INSITU
Interpretation of In Situ geotechnical tests

geo&soft
international

Geo Soft di ing. G. Scioldo

Summary

Chapter 1 - Introduction to the program

Introduction to the program

INSITU manages the interpretation of in situ static and dynamical geotechnical tests.

Standard Penetration Test

One of the test most used is without doubt the SPT test. It consists of determining the resistance the terrain offers to the dynamical penetration of a sampler driven from the bottom of the borehole. It is as a matter of fact a function of the characteristics and type of terrain. The results obtained are normally used to determine the terrain's geotechnical parameters.

Its large diffusion is due mainly to the simplicity the test can be performed in any terrain directly during the drilling of the borehole, without using any additional equipment. Its use throughout the world has generated a rich bibliography that renders the interpretation of the results easy. These have to be evaluated with caution as these can be strongly influenced by the way the test is performed. Moreover the SPT test does not give significant indications in the field of static loads and hence the correlations with the geotechnical parameters found by researchers throughout the years are purely empirical. Let us see what information can be gathered:

- **Relative density (D_R):** to estimate the relative density the Gibbs-Holtz and Terzaghi-Peck-Skempton methods are used. The method proposed by Gibbs-Holtz enables one to determine the relative density of the terrain traversed through the relation between resistance to penetration and the effective vertical pressure. This method is particularly useful for non-cemented and fairly compressible quartz sands while in the case of gravel the estimated value should be corrected in order to take into account the difference in compressibility. The Terzaghi and Peck classification correlates the relative density of the terrain with normalised Nspt [$(N_1)_{60}$]value..

- **Friction angle (ϕ'):** the data are treated with three different methods: De Mello, Schmertmann from Gibbs-Holtz and Schmertmann from Terzaghi-Peck-Skempton. The method proposed by De Mello enables one to determine the friction angle of terrain traversed as a function of the effective vertical force. This method is particularly useful for non-cemented and fairly compressible quartz sands One should remember that the De Mello correlation tends to over-estimate the friction angle for affective forces less than 10 kPa for ϕ' > 38° the values obtained are larger than the real value. The Schmertmann method relates the effective friction angle as a function of different granulometric distributions, using in this case the DR values calculated with both the Gibbs-Holtz and Terzaghi-Peck-Skempton method.

- **Effective vertical tension and total vertical tension**: these are derived directly from the stratigraphical information.

- **Confined modulus (Mo)**: the program uses, to determine the confined modulus, three different calculation methods: Schultze-Mezenbach, Studio Geotecnico Italiano from Gibbs-Holtz and Studio Geotecnico Italiano from Terzaghi-Peck-Skempton. The latter two are valid for non-cemented quartz sands and are based on CPT test performed in a calibration chamber setting the qc/Nspt ratio equal to 5.

- **qc**: the point resistance is derived from the relation (Seed e De Alba) between the mean size of the clasts (D50) entered with the stratigraphical information required by the program and the normalised Nspt (N60) value.

- **Young's modulus (E25)**: Also in this case the CPT test results performed in the calibration box (SGI from Gibbs-Holtz and SGI from Terzaghi-Peck-Skempton). The proposed correlation is valid for non-cemented quartz sands by using a ratio qc/Nspt = 5.

- **Dynamic shear modulus (Go)**: the method, most frequently used is due to Ohta and Goto where Go is derived by multiplying the square of the velocity of the shear waves with the ration between unit volume weight and the acceleration due to gravity. The method is particularly indicated for recently deposited clean sands. The second method used (Yoshida) employs however statistical correlations, determined by in situ and calibration box test, between Nspt and shear wave velocity.

- **Settlements (Smax/Qamm)**: the program uses the method by Burland, Broms and De Mello, valid for sands, that enables one to assign upper limits to the ratio (Smax/Qamm) - that is a function of the foundation width - based on the characteristics of compaction of the sand one can derive from the Nspt

value.

- **Cyclical stress (τ)**: the cyclical stress is used as an index in the correlations to determine the resistance to liquefaction of a sandy soil. The calculation method uses the normalised Nspt value [$(N_1)_{60}$].

Cone Penetration Test

The CPT test is normally used to survey the vertical stratigraphic development and in identifying the types of terrain traversed.

If the point is provided with a porous sector and piezometer cone the pore pressure corresponding to the hydrostatic level is measured with corresponding force opposing the penetration into the soil.

As for the SPT test, the identification of the terrains traversed and the evaluation of the geotechnical parameters is effected using empirical correlations.

The interpretation of the results is normally performed differentiating between granular terrains prevalently made of sand, and for which we can determine with this test the friction angle, the drained compressibility and the relative density, and the cohesive terrains with a prevalence of clay, for which the non-drained shear resistance, the compressibility, the sensitivity and the degree of over-consolidation. Let us consider in detail how the data are treated by the program:

- **Classification of the terrains traversed**: the terrain classification is normally based on the lithological schemes proposed by Begemann - determined on the base of the values assumed for the point resistance (qc) and the local lateral friction (fs) obtained with a mechanical point - and from Schmertmann, who updates the Begemann scheme considering the relation between the point resistance with ratio of the resistances. The classification most commonly used to interpret data contained with an electrical point is perhaps the one proposed by Douglas and Olsen, based on the USCS classification obtained by relating the point resistance and the ratio of the resistances. This classification is not quite indicated for materials with low qc and fs values, for which there is a large influence due to the dynamic water pressure in the pores. A subsequent update to this table has been proposed by Olsen and Farr, that uses the ratio between the normalised point resistance (qcn) and the ratio of the resistances Rf. In case the ratio between point resistance and the local lateral friction exceeds the range foreseen by the interpretation scheme proposed by the author, selected for the interpretation, the program will bring back automatically the values within the range foreseen by the table. To the stratum a description will be assigned that presents the geotechnical characteristics most similar to those obtained by the readings; to stress the uncertainty of the interpretation this will therefore be followed by a question mark (?)".

Drained terrains

- **Relative density (DR)**: the correlation between the qc values and the relative density is differentiated in the case of normally consolidated and over-consolidate deposits (Baldi). In the first case a correlation based on the qc values and the effective vertical pressure is used; in the second one however the qc values are correlated with the effective horizontal pressure inasmuch the vertical pressure tends to overrate DR.

- **Shear resistance**: the parameter that expresses shear resistance in granular terrains is the effective shear angle (ϕ'), to determine it the method due to Robertson and Campanella is normally used. While it is not possible to obtain a direct relation between point resistance and the effective shear angle, they found an expression valid for normally consolidated sands mainly made up by quartz; in over-consolidated deposits the value of ϕ' can be overrated.

- **Determination of the compressibility [Tangent confined modulus (Mt), Secant drained modulus (E50), Dynamic shear modulus (Gmax)]**: to evaluate compressibility different empirical correlations have been proposed for the modulus of deformation and point resistance; one ought to remember that these can be used to interpret tests performed in terrains mainly made up of normally consolidated quartz sands, while the method will yield too low values for over-consolidated deposits.

Non-drained terrains (from tests performed with electrical point and piezometric cone)

- **Non-drained shear resistance (Su)**: the determination of this parameter form the CPT test results is extremely complex. The program calculates and estimates Su using the expression Su= (qc-σo)/Nk where σo= in situ total pressure, and Nk = cone factor = 15 ± 3. The mean value Nk is determined by using non-drained shear resistance values obtained by in situ shear tests (Bjerrum).

- **Sensitivity (St)**: although it is normally determined through shear tests it is possible to estimate St through the Robertson and Campanella correlation St=Ns/Rf where the sensitivity coefficient Ns is estimated around 15 for CPTs executed with a mechanical point and between 6 and 10 for CPTs with an electrical point.

- **Compressibility**: to evaluate compressibility in cohesive, undrained terrains different empirical correlations have been proposed between the point resistance, the deformation moduli - drained confined modulus (M)

and undrained Young's modulus (Eu) - and the compressibility index Cc. One ought to take into account that the evaluation of the compressibility obtained through M and Cc can be devoid of significance as it is subject to errors up to 100%. Thus it should be considered that only the result can be verified through the study of the behaviour of previously built structures.

- **Degree of over-consolidation (OCR)**: the evaluation of the degree of over-consolidation of a clay can be effected through the ratio that binds OCR to the normalised shear resistance (Su/σ'vo). Useful indications to estimate over-consolidation can be gained from reading the profile of q_c shown under graphical form.

Dynamic Penetrometer Tests

The Dynamic Penetrometer Tests is one of the eldest and most widespread in situ geotechnical tests. It enables one to determine the resistance offered by the terrain to the penetration of a pointed metallic cone mounted at the extremity of a steel rod driven in by blows. It's wide application is fundamentally due, like the SPT test, to its simplicity.

The test is mainly used in granular terrains, it is furthermore quite effective to localise resistant strata and is thus quite useful to plan pile foundations in non-cohesive strata, particularly for pre-fabricated piles, also because there is a large similarity between driving the sampler and the piles.

The results obtained from the test should be evaluated quite carefully as these can be strongly influenced by the way the test is performed: these are as numerous as the various types of extant penetrometers. The geotechnical results derived from the tests are not accepted at an international level. These are normally correlated with other in situ test, in particular with SPT tests where the N_{DP} data are transformed into Nspt.

Chapter 2 - System requirements and program installation

System requirements

- Pentium® class processor

- Microsoft® Windows® 95 OSR 2.0, Windows 98, Windows Me, Windows NT®* 4.0 with Service Pack 5 or 6, Windows 2000, or Windows XP

- 64 MB of RAM (128 MB recommended)

- 100 MB of available hard-disk space

- CD-ROM drive

- **A printer driver <u>must</u> be installed, even if the printer itself is not connected to the PC.**

Program Installation

To install INSITU run the **insitu32setup.exe** installation package from the CD-ROM or from the download directory.
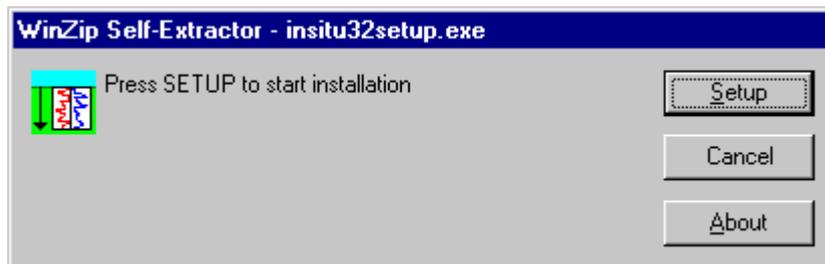
Press the **<u>Setup</u>** button…
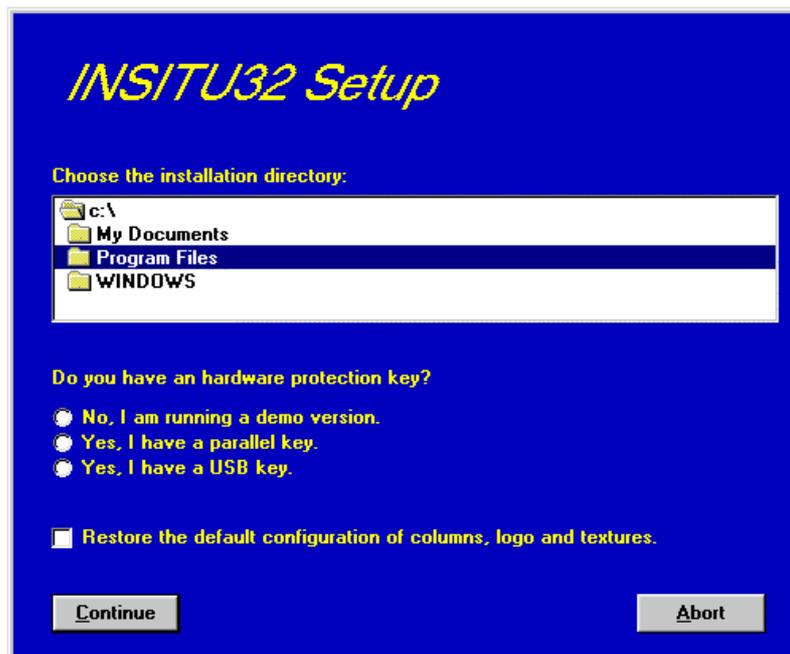
…and select the directory to create the **INSITU32** folder.

Click the **Continue** button and the program program is automatically installed.

The first time you run the program the window that allows you to select your preferred language appears.
Simply click on the flag of the language you prefer.

The language selection will be saved in the "LANGUAGE.CFG" file, which is found in the program directory. To select another language, it is sufficient to exit the program and delete this file. The language selection window is shown once more at the next run of the program.

Chapter 3 - The program protection

Hardware protection key

This section should instead be carefully read if the program was bought through the Internet.

Hardware protection key - Parallel port

Plug the hardware protection key that is supplied with the program into the parallel port connector of your PC. The hardware key should be plugged directly into the PC, before any other device, to avoid hardware conflict with other keys.
The printer cable can then be connected to the hardware protection key, as it does not interfere with the printing operation. If the hardware key has not been correctly installed, the program will start in demo mode.

For further information about the hardware key, please visit the Web site http://www.eutron.com

Windows 95, Windows 98 and Windows Me
Windows 95, Windows 98 and Windows Me automatically recognize the hardware key, so no other operation is required.

Windows NT, Windows 2000 and Windows XP
Windows NT, Windows 2000 and Windows XP require the installation of a software driver to enable access to the hardware key. To install the software driver, follow this procedure:

1. start Windows, and login as Administrator

2. install the package

3. browse the program directory, and run the program SKEYADD.EXE in the folder HardKeyDrivers\Parallel_NT-2000-XP

4. restart the computer

To uninstall the software driver, follow this procedure:

1. start Windows, and login as Administrator

2. browse the program directory, and run the program SKEYRM.EXE in the folder HardKeyDrivers\Parallel_NT-2000-XP

3. restart the computer

Hardware protection key - USB port

Plug the hardware protection key, supplied with the program, into one of the USB connectors of your PC.

For further information about the hardware key, please visit the Web site http://www.eutron.com

Windows 95, Windows 98, Windows Me, Windows 2000 and Windows XP
All Windows versions, except Windows NT, automatically recognize the PnP hardware key, and require the path

to load the driver from. To install the driver, follow this procedure:

1. start Windows, and login as Administrator (if necessary)

2. install the package

3. browse the program directory, and select the folder HardKeyDrivers\ USB_9x-Me-2000-XP

Windows NT

Windows NT requires the installation of a software driver to enable the access to the hardware key. To install the software driver, follow this procedure:

1. start Windows, and login as Administrator

2. install the package

3. browse the program directory, and run the program SKEYUSBADD.EXE in the folder HardKeyDrivers\USB_NT4

4. restart the computer

To uninstall the software driver, follow this procedure:

1. start Windows, and login as Administrator

2. browse the program directory, and run the program SKEYUSBRM.EXE in the folder HardKeyDrivers\USB_NT4

3. restart the computer

Chapter 4 - Using the program in a local network

Using the program in a local network

The programs can be used in a local network without moving the hardware key from one computer to another. It is also possible to purchase multiple licenses to use the program on several computers at once.

The computer to which the hardware key is physically connected is defined as the "Server", and the computer that requests the authorisation to run in fully operational mode from to the Server is defined as the "Client".
The program must be installed on the Server (with the proper hardware key drivers if necessary), and on each Client (in demo mode).
The program *keyserver.exe* should also be installed on the Server. The installation file of this program can be found on the distribution CD-ROM, or on the Internet, at the URL:
http://www.geoandsoft.com/download/KeyServerSetup.exe

Run *keyserver.exe* and the hardware key management window appears.
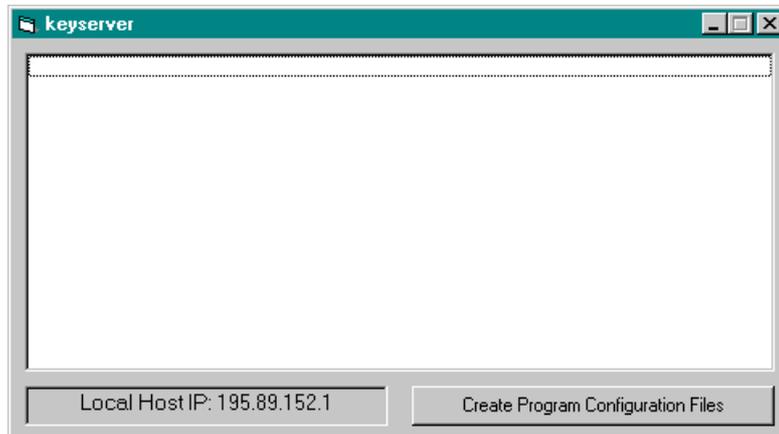
Click the "Create Program Configuration File" button, and browse your network to select the executable file you want to remotely activate (for example \\computer03\c\program files\insitu32\insitu32.exe). Now, with the *keyserver.exe* program running, insitu32.exe can also be run from the PC "computer03".

NOTE: the contemporary use of the program on more then one computer is allowed only if a multiple license has been purchased.

Chapter 5 - General information

Usage Notations

Some typographical notations and keyboard formats are used in this manual to help locate and interpret information more easily.

Bold print is used to indicate command names and related options. Characters appearing in bold print should be typed exactly as printed, including spaces.

Words written in *italics* indicate a request for information.

CAPITAL letters are used to indicate computer, printer, directory, and file names.

Keyboard formats are used as follows:

- KEY1+KEY2 - indicates press and hold down key1 and then, at the same time, press key2. For example, alt+c means one should press and hold the alt key down and, at the same time, press the c key. The keys are always indicated with capital letters.

- key1,key2 - A comma (,) between key names means that the keys must be pressed in sequence. For example, ALT,C means one should press and release the ALT key and then press and release the C key.

Because of the differences in keyboard layouts, the names of the keys on the keyboard may not correspond with those described in this manual. The word ARROW (LEFT, UP, RIGHT, DOWN) indicates the use of the arrow

Chapter 6 - User Interface

User Interface and Data Entering

The user interface is designed to be easy to use and powerful and is supported by complete on-line help. This help contains practical hints and the theoretical background, where applicable. It should reduce the requirement of frequently consulting the printed manuals.

All the commands are located inside a menu bar. Each menu contains a list of commands that one can select with the mouse or the keyboard. The arrangement of the menus, designed with ergonomic criteria, follows the logical order of the operations, inhibiting the access to further operations until all the necessary data have been entered.

The interface layout is maintained in all of our programs, to simplify, as much as possible, the transition from one program to another to avoid having to learn different commands and procedures for similar functions (such as entering data or managing files).

Let us examine the general components that are available in the user interface of geo&soft programs.

User Interface: Menu Bar and Menus

The Menu Bar manages the access to all the program commands. The goal of the menu design is to offer an ergonomic, simple, and understandable arrangement of the commands.

The menus used to perform a complete operation are normally ordered left to right and top to bottom. When possible, the following scheme is used: definition of the name of the project, entering the required data, performing the calculation, and generating the output as a preview or final print.

The programs automatically disable some menus or commands when the execution of such menus or commands is not yet feasible. Typical examples are: a calculation menu is disabled when not all the data needed for the calculation have been completely entered, or a print menu is disabled if not all the calculations have been executed.

To choose a command from a menu, use the following procedures:

☞ Point the menu that is to be activated, click the left button of the mouse, then point the command to be activated, and click the left button of the mouse again. If one does not wish to select any command from the menu that is open, exit the area of the menu before releasing the mouse button.

⌨ Press the ALT key to activate the menu bar. Press, on the keyboard, the underlined character in the menu name or press ENTER or the DOWN arrow, to select the first menu. Press on the keyboard the underlined character in the menu name or select it using the arrow key and then press ENTER, to execute a command in the selected menu. Press ESC to close the menus without executing any command.

The Graphical Output Preview Window

The Toolbar is located in the upper side of the preview window.

The Toolbar allows fast access to the commands with the mouse. Click the corresponding icon, to select one of the commands that belong to the Toolbar. The Toolbar displays the following commands:
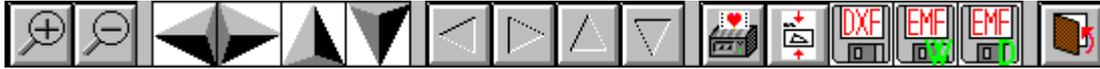
- **Zoom +** : clicking the first icon activates the ZOOM function (it can only be used with the mouse) that permits the enlargement of part of the drawing. The function remains active until the Zoom - icon is selected. To enlarge a part of the drawing:

☞   click the icon, and then select the area to be enlarged by clicking the upper-left corner and dragging the mouse pointer to the lower-right corner. At this point, release the mouse button. Note: due to the low resolution of the screen, the texts could appear in a slightly different scale at different zoom levels. This does not affect the quality of the final printouts.

- **Zoom -** : click this icon to return to the original scale of the preview.

- **Arrows**: click the arrow icons, in "Zoom + " mode, to pan the on-screen preview.

- **Print**: click the print icon to send the drawing to the default printer.

- **Resized print**: click this icon to send the drawing to the default printer. The image will be resized to fit the current paper size.

- **DXF**: one can export the graphic output as a DXF file by clicking this icon; it gives access to a dialogue window that enables one to assign a different name to the DXF file, which has, by default, the same name as the current project.

- **EMF/W**: This icon allows the graphic output to be exported to a version of the Enhanced Windows Metafile which is compatible with Microsoft Word. Clicking this icon gives access to a dialogue window that enables one to assign a different name to the EMF file, which has, by default, the same name as the current project.

- **EMF/D**: This icon allows the graphic output to be exported to a version of the Enhanced Windows Metafile which is compatible with Corel Draw. Clicking this icon gives access to a dialogue window that enables one to assign a different name to the EMF file, which has, by default, the same name as the current project.

- **Exit**: click this icon to close the preview window and return to the main menu.

The Input Dialogue Windows

The different menu commands can perform an immediate action, or display a dialogue window in order to input or edit the various data sets.
When a dialogue window is visible, all the actions that do not pertain to it are ignored. Hence, it is necessary to close the dialogue window to resume the normal use of the program.

Some fundamental tools are used inside the dialogue windows: data fields such as text and list boxes, and buttons.
The text boxes are used to input numerical values and text strings. Most of the editing keys (HOME, END, INS, DEL, etc.) can be used inside these fields. If one sees a small arrow pointing down on the right side of the data

field, one has a list box.

To scroll the list box and select an item, do as follows:

🖰   click the arrow, and then click the item to be selected.

⌨   press the DOWN arrow until one arrives at the item to be selected. It is also possible to press a letter to directly reach the first item that begins with that letter.

Tere are three buttons in the dialogue window:

- <<u>O</u>k> - this button saves the entered information and goes on to the next phase.

- <<u>C</u>ancel> - this button closes the Dialogue window without saving the just entered data, or without executing the command.

- <<u>H</u>elp> - this opens a window that contains general information on how to use the dialogue windows.

To use the buttons:

🖰   click the button

⌨   press alt+underlined letter

To edit the data inside the dialogue window, use the following keys:

- TAB - moves the cursor to the next field; when the cursor is inside the last visible field the cursor goes to the first control button of the Dialogue window. To return to the previous field, press SHIFT+TAB.

- ENTER - moves the cursor to the next field. If the cursor is positioned on one of the window buttons, the corresponding command is executed.

- BACKSPACE - cancels the last character that has been entered.

- DEL - cancels the character to the right of the cursor.

- ESC - closes the Dialogue window without saving the entered values or without executing the command. The <Cancel> button will do the same.

- UP ARROW/ DOWN ARROW - these are used in multiple fields, or those fields that have a list box.

- LEFT ARROW/ RIGHT ARROW - moves the cursor to the previous or next field.

- HOME -moves the cursor to the beginning of the field.

- END - moves the cursor to the end of the field.

A yellow box with a short text that explains the meaning of the value to be entered, can be seen in the lower part of the window. If the text is not completely visible, click the yellow box to read the complete text.

Data Input With Tables

Tables are used to enter long sequences of numerical values and/or text strings. The keys to be used are the following:

- TAB - moves the cursor to the first button in the window. When one presses this key again, the cursor is moved to the next button.

- SHIFT+TAB - moves the cursor to the previous button.

- ENTER - moves the cursor into the next input field. If the cursor is positioned on one of the window buttons, the corresponding command is executed.

- PAGE UP - moves the cursor up 15 lines.

- PAGE DOWN - moves the cursor forward 15 lines.

- UP ARROW - moves the cursor to the input field directly above.

- DOWN ARROW - moves the cursor to the input field directly below.

- LEFT ARROW / RIGHT ARROW - moves the cursor to the field respectively to the left or to the right of the current position.

- HOME - moves the cursor to the beginning of the line.

- END - moves the cursor to the end of the line.

- F2 - copies the field contents to the extended editing field under the title bar in order to facilitate the editing of the long strings. When working in this editing field, please **REMEMBER** to press ENTER, even before clicking the <Ok> button. Double-clicking a field has the same effect as pressing the F2 key.

The tables have two additional buttons:

- <Insert> - creates an empty line before the one in which the cursor is positioned.

- <Delete> - deletes the line in which the cursor is positioned.

IMPORTANT SUGGESTION: you can copy data to or from other programs such as Microsoft Excel:

The data entered in the table can be copied in order to be pasted into another table.

To copy the table's contents:

✎   press the key combination CTRL+C. The contents will be copied into the Clipboard of Windows.

To paste the Clipboard contents into the table:

✎   press the key combination SHIFT+INS, or CTRL+V.

A yellow box with a short text that explains the meaning of the value to be entered, can be seen in the lower part of the window. If the text is not completely visible, click the yellow box to read the complete text.

Message Windows

The function of these windows is to give information to the user concerning the system status, as in the case of an error due to an improper use of the program.
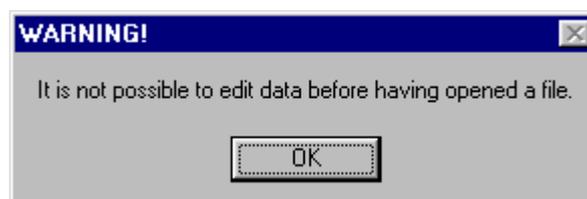
Help On Line

A complete Help On Line is available. It is possible to ask for information or suggestions related to the commands or the use of the program. In order to access the help on line, proceed as follows:

1. Position the cursor on a field of a dialogue window and press F1.

2. Use the Summary from the Help menu.

Chapter 7 - Files Menu

Files Menu (ALT,F)

This menu contains the commands for opening and saving files. In these all the information relative to the project is stored.

New Command (ALT,F,N)

By selecting this command the program opens a sub-menu where one can select the type of test.

SPT Command (ALT,F,N,S)

Enables one to enter the data relative to the SPT tests. To open a new file:

🖰   from the menu choose New by first clicking on the name of the menu then on the New command.

⌨   from the File menu choose New by using the combination of the keys ALT,F,N,S.

Electrical CPT Command (ALT,F,N,E)

Enables one to enter the data relative to the CPT tests performed with an electrical point. To open a new file:

🖰   from the menu choose New by first clicking on the name of the menu then on the New command.

⌨   from the File menu choose New by using the combination of the keys ALT,F,N,E.

Mechanical CPT Command (ALT,F,N,M)

Enables one to enter the data relative to the CPT tests performed with an mechanical point. To open a new file:

🖰   from the menu choose New by first clicking on the name of the menu then on the New command.

⌨   from the File menu choose New by using the combination of the keys ALT,F,N,M.

DP Command (ALT,F,N,D)

Enables one to enter data from DP tests. To open a new file:

🖰   from the menu choose New by first clicking on the name of the menu then on the New command.

⌨   from the File menu choose New by using the combination of the keys ALT,F,N,D.

Open Command (ALT,F,O)

To work with program one should open a file that can be new or pre-existing. By selecting this command the program opens a sub-menu where one can select the type of test.

SPT Command (ALT,F,N,S)

To open a file:

🖰   from the menu choose Open by first clicking on the name of the menu then on the Open command. In the File Name field type the name of the file to be opened or, if the file already exists, double click on the name of the desired document which can be found in the list underneath the File Name field.

⌨   from the File menu choose Open by using the combination of the keys ALT,F,O,S. In the File Name cell, type the name of the file to be opened or, if the file already exists, press TAB and then the UP ARROW or DOWN ARROW to select the name from the list underneath the File Name field and press ENTER.

The name of the file being used is reported inside the title bar of the main window and inside a window referable by selecting the Help menu.
The name of the file should not contain spaces and/or punctuation marks. It is not necessary to indicate extensions, since the extension ".SPT" is added automatically: for example, the given name "TEST" will have the file name "TEST1.SPT"

Electrical CPT Command (ALT,F,O,E)
Enables one to enter the data relative to the CPT tests performed with an electrical point.
The name of the file should not contain spaces and/or punctuation marks. It is not necessary to indicate extensions, since the extension ".CPT" is added automatically: for example, the given name "TEST" will have the file name "TEST1.CPT"

Mechanical CPT command (ALT,F,O,M)
Enables one to enter the data relative to the CPT tests performed with a mechanical point.
The name of the file should not contain spaces and/or punctuation marks. It is not necessary to indicate extensions, since the extension ".CPT" is added automatically: for example, the given name "TEST" will have the file name "TEST1.CPT"

DP Command (ALT,F,O,D)
Enables one to enter data from DP tests.
The name of the file should not contain spaces and/or punctuation marks. It is not necessary to indicate extensions, since the extension ".DPR" is added automatically: for example, the given name "TEST" will have the file name "TEST1.DPR"

Save Command (ALT,F,A)
During the work session the program uses a copy of the file which is temporarily loaded into the computer's RAM. To save work on the hard disk it is necessary to use the Save command; otherwise all the data introduced will be lost when one exits from the program. If an electrical problem or any other type of problem interrupts the computer's functioning all the data not yet saved will be lost, so it is advisable to save the work often.
To save a file:

🖰   select Save from the file menu by clicking first on the name of the menu and then on the Save command. In the File Name field, the name given to the file when it was originally opened appears. To confirm that name click on the <Ok> button. To assign a new name to the file, type the new name in this field.

⌨   select Save from the File menu by using the key combination ALT,F,S. To confirm the name given to the file when it was opened press ENTER. To assign a new name, type the name in the File Name field and press ENTER.

The program will save the file in the current disk unit and directory unless specified otherwise. To save the file on a different disk unit or in a different directory, type the full path in the File Name field. For example, to save the document in the root of disk C: type *c:\filename* or select a different unit or directory.

Printer Setup Command (ALT,F,P)
When selecting this command, one calls the printer configuration dialogue window. Here one can verify and modify the default printer setup or select another printer from the list of the installed ones.

Chapter 8 - Edit Menu

Edit Menu (ALT,E)

This is the menu to enter and edit data, these have to be entered directly, manually, or (optionally) can be imported directly from the measurement instruments.
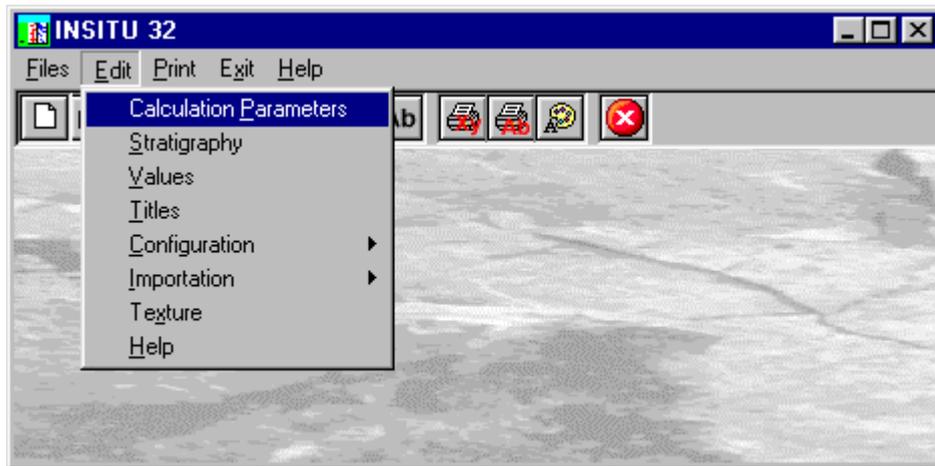
According to the file type opened (SPT, CPT or DP) different commands are shown.

Calculation Parameters Command (ALT,E,P)

Enables one to define the general parameters to interpret the tests.

The "Calculation parameters" dialogue window - SPT

As known the SPT tests can be influenced by different factors, which one can group in four categories:

1) method of the performance of the test;

2) pressure of the overlying terrain;

3) driving device;

4) terrain's characteristics

To limit interferences to the interpretation of the data surveyed, it is fundamental that the test is performed in the best of ways; there exist calculations to normalise the values to limit the influence of disturbing factors mentioned above.

In the "Calculation parameters" dialogue window the following data can be entered:

→ *Method to recognise the terrain*: two different diagrams to identify the type of terrain are proposed due to Skempton e Schmertmann.

→ *Aquifer*: enables one to define the presence or absence of an aquifer.

→ *n exponent*: parameter to normalise the Nspt data in respect to the pressure due to the overlying terrain. The value to enter is the exponent to which the reciprocal of the effective vertical tension is elevated to obtain the correction factor to normalise Nspt ($C_N = 1/\sigma'^{(n)}_{vo}$ where σ'_{vo} = 0.1 N/mm^2). The values normally used are 0.56 (Jamiolkowki et al.) or 0.5 (Liao and Whitman). The corrected number of blows is referred to a unit value of σ'_{vo} and is indicated as N1.

→ *ERim*: mean percentage value of yield of driving method. For devices with capstan and cable the average yield is normally between 70% and 40% while for devices with automatic uncoupling the average yield is about 60%: this is therefore the advisable reference value. During the calculation the program shows the average yield referred to the average reference value (60%) according to the formula N_{60} =(ERim/60)N where with the term N_{60} the number of blows referred to a 60% yield is indicated. The normalised value of blows that takes into account both the pressure of the overlying terrain and the yield of the driving system is indicated as $[(N_1)_{60}]$.

→ *Depth of aquifer*: it is the depth at which the aquifer table was found, expressed in metres from surface level.

→ *Nspt factor → qc*: it is the conversion factor from Nspt to the point resistance of the static penetrometer (qc), used to calculate the confined modulus (Mo) and Young's modulus (E25). Usually it is set equal to 0.5; for fine and silty sands the value 0.4 is advisable.

→ *Foundation width (m)*: foundation width to calculate the ratio settlement/admissible load (Smax/Qamm). The calculation method used (Burland, Broms and De Mello) is only valid for sands and is based on observing real settlements. The calculation performed by the program returns the upper limits of that ratio, and is a function of the foundation width for three characteristics of sand consolidation based on the NSpt value (<10 very loose sand; 10÷30 averagely dense sand; >30 dense sand). The method is considered to be good for foundations with a width > 3 m.

When the cursor is positioned inside a field the program shows, at the bottom of the window, the relative help on line. Whenever the text is not completely visible this can be recalled by clicking on it. Once the data have been entered click on the <Ok> button.

The "Calculation parameters" dialogue window - CPT

Enables one to define the general parameters necessary to interpret the tests. As known the CPT tests can be influenced by different factors, that one can group in three categories:

1. equipment used: mechanical or electrical point, form of the point, position and dimensions of the filter, etc.;

2. method of the performance of the test;;

3. environmental factors (for example temperature);

In the "Calculation parameters" dialogue window the following data can be entered, necessary to the program to effect possible corrections:

CALCULATION PARAMETERS

Terrain recognition method	Schmertmann
Minimum layer thickness [mm]	0
Depth of aquifer [m]	0
Natural unit weight of the ground [kN/m³]	0
Saturated unit weight of the ground [kN/m³]	0
Point Distance - joint [mm]	0
Distance between porous septum and point [mm]	0
An/Ac ratio for qc correction [-]	0
An/Ac ratio for fs correction [-]	0
'n' exponent Olsen and Farr [-]	,73
Constant sensitivity (-)	8
Young constant [-]	,25
Cone factor [-]	15
Areas ratio [-]	15
Start depth CPT [m]	0
Execution step of the CPT [cm]	0

OK   Cancel   Help

Different diagrams to identify the terrain are proposed. The type of terrain is the most important parameter, because on this base the strata are recognised and hence the average terrain parameters are determined

→ *Methodology to recognise the terrain*: three different diagrams are proposed to identify the terrain (Schmertmann, Begemann, Douglas and Olsen, Olsen and Farr, Searl). The choice of the method to recognise the type of terrain is quite important, because on this base the recognition is effected and hence to determine the average of the terrain traversed.

→ *Minimum thickness of the strata (mm)*: the strata with a thickness less than defined in this field are eliminated when comprised between two strata of the same type. This enables one to simplify much the stratigraphical representation. Please note that the strata are not eliminated when not comprised between strata of the same type, hence chaotic series are described as individual strata.

→ *Aquifer depth*: is should be expressed in meters from surface level.

→ *Natural volume weight of terrain (kN/m³)*: mean natural volume weight of terrain, used to calculate the effective vertical tensions in the parts above the aquifer.

→ *Saturated volume weight of terrain (kN/m³)*: mean saturated volume weight of terrain, used to calculate the effective vertical tensions in the parts under the aquifer surface.

→ *Point-sleeve distance*: distance, expressed in meters, between the point - to resist the point resistance - and the sleeve - to measure the unit resistance of the lateral friction.

→ *Point-porous screen distance*: distance, to be expressed in meters between the point to measure qc and the porous screen to measure pore pressure.

→ *An/Ac ratio to correct qc*: ratio between the area of the cone joint and the cone area. It is used to correct the point resistance value when the pore pressure is read off, otherwise it should be set equal to 0.

→ *An/Ac ratio to correct fs*: ratio between the area of the cone joint and the cone area. It is used to correct the point resistance value when the pore pressure is read off and only in case the determination of fs is done by subtraction. Otherwise it should be set equal to 0.

→ *'n' exponent Olsen and Farr*: it is used to normalise the CPT values in respect to the effective vertical tension in the Olsen and Farr method. It varies normally between 0.6 and 0.86.

→ *Constant sensitivity*: the constant Ns to calculate the sensitivity according to the correlation proposed by Robertson and Campanella is estimated around 15 for CPT tests with mechanical point (Schmertmann) and between 6 and 10 for CPT test with electrical point (Robertson-Campanella).

→ *Young's constant*: Ratio of Young's drained modulus (Eu) and the non-drained shear resistance (Su) according to the correlation Eu = n Su. Young's constant depends fundamentally from the applied level of force, from the OCR degree and sensitivity. It varies normally between 0.20 and 0.30.

→ *Cone factor*: this parameter depends on the cone aperture and the index of rigidity used to determine non-drained shear resistance. The value is normally comprised between 12 and 18 (mean value 15).

→ *Area ratio*: it is the ratio between the lateral area of the sleeve and the cone's area Ac. It is used to determine the fs value in mechanical borings, when the values (P) and (P+M) are known, through the formula fs=[(P+M)-P]/(As/Ac).

→ *Initial depth of CPT*: it is the depth, measured from the ground level, of the point where the CPT test is started.

→ *Execution step of CPT [cm]*: step between two consecutive CPT readings.

The last two data are used only for the mechanical CPT tests. If those two data are inserted, it is no more necessary to insert the depth of each single reading in the "CPT Test" windows of the command "VALUES" of this menu: the program will automatically calculate the depth values as function of the initial depth and of the execution step.
Once one has finished entering the data click on the <Ok> button.

The "Calculation parameters" dialogue window - DP
In the "Calculation parameters" dialogue window the following data can be entered:

→ *Method to recognise the terrain*: two different diagrams to identify the type of terrain are proposed due to Skempton e Schmertmann.

→ *Aquifer*: enables one to define the presence or absence of an aquifer.

→ *n exponent*: parameter to normalise the Nspt data in respect to the pressure due to the overlying terrain. The value to enter is the exponent to which the reciprocal of the effective vertical tension is elevated to obtain the correction factor to normalise Nspt ($C_N = 1/\sigma'^{(n)}_{vo}$ where σ'_{vo} = 0.1 N/mm^2). The values normally used are 0.56 (Jamiolkowki et al.) or 0.5 (Liao and Whitman). The corrected number of blows is referred to a unit value of σ'_{vo} and is indicated as N1.

→ *ERim*: mean percentage value of yield of driving method. For devices with capstan and cable the average yield is normally between 70% and 40% while for devices with automatic uncoupling the average yield is about 60%: this is therefore the advisable reference value. During the calculation the program shows the average yield referred to the average reference value (60%) according to the formula N_{60} =(ERim/60)N where with the term N_{60} the number of blows referred to a 60% yield is indicated. The normalised value of blows that takes into account both the pressure of the overlying terrain and the yield of the driving system is indicated as $[(N_1)_{60}]$.

→ *Depth of aquifer*: it is the depth at which the aquifer table was found, expressed in metres from surface level.

→ *Nspt factor → qc*: it is the conversion factor from Nspt to the point resistance of the static penetrometer (qc), used to calculate the confined modulus (Mo) and Young's modulus (E25). Usually it is set equal to 0.5; for fine and silty sands the value 0.4 is advisable.

→ *Foundation width (m)*: foundation width to calculate the ratio settlement/admissible load (Smax/Qamm). The calculation method used (Burland, Broms and De Mello) is only valid for sands and is based on observing real settlements. The calculation performed by the program returns the upper limits of that ratio, and is a function of the foundation width for three characteristics of sand consolidation based on the NSpt value (<10 very loose sand; 10÷30 averagely dense sand; >30 dense sand). The method is considered to be good for foundations with a width > 3 m.

→ *Duration of penetration cycle*: it is the duration of the penetration cycle during which the blows are counted, typically 20 cm or 30 cm.

→ *Conversion factor from NDP to Nspt*: the conversion factor is dependent on the equipment type and the way the test is executed. The equation used by the program is Nspt = conversion factor * Ndp.

Once one has finished entering the data click on the <Ok> button.

Stratigraphy Command (ALT,E,S)

It handles the entering of the geotechnical data of the terrain.

The "Geotechnical parameters of the stratigraphy" dialogue window - SPT

In the "Geotechnical parameters of the stratigraphy" dialogue window the following data can be entered:

→ *Depth*: depth expressed in metres from surface level to the bottom of the bed of the stratum.

→ *Gn (kN/m³)*: Natural volume weight of terrain

→ *Gs (kN/m³)*: Saturated volume weight of terrain

→ *D50 (mm)*: mesh diameter corresponding to the median of the sediment. This value is used in the correlations between Nspt and qc

→ O*CR:* degree of over-consolidation of the stratum, used to calculate the confined modulus.

Once one has finished entering the data click on the <Ok> button.

The "Geotechnical parameters of the stratigraphy" dialogue window - CPT

In the "Geotechnical parameters of the stratigraphy" dialogue window the following data can be entered:

→ *Depth*: depth expressed in metres from surface level to the bottom of bed of the stratum.

→ *Gn (kN/m³)*: Natural volume weight of terrain

→ *Gs (kN/m³)*: Saturated volume weight of terrain

Whenever the stratigraphy entered does not reach the maximum depth of the test, the program will assign the missing part with the average volume weight into the general calculation parameters

The "Geotechnical parameters of the stratigraphy" dialogue window - DP

In the "Geotechnical parameters of the stratigraphy" dialogue window the following data can be entered:

→ *Depth*: depth expressed in metres from surface level to the bottom of bed of the stratum.

→ *Gn (kN/m³)*: Natural volume weight of terrain

→ *Gs (kN/m³)*: Saturated volume weight of terrain

→ *D50 (mm)*: mesh diameter corresponding to the median of the sediment. This value is used in the correlations between Nspt and q_c

→ *OCR:* degree of over-consolidation of the stratum, used to calculate the confined modulus.

Once one has finished entering the data click on the <Ok> button.

Values Command (ALT,E,V)

It is used to enter the data measured during the test.

The "SPT tests" dialogue window

In the "SPT tests" dialogue window one should enter:

→ *Depth*: initial depth, expressed in meters, at which the measure is effected.

→ *n1*: number of blows necessary to advance 150 mm for the initial positioning.

→ *n2*: number of blows necessary to advance the first 150 mm.

→ *n3:* number of blows necessary to advance the second 150 mm of the 300 mm. to complete the test.

Once these data have been entered click on the <Ok> button.

The "CPT test" dialogue window - electrical CPT

In the "CPT test" dialogue window the following data can be entered:

→ *Depth*: initial depth, expressed in meters, at which the measure is effected.

→ *qc*: point resistance in N/mm². Please note that in case the qc data entered here have already been

corrected for the sleeve-point distance, one ought to enter zero for the sleeve-point distance in the field where the correction factors are entered.

→ *fs*: local lateral friction, expressed in N/mm², at the indicated depth. Please note that in case the fs data entered here have already been corrected for the sleeve-point distance, one ought to enter zero for the sleeve-point distance in the field where the correction factors are entered.

→ *Pore pressure*: dynamic pore pressure of the water expressed N/mm².

Once these data have been entered click on the <Ok> button.

The "CPT test" dialogue window - mechanical CPT

In the "CPT test" dialogue window the following data can be entered:

→ *Depth*: initial depth, expressed in meters, at which the measure is effected.

→ *P*: point resistance in Kg/cm², equivalent to qc (P=qc*Ac/Ac, Ac=cone area).

→ *P+M*: sum of the point and sleeve resistance, expressed in Kg/cm² in terms of: P+M=(qc*Ac+fs*As)/Ac, where Ac=cone area and s=sleeve area.

Once these data have been entered click on the <Ok> button.

The "DP test" dialogue window
The "DP test" dialogue window one should enter the number of blows necessary to drive in the point for the length indicated in the "Calculation parameters" window, previously described, and the number of blows neccessary to dynamically drive the covering for the length indicated for the DP tests.

DP TESTS

N.	Depth [m]	n (point) [-]	n (covering) [-]
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			

Measurement depth

[<u>O</u>K] [<u>C</u>ancel] [<u>I</u>nsert] [<u>D</u>elete] [<u>H</u>elp]

If the Initial depth and the execution step of the CPT have been defined, it is not necessary to insert the depth of each single reading: the program will automatically calculate the depth values.
Once these data have been entered click on the <Ok> button.

Titles Command (ALT,E,T)

This command enables one to enter and edit the titles to be written on the end results.

The "Titles" dialogue window

→ Test name

→ Date: date on which the test was performed

→ Company that performed the test

→ Province

→ Location

→ Position: The position of the is normally referred to the code used on detailed maps.

→ UTM Coord.: enables the exact identification of the test location

→ Height m.s.l.: height of the surface in meters from sea level.

→ Initial level: level from which the Nspt measures start (i.e. height which is considered zero)

→ Scale: Vertical scale used by the program for the graphical output.

Configuration Command (ALT,E,C)

Through the selection of this command a sub-menu is shown that enables one which columns to choose to represent the data in the drawing and in what order these should be shown; through the Column configuration command of this sub-menu it is furthermore possible to effect some modifications to said columns.

Order Columns Command (ALT,E,C,O)

Through this command the type of data to represent is defined as well as the disposition of the columns in the final drawing.

The "Select configuration" dialogue window

Inside the "Select configuration" dialogue window are listed all the column configurations previously created. When one is working on a new file the order and type of column proposed is the one contained in the standard configuration for the relative tests.

Configuration Option


```
CPT
DP
SPT
```

[Modify]   [OK]   [Cancel]
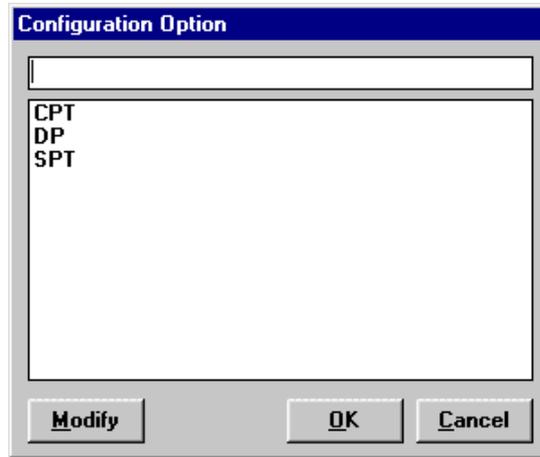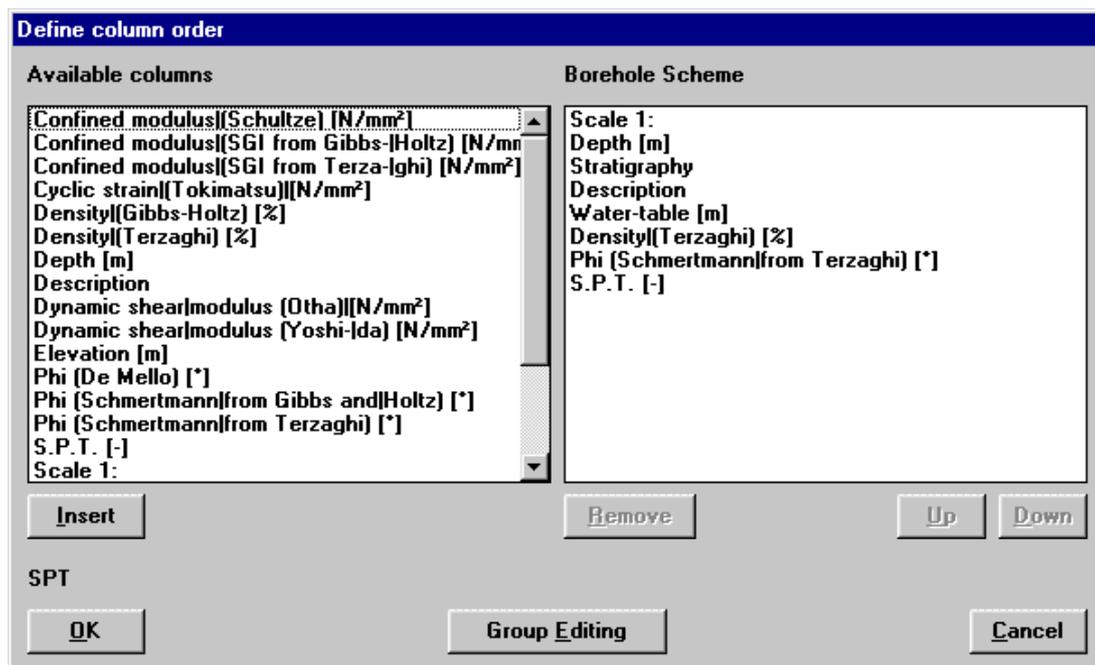
To use a pre-existing column configuration:

🕹   click on the name of the configuration to use, hence click on the <OK> button. To select a configuration one can also double-click on the name to be selected.

⌨   by using the up and down arrows select the name to be used, hence press the key combination ALT+C.

To use a pre-existing column configuration after editing:

🕹   click on the name of the configuration to edit, hence click on the <Edit> button. To select a configuration one can also double-click on the name of the configuration to be edited.

⌨   by using the up and down arrows select the name to be used, hence press the key combination ALT+M.

The "Define column order" dialogue window

Thus one arrives to the "Define column order" dialogue window where one finds the following fields:

Define column order

Available columns

```
Confined modulus|(Schultze) [N/mm²]
Confined modulus|(SGI from Gibbs-|Holtz) [N/mm
Confined modulus|(SGI from Terza-|ghi) [N/mm²]
Cyclic strain|(Tokimatsu)|[N/mm²]
Density|(Gibbs-Holtz) [%]
Density|(Terzaghi) [%]
Depth [m]
Description
Dynamic shear|modulus (Otha)|[N/mm²]
Dynamic shear|modulus (Yoshi-|Ida) [N/mm²]
Elevation [m]
Phi (De Mello) [*]
Phi (Schmertmann|from Gibbs and|Holtz) [*]
Phi (Schmertmann|from Terzaghi) [*]
S.P.T. [-]
Scale 1:
```

Borehole Scheme

```
Scale 1:
Depth [m]
Stratigraphy
Description
Water-table [m]
Density|(Terzaghi) [%]
Phi (Schmertmann|from Terzaghi) [*]
S.P.T. [-]
```

[Insert]   [Remove]   [Up]   [Down]

SPT

[OK]   [Group Editing]   [Cancel]

→   Available columns - in this field all the available columns are enumerated pertaining to the S.P.T. tests, identified through the column title. This description can be edited through the Column Configuration command, described later.

→   Drilling Scheme - In this field all the columns that are in the configuration file are enumerated, in the order they were created.

To insert a new column:

🕹   click on the column name present in the Available Columns field, hence click on the <Insert> button. It is also possible to select a column by double-clicking on the column name to insert.

☞   by using the UP and DOWN arrows select the column to insert, hence press the key combination ALT+I.

The column inserted is automatically added at the end of the list present in the Drilling Scheme field.

To modify the position of a column inside the list present in the Drilling Scheme field.

🖰   click on the column name to be moved hence click on the "Up" button to move the column up one position in the list, or on the "Down" button column to move the column down one position in the list.

☞   press the TAB button to move the cursor into the Drilling Scheme field, hence by using the UP and DOWN arrows select the column to move. At this point press the key combination ALT+S, which moves the column one position up in the list, or press the key combination ALT+G, which moves the column one position down in the list .

To delete a column inside the list present in the Drilling Scheme field.

🖰   click on the column name to be deleted hence click on the <Delete> button.

☞   press the TAB button to move the cursor into the Drilling Scheme field, hence by using the UP and DOWN arrows select the column to be deleted. At this point press the key combination ALT+R.

Let us now consider how to make a new configuration of columns. As previously described inside the dialogue window "Select configuration" all column configurations previously created are listed.

To create a new column configuration:

🖰   highlight the name of the configuration defined at this moment by double-clicking on the field wherein it is contained, hence enter the name of the new configuration to be created and click on the <Ok> button.

☞   delete with the DEL button the name already present and enter the name to be assigned to the configuration to be created, hence press the key combination ALT+C.
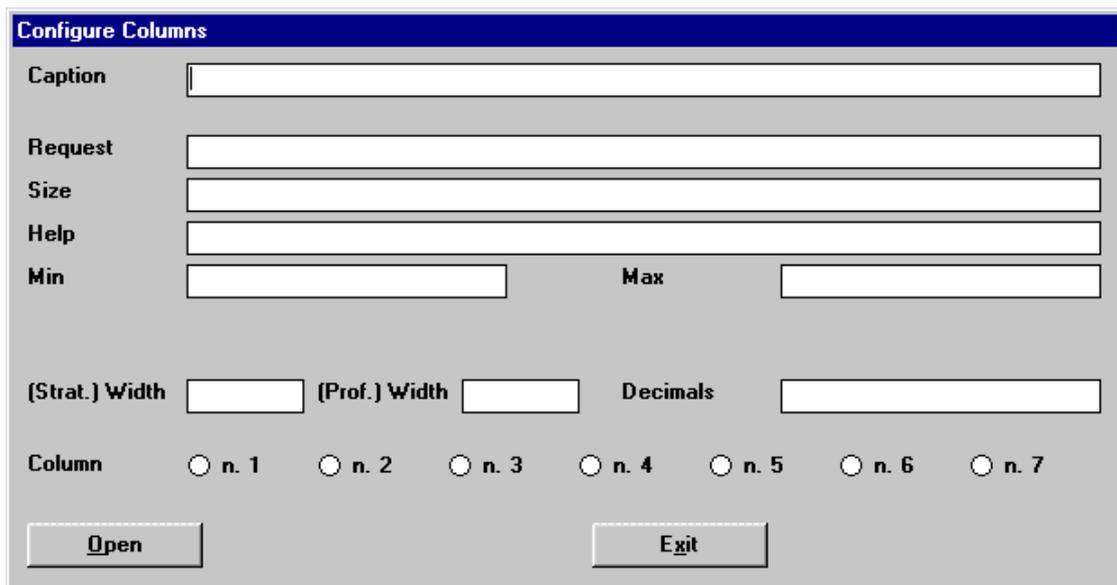
One arrives thus to the "Define column order"; to insert, delete or edit a column's position one should use the procedures described above.

Column Configuration Command (ALT,E,C,C)

This command enables one to edit the columns supplied with the program. When one selects this command the "Configure columns" dialogue window is shown.

The "Configure columns" dialogue window

When one clicks the <Open> button all existing columns are shown, characterised by the ".DFC" extension.

To edit a column it is necessary to select the column from the list:

🖰   double-click on the column name to be edited.

☞   use the UP and DOWN arrow keys to select the column to be edited and press the ALT+C. key combination.

Inside the "Columns configuration" window the contents of the column is loaded. At this point the data can be edited:

→ Title - A field where the text is entered that will become the columns title in the drawing. The text entered is used to identify the column in the available columns list when the Order Columns command is used. Please remember that the maximum text length is 16 characters. To define a title of two lines separate the text of the first line from the text of the second line with the pipe character (|). For example to enter a column title "Fossil Nomenclature" type the following text: Fossil|Nomenclature.

→ Prompt - Define the prompt of the field to be shown inside the dialogue window to enter the data. When the drawing type chosen has more fields to be filled in one can define the texts of the other fields by clicking on the buttons on the side next to the column field.

→ Format - In this field one can define the format of the prompt which can be numerical or alphanumerical:

Numerical formats: use the "#" character. E.g.: by entering ####.## only numbers are accepted with a maximum of four digits and four decimals.

Fixed alphanumerical format: use the "/" character to indicate the beginning and end of the text to be entered, separated by spaces. The number of characters accepted is inclusive of the delimiting "/" characters, E.g.: by entering /   / a maximum of 8 characters is accepted.

Scrolling alphanumerical format: the "/" character is used to mark the beginning of the text and the "@" as the end of the text which is visualised during data entering, separated by spaces. the number of characters accepted is inclusive of the "/" and "@" characters. E.g.: by entering /   @ 8 characters are shown per time, scrolling the text to the left when it is longer than eight characters.

When there is more than one field to be entered for the drawing, more fields can be defined by clicking on the buttons at the side of the Column field.

→ Help - A field to enter help text that is visualised through the function key f1 when the cursor is positioned inside the field. In case the type of drawing selected has more fields to enter data into one can define the help text of the other fields by clicking on the buttons next to the Column field.

→ Minimum - A field to define the lowest admissible value. In case the type of drawing selected has more fields to enter data into one can define the minimum value of the other fields by clicking on the buttons next to the Column field.

→ Maximum - A field to define the highest admissible value. In case the type of drawing selected has more fields to enter data into one can define the minimum value of the other fields by clicking on the buttons next to the Column field.

→ Help Window - A field to enter the help text which will be visualised when pressing the <Help> button in the window where one enters the data.

→ Stratigraphic width - A field to define the column width to print the stratigraphy. The width should be entered in centimetres. When one sets this value equal to zero the program considers the column as re-dimensionable and changes the width according to the print width defined through the parameters button in the Stratigraphy command in the same menu and the number of columns selected.

→ Profile Width - A field to define the column width when printing the profile. By increasing or diminishing the width of the column inserted into the profile according to the scale used it is possible to improve quite a lot the resulting print. The width should be indicated in centimetres.

→ Decimals - A field where one defines the number of decimals to be printed. This value can hence differ from the number of decimals defined in the format applied.

→ Maximum Value - A field to define the maximum height to be used in the histograms. This field is absent when the type of drawing selected does not use a histogram representation.

→ Column - Number of fields required in the data entering window. This number depends on the type of drawing.

Some of the fields described above can be absent when these are not contemplated by the kind of data represented in the column selected.
Once one has finished edit click on the <Ok> button.
The name given to the file can be different from the column title used as the title for the column when this is printed.
Please remember that in available columns list, shown when one uses the Order Columns command, the description used in the Titles field, previously described, is shown and not the name given to the file that contains the description of the column created.

Heading Configuration Command (ALT,E,C,H)

Through this command it's possible to customize the heading of the tests. The description of the structure of the stratigraphy heading is contained in the LOGOWIN.CFG file.

The "Heading Configuration" dialog box

The program is sold with a default simple configuration of the heading, which can be modified or substituted by the user with the commands described in the following. The workarea is represented on a grid with a step of one millimeter.

- <Redraw> button: redraws the workarea to show and regenerate a clean image. The <Redraw> button does not affect the execution of the other commands.

- <Add lines> button: allows to draw lines using the mouse like a pencil on a paper sheet.

  Click the <Add lines> button, that will appear highlighted.

  Click the initial point of the line.

  Click the final point of the line.

  If one of the snap options is activated, the ending points of the lines are snapped on the nearest millimeter or centimeter of the grid.

- <Add texts> button: allows to add on the grid the text written in the box "Text to be inserted". The inserted text will appear with the font and pitch as described in the "Texts" section.

  Click the <Add texts> button, that will appear highlighted.

  Click the point where the text will have to be written.

  Due to the poor resolution of the screen, the horizontal size of the texts can be different from the size of the same texts when printed. For this reason a white rectangle is drawn under the texts to show the effective size on the printer.

- <Import graphics> button: allows to import both the Bitmap pictures. The external files must be in the same directory of the program.

  Click the <Import graphics> button, that will appear highlighted.

  Click the desired file in the "Picture to be imported" list box.

  Click the bottom-left corner of the imaginary rectangle where the picture will be drawn.

  Click the top-right corner of the same imaginary rectangle.

  The images are automatically stretched to best fit the rectangle.

- <Move object> button: allows to change the position of an object (text, line or picture)

  Click the <Move object> button, that will appear highlighted.

  Choose a reference point on the object and click it, then click the new position of the reference point. The object will be shifted using the current snap settings.

- <Delete object> button: allows to remove an object from the grid. The object will NOT be copied in the clipboard.

  Click the <Delete object> button, that will appear highlighted.

  Select the object with the mouse pointer.

- <Open> button: loads the current heading.

- <Save> button: saves the modified heading.

- <Cancel> button: quits without saving.

- <New> button: clears the grid allowing to create a new heading.

General settings

- Snap: the options of the Snap command make easier an high precision positioning of the objects, while adding or moving objects; clicking a point it is forced to the nearest millimeter or centimeter of the grid, following the chosen option. The selected point appears as a small red circle. When the Snap is disabled ("Off") the resolution of the positioning is one pixel of the screen.

- Width and Height: are used to describe the final size of the heading.

Text formatting settings

The titles in the INSITU files are formed of the parts: a common label, used in every file (for example "Customer:"), and a variable text (for example "Mr. Charlie Brown") inserted in the "Titles" window. It is possible to assign a different format to the two parts using the following commands.
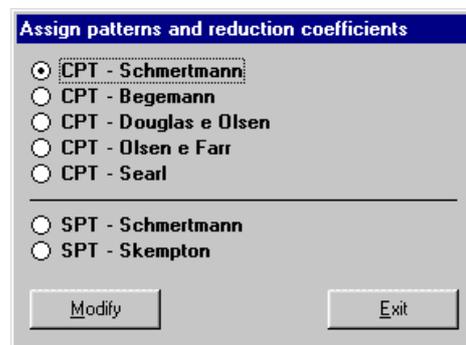
- Alignment: the text is aligned to the clicked point in two different ways: selecting "Left alignment" the point is the bottom left corner of the text; selecting "Center alignment" the point is the bottom-center point of the text.

- Font face: using the scroll bar all the available font sets are shown. Click the preferred font to select it.

- Font size: it is necessary to set the size of the font (in centimeters) before adding the text to the grid.

- Text to be inserted: once defined font face and size, it is possible to write here the text to be inserted.

- Type: while creating the heading, two types of texts are available: Label and Text. The Label type is used as a common label of the stratigraphy (for example "Customer:"). If no more information is given the program will create automatically a Text type field with the same format of the label and will print the two fields together (for example: "Customer: Mr. Charlie Brown"). It is possible to assign to the Text type a different format. In this case select the "Text" type, set the new format and insert in the "Text to be inserted" box exactly the same text inserted for the corresponding label type. This way it is possible to position the Text filed in any point of the grid, for example under the label instead of beside it. The program compares the values of the "Text to be inserted" boxes to link Labels and Texts, so it is not possible to define two Labels or two Texts with the same name. It is anyway possible to print more then one Text for any Label (for example to get two lines for the informations related to the "Address" Label). To do this, create more Texts calling them, for example "Address_1" and "Address_2", without creating the corresponding labels. This way the program creates automatically two fictitious labels that will appear only in the input window of the titles but not on the printer heading of the stratigraphy.

Assign Texture Command (ALT,E,C,A)

Through this command the type of texture to represent the stratigraphy is defined.

"Assign patterns and reduction coefficients" dialog window

Through this window the terrain classification is defined.

Through this window the terrain classification as modified.

Each texture is identified by three figures (Ex: 912, 504), the first number, which is optional, is interpreted as the enlargement scale of the texture inside the drawing while the following two numbers represent the identification code of the texture. When it is necessary to superimpose two textures, enter the codes of the two textures one after the other (ex. 912504). Give a colour to the texture by adding the indication "Cn" con n= number between 1 and 15, to the texture number (ex. 904C5 or 305712C7). The indicated number refers to the colour definition that can be used with the Configuration command of the Print menu. If one does not wish to indicate to the program the separation line between two neighbouring textures, introduce "-" as the first character of the line (ex. -504).

In the CPT tests, the reduction coefficients for the friction angle is used to diminish or render zero the friction angle associated to different lithotypes, in order to use the data from other calculation programs. The Alpha coefficient is only used to calculate the confined drained modulus (after Mitchell and Gardner).

Importation Command (ALT,E,I)

At present this command is not used.

Textures Command (ALT,E,X)

Selecting this command starts the utility used to generate and modify geological textures in the stratigraphy column. More than thirty geological types of textures are supplied with the program, these are inspired by the A.G.I. legend and the Standard American legend, all these can be modified with this command. It is also possible to create new textures up to a maximum of 99 base textures are obtained, each can be reproduced in 9 different scales and be superimposed on any of the others obtaining a vast range of possibilities.

The textures are saved in four files, in the program directory, called SET1.NTR, SET2.NTR, SET3.NTR, SET4.NTR. If it is necessary to reinstall the program, remember to save these four files before beginning the installation to avoid the losing previously executed texture modifications and additions. After the new installation, copy the files one saved in the directory indicated above.

On the right of the "Texture Editing" window is a list of the existing textures, listed in order of creation and distinguished by a number. We shall now consider how to create, modify or eliminate a texture.

Creation of a new texture

    🖰   select the first available position from the list (where the line number followed by a zero) and double click it.

    ⌨   press the TAB key to put the cursor on the first texture listed, then, by using the UP and DOWN arrows, select the first available position and press the key combination of ALT+E to activate the <Edit Texture> key.

In the appropriate fields of the window, one can define the texture's scale of representation in respect to the dimensions as predefined by the program for the base cell (100x50 cm) and the lithotype description. During the stratigraphy creation phase an enlargement factor (varying from 1 to 9) can be added beside the scale base of the texture defined here; this factor will be multiplied by the base scale when it is printed: this permits the same texture to assume different characteristics enabling, for example, the reproduction of large grain gravel by drawing the texture in large scale and fine gravel by reducing the scale factor.

The drawing of a new texture is done with the mouse. The base cell, which is traced in light grey when a texture is selected, is subdivided into four squares. By moving the mouse inside the base cell the coordinates of the point in which the mouse is found are reported in the two fields located underneath the list for this purpose. Double click to start drawing a new segment then move the mouse. To interrupt the segment and start a new one connected to it, double click. To end a segment, click once. The program is only able to draw straight lines. To facilitate the drawing phase, the following buttons are available as well:

- <Add segment / Remove segment>: by clicking on this button one passes from the drawing function to segment cancellation. When the form used to create or modify texture is opened the drawing function is active. A reminder to this is placed beneath the list of textures: if the Add segment function is active one can draw in the cell; if the Remove segment function is active the segments composing the textures can be deleted simply by clicking on them.

- <Delete last segment>: deletes the last drawn segment.

- <Restore last segment>: redraws the last segment cancelled.

- <Zoom>: by clicking on this button it is possible to verify the result that will be obtained in the printing phase: all of the modifications effected in the same cell are presented in numerous cells positioned side by side, permitting a more realistic view of what will be obtainable using the texture inside the stratigraphic column. By clicking on this button again, normal visualisation is returned.

How to modify a texture

🖰   choose the texture to be modified from the list then double click it to select it.

⌨   press the TAB key to put the cursor on the first texture of the list then, by using the UP and DOWN arrows, select the texture to be modified and press the key combination ALT+E to activate the <Edit Texture> key.

The drawing scale and description of the texture are shown in specific fields present in the window, this enables them to be modified. By using the commands described previously the texture drawing can be modified.

How to copy an existing texture

With the <Import Texture> button it is possible to duplicate an existing texture:

🖰   from the list, choose the place into which one wants to import the texture to be copied by double clicking on it. The this can be empty or already occupied by a texture.

⌨   press the TAB key to put the cursor on the first texture of the list then, using the UP and DOWN arrows, select the texture, that can be empty or already occupied, where one wants to have the texture to be copied and press the key combination ALT+I to select it.

Now one should indicate the texture to import:

🖰   click on the <Import Texture> button to call up the "Selection of texture to copy" window and enter the number of the texture to be imported in the Texture number field then click on the <Ok> button. If the selected texture is be imported into a place that is not empty the program asks for confirmation before executing the operation.

⌨   press ALT+I to call up the "Selection texture to copy" window and enter the number of the texture to be duplicated in the Texture number field then confirm by pressing the key combination ALT+O. If the selected texture is to be imported into a place that is not empty the program asks for confirmation before executing operations.

How to delete an existing texture

🖰   select the texture to be deleted from the list by double clicking on it and then click on the <Delete Texture> button. If the deletion is confirmed the texture is deleted from the list.

⌨   press the TAB key to put the cursor on the first texture listed then, using the UP and DOWN arrows, select the texture to delete and press the key combination ALT+T to activate the <Delete Texture> button. If the deletion is confirmed the texture is deleted from the list.
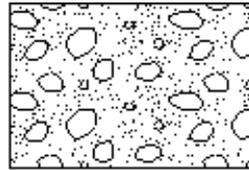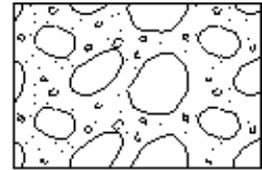
Textures used in drawing stratigraphies
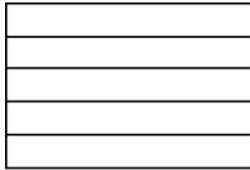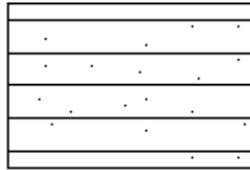
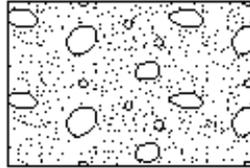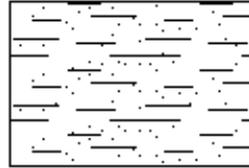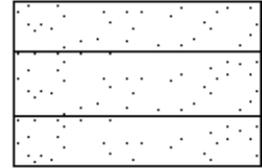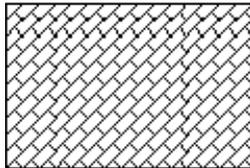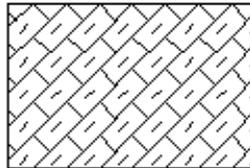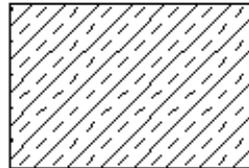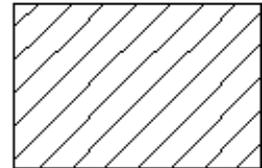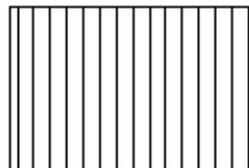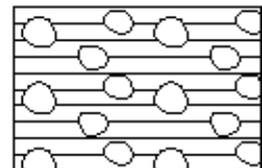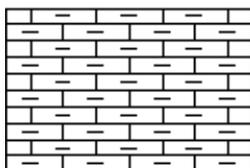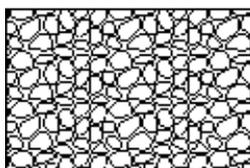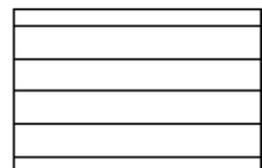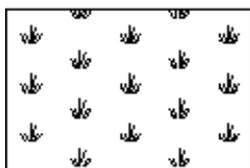|			
29 CEMENTED SAND	30 SLIGHTLY SANDY CLAY	31 CLEAN GRAVEL AND SAND	32 GRAVEL AND HEADERS
25 FOSSILS	26 SAND AND GRAVEL	27 SLIGHTLY CLAYED SAND	28 CLAYED SAND
21 LIMESTONE AND DOLOMIA	22 LIMESTONE WITH MARL	23 MARL	24 SANDSTONE
17 DEBRIS	18 DOLOMIE	19 VERTICAL	20 CHAOTIC
13 MARL	14 IGNEUS ROCKS	15 GREEN ROCKS	16 METAMORPHOSITES
9 GRAVEL	10 FLYSH	11 SANDSTONE	12 CLAY
5 COVERING	6 CLAYSTONE	7 SAND	8 SCHISTS
1 SILT	2 SANDY SILT	3 LIMESTONE	4 CRYSTALLINE
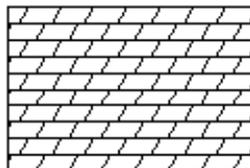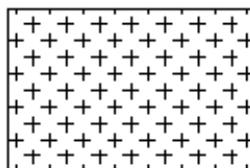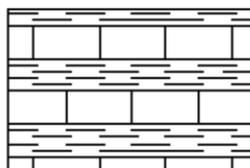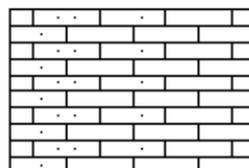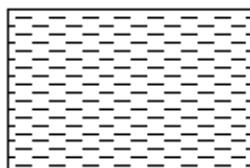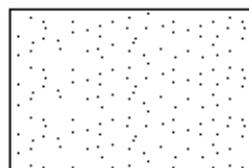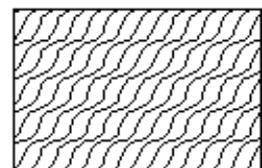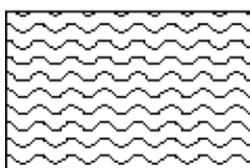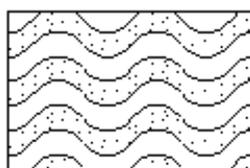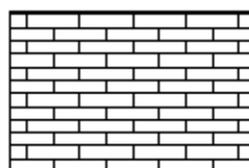
The columns of the SPT tests

Let us consider which are the columns relative to the SPT test:

- **Relative density (Gibbs-Holtz)**: the standard configuration of the Relative Density (Gibbs and Holtz method) column is contained in the DRGIBHOL.DFC file. It is represented as a histogram.

- **Relative density (Terzaghi)**: the standard configuration of the Relative Density (Terzaghi method) column

is contained in the DRTERZAG.DFC file. It is represented as a histogram.

- **Description**: the standard configuration of the Description column is written in the DESCRIZI.DFC file. In this column the description of the strata traversed are entered, given by the chosen classification. In the standard configuration the Description column is the only one to have an automatically calculated variable width so as to try to stay within the boundaries of the drawing selected by the user through the General parameters command.

- **Aquifer**: The standard configuration for the aquifer column is contained in the FALDA.DFC file. The depths of the aquifer level is expressed in meters from ground level.

- **Confined modulus (Mo)**: the standard configuration of the confined modulus column (S.G.I. method from Gibbs-Holtz) is contained in the MOSGIGH.DFC file. It is represented as a histogram.

- **Confined modulus (Mo)**: the standard configuration of the confined modulus column (Terzaghi method) is contained in the MOSGITE.DFC file. It is represented as a histogram.

- **Confined modulus (Mo)**: the standard configuration of the confined modulus column (Schultze method) is contained in the MOSHULZ.DFC file. It is represented as a histogram.

- **Young's modulus (E25)**: the standard configuration of Young's modulus column (Gibbs-Holtz method) is contained in the E25GIHOL.DFC file. It is represented as a histogram.

- **Young's modulus (E25)**: the standard configuration of Young's modulus column (Terzaghi method) is contained in the E25TERZA.DFC file. It is represented as a histogram.

- **Dynamic shear modulus (Go)**: the standard configuration of the dynamic shear modulus column (Otha-Goto method) is contained in the GOTHGOT.DFC file. It is represented as a histogram.

- **Dynamic shear modulus (Go)**: the standard configuration of the dynamic shear modulus column (Yoshida method) is contained in the GOYOSHID.DFC file. It is represented as a histogram.

- **Phi (De Mello)**: the standard configuration of the shear angle column (De Mello method) is contained in the PHIDEMELL.DFC file. It is represented as a histogram.

- **Phi (Schmertmann from Gibbs and Holtz)**: the standard configuration of the shear angle column (Schmertmann method) is contained in the PHISCHGH.DFC file. It is represented as a histogram.

- **Phi (Schmertmann from Terzaghi)**: the standard configuration of the shear angle column (Schmertmann method from the relative density classification developed by Terzaghi) is contained in the PHISCHTE.DFC file. It is represented as a histogram.

- **Layer thickness**: the standard configuration of the layer thickness column is contained in the POTENZA.DFC file. This column does not require one to enter data as the program calculates these automatically and shows the thickness of each layer expressed in meters.

- **Depth**: the standard configuration of the Depth column is contained in the PROFONDI.DFC file. This column does not require one to enter data as the program calculates these automatically and shows the bed depth of each stratum expressed in meters.

- **Level**: the standard configuration of the Depth column is contained in the QUOTA.DFC file. This column does not require one to enter data as the program calculates these automatically as a function of the absolute level defined through the General Parameters command of the print menu and the type of test executed.

- **Settlement/Admissible Load Ratio**: the standard configuration of the Settlement/Admissible Load Ratio is contained in the SMAXSUQA.DFC file. The settlement is represented as a histogram.

- **Point resistance**: the standard configuration of the Point resistance column is contained in the QCSEEDEA.DFC file. It is represented as a diagram.

- **Drawing scale**: the standard configuration of the Drawing Scale column is contained in the SCALAGRA.DFC file. It is shown as alternate black and white bands with numbers at it side.

- **Cyclical force**: the standard configuration of the Cyclical force (Tokimatsu method) column is contained in the TAUTOKIM.DFC file. It is represented as a histogram.

- **S.P.T.**: the standard configuration of the S.P.T. column is contained in the SPT.DFC file. It is shown as a graph where on the abscissa the number of blows 10, 20, 30, 40) is shown and on the ordinate the blows at different depths, with the values of initial depth and final blow.

- **Stratigraphy**: the standard configuration of the Stratigraphy column is contained in the STRATIGR.DFC file. The program calculates automatically the stratigraphy as a function of the geotechnical parameters and the terrain classification method selected.

The columns of the CPT tests

Let us consider which are the columns relative to the CPT test:

- **Effective friction angle**: the standard configuration of the Effective friction angle column is contained in the ANGATTR.DFC file. It is represented as a histogram.

- **Local lateral friction**: the standard configuration of the Local lateral friction column is contained in the FS.DFC file. It is represented as a diagram.

- **Compressibility**: the standard configuration of the Compressibility column is contained in the CCPRIMO.DFC file. It is represented as a histogram.

- **Relative density (Baldi)**: the standard configuration of the Relative density (Baldi method) column is contained in the DRBALDI.DFC file. It is represented as a histogram.

- **Description**: the standard configuration of the Description column is contained in the DESCRIZI.DFC file. In this column one enters the description of the strata traversed, given by the selected classification. In the standard configuration the Description column is the only one to have a variable width automatically recalculated by the program so as to satisfy the drawing width selected by the user the General Parameters command.

- **Aquifer**: The standard configuration for the aquifer column is contained in the FALDA.DFC file. The depths of the aquifer level is expressed in meters from ground level.

- **Degree of over-consolidation**: the standard configuration of the Degree of over-consolidation column (Ladd method) is contained in the OCRLADD.DFC file. It is represented as a histogram.

- **Tangent confined modulus (Mt)**: the standard configuration of the Tangent confined modulus column (method of Robertson and Campanella) is contained in the MTROBCAM.DFC file. It is represented as a histogram.

- **Drained Young's modulus (Eu)**: the standard configuration of the drained Young's modulus column (Ladd method) is contained in the EULADD.DFC file. It is represented as a histogram

- **Drained Modulus secant (E50)**: the standard configuration of the secant, drained Young's modulus column (Robertson and Campanella method) is contained in the MYROBCAM.DFC file. It is represented as a histogram

- **Drained confined modulus**: the standard configuration of the drained confined modulus (M) column is contained in the MODCOND.DFC file. It is represented as a histogram

- **Drained confined modulus**: the standard configuration of the drained confined modulus (Mc) column (Mitchell and Gardner method) is contained in the MCMITGAR.DFC file. It is represented as a histogram

- **Dynamic shear modulus (Gmax)**: the standard configuration of the Dynamic shear modulus column (Robertson and Campanella method) is contained in the GMROBCAM.DFC file. It is represented as a histogram

- **Layer thickness**: the standard configuration of the layer thickness column is contained in the POTENZA.DFC file. This column does not require one to enter data as the program calculates these automatically and shows the thickness of each layer expressed in meters

- **Dynamic pore pressure**: the standard configuration of the Dynamic pore pressure modulus column is contained in the U.DFC file. It is represented as a diagram

- Depth: the standard configuration of the Depth column is contained in the PROFONDI.DFC file. This column does not require one to enter data as the program calculates these automatically and shows the bed depth of each stratum expressed in meters.

- **Level**: the standard configuration of the level column is contained in the QUOTA.DFC file. This column does not require one to enter data as the program calculates these automatically as a function of the absolute level defined through the General Parameters command of the print menu and the type of test executed.

- **qc**: the standard configuration of the point resistance column is contained in the QC.DFC file. It is represented as a diagram

- **Non-drained shear resistance (Su)**: the standard configuration of shear resistance column is contained in the SUMIN.DFC file. It is represented as a histogram

- **Graphic scale**: the standard configuration of the graphic scale contained in the SCALAGRA.DFC file. The graphic scale is defined through the General parameters command in the Print menu. It is shown as alternate black and white bands with a numbering on its side.

- **Sensitivity**: the standard configuration of the Sensitivity column is contained in the SENSITIV.DFC file. It is

represented as a histogram

- **Stratigraphy**: the standard configuration of the Stratigraphy column is contained in the STRATIGR.DFC file. The program calculates automatically the stratigraphy as a function of the geotechnical parameters and the terrain classification method selected.

- **Tr**: the standard configuration of the Total Resistance column is contained in the RT.DFC file. It is represented as a diagram.

- **100 fs/qc ratio**: the standard configuration of the column is contained in the FSQC.DFC file. It is represented as a diagram.

The columns of the DP tests

Let us consider which are the columns relative to the DP test:

- **N(dp)**: the standard configuration of the N(DP) column is contained in the NDP.DFC file. It is represented as a histogram

- **N covering**: the standard configuration of the N covering column is contained in the NDPR.DFC file. It is represented as a histogram

For the description of these columns please refer to the section on the SPT tests, described previously.

Chapter 9 - Print Menu

Print Menu (ALT,P)

With this menu it is possible to produce graphic output or listings of all data by selecting from the following menu titles: Graphics and Listings.
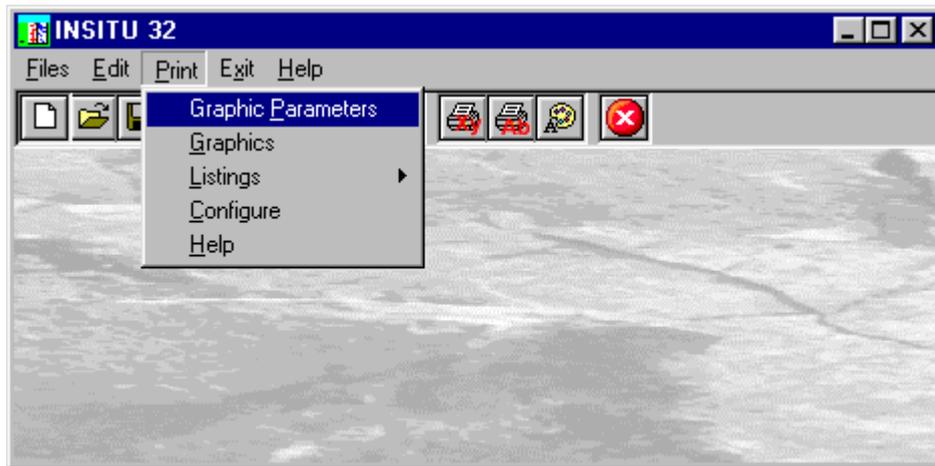
Graphic Parameters Command (ALT,P,P)

By selecting the Grapgic Parameters command one opens the "General parameters" dialog box used to define the following parameters:

- the *groundlevel elevation* expressed in meters;

- the *vertical scale*: the default value used by the program as the drawing scale is 1:100;

- the *stratigraphy width (cm)*: the program proposes as default 19 cm, the maximum width of a page in A4

format (portrait) that can be used, in fact, a border of 1 cm is left: these values can be modified by the user by indicating the new values in centimetres or by the program if the number of the requested columns is such that it can not be contained by the indicated width.

- *initial depth and final depth (m)*: to define the borehole range to be printed. If these are left as zero they will not be considered. Each range can be printed with or without titles and the symbol of the company as a heading. If one chooses to print the ranges preceded by such headings use the following illustrated commands. Each range will be subdivided and printed separately. By indicating a final depth as more than the true value, the program will extend the separation lines of the columns until the indicated depth is reached. This is an imposition that may result useful if one wants to render all of the output the same length. It is important to understand that this option does not interfere with the scale defined by the user. Here is an example: by defining a minimum length of 100, and using a vertical scale of 1:250, the program will continue with the border lines of the columns until the 40 cm length is reached, if the scale output is shorter than the minimum length. If the output is longer than 40 cm the lines will be drawn with their exact length.

- *header and footer (cm)*: to define of the upper and lower print margins of the page.

- *left margin (cm)*: to define the left margin of the page. This is useful for binding together the output and the report.

- *block spacing (cm)*: with this command it is possible to increase or decrease not only the space between the titles and the captions of the columns, but also between the annotations at the foot of the page and the end of the stratigraphy.

- *the drawing scale rate (m)*: with this field the rate of the drawing scale is defined for the selected column.

After having defined these data click on the <Ok> button to close the window.

Graphics Command (ALT,P,G)

By selecting this command the program makes a calculation on the data that were entered and draws the drawing with a reduced size.

Listings Command (ALT,P,L)

By selecting this command the program opens a sub-menu where one can select the preview mode, and wether to print or export the listing.

Listings Preview Command (ALT,P,L,P)

With this command it is possible to preview the listings pertaining to the calculation result. The listing can not be changed here.
To scroll the text use the scroll bars on the window or use the UP and DOWN arrow keys, or the PAGE UP e PAGE DOWN. keys. To exit press ESC or double-click any point of the listing.
The file containing the listing is saved on disc in the same directory where the data files resides. It has the same name with the difference of the ".TAB" extension. The file is in the normal ASCII format and its pagination is such that all commands have the # sign as prefix.

Fast Print Listings Command (ALT,P,L,F)

With this command the listings pertaining to the calculation result are printed directly.

Export Listings in DOC Format (ALT,P,L,E)

With this command the listings pertaining to the calculation result are exported in the format used by Microsoft Word 97.
The file will have the same name but with the ".DOC" extension and will be saved in the same directory where the data files reside.

Export Listings in TXT Format (ALT,P,L,T)

With this command the listings pertaining to the calculation result are exported in the "Text only" format.
The file will have the same name but with the ".TXT extension and will be saved in the same directory where the data files reside.

Export Listings in EXCEL Format (ALT,P,L,X)

With this command the listings pertaining to the calculation result are exported in the Microsoft Excel 97 format.
The file will have the same name but with the ".SLK" extension and will be saved in the same directory where the data files reside.

Configure Command (ALT,P,C)

With this command, one can define the graphical properties of the different objects in the graphical output.
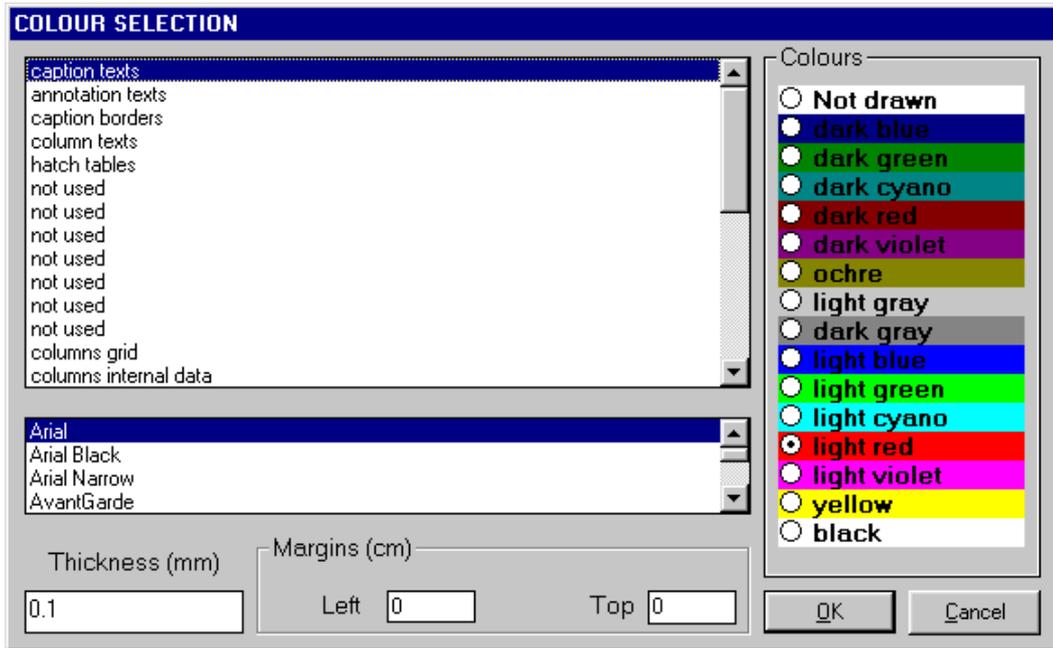
One can associate a colour, a line thickness and a character font to each object. Notice that not all the objects have both a line thickness and a character font: for example, a *title* only requires the colour and the character font to be defined.

- Click an object to select it (use the scroll bar to see the entire list)

- Click one of the option buttons, in the "colours" frame, to select the colour that has to be associated to the selected object. The *Not drawn* option hides the object of the graphical output.

- If the object contains texts, one can choose a character font from the list (use the scroll bar to see the entire list)

- If the object contains lines, one can assign a thickness to the lines (in mm). If the value is zero, the program uses the thinnest line on the output device.

- It is possible, as an option, to assign a left and a top margin (in cm) to the whole graphical output.

NOTE: although the available set is limited to fifteen colours, they can be manually customised; double-click the coloured bar to open the Colour Dialogue Box and choose a different RGB value associated to the selected colour.

Chapter 10 - Exit Menu

Exit Menu (ALT,X)

This command allows one to exit the program. If the file being used contains modifications that have not yet been saved the program will propose the file saving window, if you would like to save these modifications.