SWEDISH
GEOTECHNICAL
SOCIETY

RECOMMENDED STANDARD FOR CONE PENETRATION TESTS

SGF Report 1:93 E

SVENSKA GEOTEKNISKA FÖRENINGEN
SWEDISH GEOTECHNICAL SOCIETY

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Recommended Standard for Cone Penetration Tests

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Contents

1. Principle of the Test

In cone penetration tests, a cylindrical cone with a cross section of 1000 mm^2 and an apex angle of 60^0 is pushed vertically into the ground at a constant rate of penetration of 20 mm/s. During penetration, measurements are made of the cone resistance, the side friction against the cylindrical shaft just above the tip and, in piezocone tests, the pore water pressure generated at penetration by the cone. The measurements are made by using electrical devices and the frequency of the readings shall be high enough to give a detailed picture of the variation of the measured parameters with penetration depth.

The main purpose of the test is normally to obtain detailed information on the stratigraphy of the soil layers and variations of soil properties in plan as well as with depth. At occasional stops in the penetration, also the dissipation of generated pore pressures with time can be observed in order to estimate the drainage properties in the soil. In more permeable soils and layers, where the dissipation of excess pore pressures is rapid, also measurements of the in-situ pore pressures can be obtained.

2. Test Classes

The tests are divided into the following test classes:

Class 1. Designation: CPT1.

- Measurements of cone resistance, side friction and, in piezocone tests, pore pressures.
- Normal equipment: 5-20 tonne cone with pore pressure measurements (piezocone).
- Wider tolerances for the cone geometry according to the International Reference Test Procedure, ISSMFE 1988.
- Measuring accuracy: see Chapter 7 - PRECISION OF MEASUREMENTS
- Application: All types of soil. In fine-grained soils the test class should only be used in those cases where the soil stratification prevents use of a higher test class.
- Possible interpretation: Stratification and properties in sands and coarse silts. Stratification in stiff fine-grained soils can be made, provided that the pore pressure is measured in the test (piezocone test).
- Limitations: If possible, a higher test class should be used in fine-grained soils. At great water depths, the test should be made with a piezocone.

Class 2. Designation: CPT2.

- Measurements of cone resistance, side friction and pore pressures, (piezocone tests).
- Normal equipment: 5-tonne piezocone.
- Narrow tolerances for the cone geometry adjusted for tests in fine-grained soils.
- Measuring accuracy: see Chapter 7 - PRECISION OF MEASUREMENTS
- Application: All types of soil. In dense sand, the penetration may be restricted. In soft and fine-grained soils, the test should be made according to class CPT3 if the stratification so permits.
- Possible interpretation: Stratification and properties in all types of soils. The accuracy, however, is limited in soft and medium stiff fine-grained soils.
- Limitations: The penetration is restricted in dense sands. Evaluation of properties in soft and medium stiff fine grained soils ought not to be made.

Class 3. Designation: CPT3.

- Measurements of cone resistance, side friction and pore pressures, (piezocone tests).
- Normal equipment: Specially calibrated 5-tonne piezocones or piezocones with smaller measuring ranges.
- Narrow tolerances for the cone geometry adjusted for tests in fine grained soils.
- Measuring accuracy: see Chapter 7 - PRECISION OF MEASUREMENTS
- Application: All types of soil. Mainly in sands, but also in other stiff soils the penetration is restricted. In those cases where the load restrictions and accuracies cannot be fulfilled, the test class has to be lowered.
- Possible interpretation: Stratification and properties in all types of soils - however, because of the load restrictions, mainly in soft and medium stiff fine grained soils.
- Limitations: The penetration is restricted in coarse and stiff soils and at infusions of coarser objects or particles in fine grained soils.

3. Existing Standards and Recommendations

Beside the present recommended standard from the Swedish Geotechnical Society, SGF, there are recommendations from the International Society for Soil Mechanics and Foundation Engineering, ISSMFE, for reference test procedures. The latter deal, among other things, with cone penetration tests. The earlier standard recommended by SGF for cone penetration tests from 1979 expires and is replaced by the present recommended standard for CPT-tests.

The international recommendation is mainly valid for CPT-tests without measurements of pore pressure, (test class CPT1), which in Sweden have previously also been designated TrS.

In the recommendations for the test equipment, it is mainly the cone itself, (i.e. the just over 1 m long lower part where the measurements are made), which has standardized dimensions and tolerances. For the rest of the equipment, the demands apply to its function.

4. Definitions

The design of a typical cone used in Sweden is shown schematically in Fig. 1.

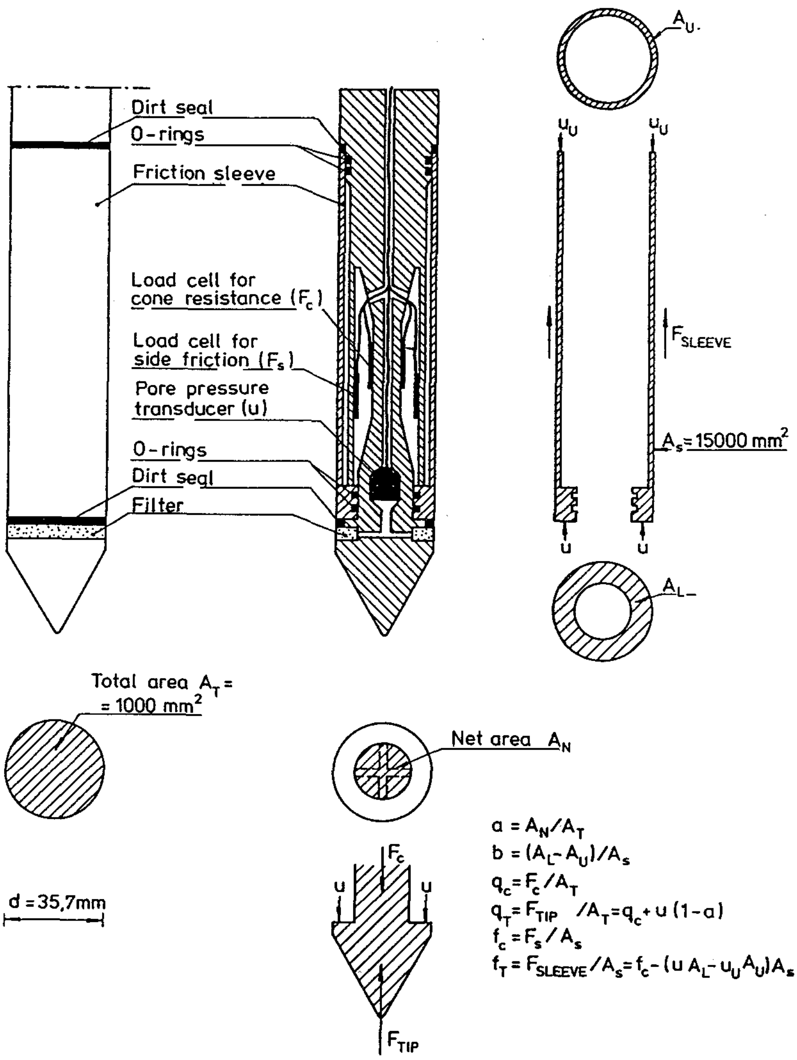

Fig.1. Schematical design and measuring principle for a typical piezocone used in Sweden.

Equalized pore pressure u_0

The equalized pore pressure corresponds to the in-situ pore pressure in the soil before the test, which returns after full dissipation of excess pore pressures at stops in the penetration.

Generated pore pressure Δu

The generated pore pressure is the change in the pore pressure that is created at penetration by the cone. The generated pore pressure can be positive or negative depending on the properties of the soil and is also strongly dependent on the location of the filter for the pore pressure measuring element.

Registered pore pressure u

The registered pore pressure is the pore pressure that is measured during the penetration, ($u = u_0 + \Delta u$). The designation u is only used for pore pressures measured at the normal filter location above the conical tip.

Tip area factor a

The tip area factor a is used for correction of the measured value of the tip resistance

$$a = A_N / A_T \approx (A_T - A_L) / A_T \qquad \text{(see Fig. 1)}$$

Sleeve area factor b

The sleeve area factor b is used for correction of the measured value of the sleeve friction

$$b = (A_L - A_U) / A_S \qquad \text{(see Fig.1)}$$

Cone resistance q_T (alt. q_c)

The cone resistance is the force per unit area which is obtained by dividing the total axial force acting against the tip by the cross sectional area of the tip base (1 000 mm²).

$$q_c = \frac{F_T}{A_T}$$

$$q_T = q_c + u(1-a)$$

In the special case where $u \approx 0$ or is negligible $q_c \approx q_T$.

The cone resistance is expressed in MPa or kPa.

Local side friction f_T (alt. f_s)

The local side friction is obtained by dividing the total friction force acting axially on the friction sleeve by the outer surface area of the sleeve, (15 000 mm^2).

$$f_S = \frac{F_S}{A_S}$$

$$f_T = f_S - [u \cdot b + 0.3\Delta u (\frac{1-a}{15} - b)]$$

In the special case where the pore pressure effects are zero or negligible $f_S \approx f_T$.

The local side friction is expressed in kPa or MPa.

Friction ratio R_f

The friction ratio is the ratio between the local side friction and the cone resistance at the actual level

$$R_f = \frac{f_T}{q_T} \cdot 100 , \%$$

(Alternatively the friction index $I_f = q_T / f_T$ may be used)

Pore pressure ratio (differential pore pressure ratio)DPPR

The pore pressure ratio DPPR is the ratio between the generated pore pressure and the cone resistance at the actual level

$$DPPR = \frac{\Delta u}{q_T}$$

(Alternatively the parameter $B_q = \Delta u /(q_T - \sigma_{vo})$ can be used)

5. Equipmemt

Geometry of the cone

The outer part of the cone consists of a conical tip, a filter, a friction sleeve and an elongated cone shaft. The friction sleeve and the elongated shaft shall together have a length of at least 1 000 mm, Fig. 2. The diameter along this distance shall be constant within given tolerances.

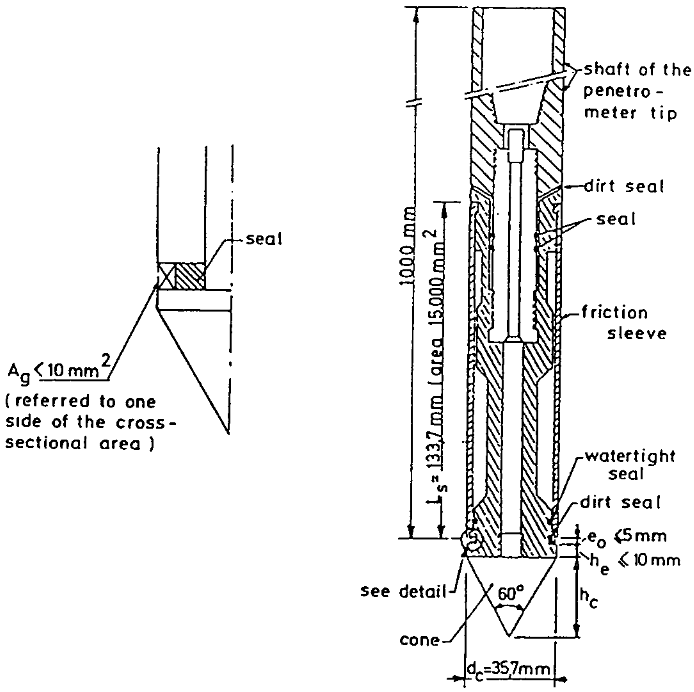

Fig. 2. Standardized dimensions of a cone. In piezocone tests the area A_g shall not be greater than 0.5 mm^2.

Conical tip

The tip consists of a conical part and a cylindrical shoulder, Fig. 3. The apex angle shall be 60^0. The cylindrical part,(including the filter in piezocones), shall have a length of 10 mm.

Cones with measurement of pore pressures, piezocones, shall have a cylindrical shoulder of 5 mm and a filter placed directly above this extension, i.e. within 5 to 10 mm above the conical part of the tip.

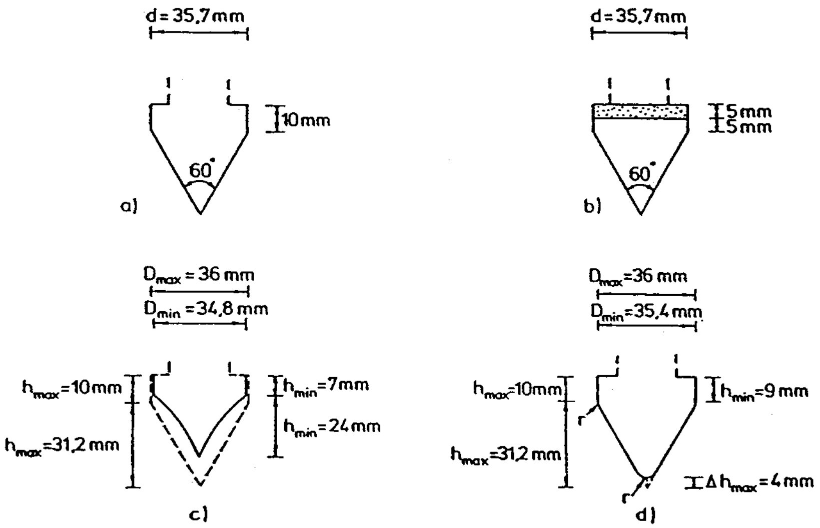

Fig. 3. Dimensions and tolerances for cone tips at manufacturing and wear.
- **a) Design of a cone tip for tests without pore pressure measurements**
- **b) Design of a cone tip for a piezocone with standard location of the filter**
- **c) Dimensions and tolerances for a cone tip for tests in class CPT1 (ISSMFE recommendations)**
- **d) Dimensions and tolerances for a cone tip to be used in piezocone tests in test classes CPT2 and CPT3 (SGF recommendations)**

The cross sectional area of the tip base shall be 1 000 mm^2, which corresponds to a diameter of the cylindrical shoulder of 35.7 mm and a height of the conical part of 30.9 mm.

The surface roughness of the cone tip in the longitudinal direction shall not exceed 1 μm, which corresponds to the normal roughness produced by the friction of the soil.

In test class CPT1, the height of the conical part may be reduced by wear by up to 7.2 mm and the height of the cylindrical shoulder correspondingly by 3 mm.

In test classes CPT2 and CPT3, the height of the cylindrical shoulder may not be more than 1 mm lower than for a new tip. A maximum wear of the outer tip of 4 mm can be accepted, provided that it is symmetrical, but no additional significant changes in the shape of the tip.

The diameter of the cylindrical shoulder shall be within 35.7 mm +0.3 mm/ - 0.9 mm in test class CPT1 and within 35.7 ±0.3 mm in tests in test classes CPT2 and CPT3.

Filter

The diameter of the filter shall be equal to the diameter of the tip shoulder. It may be slightly larger but never smaller

$$d_{FILTER} = d_{TIP} \begin{cases} +0,2 \\ -0 \end{cases} \text{, mm}$$

The filter shall fulfil this demand also after the penetration test.

Porous filters shall have small pore sizes, be incompressible and have a good resistance against abrasion. Filters made of sintered stainless steel or bronze with pore sizes between 2 - 20 μm are recommended. Also ceramic filters and porous plastic filters may be used.

Other types of filters, e.g. slot filters, must be verified to give the same results as the filters mentioned above, (within the demands for accuracy of pore pressure measurements).

Friction sleeve

The friction sleeve shall have an outer surface area of 15 000 mm^2 ± 2 %, which corresponds to a length of about 133.7 mm. It shall be located directly above the tip, (including possible filter). The maximum allowable distance caused by gaps and seals is 5 mm.

The surface roughness shall be within the limits 0.25 μm < r <0.75 μm.

The diameter of the friction sleeve shall be equal to or slightly larger than the diameter of the lower parts, (tip and possible filter). In piezocone tests with standard location of the filter, the generated pore pressure may be affected by the diameter of the friction sleeve and the the following tolerances apply

$$d_{FRICTION\ SLEEVE} \geq d_{FILTER} \geq d_{TIP}$$

$$d_{FRICTION\ SLEEVE} = d_{TIP} \begin{cases} +0.2 \\ -0 \end{cases} \quad \text{, mm}$$

For cone penetration test without measurements of pore pressures wider tolerances may be used

$$d_{FRICTION\ SLEEVE} = d_{TIP} \begin{cases} +0.35 \\ -0 \end{cases} \quad \text{, mm}$$

Elongated cone shaft

The elongated cone shaft shall have the same diameter as the friction sleeve within the tolerances + 0 mm/- 0.3 mm.

Gaps and seals

The gaps between the different parts of the cone shall not be geater than 5 mm. The seals in the gaps shall be designed to prevent intrusion of soil particles into the gaps. The seals must also be so compressible in relation to the measuring elements that no significant axial forces can be transmitted by them and cause measuring errors. The cross sectional area of a gap, remaining after deduction of the area occupied by the seal, shall be less than 10 mm² when no measurements are made of the pore pressure. In piezocone tests the corresponding area in the gap between the filter and the friction sleeve must not exceed 0.5 mm².

Push rods

The push rods are selected with consideration to the required pushing force and the actual method for transmission of measuring signals to the data acquisition system. The joints shall be rigid and the rods shall be straight. The deflection (from a straight line through the ends at the mid-point of a 1 m long push rod shall not exceed (i) 0.5 mm for the five lowest push rods and (ii) 1 mm for the remainder. For any pair of joined push rods the deflection (from the mid-points of the rods) at the joint shall also not exceed these limits.

Measuring equipment

Forces and pressures shall be measured by suitable devices and the signals shall be transmitted to registering instruments and data acqusition systems by suitable methods. Pore pressures shall be measured by transducers with very small volume changes. Recording systems where the measurements can be followed during the test are recommended.

Thrust machine

The thrust machine shall have a stroke of at least one metre. It shall push the rods into the soil at a constant rate of penetration of 20 mm/s. The thrust machine shall be ballasted or anchored in such way that it gives sufficient pushing force and does not move relative to the soil surface during the penetration test. Blows or rotation must not be used.

Friction reducer

In order to reduce the total penetration force, a local enlargement of the push rod may be applied at the bottom of the first push rod or at the joint between the cone and the push rods. Such a friction reducer may only be located above the 1000 mm long part of the cone consisting of friction sleeve and elongated shaft, where the cross section is standardized.

6. Test Procedure

Predrilling

In tests in soft soils, predrilling should be made through the dry crust. The predrilled hole is filled with water. When required, a casing may be used, partly to keep the predrilled hole open, partly to retain the water.

Fills with contents of coarser particles are always predrilled.

In some cases, the predrilling can be replaced by pushing a solid dummy cone with a diameter of about 45 - 50 mm through the stiffer layers.

Verticality

The thrust machine shall be set up so as to obtain a thrust direction as near vertical as practicable. The deviation from vertical of the thrust direction shall not exceed 2 %. The axis of the push rods shall coincide with the thrust direction.

Push rod guides

When required, guides shall be provided for the part of the push rods protruding above the soil and for the push rod length in water in order to prevent buckling.

Rate of penetration

The rate of penetration shall be 20 mm/s ± 10 %. In cone penetration tests without pore pressure measurements, the rate of penetration may be within 20 mm/s ± 25 %.

Stops in the penetration are made only for addition of more push rods and reclutching of the thrust machine for a new stroke. If longer stops are to be made in order to measure the dissipation of the generated excess pore pressure with time, it is recommended first to perform a normal penetration test with as few and short stops as possible. The longer measurements of pore pressure dissipation can then be made in supplementary penetration tests. This, however, does not apply to short stops in permeable layers with a rapid pore pressure equalization.

Frequency of readings

The frequencies of the readings for the different parameters may be varied and are chosen with consideration to the soil volumes influencing the different parameters.

Typical depth intervals for readings of cone resistance and side friction are every 50 mm. Readings of these parameters can be made more frequently and averaged for depth intervals of 50 mm before they are stored in the data memory.

The pore pressure ought to be registered at least every 20 mm of depth and reading at every 10 mm of penetration is recommended.

Depth recording

The actual level of the cone tip shall be measured with an accuracy of at least ± 0.1 m relative to the ground surface or some other fixed reference system. This often requires manual controls to be made of the penetrated depth and the registered depths to be adjusted accordingly. The resolution in the automatic depth recording shall be at least 0.01 m.

7. Precision of Measurements

Taking into account all possible sources of error (parasitic frictions, errors of measuring devices, eccentricity of the loads on the cone and the sleeve, temperature effects, etc.), the accuracy shall be better than

- 2 % of the typical measured value (the average value) for any of the soil layers* in which the results are to be interpreted in terms of classification and soil properties
- 1 % of the measured values for static pore pressures

For the different test classes there are lower limits to the required precision in terms of generally accepted inaccuracies according to Table 1.

Table 1. Generally accepted inaccuracies in different test classes.

Test class	Tip resistance	Sleeve friction	Pore pressure
CPT1	100 kPa	10 kPa	10 kPa
CPT2	40 kPa	4 kPa	5 kPa
CPT3	20 kPa	2 kPa	1 kPa

The precision of a cone must be verified by regular calibration.

Temperature stability

All measuring elements and all other electronic devices shall be stable for temperature changes. When handling the equipment, care shall be taken to minimize temperature changes in the cone. The required stability expressed as maximum zero shifts is

2.0 kPa/^{0}C	for cone resistance
0.1 kPa/^{0}C	for side friction
0.05 - 0.1 kPa/^{0}C	for pore pressure (transducers with measuring ranges of 10 - 20 bars)

This demand for stability, which applies to 5-tonne cones, shall be verified. For cones with higher measuring ranges a proportional instability is accepted.

*) *In thick homogeneous soil layers, this refers to 1m thick depth intervals.*

8. Checking Measures

Straightness of push rods

Before the penetration test, the straightness of mainly the lower five rods is checked. The check shall be made before each test and special attention should be paid after tests in soft soils with stop against rock or firm bottom, especially if the latter is inclined, and in soils containing stones or other large objects.

Wear

Checks are made on the wear of the cone tip and the friction sleeve and their surface roughnesses before each test, as well as to ensure that the criteria for the relations between the diameters of the tip, the filter and the friction sleeve are fulfilled. The much higher demands in piezocone tests in fine-grained soils than in cone penetration tests in sand must be observed.

Seals

The condition of the seals between the different outer parts of the cone shall be checked before each test. Any soil particles that have intruded into gaps and seals shall be removed. No obvious wear of the seal between the filter and the friction sleeve can be accepted in the higher test classes.

Distance to other tests

The distance to adjacent penetration tests should be greater than 2 m.

Calibration

Calibration of the measuring system shall be made between each testing project and regularly during larger test programmes, at least every third month. Simpler checks of the function shall also be made at the site. During the project, the zero readings of the measuring elements are checked before and after each test and the values shall remain stable. The calibration of the cone resistance can be checked by a load cell or by applying a dead weight. Sensitive pore pressure transducers may be checked by lowering the cone into an open waterfilled hole, e.g. when predrilling through thick dry crusts.

Thrust machine

The verticality of the thrust machine is checked at every new test point. Any safety valves for maximum thrust force shall be calibrated. The rate of penetration shall be checked during each test.

Saturation of filters and treatment of fluids

Porous filters shall be saturated in the laboratory. If a piezocone test is to be made in soils where negative pore pressures may be expected, e.g. in dense sand and silt or overconsolidated clay, in non-saturated soils or without predrilling through the crust, glycerine is normally used. In other tests, water may be used as an alternative.

When using glycerine, the dry filters are submerged in the fluid and treated with high-vacuum for a few hours. Also a larger quantity of glycerine is treated in the same way. Filters and fluids are then kept in air-tight containers.

When using water, the filters are boiled for at least 15 minutes. Filters and water are allowed to cool under a tight lid and are then kept in well filled air-tight containers. A larger amount of water is de-aerated by use of e.g. a vacuum jet. Also this water is then kept in an air-tight container.

When using a slot-filter, a careful saturation is also required. Glycerine or other considerably less viscous fluids may be used. Also in this case the use of vacuum treated fluids is recommended.

Height of filter

After saturation of the pore pressure measuring system and assembly of the different parts, the fit of the filter has to be checked. The height shall be such that there is no obvious play and at the same time it shall be easy to rotate the filter by the finger tips. This check ensures that there are no unnecessary gaps and that there are no forces built in at the assembly, which may otherwise affect the measurements.

Required checks and calibrations in connection with a cone penetration test project are summarized in Table 2.

This schedule shall be used together with the instructions from the manufacturer of the equipment in order to ensure good quality control.

Table 2. Control schedule for a cone penetration test project.

CONTROL	TIME				
	Start of project	During project	Start of test	After test	Every 3rd month
Verticality of thrust direction			●		
Rate of penetration			●		
Safety functions	●				●
Push rods	●		●		
Wear and tolerances	●		●	●	
Seals	●		●		
Fit of filters	●		●		
Zero readings		●	●	●	
Detailed calibration	●				●
Function checks	●				

9. Calibration

Each new cone has to be carefully calibrated with respect to area factors, internal friction and possible interference between the different measurements. These data are specific for the cone, but they may be changed if cone tips with other designs are used. They therefore have to be calibrated for each type of cone tip that is to be used. They also have to be recalibrated after any change in the design of the cone.

Calibration of cone resistance and sleeve friction is performed by step-wise axial loading of the tip and the friction sleeve respectively. When calibrating the sleeve friction, the tip is replaced by an adaptor, which is designed to transmit the axial forces to the sleeve. The calibrations are made separately, but the other measuring elements are also monitored in order to check whether they are affected by the applied force. The calibration is made for different measuring ranges with special consideration to ranges which are expected to be most relevant. When a new cone is calibrated, the different measuring elements should first be subjected to 15-20 cycles with loads up to full capacity before they are calibrated.

Calibration of area factors a and b must be made in a special calibration cell. This cell is designed in a such way that the lower part of the cone including the friction sleeve can be inserted into the cell. The cone shaft is then locked in position and sealed above the friction sleeve, Fig. 4. The lower part of the cone can then be subjected to an all-round pressure in the chamber. This is done in steps and readings are taken for all three measuring elements in the cone for pore pressure, cone resistance and friction. In this way a calibration is obtained for the pore pressure measurements, area factors a and b and measurements of the internal friction inside the cone, Fig. 5. With special registration equipment also the response time of the pore pressure transducer for pressure changes in the cell can be checked.

Later calibrations of the pore pressure transducer can be made by replacing the cone tip by an adaptor for a pressure tube, which is screwed into the same thread.

The calibrations shall be made using the same electronic devices and data acquisition system which is used in the field tests in order to obtain a check of the complete system and its sources of errors. High precision transducers which are regularly checked are used as references in the calibrations.

The cones shall also be calibrated with regard to temperature stability. This can be done e.g. by lowering them into water baths with different temperatures. The signals from the transducers are then recorded versus time until the readings have become stable. From the results, the zero off-sets per ^{0}C are evaluated. In addition, a measure is obtained of the time required for stabilization of the cone when it is submerged in water.

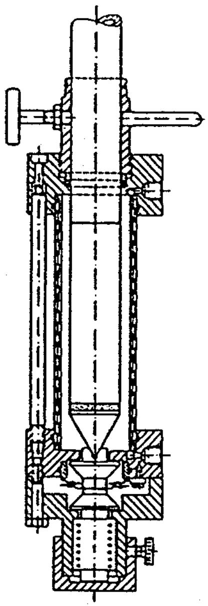

Fig. 4. Calibration cell for CPT cones.

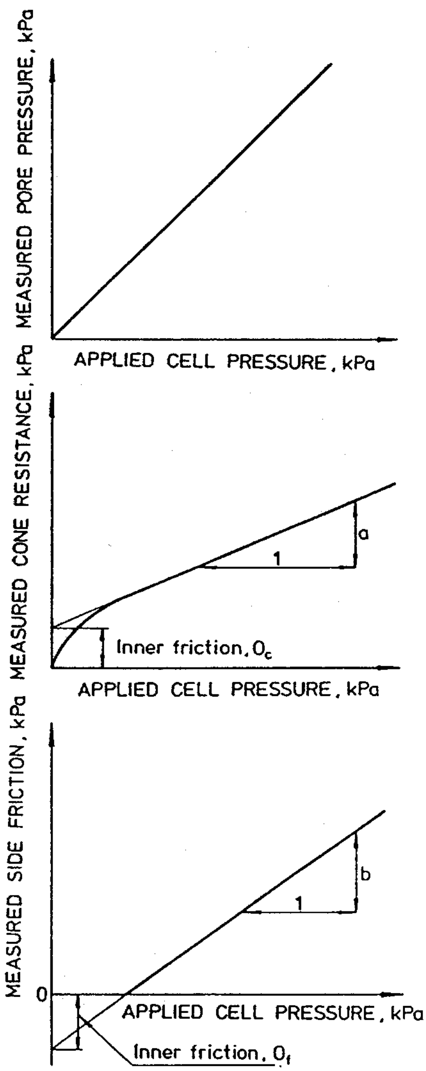

Fig. 5. Results from calibrations in the calibration cell.

10. Reporting Test Results

Basic parameters and supplementary parameters for interpretation

The basic parameters obtained in the penetration test are

- Total cone resistance, q_T
- Total side friction, f_t
- Total (registered) pore pressure, u

Interpretation of the results also requires the basic parameters:

- Initial in-situ pore pressure, u_o
- Initial in-situ vertical stress, σ_{vo}

The initial pore pressure is estimated by observations of the free ground water level and fully equalized pore pressures in more permeable layers. If the latter observations are missing, supplementary pore pressure measurements must be made at a number of levels in the soil.

The initial in-situ vertical stress is calculated from the density of the soil. This estimation can often be made with an interactive procedure using the type of soil and its denseness that is interpreted from the test results. A careful interpretation in clay and organic soil requires samples to be taken for determination of the liquid limit w_L. From these samples also the density can be determined.

Different relations between the basic parameters are used for interpretation of the test results. For a preliminary interpretation and soil classification the following parameters are used

- Generated pore pressure $\Delta u = u - u_o$
- Friction ratio $R_f = (f_T/q_T)\cdot 100$, %
- Pore pressure ratio $DPPR = (\Delta u/q_T)$ (or $B_q = \Delta u/(q_T - \sigma_{vo})$)

Graphical presentation

The test results are presented as curves for the basic parameters q_T, f_T and u versus depth.Uncorrected values of q_c and f_c must never be presented without clear information that they are uncorrected values which cannot be used for interpretation, except for those special cases where the influence of the pore pressure may be neglected, (i.e. mainly in sand).

Curves of the parameters u_o, Δu, R_f and DPPR versus depth are alsqpresented as an aid for a preliminary manual evaluation and interpretation of the results.

The basic parameters from the test are presented in a graph with the following scales

Depth	1 m / 10 mm
q_T	2 MPa / 10 mm
f_T	50 kPa / 10 mm
u	200 kPa / 10 mm

An initial presentation in these scales should always be made in order to give a unified picture of the relative stiffness of the soil. In fine grained soils, a detailed presentation can then be made in scales which have been selected on the basis of the actual test results, Fig. 6. This latter graph also presents the parameters u, Δu, R_f and DPPR versus depth. For the latter parameters the following scales are used

R_f	2 % / 10 mm
DPPR	0.5 / 10 mm

The report shall also contain information on:

- Test location.
- Operator.
- Date.
- Designation of the test point.
- Coordinates and ground level at the test point.
- Reference level.
- Free groundwater level.
- Pore pressure observations.
- Depth of predrilling.

- Type and properties of the predrilled material.
- For tests from the bottom of excavations, also the depth of the excavation and the type and properties of the excavated material.
- Type and manufacture of the test equipment.
- Cone number, filter position and measuring ranges.
- Date for last calibration.
- Area factors a and b.
- Type of filter and fluid in the pore pressure measuring system.
- Any longer stops in the penetration, e.g. for performance of special tests such as seismic tests or pore pressure dissipation tests.
- All observations made by the operator during and after the test, such as indications of presence of stones, sounds from the rods, disturbances that may affect the results, bent rods or joints, unusual wear of the cone or significant zero-shifts.
- Differences in zero-readings before and after the test are given in kPa. Significant differences in calibrations before and after the actual test date shall be reported as well as errors in depth registration.
- If significant zero-shifts have occurred, the report shall indicate how this has been accounted for in the data processing and presentation.

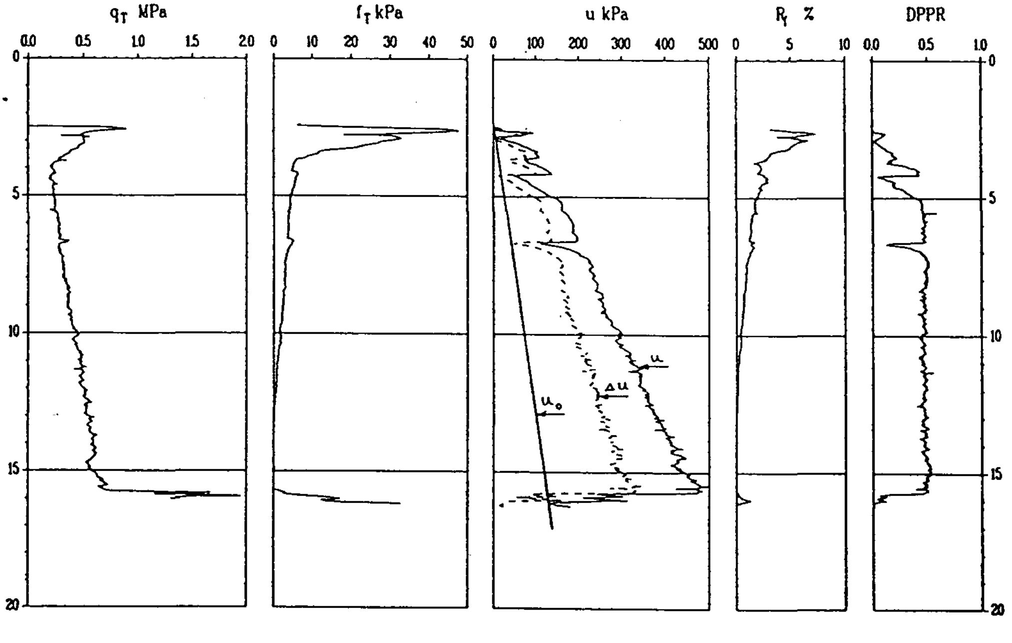

Fig. 6. Presentation of results from a piezocone test.

SGF Rapport

1:93 Rekommenderad standard för CPT-sondering

1:93 E Recommended Standard for Cone Penetration Tests

2:93 Rekommenderad standard för vingförsök i fält

The Swedish Geotechnical Society (SGF) was formed in 1950 and has currently 650 members with at least two years experience in geotechnics. In addition, there are some 35 corporate members comprising institutions, universities, official bodies, consultants, contracting companies and manufacturers with activities in the area of geotechnics.

The objective of the SGF is to promote development in geotechnics and foundation engineering through lectures, discussions and committee work, and to cooperate with Swedish, Nordic and other international bodies having a similar orientation.

The SGF is the Swedish representative of the International Society for Soil Mechanics and Foundation Engineering (ISSMFE). Every member of the SGF is also a member of the international society.

The series of Reports published by the SGF contains recommendations for geotechnical standards, in addition to monographs and documentation from conferences, seminars and other events.

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