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G.I.-30 SEPT. 1976

GEOCRES No. 30M14-245

DIST. 6 REGION

W.P. No. 71-84-01

CONT. No.

W. O. No.

STR. SITE No. N/A

HWY. No. 401

LOCATION HWY 401 & LIVERPOOL RD.

INTERCHANGE IMPROVEMENTS O/H SIGNS

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT.

REMARKS:

memorandum

Ontario

To: D. Gunter
Head, Geotechnical Section
Central Region

Date: 85 - 03 - 01

Att: S. Cheng

GEOCRES 30M14-245

Re: W.P. 71-84-01
Hwy. 401 and Liverpool Rd. Interchange Improvement,
Overhead Sign at Sta. 10+170 ± Ramp
(Sta. 28+868 ± Hwy. 401)

Further to your memo of 85-02-05, the Foundation Design Section has advanced two boreholes at the above - mentioned site. This memo serves as a summary of the findings and recommendations.

1. INTRODUCTION

In conjunction with the proposed interchange improvements at Hwy. 401 and Liverpool Rd. it is proposed to erect an overhead sign across the west bound lane of Hwy. 401 and the proposed E-N/S ramp, approximately at (Hwy. 401) Sta. 28+868. One leg of the overhead sign will be located at the Hwy. 401 median and the other leg will be located approximately 10m north of the west bound lane right shoulder. It is estimated that the ground elevation at each leg will be approximately 85.5 m.

2. SUBSURFACE CONDITIONS

Two boreholes were advanced at this site. Record of Borehole sheets for each of the boreholes are attached to this memorandum for reference. One borehole was advanced at each of the west bound lane shoulders approximately at (Hwy. 401) Sta. 28+868. The two boreholes were advanced to depths greater than required in order to establish the character and extent of the upper cohesive deposit.

The subsurface conditions are summarized as follows:

Beneath the asphalt pavement, and extending 1.4 m below the pavement surface, sand and gravel roadway granular was encountered. Standard Penetration Test 'N' values of 30 and 39 blows per 0.3m were obtained through this material. However, as a result of ground frost, these 'N' values may be unrealistically exaggerated.

Underlying this granular sub-base, 0.7 to 0.9 m of brown silty clay, trace sand, trace gravel was encountered. This material may

...2

be a fill since evidence of small organic pockets and other inconsistant soil was noted within the statum. Based on 'N' values ranging from 7 to 14 blows per 0.3 m and a vane test result of greater than 100 kPa, this silty clay of low plasticity (CL) can be considred to have a consistancy of stiff to very stiff.

Underlying this "fill" a stratum of silty clay, trace sand was encountered, extending down to elevation 78.5 to 79 m. At elevation 81 ± m, the colour of this deposit changes from brown to grey. In BH 1 , three vane tests were conducted within the upper zones. In BH 2 four vane tests were conducted.Shear strengths and associated sensitivity values are reported on the log sheets. Generally, the strength of this silty clay of intermediate plasticity (CI) decreases with depth.

Underlying this silty clay deposit is a second silty clay deposit extending down to elevation 76± m. This stratum is described as a silty clay,some sand, trace gravel. This CI-CL deposit is similar to the overlying deposit, however, sand and gravel contents are higher. This stratum generally has a soft to stiff consistancy.

The boreholes were advanced to elevation 74.3 ± m, into a silt, some clay, sand layer. Based on 'N' values of 40 to 59 blows per 0.3 m, this deposit has a dense to very dense relative density.

Groundwater level was not established in this investigation.

3.RECOMMENDATIONS

3.1 Caissons

In view of the fact that the silty clay, trace sand deposit becomes weaker with depth, it is recommended that the caissons be founded at elevation 82m. The following design loads can be used.

30" caisson	175 kN at SLS type II 270 kN at ULS
36" caisson	240 kN at SLS type II 360 kN at ULS

(The 30" caisson extending down to elevation 82m is the minimum requirement.)

The pressure distribution shown on Fig. 1 can be used for the active and passive conditions on the caissons.

...3

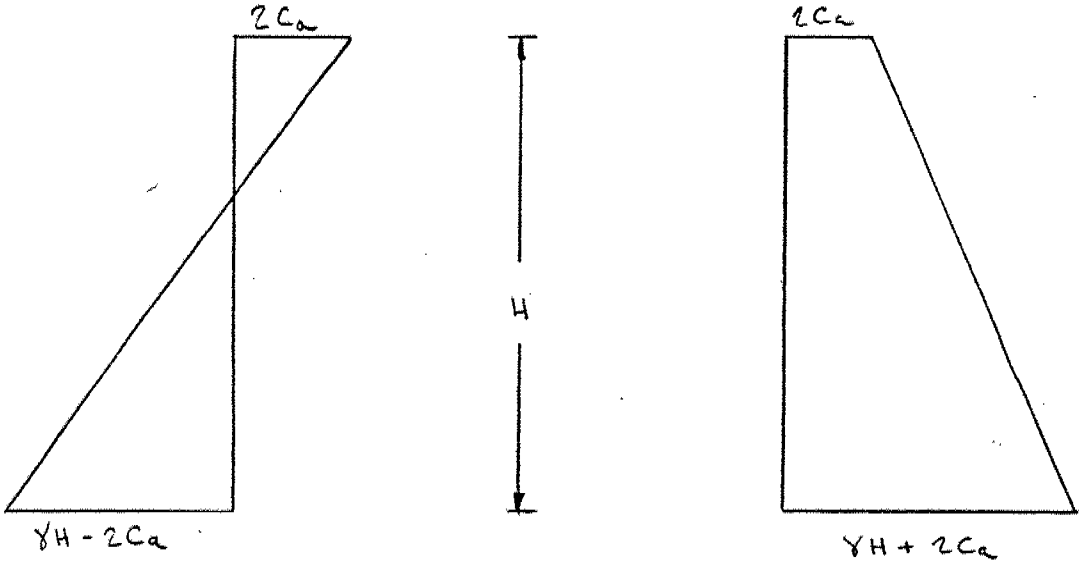

Fig. 1

where γ = 19kN/m^3
C_a= 30 kPa

3.2 SPREAD FOOTINGS

Alternatively, the overhead sign can be founded on spread footings at elevation 83 m using values of 100 kPa at SLS type II and 180 kPa at ULS.

This office would like to review the final drawing of the overhead sign when it becomes available. If you have any questions or require further information please do not hesitate to contact the undersigned.

L. Politano P. Eng.
Project Foundation Engineer

for

M. Devata, P. Eng.
Chief Foundations Engineer (East)

c.c. H. Jagasia

Ministry of Transportation and Communications
Ontario

RECORD OF BOREHOLE No 1 METRIC

W P 71-84-01 LOCATION STA. 28+868 3 m LT. OF 401 ℄ ORIGINATED BY S.W.
DIST 6 HWY 401 BOREHOLE TYPE SOLID STEM AUGER COMPILED BY S.W.
DATUM DATE 85-02-18 CHECKED BY L.P.

SOIL PROFILE ELEV/DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	TYPE	'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPA (○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE)	PLASTIC LIMIT Wp / NATURAL MOISTURE CONTENT W / LIQUID LIMIT W_L — WATER CONTENT (%)	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
85.5 / 0.0	PAVEMENT LEVEL ASPHALT					*					
84.1 / 1.4	SAND AND GRAVEL (FILL)		1	S.S.	39		85				
83.4 / 2.1	SILTY CLAY, TRACE SAND (FILL ?) (CL) BROWN STIFF		2	S.S.	14		84				
	SILTY CLAY, TRACE SAND (CI)		3	S.S.	15		83				
			4	S.S.	7		82				
	FIRM TO VERY STIFF BROWN		5	S.S.	12						
			6	S.S.	6		81				
			7	S.S.	4		80				
78.5 / 7.0	VERY SOFT TO FIRM GREY		8	S.S.	2		79				
	SILTY CLAY, SOME SAND, TRACE GRAVEL, OCCASIONAL SAND SEAMS (CI)		9	S.S.	2		78				
76.1 / 9.4	GREY SOFT						77				
	SILT, SOME CLAY, SAND						76				
74.4 / 11.1	GREY VERY DENSE END OF BOREHOLE		10	S.S.	59		75				

* GROUNDWATER LEVEL NOT ESTABLISHED.

$+^3$, $\times^5$: Numbers refer to Sensitivity

20
15 ⊹ 5 (%) STRAIN AT FAILURE
10

OFFICE REPORT ON SOIL EXPLORATION

Ministry of Transportation and Communications
Ontario

RECORD OF BOREHOLE No 2 METRIC

W P 71-84-01 LOCATION STA. 28+868 16 m LT. OF 401 ℄ ORIGINATED BY S.W.
DIST 6 HWY 401 BOREHOLE TYPE HOLLOW STEM AUGER COMPILED BY S.W.
DATUM — DATE 85-02-18 CHECKED BY L.P.

SOIL PROFILE ELEV/DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	TYPE	'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE)	PLASTIC LIMIT Wp / NATURAL MOISTURE CONTENT W / LIQUID LIMIT W_L — WATER CONTENT (%)	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
85.4	PAVEMENT LEVEL										
0.0	ASPHALT					*	85				
	SAND AND GRAVEL (FILL)		1	SS	30						
84.0							84				
1.4	SILTY CLAY, TRACE SAND, TRACE GRAVEL (FILL ?)		2	SS	7						
83.1							83	>+			
2.3	SILTY CLAY, TRACE SAND (CL)		3	SS	12						
			4	SS	5		82				
	VERY STIFF BROWN							>+			
							81				
			5	S.S.	3			4			
							80				
			6	S.S.	2						
	FIRM TO STIFF GREY							2			
79.0							79				
6.4	SILTY CLAY, SOME SAND, TRACE GRAVEL (CL)		7	S.S.	4						
							78	7			
							77				
76.0	GREY SOFT TO STIFF										
9.4	SILT, SOME CLAY, SAND						76				
							75				
74.3	GREY DENSE		8	S.S.	40						
11.1	END OF BOREHOLE										

* GROUNDWATER LEVEL NOT ESTABLISHED.

+3, ×5 : Numbers refer to Sensitivity

20 / 15 ◇ 5 / 10 (%) STRAIN AT FAILURE

OFFICE REPORT ON SOIL EXPLORATION

memorandum

Ontario

To: R.D. Gunter
Head, Geotechnical Section
5000 Yonge Street

Date: 1985 02 15

Atten: S. Cheng

From: Foundation Design Section
Room 315, Central Building

RE: W.P. 71-84-01
Hwy. 401 and Liverpool Rd. Interchange
Proposed Overhead Sign at Sta. 10 + 170±
(W.B.L.)

Further to your memorandum of 85 02 05, we have reviewed the soils information obtained by the Regional Geotechnical Section. We feel that the information provided is not sufficient for us to make proper recommendations for the overhead sign foundations. Consequently, a foundation investigation is warranted at this site.

This Section intends to carry out the field work on Monday, February 18, 1985 and report on the findings at the earliest opportunity.

L. Politano, P. Eng.
Project Foundations Engineer

For

M. Devata, P. Eng.
Chief Foundations Engineer (East)

LP/mmj

c.c R.Kunkel
H.Jagasia