

## DEPARTMENT OF HIGHWAYS ONTARIO

## MEMORANDUM

TO: Mr. C. S. Moase,  
Manager,  
Special Services Section,  
Admin. Bldg.

FROM: Foundation Section,  
Materials & Research Div.,  
Room 107, Lab. Bldg.

DATE: May 29, 1964

OUR FILE REF.

IN REPLY TO

SUBJECT:

## FOUNDATION INVESTIGATION REPORT

For

Proposed D.H.O. Patrol Yard, Hwy. #3  
County of Elgin, Twp. of Dunwich,  
Con. 7, Lot 10, District #2

W.J. 64-F-27 -- W.P. (N11)

It is proposed to erect a D.H.O. Patrol Garage on Hwy. #3, approx. 1.5 miles west of the Village of Wallacetown. A request for a foundation investigation was received from Mr. C. S. Moase, dated April 1, 1964.

In order to determine the properties of the soil and decide on the type of foundations, an investigation was carried out by this Section. The field investigation was confined to three sampled boreholes, supplemented by four cone penetration tests.

The elevations, as well as the locations of the boreholes, are shown on Dwg. No. 64-F-27A, attached to this report.

The stratigraphy of the soil throughout the site, was found to be quite uniform. The upper 20" to 24" consist of organic topsoil followed by compact to very dense silty fine sand, which in turn, is underlain by stiff to very stiff clayey sandy silt - (glacial till).

cont'd. /2 ...

May 29, 1964

The safe bearing pressure for spread footings, 2 feet wide, at a depth of 6 feet below ground level, is estimated to be 2.5 tons/sq.ft.

At the time of the investigation, the ground water level was encountered approx. 5'-0" below existing ground elevations.

The sand pile, at any location, may be built without danger of base failure.

Because of the granular and therefore permeable character of the subsoil, the probability of salt contamination is very real, and this fact should be kept in mind when final consideration is given to this site.

Attention is drawn to the existence of wells located approx. 300 feet east and 800 feet north, respective.

The recommendations given by the Regional Materials Engineer for grading and paving, are as follows:

It is recommended that 24" of granular material consisting of 4" G.B.C. Class "A" over 20" Sand Cushion be provided on all roads and parking areas. Sources of material suitable for Sand Cushion are located north of Dutton along Highway 401. These sources have been used extensively in the construction of Hwy. 401. The Kintyre area also contains sources of Sand Cushion material. Sources of crushable material are located at some distance from the project. The closest sources of G.B.C. Class "A" material are located east of St. Thomas, at Komoka and Byron.

The depth of topsoil may be taken as 20" for estimating purposes.

cont'd. /2 ...

May 29, 1964

Hot Mix pavement should consist of 2" HL-6 Binder Course and 1-1/2" top course.

The field work, performed during April 23 and 24, 1964, together with the preparation of this report, was undertaken by Mr. W. W. Kulmatickas, Project Foundation Engineer. The investigation was carried out under the supervision of Mr. K. G. Selby, Senior Foundation Engineer.

We believe the information contained in this report will suffice for your design work. However, should further information be required, please do not hesitate to contact our Office.

WWK/MdeF  
Attach.

*A. G. Stermac*  
A. G. Stermac,  
PRINCIPAL FOUNDATION ENGINEER

cc: Messrs. C. S. Moase (4)  
E. J. Orr  
H. D. McMillan  
H. C. Dernier  
J. Roy  
A. Watt

Foundations Office  
Gen. Files ✓

APPENDIX I

L

LONG DOWN 1 APR 14/4 913A VR

H C DERNIER DIST ENGR

ATTN R A SHANNON MICE ENGR

FOUNDATION SECTION WILL START FIELD WORK FOR PROPOSED

STRUCTURE VP201-64 AT WATERFORD APRIL 14TH/64

AT COMPLETION OF THIS WE WILL CARRY OUT FIELD WORK

FOR PROPOSED PATROL YARD AT WALLACETOWN LOT 30 CON 7 TWP DUNNIGH

K G SELBY SR FOUNDATION ENGR FOR A G STERNAC PRINC FOUND ENGR

MATS & RES DIV

SP

00026

LONG DOWN 1 APR 14/4 913A VR

64-7-27

DEFECTS IN NEGATIVE DUE TO  
CONDITION OF ORIGINAL DOCUMENT

## ABBREVIATIONS USED IN THIS REPORT

### PENETRATION RESISTANCE

STANDARD PENETRATION RESISTANCE 'N' - THE NUMBER OF BLOWS REQUIRED TO ADVANCE A STANDARD SPLIT SPOON SAMPLER 12 INCHES INTO THE SUBSOIL, DRIVEN BY MEANS OF A 140 POUND HAMMER FALLING FREELY A DISTANCE OF 30 INCHES.

DYNAMIC PENETRATION RESISTANCE :- THE NUMBER OF BLOWS REQUIRED TO ADVANCE A 2 INCH, 60 DEGREE CONE, FITTED TO THE END OF DRILL RODS, 12 INCHES INTO THE SUBSOIL, THE DRIVING ENERGY BEING 350 FOOT POUNDS PER BLOW.

### DESCRIPTION OF SOIL

THE CONSISTENCY OF COHESIVE SOILS AND THE RELATIVE DENSITY OR DENSENESS OF COHESIONLESS SOILS ARE DESCRIBED IN THE FOLLOWING TERMS :-

<u>CONSISTENCY</u>	<u>'N' BLOWS / FT.</u>	<u>c LB. / SQ. FT.</u>	<u>DENSENESS</u>	<u>'N' BLOWS / FT.</u>
VERY SOFT	0 - 2	0 - 250	VERY LOOSE	0 - 4
SOFT	2 - 4	250 - 500	LOOSE	4 - 10
FIRM	4 - 8	500 - 1000	COMPACT	10 - 30
STIFF	8 - 15	1000 - 2000	DENSE	30 - 50
VERY STIFF	15 - 30	2000 - 4000	VERY DENSE	> 50
HARD	> 30	> 4000		

### TYPE OF SAMPLE

S.S.	SPLIT SPOON	T.W.	THINWALL OPEN
W.S.	WASHED SAMPLE	T.P.	THINWALL PISTON
S.B.	SCRAPER BUCKET SAMPLE	O.S.	OESTERBERG SAMPLE
A.S.	AUGER SAMPLE	F.S.	FOIL SAMPLE
C.S.	CHUNK SAMPLE	R.C.	ROCK CORE
S.T.	SLOTTED TUBE SAMPLE		
	P.H.	SAMPLE ADVANCED HYDRAULICALLY	
	P.M.	SAMPLE ADVANCED MANUALLY	

### SOIL TESTS

Qu	UNCONFINED COMPRESSION	L.V.	LABORATORY VANE
Q	UNDRAINED TRIAXIAL	F.V.	FIELD VANE
Qcu	CONSOLIDATED UNDRAINED TRIAXIAL	C	CONSOLIDATION
Qd	DRAINED TRIAXIAL	S	SENSITIVITY

# ABBREVIATIONS USED IN THIS REPORT

## SOIL PROPERTIES

$\gamma$	UNIT WEIGHT OF SOIL (BULK DENSITY)
$\gamma_s$	UNIT WEIGHT OF SOLID PARTICLES
$\gamma_w$	UNIT WEIGHT OF WATER
$\gamma_d$	UNIT DRY WEIGHT OF SOIL (DRY DENSITY)
$\gamma'$	UNIT WEIGHT OF SUBMERGED SOIL
G	SPECIFIC GRAVITY OF SOLID PARTICLES $G = \frac{\gamma_s}{\gamma_w}$
e	VOID RATIO
n	POROSITY
w	WATER CONTENT
$S_r$	DEGREE OF SATURATION
$w_L$	LIQUID LIMIT
$w_p$	PLASTIC LIMIT
$I_p$	PLASTICITY INDEX
s	SHRINKAGE LIMIT
$I_L$	LIQUIDITY INDEX = $\frac{w - w_p}{I_p}$
$I_c$	CONSISTENCY INDEX = $\frac{w_L - w}{I_p}$
$e_{max}$	VOID RATIO IN LOOSEST STATE
$e_{min}$	VOID RATIO IN DENSEST STATE
$I_D$	DENSITY INDEX = $\frac{e_{max} - e}{e_{max} - e_{min}}$
	RELATIVE DENSITY $D_r$ IS ALSO USED
h	HYDRAULIC HEAD OR POTENTIAL
q	RATE OF DISCHARGE
v	VELOCITY OF FLOW
i	HYDRAULIC GRADIENT
k	COEFFICIENT OF PERMEABILITY
j	SEEPAGE FORCE PER UNIT VOLUME
$m_v$	COEFFICIENT OF VOLUME CHANGE = $\frac{-\Delta e}{(1+e)\Delta\sigma}$
$c_v$	COEFFICIENT OF CONSOLIDATION
$C_c$	COMPRESSION INDEX = $\frac{\Delta e}{\Delta \log_{10} \sigma}$
$T_v$	TIME FACTOR = $\frac{c_v t}{d^2}$ (d, DRAINAGE PATH)
U	DEGREE OF CONSOLIDATION
$\tau_f$	SHEAR STRENGTH
$c'$	EFFECTIVE COHESION
$\phi'$	EFFECTIVE ANGLE OF SHEARING RESISTANCE, OR FRICTION
$c_u$	APPARENT COHESION
$\phi_u$	APPARENT ANGLE OF SHEARING RESISTANCE, OR FRICTION
$\mu$	COEFFICIENT OF FRICTION
$S_t$	SENSITIVITY

## GENERAL

$\pi$	= 3.1416
e	BASE OF NATURAL LOGARITHMS 2.7183
$\log_e a$ OR $\ln a$	NATURAL LOGARITHM OF a
$\log_{10} a$ OR $\log a$	LOGARITHM OF a TO BASE 10
t	TIME
g	ACCELERATION DUE TO GRAVITY
V	VOLUME
W	WEIGHT
M	MOMENT
F	FACTOR OF SAFETY

## STRESS AND STRAIN

u	PORE PRESSURE
$\sigma$	NORMAL STRESS
$\sigma'$	NORMAL EFFECTIVE STRESS ( $\bar{\sigma}$ IS ALSO USED)
$\tau$	SHEAR STRESS
$\epsilon$	LINEAR STRAIN
$\gamma$	SHEAR STRAIN
$\nu$	POISSON'S RATIO ( $\mu$ IS ALSO USED)
E	MODULUS OF LINEAR DEFORMATION (YOUNG'S MODULUS)
G	MODULUS OF SHEAR DEFORMATION
K	MODULUS OF COMPRESSIBILITY
$\eta$	COEFFICIENT OF VISCOSITY

## EARTH PRESSURE

d	DISTANCE FROM TOP OF WALL TO POINT OF APPLICATION OF PRESSURE
$\delta$	ANGLE OF WALL FRICTION
K	DIMENSIONLESS COEFFICIENT TO BE USED WITH VARIOUS SUFFIXES IN EXPRESSIONS REFERRING TO NORMAL STRESS ON WALLS
$K_0$	COEFFICIENT OF EARTH PRESSURE AT REST

## FOUNDATIONS

B	BREADTH OF FOUNDATION
L	LENGTH OF FOUNDATION
D	DEPTH OF FOUNDATION BENEATH GROUND
N	DIMENSIONLESS COEFFICIENT USED WITH A SUFFIX APPLYING TO SPECIFIC GRAVITY, DEPTH AND COHESION ETC. IN THE FORMULA FOR BEARING CAPACITY
$k_s$	MODULUS OF SUBGRADE REACTION

## SLOPES

H	VERTICAL HEIGHT OF SLOPE
D	DEPTH BELOW TOE OF SLOPE TO HARD STRATUM
$\beta$	ANGLE OF SLOPE TO HORIZONTAL

Mr. G.A. Wrong

May 14, 1964.

Downsview

Principal Soils Engineer-

Re: Wallacetown Patrol Yard.

Materials & Research-London

District 2, London.

This memo will serve as the soils design report for the above mentioned project.

A soils survey was carried out in April 1964. Hand auger holes were placed to a depth of 4 feet below existing ground elevation. Below an average depth of 14" of topsoil a very fine to fine sandy loam to a very fine to fine sand was encountered. This sandy material was found to be in a saturated condition at the time of the investigation.

It is recommended that 24" of granular material consisting of 4" G.B.C. Class A over 20" sand cushion be provided on all roads and parking areas. Sources of material suitable for sand cushion are located north of Dutton along Highway 401. These sources have been used extensively in the construction of Highway 401. The Kintyre area also contains sources of sand cushion material. Sources of crushable material are located at some distance from the project. The closest sources of G.B.C. Class A material are located east of St. Thomas, at Komoka and Byron.

The depth of topsoil may be taken as (14") for estimating purposes.

Hot mix pavement should consist of 2" H.L. 6 binder course and 1½" H.L. 3 top course.

DS/jb

cc: A. Gater

A. Stermac

B. Collins

file

for:

*D. Suzuki*

D. Suzuki

J.R. Roy

Regional Materials Engineer



#64-F-27

HWY. #3

WALLACE TOWN

PATROL YARD

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