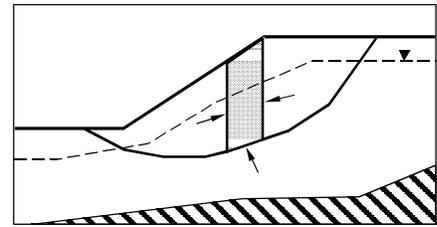


XSTABL v5

An Integrated Slope Stability Analysis Program for Personal Computers



DESCRIPTION OF XSTABL

XSTABL provides an integrated environment for performing slope stability analyses on an IBM personal computer, or compatible. The program combines an intuitive user friendly interface and the analytical philosophy behind the popular slope stability program, STABL, developed at Purdue University. An analysis may consist of a search for the most critical failure surface or the determination of the factor of safety of a single surface with one of the many rigorous limit equilibrium methods incorporated into XSTABL. With each

analysis, graphical screen plots may be saved for later printing or for inclusion into other software applications such as word processors. The integrated menu-driven interface provides intuitive access to descriptive tables for data entry, allowing the user to enter, edit or review slope data quickly. While assembling the data, the user may view the slope geometry and access context-sensitive help. It is expected that this approach will minimize potential errors and provide a more appropriate data preparation method for the less familiar user.

MAIN MENU

Figure 1 presents the opening menu that a user will encounter upon starting XSTABL. In this particular menu the option: "LOAD DATA FROM DISK" is currently highlighted, and ready for possible selection. As each option is highlighted, a short description of each selection is provided below the menu-box for the convenience of the user.

If additional information is required, pressing the F1 key allows the user can obtain extensive context sensitive help at all stages. The available selections are also completely described in the XSTABL Reference Manual. This opening menu represents the control center of the program and allows users to prepare datafiles, perform analyses and, if necessary, copy, delete, print, rename or view XSTABL files without exiting the program.

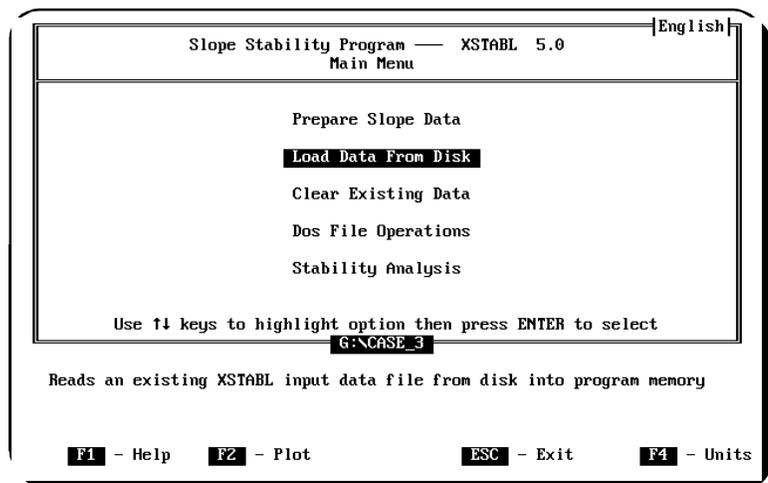


Figure 1

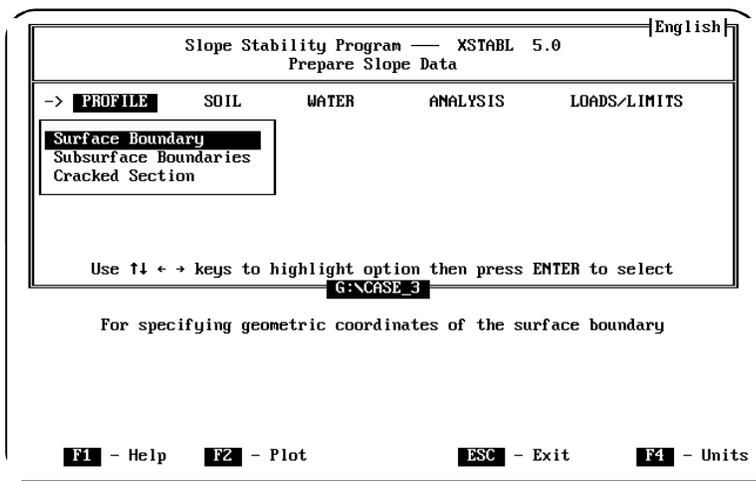


Figure 2

PREPARE SLOPE DATA MENU

With this option selected, XSTABL presents the user with the screen shown in Figure 2. From this menu the user prepares all data for defining the geometry of the slope, water surfaces and cracked zones as well as assigning soil strengths and selecting the appropriate analytical method. External surcharge loads, limiting boundaries and different strength types that include anisotropic, undrained and nonlinear Mohr-Coulomb strength envelopes are also available for advanced slope stability analysis. Data options are selected by moving the cursor horizontally and vertically through the available menus. If any of the options are selected in this particular menu, the user is then prompted for numeric data for developing an input file for use with the slope stability analysis portion of XSTABL. A description of each option, as it is highlighted, is shown below the menu and additional information is available via the F1 key.

DATA TABLES

As an example, the data table for entering soil properties is shown in Figure 3. The cursor keys control movement between the columns and rows of the table, allowing the user to enter new data or edit existing values. Also, lines may be inserted, or deleted from these tables. The descriptive nature and instinctive sequences of data entry into these tables (almost) precludes the use of a "User-Manual". Context sensitive help is available from all data tables and provides relevant information about the required content of each data table and the parameters required for slope stability analysis.

English or metric units can be readily accommodated by *XSTABL*. Information about the selected units is written to the created data file, thus ensuring that the correct units are automatically set if the file is read again.

XSTABL 5.0 — Copyright ISD, Inc., 1994 Soil Property Data						
Soil Unit	UNIT Moist (pcf)	WEIGHT Saturated (pcf)	STRENGTH c (psf) ϕ (deg)		Water Surface Index	Type of Strength
1	116.4	124.2	500.0	14.00	1	ISO, Conven M-C

A/a:= Append Ins:= Ins Line D/d:= Del Line Move:= End, Home, PgUp, PgDn

F1 - Help **F2** - Plot **ESC** - Exit **Editing**

Figure 3

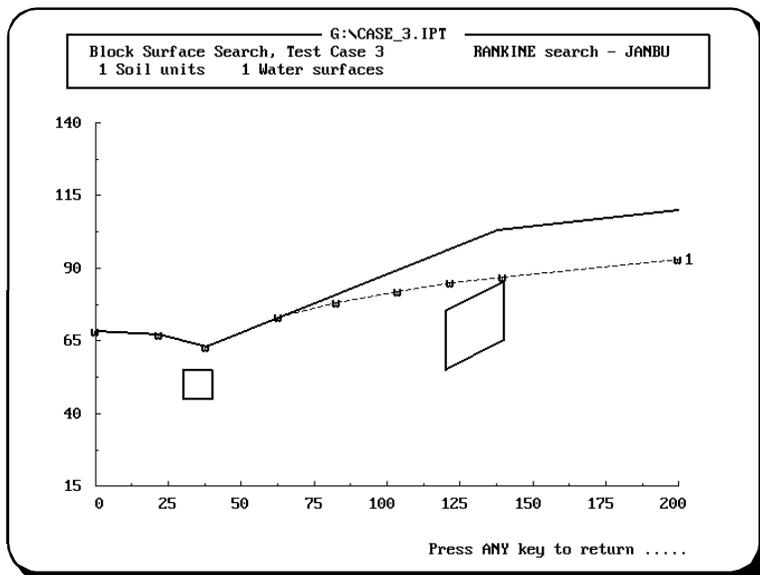


Figure 4

SLOPE GEOMETRY PREVIEW

The assembled slope geometry can be quickly viewed on the screen monitor by pressing the F2 key from any menu or data table. This allows the user to constantly review the slope geometry as data is entered for the surface or subsurface boundaries, surcharge loads and the upper or lower limiting boundaries.

A typical example is shown in Figure 4. Such a display provides a quick summary of the information contained in a complete, or partially complete, data file. This is a truly valuable feature of *XSTABL* and greatly helps in reducing common slope geometry errors. Also, it may be used to quickly review the slope geometry contained in previously created data files.

ANALYTICAL FEATURES

The *Generalized Limit Equilibrium* (GLE) method has been implemented into *XSTABL*. This method allows factors of safety to be calculated for force and moment equilibrium or for force equilibrium only, using different interslice force angle distributions. With this approach, the user can readily calculate the factor of safety according to *Spencer's*, *Morgernstern-Price* or one of the methods proposed by the Corps of Engineers.

If an analysis requires a search for the most critical failure surface, the simplified Bishop and Janbu methods of analysis are selected due to their relative ease of use. The program may be used to either search for the most critical circular, noncircular or block shaped surface or alternatively, used to analyze a single circular or non-circular surface. The critical surface is identified by automatically generating and analyzing failure surfaces between defined initiation / termination ranges or by connecting points randomly located within search boxes specified by the user. This approach minimizes the required

input parameters and can be effectively used to confine the surface generation within a narrow, well defined zone. The soil strength along the failure surface may be described as either conventional (i.e. c , ϕ), undrained or non-linear Mohr-Coulomb and can be either isotropic or anisotropic. The undrained strengths are assigned as a function of the vertical effective stress.

For effective stress analyses, pore water pressures may be simulated by specifying :

1. A piezometric surface
2. Multiple phreatic surfaces
3. Pore water Pressure Grid
4. Constant pore pressure
5. Pore pressure parameter, r_u

GRAPHICAL OUTPUT

During the analysis phase the user may elect to save the slope geometry and failure surface plots, as viewed on the monitor, for printing at a later time. **XSTABL** supports the following graphical formats:

1. Internal (**XSTABL**)
2. WordPerfect Graphics Format (WPG)
3. Hewlett Packard Graphical Language (HPGL)

The internal format files are intended for printing on an IBM graphics compatible 9 or 24-pin dot-matrix printer (e.g.

EPSON FX-85), HP LaserJet, or a HP Plotter (e.g. HP-7475A). The other formats, WPG or HPGL, may be imported into popular word processors (e.g. WordPerfect, Word or Ami Professional), desktop publication applications or general drawing programs (e.g. AUTOCAD) for direct inclusion into final reports or project drawings.

Figure 5 illustrates the use of the WPG format file printed, as part of this document, using the DOS word processor WordPerfect 6.0. The ability to include plots, such as Figure 5 or 6, within a final report is a major asset.

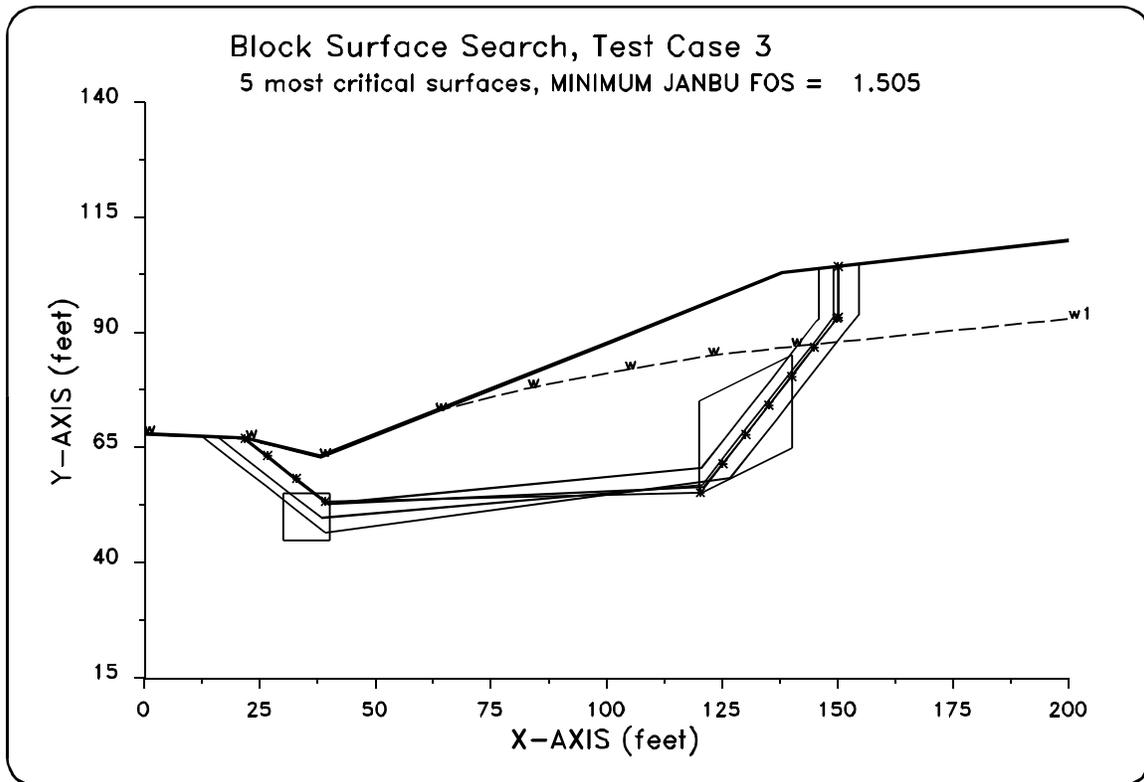


Figure 5

STABILITY ANALYSIS OUTPUT

The input data, warning messages, possible errors and the results of the stability analysis are all written to the **XSTABL** output file. This output file, in conjunction with any saved plot files, provides the user with complete documentation for each stability analysis. If a search for a critical surface is performed, a summary table listing the *ten* surfaces with the lowest Factor of Safety is included in the output. This table is suitably formatted for direct inclusion into reports prepared using a word processor. A time and date stamp, as well as the filename, are included in the input, output and plot files for easier cross-referencing and final documentation.

If a single surface is analyzed, considerable data regarding the slice dimensions and the forces (or stresses) acting on the slice boundaries are written to the output file and plotted in the format shown in Figure 6. This extensive information is

presented to allow the user to check the computed results as well as for assessing the reasonableness of the reported factor of safety for the rigorous methods.

ERROR CHECKING

XSTABL checks for erroneous input data prior to analysis. If errors are detected, a descriptive error message is written to the output file to help the user make the necessary correction. This error message does not require the user to refer to the Reference Manual even though a complete listing of all error messages is provided for informational purposes. As a further check, the user has an option to view the input slope geometry before the start of the calculation stage, and if any geometric errors are noticed, the analysis can be stopped so that the user can make the necessary corrections.

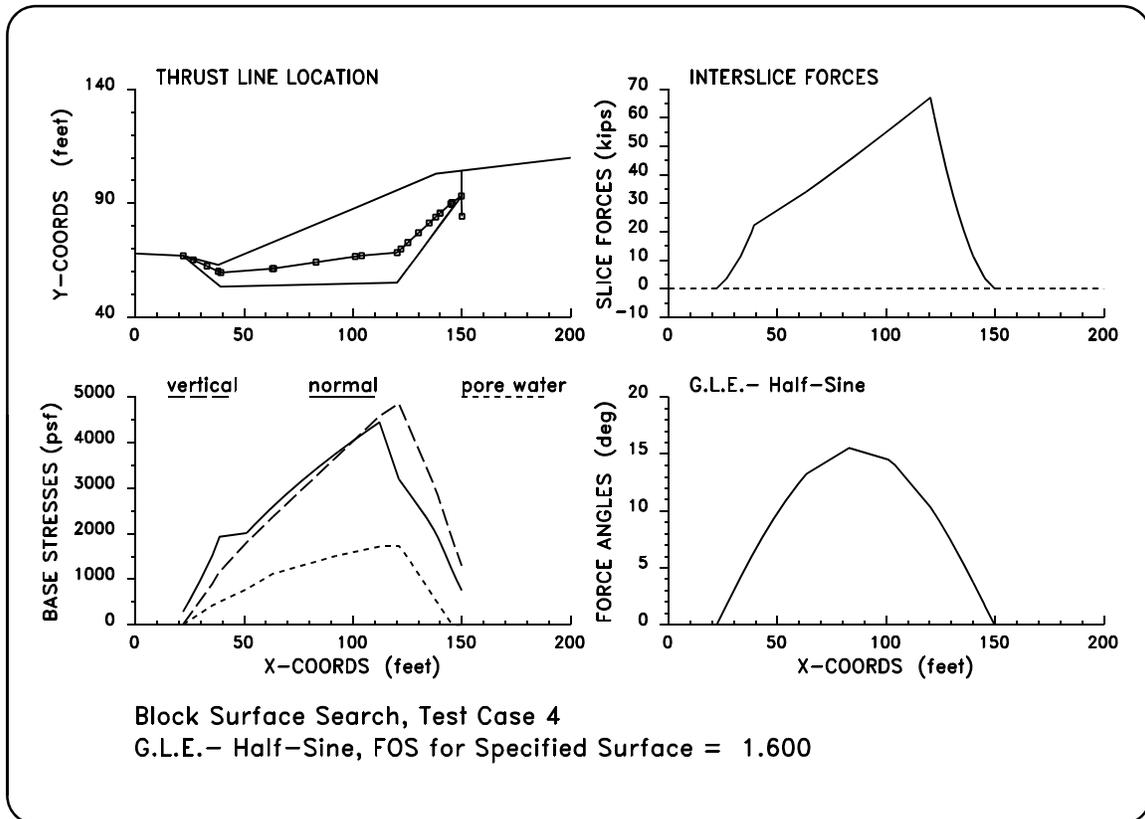


Figure 6

MINIMUM HARDWARE REQUIREMENT

1. An Intel-PC, MS Windows OS, a CD drive (for installing the software); at least 440 kb of available RAM in DOS.
2. For hardcopy output, an IBM graphics compatible dot-matrix printer, HP LaserJet (with at least 1.5 Mb of RAM) or a HP Plotter is required for printing the internal (XSTABL) graphics files.

Please note that files created in WPG or HPGL graphical formats will require **additional** third party software for final hardcopy printing. For increased computational speed XSTABL automatically uses a floating point coprocessor (80x87), if installed.

For best results, a computer system with a hard-disk, coprocessor, VGA adaptor and a color monitor is recommended for effective use with XSTABL.

02/28/07

PROGRAM AVAILABILITY

A license to use a fully operational version of **XSTABL** on a single computer is available at a cost of **US\$ 450.00**. This license fee includes telephone support and the option for future upgrades at a nominal charge for registered users. For organizations interested in licensing multiple copies, a special discounted rate is available. A demonstration or test version of **XSTABL** is also available to prospective users at a cost of \$25.00 (with manual), which may be applied towards final purchase. The complete program, or the latest demonstration version, may be ordered by contacting Dr. Sunil Sharma (208-885-6403) or by writing to:

Interactive Software Designs, Inc.
 953 N. Cleveland Street
 Moscow, ID 83843, U.S.A.