | Welcome | Allen |
| 8:05-8:45 | Introductions to Drainage Geocomposites | Narejo |
| 8:45-9:30 | Common Manufacturing Quality Issues and MQC | Allen |
| 9:30-10:00 | Design Needs<br>(What is needed in design? Transmissivity, compression strength, creep, etc.) | Narejo |
| 10:00-10:15 | Break | |
| 10:15-11:45 | Standards and Testing<br>(Transmissivity, creep, ply-adhesion strength, interface shear strength | Allen |
| 11:45-12:00 | Open Discussion | |
| 12:00-1:00 pm | LUNCH | |
| 1:00-2:00 | **Special Guest Speaker: TBD** | |
| 2:00-2:45 | Drainage Core Structural Stability | Narejo |
| 2:45-3:15 | Ensuring Structural Stability through Testing | Allen |
| 3:15-3:30 | Break | |
| 3:30-4:00 | Writing Wining Specifications | Narejo |
| 4:00-4:45 | Case Histories<br>(Illustrative examples of a problem specifications, what happened? who was responsible? How was the issue resolved?) | Narejo & Allen |
| 4:45-5:00 | Q&A and Summary | Narejo & Allen |
| 5:00 pm | Adjourn | |

## Course Schedule:
# INTERFACE FRICTION EVALUATIONS & SLOPE STABILITY ISSUES

Tuesday, May 3, 2011:

| | | |
|---|---|---|
| 7:30-8:00 am | Registration | |
| 8:00-8:05 | Welcome | Allen |
| 8:05-8:45 | Background and History<br>(Kettleman Hills and other failures: What happened; what was learned, how industry was impacted) | Gilbert |
| 8:45-10:00 | Slope Stability Basics<br>(How to approach a slope stability problem; what's needed for evaluation; what can be done and what can't be done) | Gilbert |
| 10:00-10:15 | Break | |
| 10:15-11:15 | Standards and Testing<br>(Historical background; descriptions of ASTM D 5321 and ASTM D 6243, normal stress application; machine friction and calibration; strain rate determination: strain rate considerations; "floating" interfaces; GCL challenges; reporting of results) | Allen |
| 11:15-11:45 | Who Tests<br>(Laboratory Accreditation; responsibilities of designer, contractor, manufacturer) | |
| 11:45-12:00 | Open Discussion | |
| 12:00-1:00 pm | LUNCH | |
| 1:00-2:00 | **Special Guest Speaker: TBA** | |
| 2:00-3:15 | Interface Strength - Designer's Perspective<br>(How to review test results; normal stresses; water pressures; peak versus residual strengths; friction angles and adhesions/cohesions; "conservative" vs. "liberal" results) | Gilbert |
| 3:15-3:30 | Break | |
| 3:30-4:00 | Testing Status and New Developments<br>(Current areas of research; GCL clamping standards; round robin test experience) | Allen |
| 4:00-4:45 | A Real World Application<br>(Illustrative example of a slope stability problem showing how a shear testing program was established (specified), how the results were interpreted and how the results were used in a stability analysis) | Gilbert |
| 4:45-5:00 | Q&A and Summary | Gilbert & Allen |
| 5:00 pm | Adjourn | |

## CQA FOR GEOSYNTHETIC INSTALLATIONS SHORT COURSE OUTLINE
## Day 1 – Wednesday, May 04, 2011

| | | |
|---|---|---|
| 7:30-8:00am | Registration | |
| 8:00-8:15 | Welcome and Introductions | Allen |
| 8:15-8:30 | CQA Principles and Philosophy<br>*(Responsibilities, appreciation of role, professional considerations and on-site protocol, conflict resolution, etc.)* | Sieracke |
| 8:30-9:30 | Background of Geosynthetics and Manufacturing<br>*(Polymers to products, material properties, product manufacturing)* | Allen |
| 9:30-10:30 | HDPE & LLDPE & fPP Geomembranes & Seams<br>*(Types and specifications, shipping/receiving, unloading, storage & installation)* | Sieracke |
| 10:30-10:45 | Break | |
| 10:45-11:15 | HDPE & LLDPE & fPP Geomembranes & Seams - Continued | Sieracke |
| 11:15-12:15 | Welding Demonstration/Seam Testing<br>*(Double track fusion welds, extrusion welds, "T" welds, seam sampling, peel and shear testing, peel incursion and strain measurements, modes of failure, break codes, field vs. laboratory testing)* | Sieracke & Installer |
| 12:15-1:00 pm | Lunch (provided) | |
| 1:00-2:00 | **Special Guest Lecture: TBD** | |
| 2:00-2:30 | PVC Geomembranes & Seams<br>(*Types and specifications, shipping/receiving, unloading, storage & installation)* | Allen |
| 2:30-3:30 | Geotextiles, Geonets/Geocomposites, Geogrids, Pipe, Erosion Control<br>*(Types and specifications, shipping/receiving, unloading, storage & installation)* | Allen |
| 3:30-3:45 | Break | |
| 3:45-4:30 | Protection and Soil Cover | Sieracke |
| 4:30-4:45 | CQA Paperwork and Record Keeping<br>*(Importance of documentation, communication records, examples of record keeping and documentation, checklists)* | Sieracke |
| 4:45-5:00 pm | Discussion | |
| 5:00-6:30 pm | Tour of TRI Geosynthetic Testing and Research Laboratories (test demonstrations, explanation of some TRI internal R&D projects, etc.) | |
| 6:00-8:00 | **Texas BBQ Dinner!!!! (Provided)** | |

## CQA FOR COMPACTED CLAY & GEOSYNTHETIC CLAY LINER INSTALLATIONS
## SHORT COURSE OUTLINE – Dr. Robert (Bob) Gilbert
## Day 2: Thursday, May 05, 2011

| | |
|---|---|
| 8:00-8:30 am | Registration |
| 8:30-9:00 | Liner and Cover Systems<br>*(single liners/double liners/composite liners, leakage rates through soil, composite action with geomembranes, importance of drainage layer properties* |
| 9:00-10:30 | Compacted Clay<br>*(materials, factors affecting hydraulic conductivity, clod vs. particle orientation theory, keys to low hydraulic conductivity, water content-density criteria, recommended procedures for determining acceptable zone, influence of overburden stress, bonding of lifts, thickness)* |
| 10:30-10:45 | break |
| 10:45-12:00 | Construction of Compacted Clay Liners and Covers<br>*(equipment, preprocessing of soil, soil moisture control, sieving, clod control, crushing/pulverizing materials, compaction, test pads)* |
| Noon-1:00 pm | Lunch (provided) |
| 1:00-2:00 | CQA for Compacted Clay Liners and Covers<br>*(CQA principles, CQA plan, tests, observations, field water content tests, field density tests, hydraulic conductivity compliance tests, frequency of tests, sampling pattern, outliers, corrective action, role of test pads, final certification)* |
| 2:00-3:00 | History of GCLs<br>*(commercially-produced GCLs, geosynthetic materials, manufacturing of GCLs, manufacturing quality control, recommended specifications)* |
| 3:00-3:15 | break |
| 3:15-4:00 | Bentonite<br>*(measures of and tests for bentonite quality, recommended specifications for bentonite in GCLs, contaminant-resistant bentonite)* |
| 4:00-5:00 | Installation of GCLs<br>*(transportation, handling, storage, subgrade preparation, placement procedures, seaming protection, construction quality control and assurance, observations, types of tests, frequency of testing, field case history)* |
| 5:00-5:30 | Open discussion |

# ABOUT TRI

TRI/Environmental, Inc. (TRI) has been active in materials testing, inspection and research and development for over twenty years. TRI is an independent, third party laboratory and consulting firm unaffiliated with any manufacturing, engineering/consulting, or construction management firm. TRI's geosynthetics testing laboratories provide a variety of services. Learn more at

**www.GeosyntheticTesting.com**

# ABOUT YOUR INSTRUCTORS

### Dr. Dhani Narejo – President, Caro Engineering

Dr. Dhani Narejo is a registered professional engineer in the state of Texas with more than 15 years of experience in geosynthetic and geotechnical design, R&D, and testing. He holds a masters in geotechnical engineering from Georgia Institute of Technology and Ph.D. in geotechnical/geosynthetics engineering from Drexel University. In the past, Dr. Narejo has worked in various capacities for such prestigious geosynthetics companies as Tensar, Tenax and GSE.

### Dr. Robert Gilbert - Professor, University of Texas at Austin

Robert (Bob) Gilbert, Ph.D., P.E. is a professor of civil engineering at The University of Texas at Austin. He has more than fifteen years of consulting experience in the design and construction of landfill lining and cover systems. He has authored or co-authored numerous publications on the stability of these systems. Dr. Gilbert has been very instrumental in understanding clay and GCL liner systems, interface friction testing, and the use of data for slope stability design.

### Special Guest Instructor: Mark Sieracke, P.E. - Landfill Design and CQA Consultant

Mark D. Sieracke, P.E. is an industry recognized expert in the fields of landfill design and construction quality assurance. Mark serves as a Principal and Solid Waste Practice Area Manager for Weaver Boos Consultants. Mark has served as a Technical Reviewer of the USEPA Technical Guidance Document: Quality Assurance and Quality Control for Waste Containment Facilities (EPA/600/R- 93/182, Sept. 1993). Mark has served as a hands-on CQA practitioner, certifying engineer and as a consultant for over 1000 acres of geosynthetic installations

### Sam Allen - Vice President and Division Manager

Mr. Allen is the Vice President of the Texas Research International (TRI) Geosynthetics Services Division. Sam is the Chairman of Committee D35 on Geosynthetics within ASTM. Sam also serves on the Technical Advisory Board of Geotechnical Fabrics Report, and is special advisor to the *In the Lab* column presenting testing issues. Sam currently serves on the Board of Directors of the Geosynthetics Institute in Folsom, PA.

# Where to Stay?

Holiday Inn Express Hotel & Suites, Austin-Sunset Valley, 4892 US Highway 290 West, Austin, TX 78733, 1 800 315 2621, 10 miles from airport, 9.9 miles from short course, NO shuttle service

Extended StayAmerica Austin – Southwest, 5100 US Hwy. 290 W., Austin, TX 78735, Telephone: 512- 892-4272, 15.7 miles from airport, 9.54 miles from short course, NO shuttle service

## Short Courses / GCI Exam Cost/Tuition (see registration form)
## For registrations before Friday, April 15th, 2011

### Design – Performance Evaluation Courses

| | |
|---|---|
| May 02-03, both courses, 1 registrant per company | $875.00/person |
| May 02-03, both courses, 2 registrants per company | $800.00/person |
| May 02-03, both courses, 3 + registrants per company | $725.00/person |
| May 02-03, both courses, both courses, government | $250.00/person |
| | |
| One DESIGN course (day) only, 1 registrant per company | $550.00/person |
| One DESIGN course (day) only, 2 registrants per company | $475.00/person |
| One DESIGN course (day) only, 3 + registrants per company | $400.00/person |
| One DESIGN course (day) only, government | $165.00/person |

### CQC/CQA Short Courses and CQA Exam

| | |
|---|---|
| May 04-05, both courses, 1 registrant per company | $800.00/person |
| May 04-05, both courses, 2 registrants per company | $700.00/person |
| May 04-05, both courses, 3 + registrants per company | $625.00/person |
| May 04-05, both courses, both courses, government | $180.00/person |
| | |
| One CQA course (day) only, 1 registrant per company | $475.00/person |
| One CQA course (day) only, 2 registrants per company | $425.00/person |
| One CQA course (day) only, 3 + registrants per company | $375.00/person |
| One CQA course (day) only, government | $95.00/person |

### GCI Exam

| | |
|---|---|
| May 06, TRI fee for one applicant only per company | $35.00/person* |
| May 06. 10, TRI fee for 2+ applicants per company | $20.00/person* |

***The exam costs above **DO NOT reflect the cost for sitting for the GCI exam,** only TRI's exam proctoring cost for offering the exam as part of the short course event.

The GCI exam is part of the GCI CQA technician certification program. Because of this, **one MUST REGISTER** with the **Geosynthetic Institute (GSI)** and **pay their required certification fee** in order to take this exam. **TRI does NOT collect this fee,** it must be paid directly to GSI.
**GSI phone:** 610-522-8440

# REGISTRATION FORM: PLEASE TYPE OR PRINT CAREFULLY:

**Please CHECK (√) each O that applies.**

| | | |
|---|---|---|
| May 02-03, both DESIGN courses, 1 registrant per company | $875.00/person | O |
| May 02-03, both DESIGN courses, 2 registrants per company | $800.00/person | O |
| May 02-03, both DESIGN courses, 3 + registrants per company | $725.00/person | O |
| May 02-03, both DESIGN courses, both courses, government | $250.00/person | O |
| One DESIGN course (day) only, 1 registrant per company | $550.00/person | O |
| One DESIGN course (day) only, 2 registrants per company | $475.00/person | O |
| One DESIGN course (day) only, 3 + registrants per company | $400.00/person | O |
| One DESIGN course (day) only, government | $165.00/person | O |

| | | |
|---|---|---|
| May 04-05, both CQA courses, 1 registrant per company | $800.00/person | O |
| May 04-05, both CQA courses, 2 registrants per company | $700.00/person | O |
| May 04-05, both CQA courses, 3 + registrants per company | $625.00/person | O |
| May 04-05, both CQA courses, both courses, government | $180.00/person | O |
| One CQA course (day) only, 1 registrant per company | $475.00/person | O |
| One CQA course (day) only, 2 registrants per company | $425.00/person | O |
| One CQA course (day) only, 3 + registrants per company | $375.00/person | O |
| One CQA course (day) only, government | $95.00/person | O |

**GCI Exam Fees**

| | | |
|---|---|---|
| __ May 06, One applicant only per company | $35.00/person* | O |
| __ May 06, 2+ applicants per company | $20.00/person* | O |

* These fees DO NOT pay for the exam, only the venue for taking the exam. The GCI exam is part of the GCI CQA technician certification. You MUST REGISTER with the Geosynthetic Institute (GSI) and pay the required certification fee directly to GSI in order to take this exam, (GSI phone: 610-522-8440)

Registrations must be received by **5:00 pm CST, Friday, April 15, 2011** - $50.00 /person late fee thereafter. Fee includes: course notes and handouts, designated dinner the evening of May 4th, and lunch and AM & PM breaks each day. $50.00 cancellation fee for refunds requested before April 15, 2011 -- no refund thereafter. Course notes are NOT sold separately.

Method of Payment: Payment may be made by check, money order, American Express, Visa or MasterCard.
☐Check ☐Money Order ☐ Purchase Order
Make check or purchase order payable to TRI/Environmental, Inc.,
Credit Card: ☐American Express ☐Visa ☐MasterCard
Credit Card # _____Expiration Date: _____
Please direct questions to Ms. Melissa Hunter or Mr. Chris Perez, phone: (800) 880-8378 fax: (512) 263 2558.

## PLEASE TYPE OR PRINT CAREFULLY AND FAX TO 512-263-2558 ATTN: CHRIS PEREZ

| | | | | |
|---|---|---|---|---|
| Name(s) | | | | |
| Position(s) | | Company | | |
| Address | | | | |
| phone | | e-mail(s) | | |
| amount paid ($'s) | | | | |
| **I have registered with GCI & paid the GCI certification fee. I will take the Geosynthetic CQA Exam May 06, 2011 (check=>)** | | | | |
| **I have registered with GCI & paid the GCI certification fee, and I will take the Compacted Clay Liner CQA Exam May 06, 2011 (check=>)** | | | | |
| | | | | |