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Microcomputer Software for Geotechnical Engineering

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PREFACE

In recent years many microcomputer software for geotechnical engineering have become available. In order to make it generally available to geotechnical engineers, the TRB Committee on Mechanics of Earth Masses and Layered Systems has compiled the information on sources and microcomputer software.

Dr. J. Michael Duncan, a member of the committee, and Ms. Karen A. Knight conducted a survey and compiled the information in 1988. This Circular presents that compiled information for the use of geotechnical professionals.

Information compiled during the period September 1988 - December 1988 as an activity of TRB Committee A2K05. Compilers: Karen A. Knight, teaching assistant, and J. Michael Duncan, Professor of Civil Engineering, Virginia Polytechnic Institute and State University, Blacksburg, VA 24061.

Modes:
1 highway transportation
3 rail transportation

Transportation Research Board
2101 Constitution Avenue, N.W.
Washington, DC 20418

Subject Areas:
33 construction
62 soil foundations
63 soil and rock mechanics
64 soil science

Computer Software Survey for Geotechnical Engineering

SUMMARY:

- Number of Sources:	40
Private Software Companies	23
Universities	11
Federal or Local Agencies	6

Types of Programs in Use and Available for Purchase

- Database Management Programs:

Geotechnical Construction Control (Source No. 40)
Boring and Subsurface Information (3,6,10)
Instrumentation (40)
Grouting (40)
Survey Analysis (24)
Office Reference (10,40)
General Purpose (10)

- Analysis Programs:

Slope Stability Analysis
    Ordinary Method of Slices (9,34)
    Bishop's Modified Method (9,15,30,33,34,36,38,40)
    Spencer's Method (9,33,34,40)
    Janbu's Method (15,30,33,36,40)
    Lowe and Karafiath's Method (33,34,40)
    Corps of Engineers Method (33,34,40)
    Probability of Failure (32)
    Unspecified Methods (8,22,28,32)

Pile Design and Analysis
    Wave Equation Analysis (9,36)
    Ultimate Capacity and Settlement (32)
    Load-Settlement Analysis (32, 36)
    Negative Skin Friction Determination (32)
    Laterally Loaded Piles and Generation of p-y Curves (9,32,40)
    Rigid Pile Cap Group Analysis (40)

-Analysis Programs (continued):

Shallow Foundation Design
- Based on Pressuremeter Data (32)
- Bearing Capacity Analysis (40)
- Mat Foundation (18)
- Foundation Response to Ground Motion and Loading (14)

Dams and Embankments
- FEM to Analyze Stress, Strain and Displacements (34)
- FEM to Analyze Seepage (9,13,34)
- Method of Fragments to Analyze Seepage (40)
- Flownet Construction (31)
- Reinforced Slope and Embankment Design (9,34)
- Pressure Change Beneath an Embankment of Infinite Length (37)
- Rapid Drawdown Analysis (34,40)
- Earthwork Quantities (1,17,21)

Retaining Wall Design
- Cantilever and Gravity Wall Design and Analysis (1,32,34,35)
- Sheet Pile Wall Analysis (37,40)
- Sliding Stability of Concrete Structures (40)

Settlement and Consolidation
- Finite Difference Analysis of Consolidation Settlements (31, 34)
- Settlement and Stress Distribution (9)

Pavement
- Non-Linear Elastic Layer Analysis (25)
- Elastic Layer Moduli from Surface Deflection Measurements (25)
- Overlay Design (36)
- Flexible Pavement Design (16,36)

Vertical Stress Due to Surface Loads (34,37,40)

FEM Analysis of Plane Strain and Plane Stress Problems (31)

Soil-Structure Interaction (29)

Seismic Analysis (12)

Groundwater Flow (20, 31)

Plastic Theory Solutions (23)

Track Analysis Programs (25, 31)

Field Density Reports (9)

- Laboratory Data Acquisition and Data Reduction Analysis:

General Purpose (7,22,39)

Grain Size Analysis (9)

Consolidation (9)

Direct Shear (9)

Compaction (9)

Atterburg Limits (9)

CBR - California Bearing Ratio (9)

USC - Unified Soil Classification System (35)

Strength from Triaxial Test Data (34)

Pressuremeter Data Reduction (32)

Conversion of Inclinometer Data (38)

- Graphics:

Geotechnical Laboratory Test Plots (3,22)

Subsurface Data Presentation (10,11,22,36)

Surface and Subsurface Contouring (20)

Survey Analysis and Graphics (24)

General Data Plotting (32)

COMMERCIAL SOFTWARE COMPANIES:

Source Name and Address
Number

1. CAW, Inc.
   4470 S.W. Hall Blvd., Suite 197
   Beaverton, OR 97005

   - Programs dealing with Earthwork Quantities and Gravity Retaining Wall Analysis

   Cost: Prices range from $195 to $295.

2. Civil Engineering Shareware
   P.O. Box 472
   Lee's Summit, MO 64063

   - Original Versions of Public Domain Software

   Cost: Small fees apply. Documentation available at additional cost.

3. (Omitted)

4. Computer Oriented Geological Society
   C.O.G.S.
   P.O. Box 1317
   Denver, CO 80201

   - Clearing House for Public Domain Programs of Interest to Geologists

   Cost: Small fees apply.

5. Ensoft, Inc.
   P.O. Box 180348
   Austin, TX 78718

   - Software dealing with Pile Analysis

   Cost: $150 - $500.

COMMERCIAL SOFTWARE COMPANIES

Source Name and Address
Number

6. ESE Software Ltd.
   14535 118th Avenue
   Edmonton, Alberta T5L 2M7
   Canada

   - Offers Software dealing with Boring Logs and Related Data Management

   Cost: $995 - $1995 (Canadian)

7. Geocomp Corporation
   66 Commonwealth Avenue
   Concord, MA 01742

   - Offers Software for Graphics, Lab Data Acquisition, and a Variety of Soil Mechanics Analyses

   Cost: Prices vary from $99 to $24,980.

8. GEO-SLOPE Programming Ltd.
   7927 Silver Springs Road N.W.
   Calgary, Alberta T3B 4K4
   Canada

   - Software for Slope Stability Analysis and Plotting

   Cost: $325 - $875 (Canadian)

COMMERCIAL SOFTWARE COMPANIES:

Source Name and Address
Number

9. GEOSOFT
   1442 Lincoln Avenue, Suite 146
   Orange, CA 92665
   (714) 998-4030
   Mr. Vikas Bhushan

   - SETTL/G - Settlement and Stress Distribution
   - PILED/G - Lateral Load with p-y Curve
   - STABR/G - Slope Stability - Circular
   - SLOPE8R/G - Slope Stability - Non-Circular
   - COM624/G - Lateral Load - Offshore
   - WEAP/G - Wave Equation Pile Drivability
   - SEEP/G - 2-Dimensional Unconfined Seepage
   - R/GRAIN - Grain Size and Soil Classification
   - R/CONSOL - Consolidation and Swell
   - R/D-SHEAR - Direct Shear
   - R/COMPACT - Proctor Compaction
   - R/U-COMP - Unconfined Compression
   - R/LIMITS - Atterburg Limits and Soil Classification
   - R/CBR - California Bearing Ratio
   - D/FDR - Field Density Test Reports

   Cost: $350 - $490.

10. Geotechnical Computer Applications
    1727 Mission Boulevard
    Santa Rosa, CA 95405
    (707) 539-0506
    Mr. Salvatore Caronna

    - gINT - Database Manager for Subsurface Exploration, Manages Field and Office Data, Text andGraphics
    - Base System
    - Table and Text Reports
    - Graph and Histogram Reports
    - Profile and 3D Fence Reports
    - Basic Laboratory Testing
    - Water Level with Time

    Cost: Total system -- $3500.

COMMERCIAL SOFTWARE COMPANIES

Source Name and Address
Number

11. Geotechnical Graphics
    1400 Shattuck Ave., No. 778
    Berkeley, CA 94583

    - GTGS - Subsurface Data Presentation

    Cost: $895.

12. Geotechnical Research, Inc.
    2400 Old Crow Canyon Road, Suite B-H
    San Ramon, CA 94583

    - micro-FLUSH - seismic analysis

    Cost: $1400.

13. Kern International, Inc.
    100/G1 Weymouth Street
    Rockland, MA 02370

    - Seepage Program

    Cost: About $85.

14. Gennaro G. Marino, Ph.D, P.E.
    Geotechnical Consulting Engineer
    1601 Parkhaven
    Champaign, IL 61820
    (217) 352-2288

    - Foundation Response to Ground Movement and Various Loading: Program No. 100

    Cost: Contact Dr. Marino for information.

COMMERCIAL SOFTWARE COMPANIES

Source Name and Address
Number

15. MITRE Software Corporation
    9636-51st Avenue
    Edmonton, Alberta
    Canada T6E 6A5
    (403) 434-4452
    Mr. John P. Graham

    - G SLOPE - Limit Equilibrium Slope Stability Program

    Cost: $780.

16. Neyer, Tiseo & Hindo, Ltd.
    38955 Hills Tech Drive
    Farmington Hills, MI 48018

    - FLEX-PAVE - Flexible Pavement Design

    Cost: $629.

17. Pizer Incorporated
    3214 West McGraw, Suite 300
    Seattle, WA 98199

    - EARTH2 - Earthwork Quantity Calculation

    Cost: $495.

18. Portland Cement Association
    5420 Old Orchard Road
    Skokie, IL 60077

    - Program for Mat Foundation Analysis
      using Winkler's Hypothesis as Subgrade Model

    Cost: $1000, plus $100 annually.

COMMERCIAL SOFTWARE COMPANIES:

Source Number — Name and Address

19. REHLIS
    43 South Avenue
    Fanwood, NJ 07023

    - Offers Eight Programs for Foundations, Walls, Bulkheads and Slope Stability Analysis

    Cost: Programs are $400 ea. or $3000 for all eight.

20. Scientific Software Group
    P.O. Box 23041
    Washington, D.C. 20026-3041

    - Software deals with Ground Water Flow and Contouring

    Cost: Several hundred to several thousand dollars.

21. SYSTEK, Inc.
    P.O. Drawer JJ
    Mississippi State, MS 39792

    - Earthwork Quantity Calculations

    Cost: $47.

22. Von Guten Engineering Software, Inc.
    P.O. Box 8813
    Fort Collins, CO 80525

    - Boring Log Plotting
    - Lab Data Reduction and Plotting
    - Slope Stability

    Cost: Prices range from $95 - $995.

COMMERCIAL SOFTWARE COMPANIES:

Source Name and Address
Number

23. ZACE Services Ltd.
    c/o ZEI Engineering Inc.
    5111 Leesburg Pike, Suite 703
    Falls Church, VA 22041

    - Z-SOIL.PC - Plasticity Theory Solutions
      for Geotechnical Problems

    Cost: Price range -- several thousand dollars.

COLLEGES AND UNIVERSITIES:

Source Name and Number
Number

24. Clarkson University
    Department of Civil and Environmental
    Engineering
    Potsdam, NY 13676
    Prof. Gordon Batson

    - Survey Data Analysis and Graphics

    Cost: Unknown.

25. Cornell University
    Local Roads Program
    Ithaca, NY 14853
    (607) 256-8033
    D.P.T. Speck

    - NELAPAV - Non-linear Elastic Layer Analysis for Pavements
    - MODCOMP 2 - computes a set of Elastic Layer Moduli for a Pavement System from Surface Deflection Information
    - GEOTRACK - Multi-Layer Track Analysis Program

    Cost: GEOTRACK - $450; others, costs unknown.

26. University of Florida
    McTrans, Department of Engineering
    512 Weil Hall
    Gainesville, FL 32611
    (904) 392-0378
    Dr. Charles E. Wallace

    - Clearing house for microcomputer programs for the highway transportation profession. Call McTrans for information on programs available.

COLLEGES AND UNIVERSITIES:

Source Name and Number
Number

27. P.C.-Trans- University of Kansas
    Transportation Center
    2011 Leonard Hall
    University of Kansas
    Lawrence, KS 66045
    Dr. Joe Lee

    - information on programs and their availability is unknown.

28. Kentucky Transportation Research Program
    College of Engineering
    University of Kentucky
    533 South Limestone
    Lexington, KY 40506-0043
    (606) 257-4516

    - HOPK-1 - Slope Stability Analysis, circular and non-circular

    Cost: Unknown.

29. Manhattan College
    Civil Engineering Department
    Bronx, NY 10471
    Dr. J.S. Horvath

    - Microcomputer conversions of Public Domain Programs
      plus original Programs dealing with Soil-Structure Interaction

    Cost: Less than $100.

30. Purdue University
    Department of Civil Engineering
    Grissom Hall
    West Lafayette, IN 47907
    (317) 494-1535
    Dr. Lovell

    - PCSTABL5M - Slope Stability by Simplified Janbu
      or Bishop Method of Slices

    Cost: $310.

COLLEGES AND UNIVERSITIES:

Source Name and Number
Number

31. Queens University
Department of Civil Engineering
Ellis Hall
Kingston, Canada K7L 3N6
Mr. G.P. Raymond

- CIVLINCO - Finite Difference Analysis of an Extension to Terzaghi's Linear Consolidation Theory
- CIVSDIST - Analysis of Axi-Symmetric Solids by Finite Elements, Plane Strain or Plane Stress
- DYNFLOW - FEM Analysis of Time-Varying Darcy type Flow Problems
- FLOWNET - Finite Element Analysis of Darcy Flow Problems for Anisotropy, Inhomogeneity, and Phreatic Surfaces
- HEAT - FEM Program to Determine the Temperature Distribution within a Body as a Function of Time
- TRACSOFT - Design for Stresses Below a Single or Double Rail Guideway Supported on Crossties
- ARTS - Analysis of Rail Track Structures

Cost: Unknown.

32. Texas A&M University
Department of Civil Engineering
College Station, TX 77843-3136
Jean-Louis Briaud, Ph.D., P.E.

- APILE - Load Settlement of Axially Loaded Piles
- COYLE - Ultimate Capacity and Settlement of Pile by SPT/Su Method
- NEWNEG - Negative Skin Friction on Piles
- HPPLOT - General Data Plotting Program
- BISTAT - Slope Stability with Probability of Failure Calculation
- RETWAL - Cantilever and Gravity Retaining Wall Design
- SHALPMT - Shallow Foundation Design using Pressuremeter Data
- PILECPT - Ultimate Capacity and Settlement of Piles using Cone Penetrometer Data
- PILEMT - Ultimate Capacity and Settlement of Piles using Pressuremeter Data
- PYPMT - p-y Curve Generation and Analysis of Laterally-Loaded Piles using Pressuremeter Data
- PRESRED - Pressuremeter Data Reduction

Cost: $500 plus shipping for the entire package.

COLLEGES AND UNIVERSITIES:

Source Name and Number
Number

33. University of Texas at Austin
Department of Civil Engineering
Geotechnical Engineering
Austin, TX 78712-1076
(512) 471-4929
Prof. Steve Wright

- UTEXAS 2 - A Computer Program for Slope Stability Calculations using Spencer's Method

Cost: $750.

34. Virginia Polytechnic Institute and State University
Department of Civil Engineering
Geotechnical Engineering
104 Patton Hall
Blacksburg, VA 24060
(703) 961-5103
Dr. J.M. Duncan

- STABR - Slope Stability for Circular Failure, Ordinary Method of Slices, Bishop's Modified Method, Auto Search for Critical Circle
- STABGM - Slope Stability Analysis of Reinforced Embankments and Slopes with Circular Slip Surfaces using Bishop's Modified Method
- STABRD - Slope Stability Analysis of Rapid Drawdown using Circular Slip Surfaces, Ordinary Method of Slices, Bishop's Modified Method, Lowe and Karafaith, and Corps of Engineers Method
- SLOPE8R - Slope Stability Analysis with non-Circular Surfaces using Spenser's Method, Analyzes surfaces one at a time
- FEADAM84 - FEM of Static Stresses, Strains, and Displacements in Earth Embankments and Dams
- CONSOL - Consolidation Settlement Analysis
- SEEP - FEM of Steady Confined or Free Surface Flow in 2-D or Axisymmetric Conditions
- SP5 - Evaluation of Strength and Hyperbolic Stress-Strain Parameters from Tri-Axial Tests Data
- GRAVWALL - Design of Gravity Retaining Wall
- ZSTRESS

Cost: Prices range from $75 to $150.

FEDERAL AND STATE GOVERNMENT AGENCIES:

Source Name and Address
Number

35. California Department of Transportation
ECE Branch
5900 Folsom Blvd.
P.O. Box 19128
Sacramento, CA 95819
Mr. Raymond A. Forsyth

- MSE - External Stability and Foundation Bearing Capacity of Retaining Walls
- Unified Soil Classification - Program gives USCS Classification from Input
- NEWCON - Pavement Layer Thickness Designs for New Flexible Pavement Structural Sections based on R-value and Traffic Index
- OVERLAY - Provides AC Overlay Thickness Design for Existing Flexible Pavement Deflection Procedure
- Computer Drafting Program for Boring Logs

Cost: Unknown, contact Ray Forsyth for information.

36. Federal Highway Administration
FHWA HRT-10
6300 Georgetown Pike
McLean, VA 22101
(703) 285-2357
Mr. Chien Tan Chang

- WEAP - Wave Equation Analysis of Pile Driving, developed by Goble, Raushe, Likins, Assoc. for FHWA
- STABL4 - 2-dimensional Slope Stability, Circular and Non-uniform, developed by Purdue for FHWA
- COM624 - Pile Static Bearing Capacity Analysis using Norlunds Method and Spread Footing Analysis

Cost: Unknown.

FEDERAL AND STATE GOVERNMENT AGENCIES:

Source Name and Address
Number

37. New York State Department of Transportation

- BRACE - Determines Earth, Water, and Surcharge Pressure on Braced Sheetpile Walls
- PRESSURE BAS - Determines the Change in Pressure with Depth below an Embankment of Infinite Length

Cost: Unknown.

38. Oregon State Highway Department

- Slidemaster - Converts SinCo magnetic tape inclinometer (blue box) data files to Digitilt data file format

Cost: Unknown.

39. United States Air Force
Department of Civil Engineering
USAF Academy
Colorado Springs, CO 80840-5841
Capt. M.F. Reynolds

- Geotechnical Engineering - Slope Stability by Bishop's Method, Phase Diagram and Analysis

Cost: Programs are free.

FEDERAL AND STATE GOVERNMENT AGENCIES (continued):

Source Name and Address
Number

40. Waterways Experiment Station
Department of the Army
Corps of Engineers
P.O. Box 631
Vicksburg, MS 39180-0631
Mr. Walter E. Barker

Program 10012 - COM624 - Laterally Loaded Piles with p-y Curves
Program 10017 - CBEAR - Bearing Capacity for Shallow Foundations
Program 10018 - CFRAG - Seepage Analysis by Method of Fragments
Program X0031 - UTEXAS 2 - Slope Stability Package
Program X0050 - CSHTWAL - Sheetpile Wall Design and Analysis by Classical Method
Program X0080 - CSLIDE - Sliding Stability Analysis of Concrete Structures

- CPGA - Rigid Cap Pile Group Analysis
- STRESS - Initial, Incremental and Total Stressed form Distributed Loads on Surface of A Semi-Infinite Mass
- VERTIS - Incremental Vertical Stresses Below Rectangular Loaded Areas (linear elastic theory)
- Geotechnical Construction Control Database
- Boring Information and Subsurface Database
- Instrumentation Database
- Grouting Database
- UTEXAS 2 - Slope Stability Program
- Office Reference Database
- Geotechnical Laboratory Test Data Plots

Cost: Contact Walter Barker at WES for information.