

GEO TESTING NEWSLETTER

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R-value Press & Compactor



CRS Machine

Online Reporting

One of the most exciting recent developments here at Cooper Testing Labs has been the implementation of our on-line reporting system on our website (www.coopertestinglabs.com). This new benefit to our customers has been getting a lot of use and we have gotten a lot of positive feedback. Our clients love the ease of use and the capabilities our online reporting offers. With this new system you have instant access to your data from any computer connected to the internet. You can download or email any desired test results directly from our website 24 hours a day and 7 days a week. Because you can download your test results from our on-line reporting system you can overcome the problems of email attachment size limitations. You can keep track of the status of your testing jobs because the results are posted as they are completed. You can even post your own files, for your clients or associates, to your folder on our website. Just send them an email with the link,

your username, password and they can go to the site and view or download the file. If you'd like, we can set your client or associate as a member of your group (company) and you will be able to email them from within the system. This is nice for large files that are too big to attach to an email. You can even send emails or posting notices to a group of people with ease from within your browser window. We can accommodate you even if your company does not have email set up for the employees because our system can use any email address. If you don't have an email address at work you can use your home email address or you can set up your own free email account at hotmail.com or a similar provider. The user interface for our on-line reporting system is very much like the Windows Explorer, which makes it user-friendly even for the first time user. If you have questions while using our new system we have on-line help available that should answer

most questions that may arise. Every client's data files are kept in their own private folder that is not visible to any other client. You can access your company's private folder by logging in with a user name and password that we provide to you. If you forget your password it is not a problem. Our system will email your user name and password to you virtually instantaneously. You can even change your user name and/or password if you wish. You have complete control over the contents of your folder and you can create subfolders to organize the files any way you want. If you want additional people to have access to your folder we would be happy to set these users up for you. It is easy to get set up on our new on-line reporting system. Simply let us know that you would like to be set up and provide us with an email address for yourself. We will set you up in the system and email your user name, password and a link to the login page to you. Once you're logged in to the site

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SECOND CRS MACHINE PURCHASED

We now have two, which means that we can complete two consolidation tests in three days. The test takes a bit of getting used to. Engineers are used to 10 point consolidation tests where the points are spaced quite a bit apart and a straight or curved line is interpolated between

the points. The CRS test takes hundreds of points, sometimes more than one thousand. The CRS test will show every little anomaly, bump and tick so the test results may not be esthetically as pleasing but it is real and P_c is usually better defined. C_v is continuous and shows a great

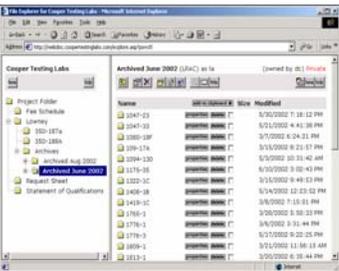
trend and typical characteristics at different points on the strain-log-p curve. It gives great insights into the way C_v works along different parts of the stress path. It makes the incremental consolidation test seem crude and antiquated.



Permeameter Boards



Torsional Shear Machine



Webdoc



Web Page

FULL CIRCLE

Back in the 70's and 80's I worked in and eventually managed the Cooper & Clark lab. For many years it was in Palo Alto right across highway 101 from the Wahler and Earth Sciences Associates labs. These three engineering and environmental consultants had three of the largest and most sophisticated geotechnical labs of that time. Dan Martin managed the Wahler lab, which specialized in the design of dams. They ran large scale cyclic triaxial compression, resonant column and all the standard geotechnical tests. The ESA lab was managed by Peter Jacke who also ran cyclic triax

and all of the standard geotechnical tests. Al Miller was a geologist at Cooper Clark & Associates. Al worked in the field and in the lab with me. The Cooper Clark lab was the first company to own a Cox & Sons automated R-value kneading compactor and automated R-value press. The machine also had cyclic triaxial and automated direct shear capabilities. All three of these companies were the leaders in geotechnical and environmental consulting. About 10 years later Mike Davis came on the scene as manager of the lab for Justiniano & Associates. These laboratory managers were

some of the best in the country. You are probably wondering why I am talking about ancient history. I mention all of these outstanding and highly knowledgeable people because they are all working at Cooper Testing Labs. We all knew of each other and even met once or twice and now we are all working together. Mike is the vice president of Cooper Testing Labs. Al manages the Petaluma lab. Dan is in charge of QA and Peter is our in-house IT support and in charge of the corrosion lab in Mountain View. Al is a geologist, Peter is an engineer and both Peter and Dan are NICET certified. When you send your

ONLINE REPORTING CONTINUED

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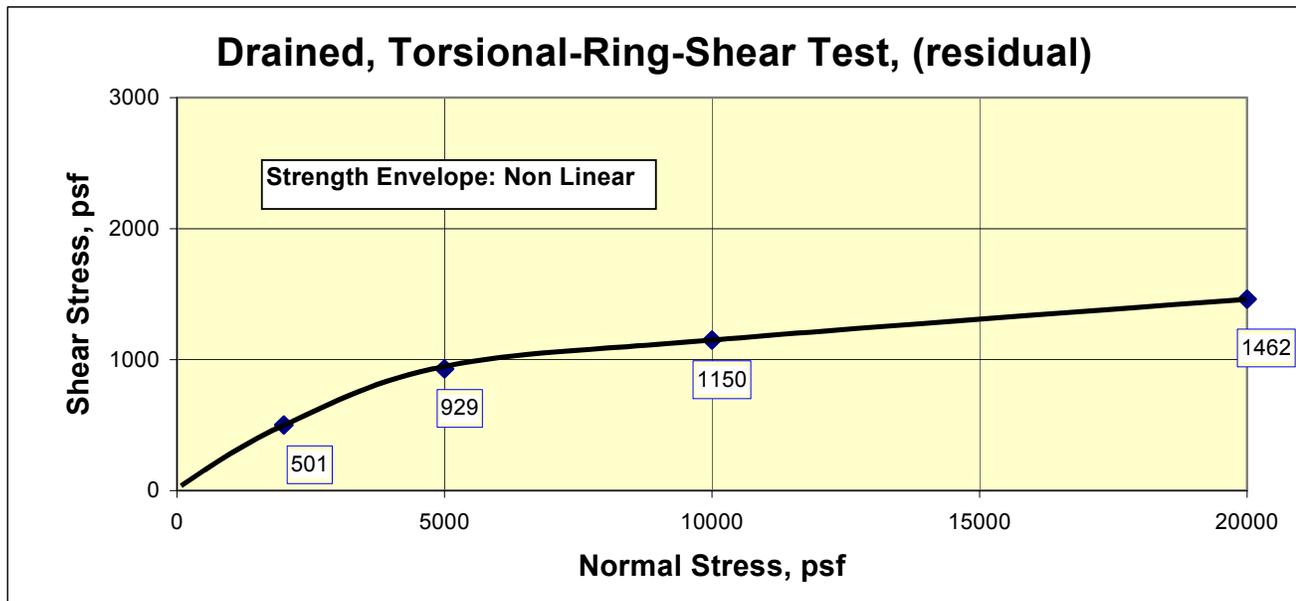
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just click on your job folder to view or download the files you want. The image to the left (webdoc) is a screen view of our on-line reporting site. The panel on the left side of this view will only show your company's folder and a folder with our fee schedule and one with our test request sheets. The panel on the right is an example of some posted files similar to what you will see. It is set up to be similar to windows explorer and operates the same way. It is very easy to use. This is how we now report all of our data. We will, of course, fax your data followed up by mailed hard copies if you aren't on line. We are happy to have this new tool to help make our clients lives a little easier. Here is a little success story that I would like to share with you. We have a client that does

not have email at work. The project managers were not happy about not being able to take advantage of our online reporting system. I received a call from one of them asking me what could be done. He did not have a personal email account either. We helped him to get an email account set up at hotmail.com and he used that. He configured his email program at work to use the hotmail account and I configured our system to send messages to him at that account. Problem solved. So if your company does not have email for it's employees just go to Yahoo or MSN and get a free one and use that. Just send me an email requesting to be added to the system. (My email address is david@coopertestinglabs.com) When you download and print the test results, they are the report ready originals. We post test results to the site as

the tests are completed. So if you have a big testing program you don't have to wait until it is complete to get data and start working on it. This system shaves about a week off the turnaround time to get final reports. If you want to take a look at it go to www.coopertestinglabs.com. There you will see three links at the top of our home page. The third link says "click here to view reports online". Click that and when you get the login screen enter "guest" for both the username and password. You will find a couple of files (one .pdf And one excel) that you can download to see how it works. If you want to get set up for our new on-line reporting service just let us know and we will do the rest.

NON LINEAR STRENGTH ENVELOPES



The strength envelope above is a drained torsional residual shear test on a weathered bentonite. I don't know why some strength envelopes are linear and some are not. The degree of curvature depends partly on where you are on the stress path. The closer you are to the origin the more severe the curvature. The higher you are on the stress path the lower the friction angle goes and the less curved it is. At the higher stresses the particles are probably arranged more like a stack of pancakes due to the higher density and lower void ratio, which would create a lower friction angle. At the lower part of the stress path the particles are probably in a more random configuration due to the lower density and higher void ratio. There may be some crushing of particles at the higher

stresses, which would also lower the friction angle. This is not new stuff here but it is interesting to actually see it to this degree. Due to the misconception that strength envelopes are linear, many engineers ask us to run two point envelopes. If that was done on the material above the resulting friction angle that we report could vary from 45 degrees using normal loads of 500 and 1000 psf to 8 degrees using normal loads of 10,000 and 20,000 psf. Using normal loads representative of the stresses that the engineer is dealing with is understandable. But wouldn't it give the engineer more options having the full stress path? Keep in mind that these are effective (drained) stresses. That is why the

friction angle is so steep near the origin and also why the cohesion is zero on a bentonite. These loads were sheared no less than 48 to 72 hours per point. That is how you get zero cohesion on a bentonite. The degree of saturation must also be 100%. Many labs do not have automated equipment and shear each load from 4 to 8 hours and call it drained. That is also why they report lots of cohesion even though it was assumed to be drained. When asking the lab for drained testing whether it be direct shear, triax etc. make sure to specify a very slow speed. .0001 to .0003 inches per minute will work for any clay. We have found that the methods used today to determine the rate of failure do not always

work. It is tricky because the overconsolidation ratio plays a big part whether the procedure works or not. For direct shear ASTM recommends taking timed readings during consolidation. The rate to failure is calculated by dividing the estimated strain at failure by fifty times t_{50} . If you load an overconsolidated clay with the current overburden pressure you will get a t_{50} of a sand, which will yield a very high rate of strain. What you will end up with are undrained results (a lower friction angle with a higher cohesion). Not good if your dealing with effective stress conditions! We now use standardized rates of strain that are closer to research speeds rather than using a flawed procedure such as the ASTM method.



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It is truly a dirty business but we love it.



Direct Shear Machine



Large Scale Triaxial System

NEW TESTS

We are feverishly working on getting set up to run the full line of corrosivity tests. Peter Jacke is in charge of the corrosivity lab. He has extensive experience and knowledge of agronomy, soil mechanics and soil chemistry. He worked in the agronomy analytical lab at Cornell University and the University of Massachusetts. He has a masters degree in civil engineering and was a part time faculty member at San Jose state university in the civil engineering department. We hope to be offering the full scope of corrosivity testing including resistivity, conductivity, sulfate and chloride content and pH in the very near future. Our Petaluma lab now offers the expansion index test and is getting set up to run the index density by shaker table test. This test is used to determine the maximum density of clean gravel and gravel-sand mix-

tures. This is an under utilized test. So few labs run it that most people try to get by with the proctor test which, is not appropriate at all for clean sand and gravels. He should be up and running by the end of the month. The equipment is heavy and takes some special block and tackle configurations to lift and move the weights onto the mold and shaker table.

Why The EI Test?

It's just another index test. And not a very good one. We already had the PI test and other better expansion tests so why the EI test too? I have no idea. It is a Mickey Mouse test if ever there was one. Sorry Mickey! The test is run on a sample that is compacted to 50% saturation based on a screwy proctor

type test that uses an oddball compactive energy. If the soil swells 64 divisions on a 0.0001" dial indicator you have an EI of 64. What the heck do you do with that? I like the expansion pressure with shrink-swell test, ASTM D3877. It gives you an expansion pressure curve so you can pick the amount of expansion that will take place for any load. You can also find the amount of volume change vs. change in moisture content. You can remold the sample to the moisture and density of the compacted fill. What fill is at 50% saturation? I always thought that the goal of the lab was to try to duplicate in the lab what takes place out in the field. I think they forgot about that concept over there at the UBC. I'm sorry but I had to get that off my chest. We will be happy to run whatever test you want, (the EI in Petaluma).