

PREPARATIONS FOR PIEZOCONE CPTU TESTING (De-airing and Saturating)

A proper preparation of the piezocone and other equipment is paramount prior to CPTU testing in order to have good pore pressure response. The following components of the piezocone should be de-aired and saturated entirely:

- the pore pressure filter
- the cavity between the pore pressure filter and the pore pressure sensor of the piezocone
- the housing of the pore pressure sensor

We recommend to use glycerine for saturating, since it is miscible with water. Other fluids, such as silicon oil, demineralized water or a vegetable type of oil (for example sunflower or olive oil) can be used as well, but present specific problems that require special attention. This manual is purely based on the use of glycerine as saturation fluid.

The saturation procedure consists of 2 specific stages, i.e. the de-airing of the pore pressure filters (mostly done in the office the day before CPTU testing) and the saturation of the piezocone (mostly done in the field).

Patience and cleanness are paramount during the whole process of de-airing and saturating. Take your time and wear clean latex gloves during the whole process in order to prevent dirt to get into the saturating fluid.

1 De-Airing the Filters

About 24 hours before the actual CPTU tests will take place, the pore pressure filters are to be de-aired and saturated with glycerine.



Pore pressure filters



Pressure vessel



Porcelain plate



Vacuum pump



Glycerine



Soup ladle



Airtight container

To achieve this, the following equipment is recommended:

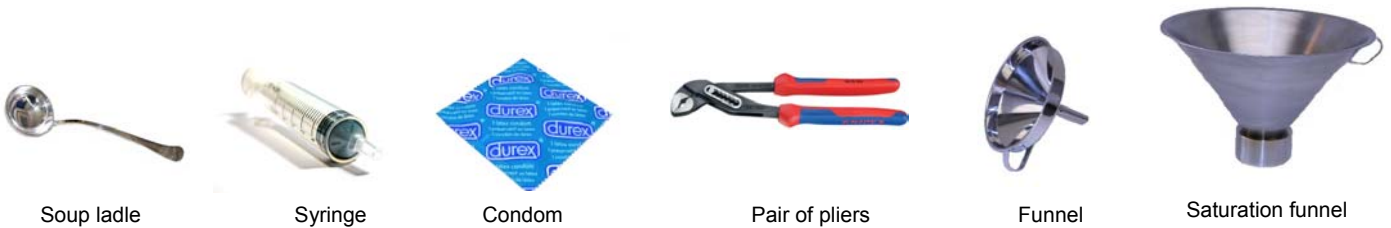
- Pore pressure filters (sufficient quantity)
- Pressure vessel with porcelain plate
- High-vacuum silicon grease
- Vacuum pump (manual or electrical) with pressure gauge
- Glycerine (saturation fluid)
- Soldering wire
- Small soup ladle
- Airtight container for storage and transport

For optimum results, please follow the following procedure to de-air the pore pressure filters:

1. Dry the pore pressure filters in a oven (approx. 1 hour at 65 °C)
2. Fill the pressure vessel for ¾ with glycerine (approx. 2 liters)
3. Fold the soldering wire around the pore pressure filters to make them more heavy so they will remain submerged much easily during the whole process
4. Place the dried and weighted pore pressure filters on the porcelain plate in the glycerine in the pressure vessel
5. Put a bit of high-vacuum silicon grease on the sealing rims of both the lid and the stop-cock
6. Put the lid and stop-cock onto the vessel
7. Connect the vessel to the vacuum pump and switch it on
8. Create an underpressure of 0.4 bar (check the pressure gauge) and make sure this underpressure is maintained for a period of 24 hours
9. Open the pressure vessel and pore some of the de-aired glycerine in the airtight container
10. Take the pore pressure filters gently out of the pressure vessel using the soup ladle and put them in the airtight container. Make sure the pore pressure filters remain submerged during this operation.
11. Fill the airtight container with glycerine as much as possible and close the lid. The pore pressure filters are now ready for use.

2 Saturating the Piezocone

Prior to the CPTU test in the field, the piezocone is to be prepared, the pore pressure filter put in place and the piezocone itself saturated.

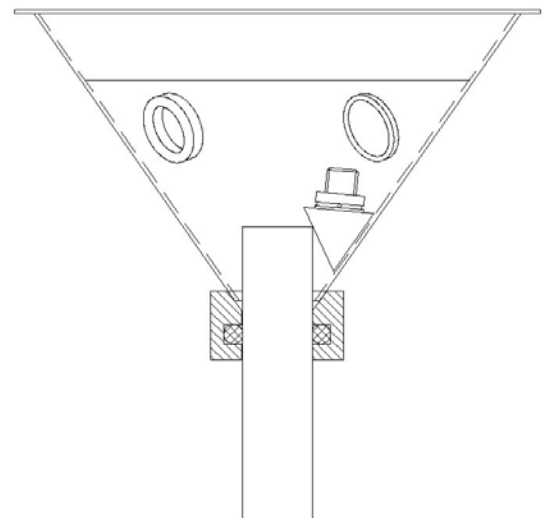


To achieve this, the following equipment is recommended:

- De-aired pore pressure filters (sufficient quantity)
- Small soup ladle
- Syringe
- Knitting needle
- Condoms
- Clean (!) pair of pliers
- Funnel
- Special saturation funnel that fits around the piezocone

Please consider the following guidelines on how to prepare the piezocone for CPTU testing:

1. Prior to the test, the cone should be checked (minimum dimensions, irregularities and damages. Read the applicable *Standard* for detailed information on this issue) and cleaned properly. Remove the conical tip and possibly present filter support ring(s) and put the cone top-up in a bench vice. Clean the visible cone interior with a soft cloth.



2. Mount the saturation funnel on the piezocone and fill the housing of the pore pressure sensor with de-aired glycerine from the airtight container using a syringe. Try to avoid possible air bubbles in the piezocone. Possible air bubbles can be removed by stirring the fluid gently using the knitting needle. Fill the funnel gently with about 1 liter of de-aired glycerine from the same airtight container. Let the fluid rest for some time and observe if air bubbles float towards the surface.

Warning: Never remove the compensation bush or friction sleeve when you fill the piezocone with saturation fluid. This will heavily damage the electronics inside the cone.

3. Clean the filter support ring(s) (if present) and put it/them back in position
4. Put the conical tip in the saturation funnel. Fill the syringe with glycerine and make sure you remove all the air from the syringe first by squeezing out some of the glycerine. While the conical tip remains submerged, place the tip of the syringe on the hole of the conical tip and squeeze the glycerine through the conical tip and push in this way all the air out of the tip. Repeat this procedure 3 to 4 times.
5. Take one of the saturated pore pressure filters out off the container using the soup ladle. The pore pressure filter should remain fully submersed at all times. Put the pore pressure filter in the de-aired glycerine in the funnel on the piezocone. Remove the soldering wire of the pore pressure filter and position it onto the conical tip.
6. Screw the conical tip back on the piezocone - hand tight is sufficient. Now give it an extra turn with a pair of pliers to assure a tight fit.
7. Take a condom out of its packing and flip the inside outwards. Now submerge the condom and flip it back in its normal position. The condom does not contain any air anymore and is ready to be rolled over the piezocone.
8. Put a condom over the cone and roll it down the sleeve as far as possible.
9. The saturation liquid can now be poured back (gently!) from the saturation funnel into the airtight container using a funnel to avoid spilling. If necessary, the glycerine is to be filtered first.
10. Remove the funnel by sliding it downwards over the piezocone and adjust the condom if necessary.
11. Adjust the condom in such manner, that it fits nicely over the cone and that it does not cause any over- or underpressure beforehand.
12. The piezocone is now ready for CPTU testing.



NOTE: It is necessary to replace the filter after each test and to follow the above procedure from point 5 on in full.

3 Saturating the Piezocone - Slideshow



Pict. 1: Cone top-up in bench vice and saturation funnel in place



Pict. 2: Fill the syringe with de-aired glycerine and force remaining air out



Pict. 3: Fill the housing of the pore pressure sensor with de-aired glycerine



Pict. 4: Fill the housing of the pore pressure sensor with de-aired glycerine layer by layer



Pict. 5: Fill the saturation funnel with de-aired glycerine



Pict. 6: Remove last remaining air bubbles and bring in the filter using the ladle



Pict. 7: Cone and funnel filled with de-aired glycerine and saturated filter



Pict. 8: Fill the syringe with glycerine from the funnel and keep the cone tip handy



Pict. 9: Squeeze the glycerine through the hole in the cone tip whilst submerged



Pict. 10: Make sure there are no air bubbles left in the cone tip



Pict. 11: Maneuver the filter onto the cone tip. Make sure that everything remains submerged



Pict. 12: Screw the cone tip and filter onto the cone



Pict. 13: Flip the inside of the condom outwards and back and slide it over the cone



Pict. 14: Slide the condom over the cone as far as possible and adjust it



Pict. 15: Pour the saturation fluid gently back into the airtight container



Pict. 16: Remove the funnel by sliding it downwards over the cone



Pict. 17: Adjust the condom such that it causes no over- or underpressure on the filter. The piezocone is now ready for CPTU