# DMT DIGEST No. 2
(10 July 83)
(3 pp. plus 9 attached pages)

## A. Site-specific $q_c$-M correlations

A recent experience has demonstrated the possibility of establishing a useable correlation between the static cone bearing capacity $q_c$ from the CPT and the 1-dimensional compression modulus, M, from the DMT. The attached p. 2-1 shows the points obtained from two such correlations at a site in Florida. These data points fall into two groups, with one correlation curve assigned to the soils above 10 m and the other for the soils below. Page 2-2 shows an electric CPT log typical of the soils at this site. The soils above 10 m consisted primarily of uniform, fine sands and slightly silty sands. Below 10 m the soil conditions were much more variable with alternating thin layers of sand, cemented sand, and some loose silty and clayey sands. All this clearly demonstrates that at present we must consider $q_c$-M correlations as site specific. However, when it proves possible to establish such correlations at a site they can allow the use of the more economical and higher-penetration-capability CPT and its $q_c$ results for estimating moduli.

## B. Towards a Common Presentation of $\phi_{ps}$ from DMTs

Until recently we presented the DMT $\phi_{ps}$ results as determined by the JHS method of analysis based on the Durgunoglu and Mitchell equations (Proc., ESOPT II, Vol. 2, p. 853). We have considered this the peak secant friction angle applicable at a normal stress taken as the value of the Rankine passive stress = vertical overburden effective stress times (1+ sin $\phi_{ps}$). Our DMT output has included this $\sigma'_{ff}$ stress level as applying to the $\phi_{ps}$ in the output. Because of the curvature in the Mohr envelope for sands the secant angle decreases with an increasing stress level on the failure plane at failure. Thus, the output from a dilatometer sounding until recently has shown decreasing $\phi_{ps}$ angles in otherwise uniform sands because of the increasing overburden pressure with depth and therefore an increasing $\sigma'_{ff}$ also. We have now decided it should prove more useful to present all DMT $\phi_{ps}$ angles for a specific, reference normal stress level and allow the user to adjust the angle for any other stress level of interest to the user.

BACK

Recent research, especially in Italy in conjunction with the continuing large calibration chamber test program there, has confirmed the usefulness in triaxial testing of the Baligh equation for the variation of $\phi$ with stress level. The attached p. 2-3 shows this equation. The equation includes a reference angle $\phi_o$, which is the secant angle for the reference stress level of 2.72 bar. We now calculate $\phi_o$ as shown on p. 2-3 and present this in the DMT results and no longer present the applicable stress level because we now use a constant of 2.72 bar. Page 2-3 also gives the equation in the form of converting $\phi_o$ to the $\phi$ you might require. It includes an example calculations. Note that you will need a value for the "$\alpha$" angle that expresses the Mohr envelope curvature. Page 2-4 shows some recent correlation data that may help with estimating $\alpha$. For the purpose of calculating $\phi_o$ we used an approximate average value of $6^\circ$ for $\alpha$. The examples used the same $\alpha$ = $6^\circ$ . Purists will note that the above assumes plane strain envelope curvature = axisymmetric curvature.

Some users might still wonder how they should convert the DMT $\phi_{ps}$ to the equivalent triaxial test value, the axisymmetric $\phi_{ax}$. As already noted on p. 1-1 of DMT D-1, we use the simple formula $\phi_{ax} = \phi_{ps} - (\phi_{ps}-32)/3$ for estimating peak $\phi_{ax}$. For values of $32^o$ or less we use $\phi_{ax} = \phi_{ps}$.

C. Changes in Computer Program

We have incorporated the above B. changes into both our HP 41CV and FORTRAN programs. In addition we have made some other changes in these programs for the purposes for making them more efficient, or for making the output more logically organized, or just plain correcting newly discovered errors.

Attached p. 2-5 shows the changes we have made in the HP 41CV program. We suggest that users make the same changes in their programs and recopy the thus modified program on to another set of magnetic cards. Attached pp. 2-6 and 2-7 present the latest format for our FORTRAN program output. It incorporates the above B. changes and includes considerable column reorganization to make the output more legible and logical. The graphical output format on p. 2-7 has also changed so as to plot overburden and preconsolidation points rather than just the OCR, and to plot these next to the modulus values for easier comparison and settlement calculations.

Some users have noted that the $\phi_{ps}$ angles computed using the above two programs do not agree exactly and sometimes may disagree by more than $1^o$. The FORTRAN program includes a more thorough and precise double-iteration procedure to obtain the $\phi_{ps}$ values, and therefore also more precise $K_o$ and OCR

BACK

values, when the DMT user also has total thrust measurements. The HP 41 CV program is less accurate. Prediction accuracy studies for the HP41 vs. the FORTRAN program have shown:

a. If the est. $K_o$ nearly = the computed $K_o$, both $K_o$ and $\phi$ are nearly correct.

b. If the calculated $\phi$ exceeds the est., then the calc. value of $\phi$ is less than the correct value and the calc. value of $K_o$ is greater. (the reverse is usually, but not always true)

D. Increased Static Thrust Reaction When Using Drillrigs

As paragraph C. in DMT D-1 discussed, advancing the DMT by static thrust sometimes produces much better results than when advancing using hammer blows. However, the user may only have a drillrig available for DMT insertion and he or she may require more than the 2 to 4 ton reaction weight typically available from most drillrigs. The actual hydraulic down-thrust capacity of most drillrigs equals at least 10 tons. A quick and effective way to increase the reaction capability of a drillrig is shown on the photos on attached p. 2-8. Here we hauled the ATV drillrig on a flatbed pulled by a tractor. After rolling the rig off the flatbed we disconnected the tractor from the flatbed and moved it into position behind the drillrig. We then hooked two wire cables going over a crown sheave on the mast and then to the bumper of the tractor and used the drillrig power to winch down on these cables. In this way we could put significant tension on the cables and hold down the rig. In this case we could use up to about 6.5 tons of down-thrust on the DMT rods compared to a maximum of about 2 tons without the addition of the tension cables.

E. DMT Conference Proceedings Available

Mobile Augers Research Ltd., Edmonton, Canada, has announced that they are taking orders for their Proceedings of the DMT Conference they sponsored last February 5th in Edmonton. The attached p. 2-9 gives more information and can be used as an order form for these Proceedings.

John H. Schmertmann
Editor

BACK

SCHMERTMANN & CRAPPS, INC. Job No. DMT D-2 P. 2-1

Problem: Correlation between DMT-M and CPT-$q_c$ Work by: Schmertmann

Check by: date:

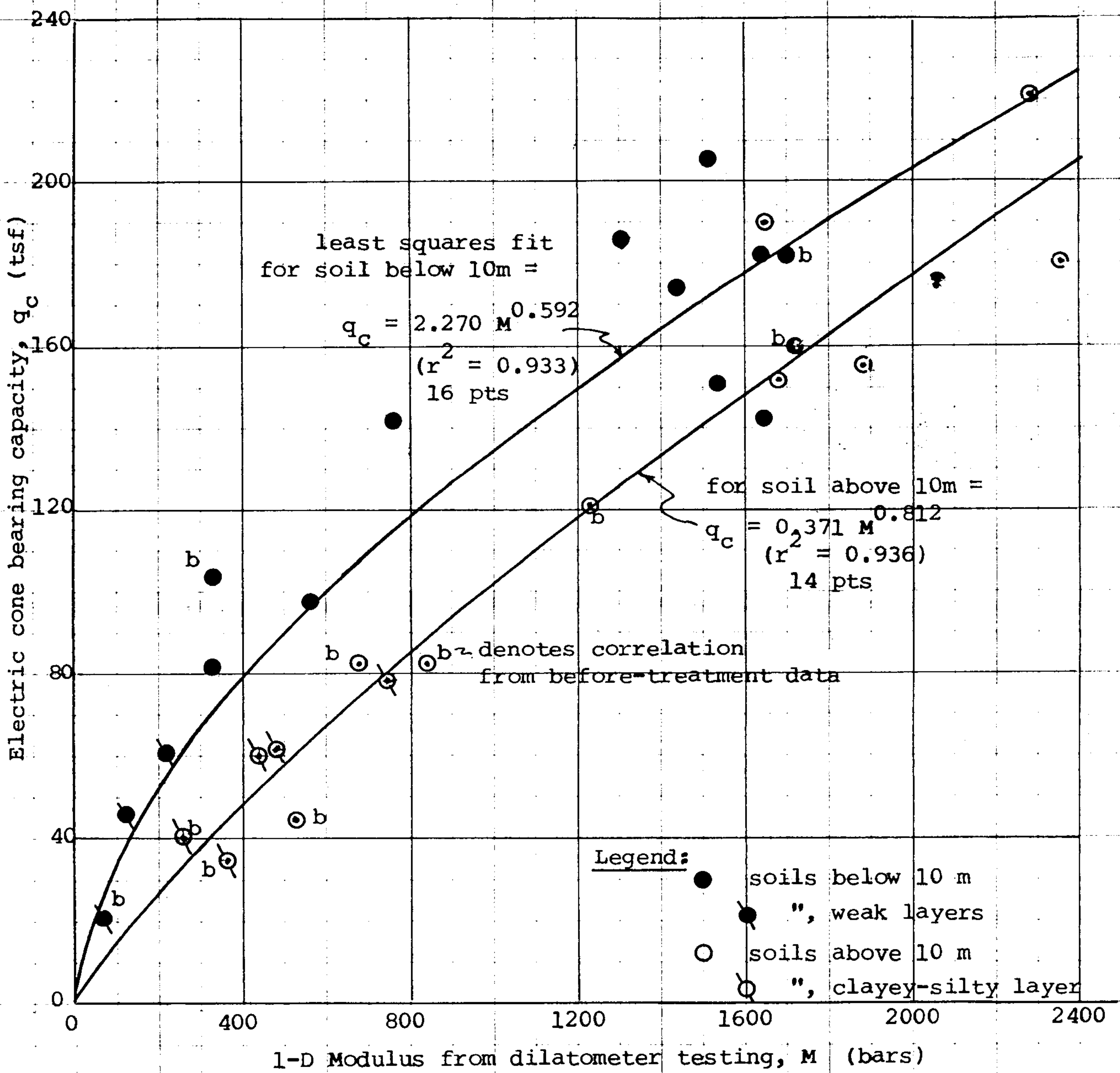
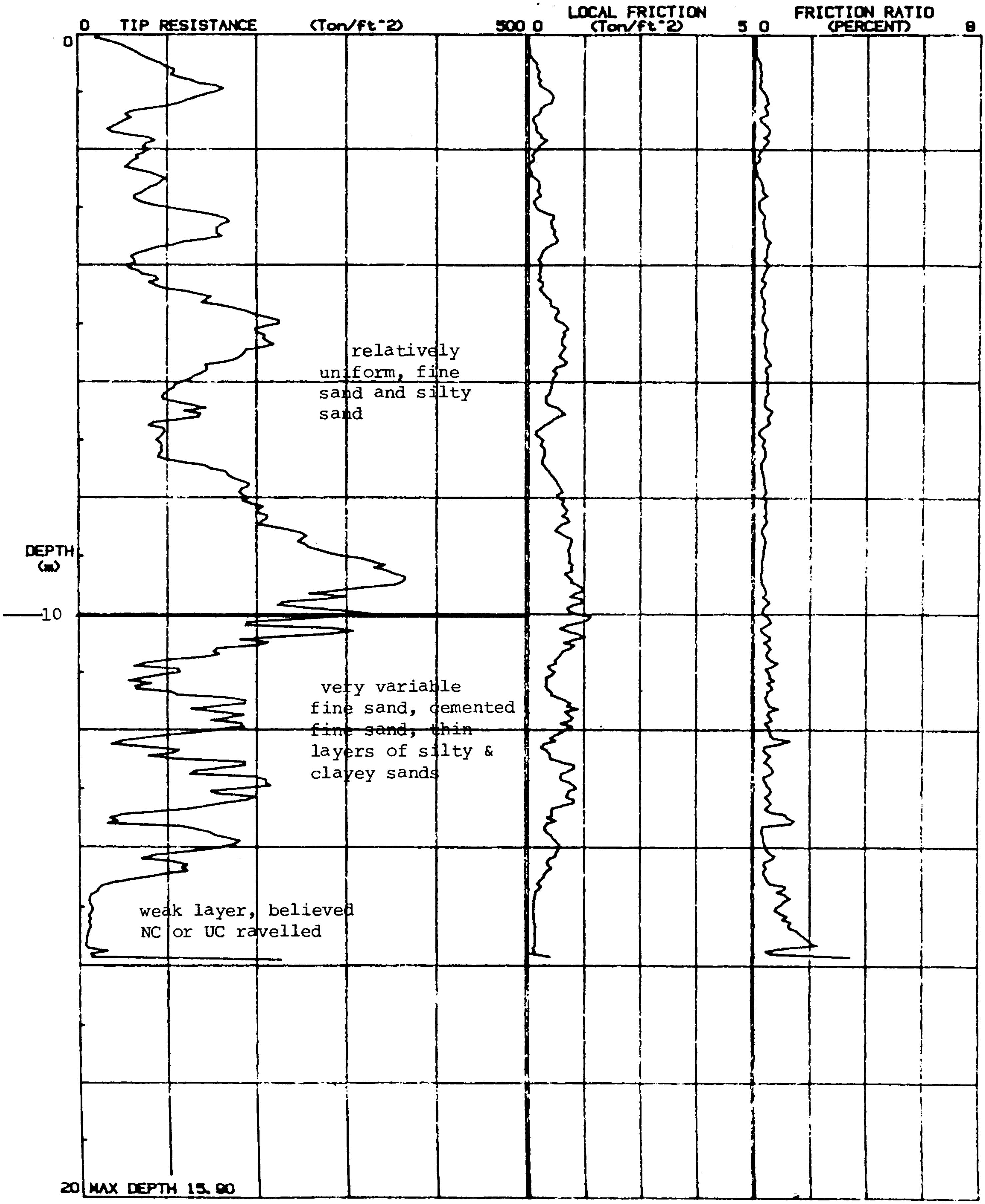



FIGURE 4.5 - CORRELATIONS BETWEEN "M" AND "$q_c$" BASED ON COMPARATIVE DATA FROM THE TEST SECTIONS

BACK

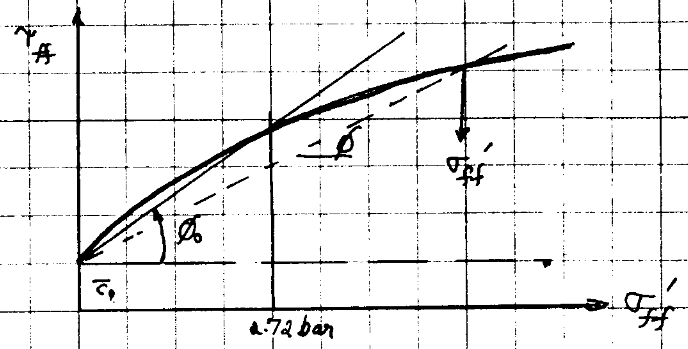
JOB # :
DATE :
LOCATION :
FILE # :

DMT D-2
p. 2 - 2




BACK

Baligh, "Cavity expansion in sands with curved envelopes", ASCE GED, Nov. 76




from Baligh ('76) above

$$\tau_{ff} = \bar{c}_0 + \bar{\sigma}_{ff}\left[\tan\phi_0 + \tan\alpha\left(\frac{1}{2.3} - \log_{10}\frac{\sigma_{ff}}{p_0}\right)\right]$$

ref. based on triax tests

DMT program gives a solution at each pt. x for $\phi_{ps_x}$ and $\sigma_{ff_x}$

**Assume** envelope curvature = from triax. and pl. strain tests

**Assume** $c_0 = 0$

**Assume** typical value of $\alpha \approx 6°$ for hard mineral sands over $40\% < D_r < 80\%$ (see attached p. 2-4)

$\tan 6° = 0.105$

$\tan 6° / 2.3 = 0.046$

$$\frac{\tau_{ff}}{\sigma_{ff}} = \tan\phi = \tan\phi_0 + 0.046 - \left(\log_{10}\frac{\sigma_{ff}}{1.0\,\text{bar}}\right)0.105$$

Solving for desired

$$\tan\phi_{0_x} = \tan\phi_x + 0.105\log_{10}\left(\frac{\sigma_{ff}(\text{bar})}{1}\right) - 0.046$$

$$\phi^{\circ}_{0_x} = \tan^{-1}(\tan\phi_x)$$

report $\phi^{\circ}_{0ps_x}$ after calculating $\phi_{ps_x}$ and $\sigma'_{ff_x}$ in accord with present program and using above equations to get $\phi_0$

this $\phi_0^{\circ}$ then applies to stress level $\sigma'_{ff} = 2.72$ bar,
to convert to any other stress level use: (for $\alpha = 6°$)

$$\tan\phi = \tan\phi_0 + 0.046 - 0.105\log_{10}\sigma'_{ff}(\text{bar})$$

Examples:

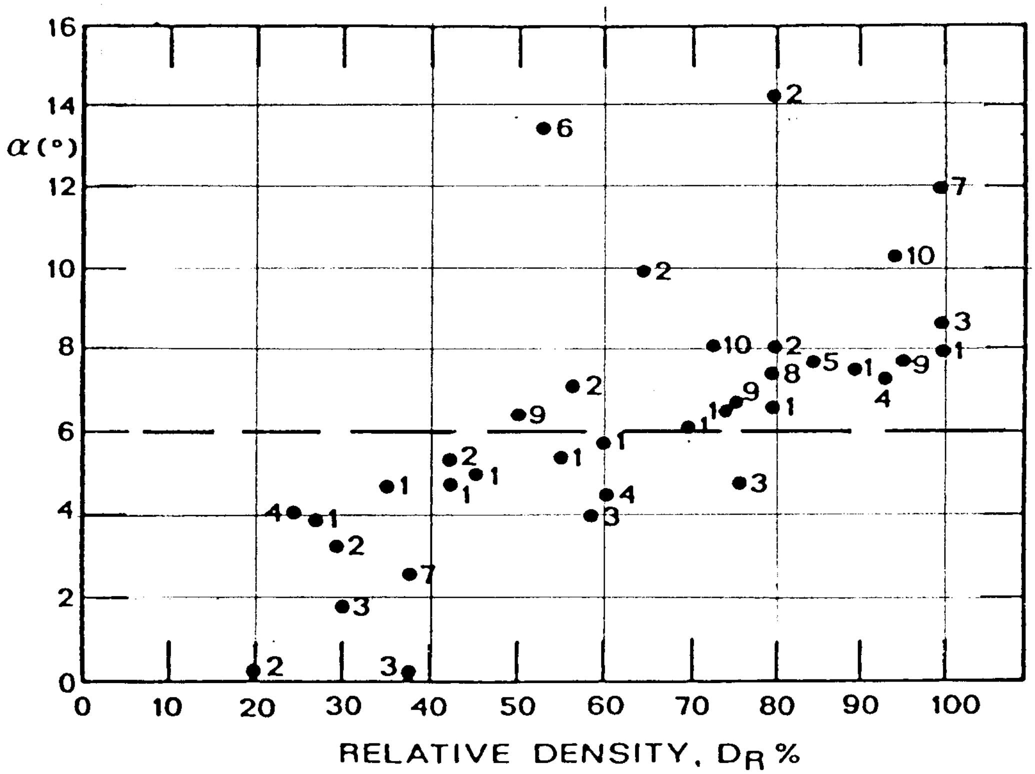
$\phi_{ps} = 40°$, $\phi_{ax} = ?$ @ $\sigma_{ff} = 1.0$ bar $\longrightarrow$ $\phi_{ps} = 41.5°$, $\phi_{ax} \simeq 38.3°$

" " @ $\sigma_{ff} = 5.0$ bar $\longrightarrow$ $\phi_{ps} = 39.1°$, $\phi_{ax} \simeq 36.7°$

BACK

FIGURE FROM: Preprint
"Evaluation of Sand Strength from CPT"
by: Bellotti, Ghionna, Jamiolkowski,
Manassero and Pasqualini
for: International Symposium Soil & Rock
Investigations by InOSitu Testing,
Paris, 18-20 May, 1983

FIG.3: $\alpha$ VERSUS $D_R$ FOR DIFFERENT SANDS




1 MOL SAND

2 CHATTAHOOCHE SAND

3 OTTAWA SAND

4 MONTEREY SAND N°20

5 GLACIAL SAND

6 NORD SEA SAND

7 SACRAMENTO RIVER SAND

8 GLACIAL SAND

9 TICINO SAND

10 HOKKSUND SAND

BACK

| | | |
|---|---|---|
| 100 | X<>Y | |
| | − | |
| | STO 08 | |
| | ~~34.6~~ | 34.7 |
| | X | |
| | STO 09 | |

$E_D$

(a) minor correction to conform better to theoretical solution.

| | | | |
|---|---|---|---|
| | RTN | | |
| | LBL 01 | FS 04? | |
| 230 | RCL 5? | RTN | Y |
| | RCL 52 | | N |
| | ÷ | | |

(b) needed to cover a possible situation not now covered.

| | | | |
|---|---|---|---|
| | PROMPT | | Read $K_0$ = |
| | RCL 20 | | |
| | ~~FIX 1~~ | SIN | |
| 650 | ~~CLA~~ | 1 | |
| | ~~PHI-PS=~~ | + | |
| | ~~ARCL X~~ | RCL 05 | |
| | ~~PROMPT~~ | X | ~~Read $\emptyset_{ps}$ = °~~ |
| | ~~SIN~~ | LOG | |
| | ~~1~~ | .105 | |
| | ~~+~~ | X | |
| | ~~RCL 05~~ | .046 | |
| | ~~X~~ | − | |
| | ~~CLA~~ | RCL 20 | |
| 660 | ~~SIG-PAT=~~ | tan | |
| | ~~ARCL X~~ | + | |
| | ~~PROMPT~~ | ATAN | ~~Read $\sigma'_{\emptyset ps}$ = (b) = $\sigma_v(1+\sin\emptyset_{ps})$~~ |
| | | FIX 1 | |
| | | CLA | |
| | | PHI-O-PS= | Read $\emptyset_{ops}$ = ° (applies at $\sigma_{ff}$=2.72 in Baligh formula) |
| 669 | | ARCL X | |
| | | PROMPT | |

(d) above to get $\emptyset_{o\ ps}$ reference angle for the reference 2.72b stress level on the failure plane.

| | | | |
|---|---|---|---|
| | ~~STO 30~~ | ← note | ~~$\emptyset$ trial ps.~~ |
| 360 | LBL B | | |
| | RCL 30 | | $\emptyset_t$ |
| | 2 | RCL 30 | for case of $\delta=\emptyset/2$: $\tan\gamma = \frac{\sin\emptyset+\sqrt{1+2\cos\emptyset}}{2+\cos\emptyset}$ |
| | ÷ | COS | |
| | STO 31 | 2 | |
| | ~~31~~ | X | |
| | ~~RCL 30~~ | 1 | |
| | ~~.8~~ | + | |
| | ~~X~~ | √ | |
| | ~~−~~ | RCL 30 | |
| | ~~STO 32~~ | SIN | ~~(31°.8Ø)-(γ-Ø)~~ |
| | ~~62~~ | + | |
| | ~~RCL 30~~ | RCL 30 | |
| | ~~.6~~ | COS | |
| | ~~X~~ | 2 | |
| | ~~−~~ | + | |
| | ~~STO 33~~ | ÷ | ~~(62°.6Ø)=(2γ-Ø)~~ |
| | ~~67~~ | tan⁻¹ | |
| | ~~RCL 30~~ | STO 32 | |
| | ~~.8~~ | 2 | |
| 380 | ~~X~~ | X | |
| | ~~+~~ | STO 33 | ~~Ω°=67+.8Ø~~ |
| | D-R | RCL 30 | |
| | STO 34 | ST-32 | |
| | R-D | ST-33 | |
| | RCL 30 | 98 | |
| | − | RCL 32 | |
| | STO 35 | − | |

(c) substitute of a formula derived from Durgunuglu & Mitchell for special case of delta = $\emptyset_{ps}/2$ to replace approx. formulas used previously.

RECENT CHANGES IN THE

41CV PROGRAM FOR DATA REDUCTION

IN THE FIELD

BACK

SCHMERTMANN & CRAPPS, INC. TEST NO. D-1
FILE NAME:
FILE NUMBER: 83-526 (test in New Orleans)

DMT D-2
p. 2 - 6
example
output

RECORD OF DILATOMETER TEST NO. D-1
USING DATA REDUCTION PROCEDURES IN MARCHETTI (ASCE,J-GED,MARCH 80)
KO IN SANDS DETERMINED USING SCHMERTMANN METHOD (1983)
PHI ANGLE CALCULATION BASED ON DURGUNOGLU AND MITCHELL (ASCE,RALEIGH CONF,JUNE 75)
MODIFIED MAYNE AND KULHAWY FORMULA USED FOR OCR IN SANDS (ASCE,J-GED,JUNE 82)

LOCATION: 40 FT. SOUTH OF CASING NO.3 -- SEGMENTAL PILE STUDY, BLADE PUSHED - FACING NORTH
PERFORMED - DATE: 07 JUNE 83
BY: SCHMERTMANN & TUMAY -- GEOGULF CPT TRUCK

CALIBRATION INFORMATION:
DA= .13 BARS DB= .51 BARS ZM= .05 BARS ZW= 1.80 METERS VSO= .180 BARS
ROD DIA.= 3.70 CM FRICTION RED. DIA.= 4.80 CM ROD WEIGHT= 6.50 KG/M DELTA/PHI= .50

1 BAR = 1.019 KG/CM2 = 1.044 TSF = 14.51 PSI ANALYSIS USES H20 UNIT WEIGHT = 1.000 T/M3

| Z | THRUST | A | B | ED | ID | KD | UO | GAMMA | SV | PC | OCR | KO | CU | PHI | M | SOIL TYPE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (M) | (KG) | (BAR) | (BAR) | (BAR) | | | (BAR) | (T/M3) | (BAR) | (BAR) | | | (BAR) | (DEG) | (BAR) | |
| ***** | ****** | ***** | ***** | ***** | ***** | ***** | ****** | ****** | ****** | ***** | ***** | ***** | ***** | ***** | ***** | *********** |
| 1.00 | | 2.65 | 6.05 | 101. | 1.12 | 14.40 | 0.000 | 1.70 | .180 | 3.91 | 21.75 | 2.30 | | | 286. | SILT |
| 1.20 | | 2.05 | 4.55 | 68. | .96 | 9.55 | 0.000 | 1.70 | .213 | 2.44 | 11.45 | 1.79 | | | 166. | SILT |
| 1.40 | | 1.35 | 3.58 | 58. | 1.24 | 5.52 | 0.000 | 1.60 | .245 | | | | | | 111. | SANDY SILT |
| 1.60 | | 1.92 | 3.82 | 46. | .68 | 6.96 | 0.000 | 1.70 | .278 | 1.95 | 7.00 | 1.46 | .29 | | 98. | CLAYEY SILT |
| 1.80 | | 1.62 | 3.22 | 35. | .61 | 5.34 | 0.000 | 1.60 | .310 | 1.43 | 4.62 | 1.22 | .23 | | 65. | CLAYEY SILT |
| 2.00 | | 1.48 | 2.91 | 29. | .55 | 4.70 | .020 | 1.50 | .319 | 1.21 | 3.79 | 1.11 | .20 | | 50. | SILTY CLAY |
| 2.20 | | 1.55 | 3.05 | 31. | .58 | 4.70 | .039 | 1.50 | .329 | 1.25 | 3.79 | 1.11 | .21 | | 54. | SILTY CLAY |
| 2.40 | | 1.55 | 3.05 | 31. | .59 | 4.51 | .059 | 1.50 | .339 | 1.20 | 3.55 | 1.08 | .21 | | 53. | SILTY CLAY |
| 2.60 | | 1.54 | 2.72 | 20. | .37 | 4.34 | .079 | 1.50 | .349 | 1.17 | 3.35 | 1.05 | .20 | | 32. | SILTY CLAY |
| 2.80 | | 1.28 | 3.28 | 50. | 1.20 | 3.31 | .098 | 1.60 | .361 | .79 | 2.20 | .85 | | | 70. | SILT |
| 3.00 | | 1.46 | 2.72 | 23. | .47 | 3.76 | .118 | 1.50 | .370 | .99 | 2.67 | .94 | .18 | | 34. | SILTY CLAY |
| 3.20 | | 1.73 | 3.54 | 43. | .76 | 4.22 | .137 | 1.60 | .382 | 1.23 | 3.21 | 1.03 | .21 | | 69. | CLAYEY SILT |
| 3.40 | | 1.52 | 3.47 | 48. | 1.00 | 3.50 | .157 | 1.60 | .394 | .94 | 2.39 | .89 | | | 69. | SILT |
| 3.60 | | 1.47 | 3.37 | 46. | 1.01 | 3.23 | .177 | 1.60 | .406 | .86 | 2.11 | .83 | | | 63. | SILT |
| 3.80 | | 1.74 | 3.70 | 48. | .89 | 3.73 | .196 | 1.60 | .417 | 1.10 | 2.65 | .93 | .20 | | 73. | CLAYEY SILT |
| 4.00 | | 2.00 | 3.75 | 40. | .64 | 4.21 | .216 | 1.60 | .429 | 1.37 | 3.20 | 1.02 | .24 | | 65. | CLAYEY SILT |
| 4.20 | | 1.72 | 3.05 | 25. | .47 | 3.48 | .236 | 1.50 | .439 | 1.04 | 2.38 | .89 | .19 | | 36. | SILTY CLAY |
| 4.40 | | 1.75 | 3.05 | 24. | .45 | 3.43 | .255 | 1.50 | .449 | 1.04 | 2.32 | .88 | .19 | | 34. | SILTY CLAY |
| 4.60 | | 1.75 | 3.14 | 27. | .52 | 3.31 | .275 | 1.50 | .459 | 1.01 | 2.19 | .85 | .19 | | 37. | SILTY CLAY |
| 4.80 | | 1.78 | 2.98 | 20. | .38 | 3.28 | .294 | 1.50 | .469 | 1.01 | 2.17 | .84 | .19 | | 28. | SILTY CLAY |
| 5.00 | | 1.75 | 3.00 | 22. | .43 | 3.11 | .314 | 1.50 | .478 | .95 | 1.99 | .81 | .18 | | 29. | SILTY CLAY |
| 5.20 | | 1.80 | 3.05 | 22. | .42 | 3.11 | .334 | 1.50 | .488 | .97 | 1.99 | .81 | .19 | | 29. | SILTY CLAY |
| 5.40 | | 1.50 | 3.00 | 31. | .76 | 2.37 | .353 | 1.60 | .500 | .65 | 1.30 | .64 | .14 | | 33. | CLAYEY SILT |
| 5.60 | | 1.70 | 3.03 | 25. | .53 | 2.69 | .373 | 1.50 | .510 | .81 | 1.59 | .72 | .16 | | 29. | SILTY CLAY |
| 5.80 | 940. | 1.44 | 4.47 | 87. | 2.49 | 1.93 | .393 | 1.70 | .523 | .48 | .91 | .41 | | 36.3 | 88. | SILTY SAND |
| 6.00 | 1000. | 1.92 | 3.92 | 50. | .94 | 2.84 | .412 | 1.60 | .535 | .92 | 1.73 | .75 | | | 61. | SILT |
| 6.20 | 1060. | 1.70 | 5.72 | 123. | 3.01 | 2.14 | .432 | 1.80 | .551 | .56 | 1.01 | .43 | | 36.7 | 143. | SILTY SAND |
| 6.40 | | 1.93 | 3.20 | 23. | .43 | 2.72 | .451 | 1.50 | .561 | .91 | 1.62 | .72 | .18 | | 27. | SILTY CLAY |
| 6.60 | | 2.14 | 3.33 | 20. | .34 | 3.02 | .471 | 1.50 | .571 | 1.08 | 1.90 | .79 | .21 | | 25. | CLAY |
| 6.80 | | 2.10 | 3.22 | 17. | .30 | 2.87 | .491 | 1.50 | .580 | 1.02 | 1.76 | .76 | .20 | | 21. | CLAY |
| 7.00 | | 2.40 | 3.66 | 23. | .34 | 3.28 | .510 | 1.50 | .590 | 1.28 | 2.17 | .85 | .24 | | 31. | CLAY |
| 7.20 | | 1.80 | 3.11 | 24. | .53 | 2.19 | .530 | 1.50 | .600 | .69 | 1.16 | .60 | .15 | | 23. | SILTY CLAY |
| 7.40 | | 1.45 | 2.50 | 15. | .45 | 1.57 | .550 | 1.50 | .610 | .42 | .69 | .42 | .10 | | 13. | SILTY CLAY |
| 7.60 | | 1.95 | 3.07 | 17. | .35 | 2.32 | .569 | 1.50 | .620 | .78 | 1.26 | .63 | .16 | | 18. | SILTY CLAY |
| 7.80 | | 1.98 | 2.98 | 13. | .26 | 2.31 | .589 | 1.50 | .629 | .79 | 1.25 | .62 | .17 | | 13. | CLAY |
| 8.00 | | 2.18 | 3.46 | 23. | .41 | 2.53 | .608 | 1.50 | .639 | .92 | 1.45 | .68 | .19 | | 25. | SILTY CLAY |
| 8.20 | | 1.94 | 3.26 | 25. | .53 | 2.09 | .628 | 1.50 | .649 | .70 | 1.07 | .57 | .15 | | 22. | SILTY CLAY |
| 8.40 | | 2.37 | 3.51 | 18. | .30 | 2.70 | .648 | 1.50 | .659 | 1.05 | 1.59 | .72 | .21 | | 21. | CLAY |
| 8.60 | | 2.61 | 3.79 | 20. | .28 | 2.98 | .667 | 1.50 | .669 | 1.25 | 1.87 | .78 | .24 | | 25. | CLAY |
| 8.80 | | 1.89 | 3.61 | 39. | .92 | 1.81 | .687 | 1.60 | .680 | .58 | .85 | .49 | | | 33. | SILT |
| 9.00 | | 2.49 | 3.62 | 18. | .28 | 2.66 | .707 | 1.50 | .690 | 1.08 | 1.56 | .71 | .22 | | 20. | CLAY |
| 9.20 | | 2.65 | 3.90 | 22. | .32 | 2.82 | .726 | 1.50 | .700 | 1.20 | 1.71 | .75 | .24 | | 27. | CLAY |
| 9.40 | | 2.65 | 3.86 | 21. | .31 | 2.75 | .746 | 1.50 | .710 | 1.17 | 1.65 | .73 | .23 | | 24. | CLAY |
| 9.60 | | 2.54 | 3.73 | 20. | .32 | 2.54 | .765 | 1.50 | .720 | 1.04 | 1.45 | .68 | .21 | | 22. | CLAY |
| 9.80 | | 2.58 | 3.70 | 17. | .27 | 2.54 | .785 | 1.50 | .730 | 1.06 | 1.45 | .68 | .22 | | 19. | CLAY |
| 10.00 | | 2.63 | 3.73 | 17. | .26 | 2.55 | .805 | 1.50 | .739 | 1.08 | 1.46 | .68 | .22 | | 18. | CLAY |
| 10.20 | | 2.75 | 4.02 | 23. | .34 | 2.64 | .824 | 1.50 | .749 | 1.15 | 1.54 | .70 | .23 | | 26. | CLAY |
| 10.40 | | 2.80 | 4.05 | 22. | .32 | 2.64 | .844 | 1.50 | .759 | 1.17 | 1.54 | .70 | .24 | | 25. | CLAY |
| 10.60 | | 2.60 | 3.88 | 23. | .38 | 2.32 | .864 | 1.50 | .769 | .97 | 1.26 | .63 | .20 | | 23. | SILTY CLAY |
| 10.80 | | 2.78 | 4.45 | 38. | .56 | 2.47 | .883 | 1.50 | .779 | 1.08 | 1.39 | .66 | .22 | | 40. | SILTY CLAY |
| 11.00 | | 3.12 | 4.45 | 25. | .32 | 2.87 | .903 | 1.50 | .788 | 1.38 | 1.76 | .76 | .27 | | 31. | CLAY |

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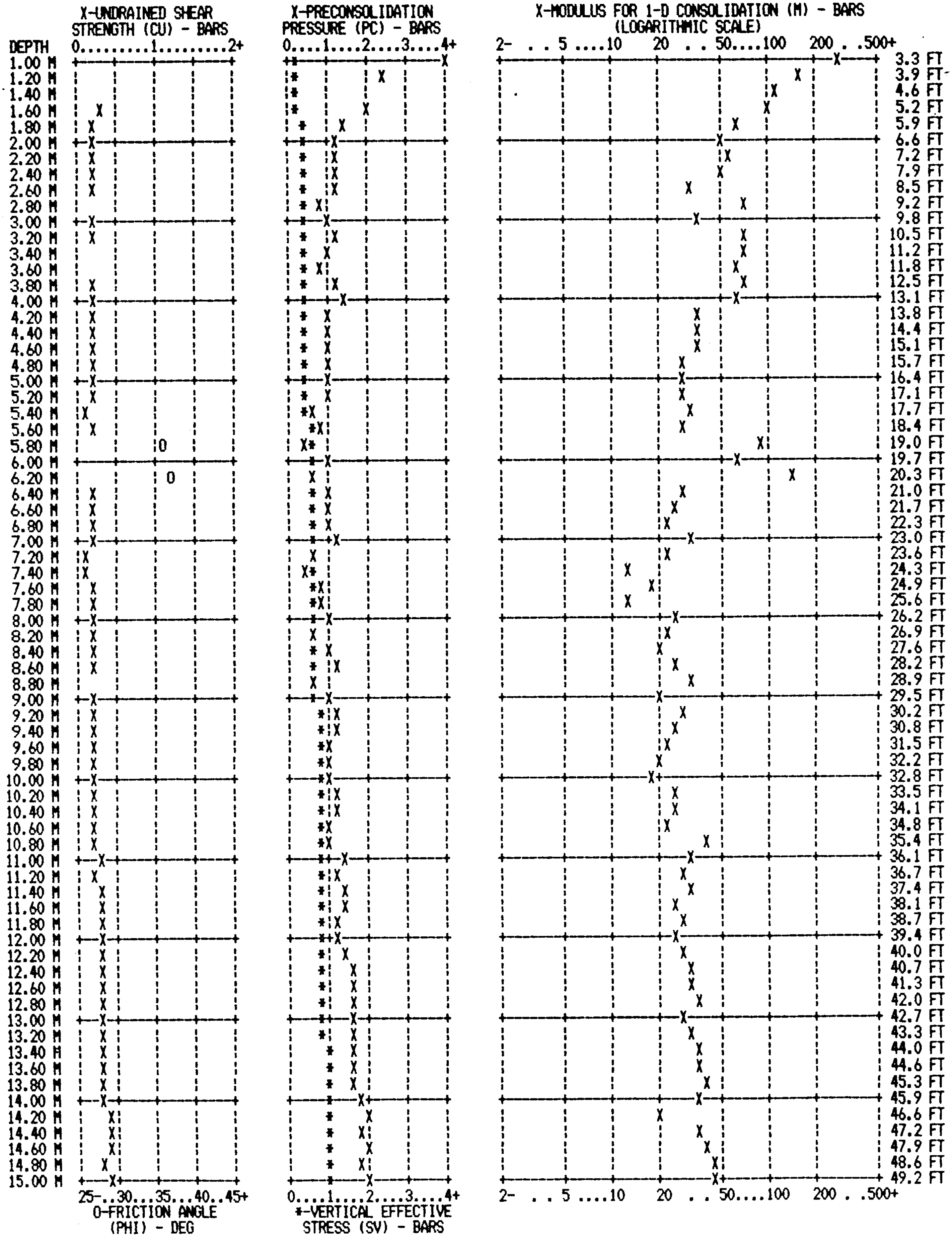
BACK

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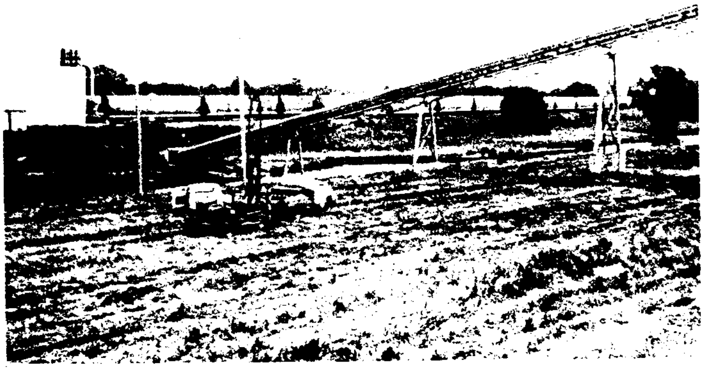
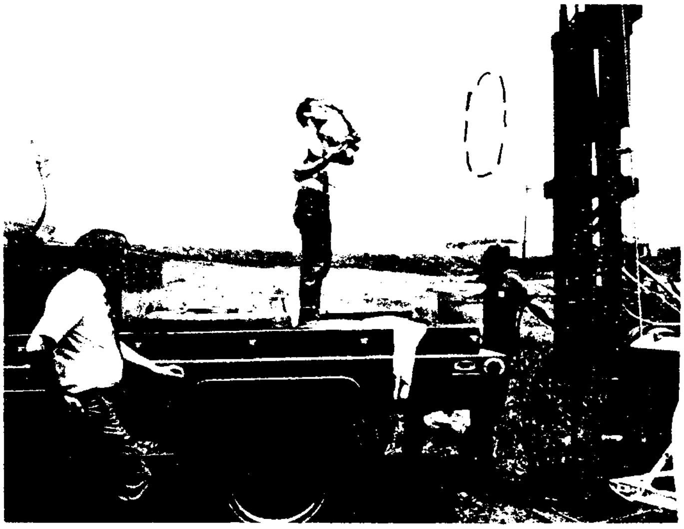
p. 2 - 7 DMT D-2
example output



BACK

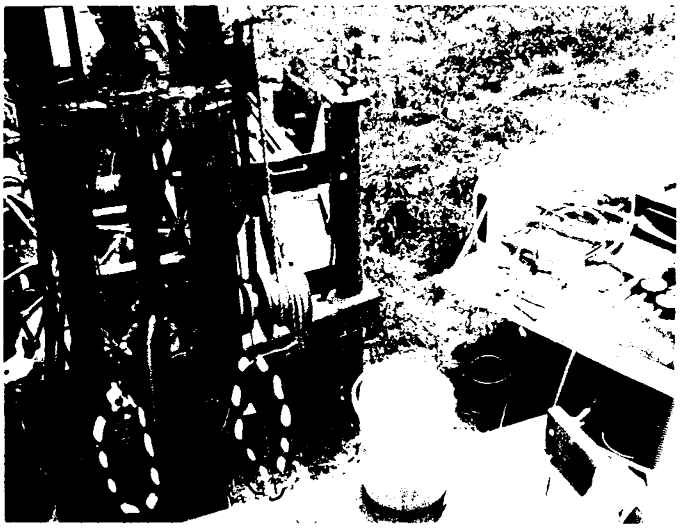


(a) View of drillrig and tractor at the DMT site.



dotted circles show the cables used for hold-down

(b) Tractor providing additional reaction via tensioned cables to back bumper, to aid DMT work in progress.



(c) Looking down from bed of tractor showing DMT equipment on back of pickup truck, and the hydraulic load cell measuring total DMT thrust.

BACK