

G.I.-30 SEPT. 1976

REMARKS: _____



Memorandum

31M-43

GEOCREC No.

To: Mr. J. McAllister (2),
Regional Structural Planning Supervisor,
Northern Region, North Bay.

From: Soil Mechanics Section,
Geotechnical Office,
West Building, Downsview.

Attention:

Date: November 14, 1975.

NOV 20 1975

Our File Ref. W.O. 75-50120

In Reply to

Subject:

FOUNDATION INVESTIGATION REPORT

for

the Proposed Structure at
the Crossing of the Local
Municipal Road* and the
Evanturel Creek
* (Formerly Hwy. 562)
New Liskeard District, Concession 1
Township of Beauchamp
W.O. 75-50120 Site 47-155

Attached we are forwarding to you our detailed Foundation Investigation Report on the subsoil conditions existing at the above mentioned site.

We believe that the factual data and recommendations contained therein will prove adequate for your requirements. Should additional information be required, please do not hesitate to contact our Office.

M. Devata,
Supervising Engineer.

cc: K. Kleinsteinber,
E.J. Orr,
B.R. Davis,
B.J. Giroux,
G.A. Wrong,
S. McCombie,
J.E. Gruspier,
T.A. Sharpe,
R. Hore,
J. Anderson)
R. Murphy) memo only
G. Sloan)

Files,
Record Services.



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FOUNDATION INVESTIGATION REPORT

for

the Proposed Structure at
the Crossing of the Local
Municipal Road* and the
Evanturel Creek

* (Formerly Hwy. 562)

New Liskeard District, Concession I
Township of Beauchamp
W.O. 75-50120 Site 47-155

1. INTRODUCTION

The Soil Mechanics Section was requested to carry out a subsurface investigation for the proposed new structure at the crossing of the local municipal road (formerly Hwy. 562) and the Evanturel Creek. This request from J.C. McAllister, Regional Structural Planning Supervisor, Northern Region, was confirmed in a memo dated July 28, 1975. The investigation was subsequently effected by the Section to determine the subsoil and ground-water conditions in the area of the proposed structure. This Report summarizes the results of the field investigation and includes the Section's recommendations pertaining to the design of the structure foundations, together with the stability and settlement considerations of the approaches to the proposed structure.

2. DESCRIPTION OF SITE

The site is located 5.7 miles west of the intersection of Hwy. 571 and Hwy. 562 along the alignment of the local road (formerly Hwy. 562). This intersection is located 3 miles south of Earlton on Hwy. 571. The site of the new structure is located 400 feet west of the crossing of the local municipal road and the Evanturel Creek, Lot 6, Concession I, Township of Beauchamp, New Liskeard District. At this location, the Evanturel Creek flows through a broad river valley with steep river banks that presently contain the meandering nature of the Creek.

At the crossing of the local municipal road, the Evanturel Creek is approximately 23 feet wide. The depth of water in the creek varied between 3 and 4 feet at the time of the investigation. The Evanturel Creek bed is

strewn with rounded cobbles and boulders ranging from 0.5 to 1.5 feet in size. The meandering nature of the Evanturel Creek accelerates the flow of the water at the crossing.

At the site location, 4 foot high brush is the predominant vegetation, changing to tall pine trees located approximately 30 feet north of the road, extending to the river's edge. The principal land use in the vicinity of the site is agricultural, with small farms in the Evanturel Creek area.

Presently, the Evanturel Creek passes through 4 Structural Steel Plate culverts at the crossing of the local municipal road. The culverts range in diameter from 24 inches (outer 2 culverts) to 36 inches (inner 2 culverts). Differential settlements within the earth and rockfill embankment carrying the local municipal road over the Evanturel Creek are evidenced by small depressions in the gravelly sand road surface.

Approximately 150 feet north of the culvert installation, the northward flowing Evanturel Creek bends to the west in a rather sharp meander. Immediately north of this bend, a 40 foot high clayey bluff is evident. It appears that the failure is of the slump variety caused by the erosive action of the creek at the toe of the slope.

3. FIELD AND LABORATORY WORK

Four boreholes, 2 of which were accompanied by dynamic cone penetration tests, were put down during the course of the field investigation. The borings and the penetration tests were effected by means of a continuous flight auger machine (C.M.E. 55, Muskeg Vehicle, Hollow Stem) adapted for soil sampling purposes.

Samples of the overburden were obtained at required depths by means of a 2 inch O.D. split spoon sampler, the sampling carried out according to the specifications for the Standard Penetration Test. This method was also used to advance the dynamic cone penetration tests. The groundwater conditions were observed by recording the water levels in the open boreholes during the course of the field investigation. The soil and groundwater conditions encountered in the borings are presented on the Record of Borehole sheets. The boring locations and elevations, together with the

estimated stratigraphical sections are shown on Drawing No. 75-50120. Surveying was carried out by construction personnel from District 14. Additional staking out of boring locations was carried out by the writer. Elevations of the boreholes are referenced to a local datum.

All samples were subjected to a careful inspection and classification, both in the field and in the laboratory. Following this examination, various laboratory tests were carried out on representative samples to determine the physical properties of the overburden, namely:

- Natural Moisture Contents
- Organic Contents
- Atterberg Limits
- Grain Size Distributions

The results of the laboratory testing are plotted on the Record of Borehole Sheets and summarized on Figures No. 1, 2 and 3 inclusive, all of which are contained in the Appendix of this report.

4. SOIL CONDITIONS

(4.1) General

Two principal soil types were encountered at the site. A cohesive stratum of soft to firm organic clay to organic silt, varying in thickness from 10.0 to 13.0 feet, overlies an extensive granular deposit which extends to 80 feet below the ground surface, varying from gravelly sand to sand of a compact to very dense nature.

The boundaries of the various deposits as determined in the boreholes are shown on the Record of Borehole sheets. The stratigraphical sections, as shown on Drawing No. 7550120, have been inferred from this data. From the ground surface downward, the soil types are described in the subsections to follow.

(4.2) Organic Clay to Organic Silt

The cohesive deposit of organic clay extends generally to depths ranging between 10 and 13 feet below the ground surface. The organic clay changes to organic silt with depth and the consistency of the material varies from soft to firm. The physical properties of this stratum were evaluated in the laboratory and are tabulated below.

<u>Property</u>	<u>Range</u>
Liquid Limit (W_L) %	27- 82
Plastic Limit (W_p) %	20- 70
Moisture Content (W) %	39-117
Organic Content %	2- 8

Undrained in situ shear strengths measurements were obtained using a standard M.T.C. field vane. The values of the undrained shear strength derived from the field vane tests ranged from 440 to 1300 PSF. However, a shear strength of 1760 PSF was found, but was not considered representative of the soil because of the influence of wood chips and other organic debris within the cohesive deposit.

(4.3) Granular Deposit

Immediately below the organic stratum, a granular deposit extends to at least a depth of 80 feet below the ground surface. The upper 7.0 feet of this layer consists of very dense gravelly sand with 'N' values ranging from 81 to 95 blows per foot. The gravel fraction of this deposit diminishes below Elev. 80 (20 feet below the ground surface). Below this elevation, the granular deposit consists of grey sand, although traces of silt and gravel were evident to a depth of 30 feet below the ground surface. 'N' values for this sandy layer ranged from 13 to 71 blows per foot indicating a relative density ranging from compact to very dense.

5. GROUNDWATER CONDITIONS

Groundwater conditions were observed by recording the water levels in the open boreholes during the course of the field investigation. Recordings established the groundwater level at depths ranging from 5 to 9 feet below the existing ground surface.

Artesian water conditions were evident in B.H. No. 1. As the borehole

was advanced through the gravelly sand layer immediately below the organic deposit, the water level within the BX casing rose about 3 inches per minute. Overnight, the water level in the casing increased to 2.3 feet above the existing ground surface. Other zones of artesian water were suspected at greater depths into the sandy layer of the granular deposit.

6. DISCUSSION AND RECOMMENDATIONS

(6.1.1) General

It is proposed to re-align Evanturel Creek approximately 400 feet west of the existing crossing with a local municipal road (formerly Hwy. 562). The proposed diversion of the Creek will not affect the existing alignment of the local municipal road, although the final grade will be established at Elev. 111.

(6.1.2) Design Requirements

The following recommendations for a structure at the proposed location were suggested by J.C. McAllister, Regional Structural Planning Supervisor.

- (1.) Size: provide a minimum effective opening of 40.0 feet.
- (2.) Location: on diversion at sta. 5+75 with 0° skew.
- (3.) Soffit: minimum soffit set at elev. 106.5, i.e. 3 feet above maximum reported HWL.
- (4.) Creek bed elevation at crossing should be at elev. 87.5.
- (5.) Diversion should provide a base width of 35 feet with 2:1 side slopes.
- (6.) Side slopes of 1½:1 and the bed of the stream should be protected with 2 feet of rip-rap for distances of 20 feet upstream and downstream of the crossing.
- (7.) Within the structure limits the width of the stream bed at Elev. 87.5 is 16 feet.

(6.1.3)

The subsoil at the site consists of 2 principal soil types; namely, a 10-13 foot thick stratum of organic clay to organic silt

which overlies a granular deposit ranging from gravelly sand, changing with depth, to sand extending to at least 80.0 feet below the ground surface.

Artesian water emanating from the upper portion of the granular deposit was evident during the course of the foundation investigation.

(6.2) Structure Foundations

(6.2.1)

Two schemes are considered for the proposed crossing of the local municipal road in the vicinity of Evanturel Creek; namely, a single span structure to accommodate the aforementioned geometry, or a structural steel pipe arch culvert of dimensions 24 feet by 16 feet.

(6.2.2) Approach Embankments

Should either scheme be selected, the organic stratum must be completely excavated from Sta. 5+00 to Sta. 6+50 to the full base width of the embankment and replaced with granular material or rockfill before the construction of the embankments. Slopes of 2:1 for granular fill and 1½:1 for rockfill should provide stable conditions.

(6.2.3) Structure Foundations

Scheme I

Spread footings in the upper gravelly sand layer can support the box foundations at the abutment locations. However, an extensive dewatering scheme would be required to provide dry working conditions. Alternatively, the abutments can be founded on timber piles, but difficulty is anticipated in the driving of the piles through the very dense gravelly sand layer immediately below the organic deposit. Damage to the timber piles is anticipated in the process of driving the piles through this layer. The foundation investigation revealed the absence of a competent end-bearing stratum to a depth of 80.0 feet below the ground surface.

Since the construction for the proposed structure shall be carried out by day labour forces, the structure should not be of a

complex nature. Because the organics will be completely removed to ensure the stability of the approaches, it is therefore desirable to construct the approaches with rockfill placed on the firm bottom and to support the abutments within this rockfill. The abutments should be founded at as high an elevation as possible so that any dewatering problems can be minimized. A minimum distance of 10 feet must be maintained between the furrowed face of the footing and the forward slope. Loads up to 2.5 TSF are allowable on the fill material. If rockfills are incorporated in the scheme, slopes could be reduced to $1\frac{1}{2}:1$ from $1\frac{1}{2}:1$, thereby reducing the overall length of the structure.

Alternatively, the abutments could be constructed on rock-filled timber cribs founded on the dense gravelly sand layer immediately below the organics. Any settlements induced by this surcharge will be of elastic nature and of a negligible magnitude.

Scheme 2

Alternatively, a multi-plate steel pipe arch scheme can be selected provided the organics are removed as discussed elsewhere. Since the excavated area would be inundated with water, a dewatering scheme may be necessary to place the bedding and backfilling up to the haunches. The bedding and backfilling operations should conform to M.T.C. Standards. The placing of the pipe can be carried out underwater provided that any annular space between the bedding and backfilling material (up to the haunches) and the pipe, can be grouted after installation of the pipe to ensure that the load is uniformly distributed to the subsoil.

Should additional information pertaining to this operation be required, this Section will provide the data based on previous experience in the underwater installation of a steel pipe arch. The following recommendations apply to the proposed pipe arch culvert.

1. A 3 foot thick blanket of approved impermeable material (clay) should be placed as a sealer behind the 2 foot rip-rap, at the inlet to the culvert.
2. A 3 foot thick blanket of granular 'A' material should be placed as a filter behind the 2 foot rip-rap, around the

outlet to the culvert.

3. Only granular 'B' material should be used for backfill purposes.

4. The fill surrounding the culvert should be well-compacted and brought up evenly on either side.

If rockfill is not used, the area of fill in contact with the water, up to the high water level, should be rip-rapped according to hydrological requirements as mentioned previously.

7. MISCELLANEOUS

The field work, performed during the period of August 20 to August 26, inclusive, 1975, was carried out under the immediate supervision of Mr. R.W. Barnes, Project Engineer.

The drilling equipment was owned and operated by Master Soil Investigation Ltd., Toronto.

This report was prepared by R.W. Barnes under the general supervision of Mr. M. Devata, Supervising Foundation Engineer, who also reviewed this report.

R. W. Barnes

R.W. Barnes,
Project Engineer.

M. Devata

M. Devata,
Supervising Engineer.

November, 1975



APPENDIX

ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 1

W.O. 75-50120

LOCATION Sta. 5 + 75 30' Rt.

ORIGINATED BY RB

DIST 14 HWY Loc.-Mun.

BORING DATE August 20 - 26, 1975

COMPILED BY HS

DATUM Assumed

BOREHOLE TYPE 3 1/2" Hollow Stem Augers, BX Casing

CHECKED BY M. J.

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20 40 60 80 100					w_p w w_L				
							SHEAR STRENGTH					WATER CONTENT %				
							○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE					20 40 60				
100.0	Ground Level															
0.0	Organic clay,changing to organic silt with depth.		1	SS	5											
	Soft to Firm (wood fragments with sand)		2	SS	3											
87.0			3	TW	PH											
13.0	Sand with gravel, trace of silt & clay.		4	TW	PM											
	Very Dense to Compact		5	SS	95											
			6	SS	80											
	Grey		7	SS	15											
			8	TW	PM											
70.0			9	TW	PH											
30.0			10	SS	32											
	Sand		11	SS	33											
	Fine - Medium Grained		12	SS	196											
	Compact to Very Dense		13	SS	71											
			14	WS	-											
	Grey		15	SS	23											
			16	WS	-											
			17	SS	26											
			18	WS	-											
			19	SS	140.6"											
			20	WS	-											
			21	SS	27											
			22	WS	-											
			23	SS	21											
			24	WS	-											
			25	SS	31											
15.0																
85.0	End of Borehole															
	Note: In situ veins are not considered representative values of undrained strength due to presence of wood chips.															

RECORD OF BOREHOLE No 3

W.O. 75-50120

LOCATION Sta. 5 + 73 17' Lt.

ORIGINATED BY RB

DIST 14 HWY Loc.-Mun.

BORING DATE August 26, 1975

COMPILED BY HS

DATUM Assumed

BOREHOLE TYPE 3 1/2" Hollow Stem Augers & Cone Test

CHECKED BY *H. D.*

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	W_P	W	W_L		
100.0	Ground Level															
0.0	Organic clay, trace of sand. Soft to Firm Brown		1	TW	PM										104.5	0 9 85 6
90.0			2	TW	PM											
10.0	Gravelly sand to sand															0 91 (9)
86.0	Grey Dense		3	SS	61											62 34 (4)
14.0	End of Borehole															
25.0																
75.0	End of Cone Test															

OFFICE REPORT ON SOIL EXPLORATION

ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

W.F. W.O. 75-50120 LOCATION Sta. 6 + 25 21' Rt. ORIGINATED BY RB
DIST 14 HWY Loc.-Mun. BORING DATE August 26, 1975 COMPILED BY HS
DATUM Assumed BOREHOLE TYPE 3 1/4" Hollow Stem Auger CHECKED BY M.T.

[illegible]

OFFICE REPORT ON SOVIET EXPLORATION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO
ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 5

W.O. 75-50120 LOCATION Sta. 6 + 75 21' Rt. ORIGINATED BY RB
DIST 14 HWY Loc.-Mun. BORING DATE August 26, 1975 COMPILED BY HS
DATUM Assumed BOREHOLE TYPE 3 1/2" Hollow Stem Augers CHECKED BY M.S.

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	w_p	w	w_L		
99.±	Ground Level															
0.0	Organic clay, some sand. Brown Soft to Firm		1	TW	PM	90										
87.0			2	TW	PM											
85.5	Grav. with sa. Compact		3	SS	23											
13.5	End of Borehole															

OFFICE REPORT ON SOIL EXPLORATION

GRAIN SIZE DISTRIBUTION

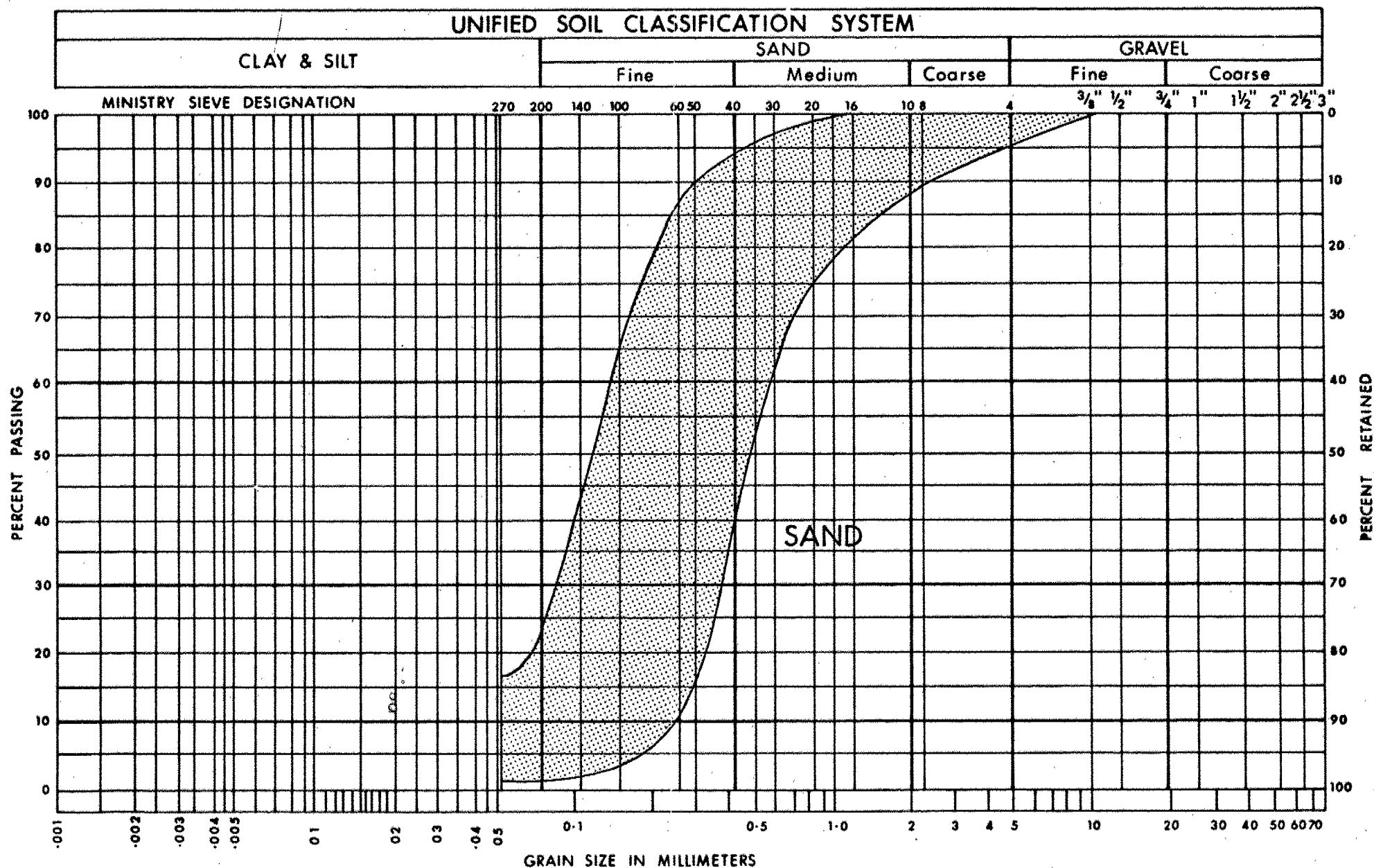


FIG. 1

GRAIN SIZE DISTRIBUTION

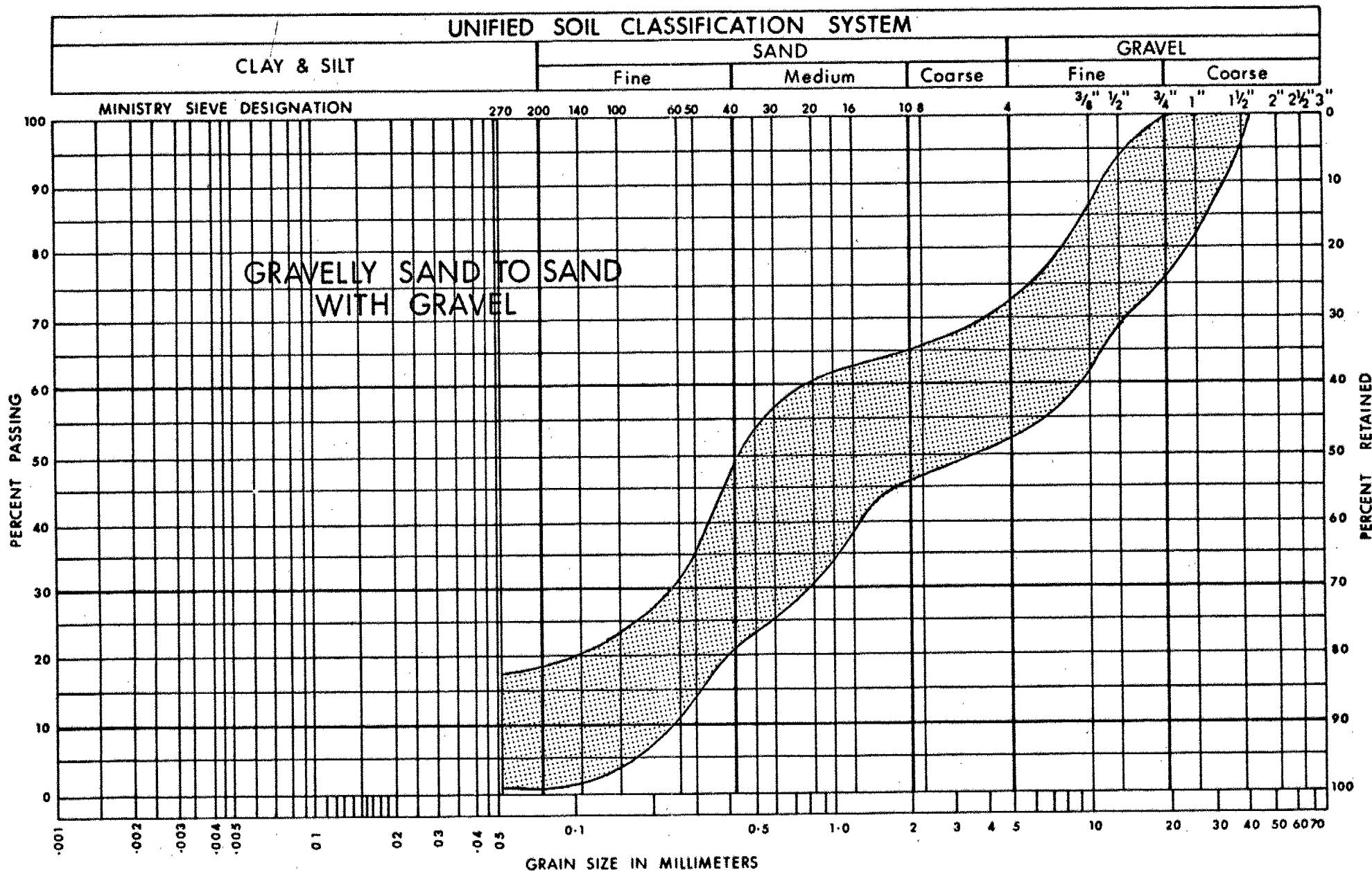


FIG. 2

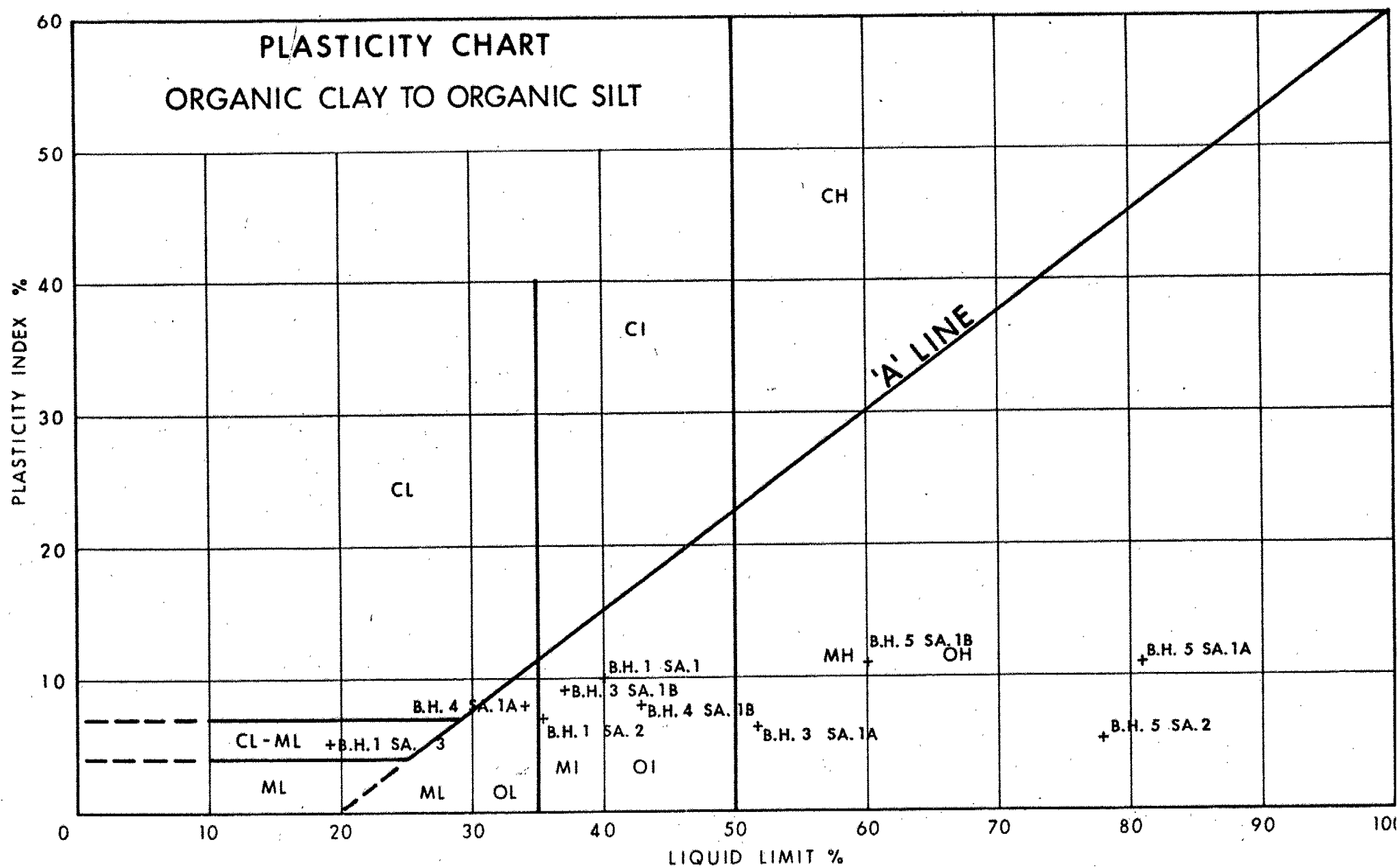


FIG. 3

ABBREVIATIONS & SYMBOLS USED IN THIS REPORTPENETRATION RESISTANCE

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

TERMS TO BE USED IN DESCRIBING SOILS :-

TRACE < 10% , SOME 10-25% , WITH 25-40% , > 40% SILTY, SANDY, GRAVELLY, CLAYEY ETC.

TYPE OF SAMPLE

S.S.	SPLIT SPOON	T.W.	THINWALL OPEN
W.S.	WASHED SAMPLE	T.P.	THINWALL PISTON
S.T.	SLOTTED TUBE SAMPLE	O.S.	OESTERBERG SAMPLE
A.S.	AUGER SAMPLE	F.S.	FOIL SAMPLE
C.S.	CHUNK SAMPLE	R.C.	ROCK CORE

P.H. SAMPLE ADVANCED HYDRAULICALLY

P.M. SAMPLE ADVANCED MANUALLY

SOIL TESTS

U	UNCONFINED COMPRESSION	L.V.	LABORATORY VANE
UU	UNCONSOLIDATED UNDRAINED TRIAXIAL	F.V.	FIELD VANE
CIU	CONSOLIDATED ISOTROPIC UNDRAINED TRIAXIAL	C	CONSOLIDATION
CID	" " DRAINED "	S	SENSITIVITY
CAU	" ANISOTROPIC UNDRAINED "		
CAD	" " DRAINED "		

ABBREVIATIONS & SYMBOLS USED IN THIS REPORTSOIL PROPERTIES

γ	UNIT WEIGHT OF SOIL (BULK DENSITY)
γ_s	UNIT WEIGHT OF SOLID PARTICLES
γ_w	UNIT WEIGHT OF WATER
γ_d	UNIT DRY WEIGHT OF SOIL (DRY DENSITY)
γ'	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
w_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_o	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
τ_f	SHEAR STRENGTH
c'	EFFECTIVE COHESION INTERCEPT
ϕ'	EFFECTIVE ANGLE OF SHEARING RESISTANCE, OR FRICTION
c_u	APPARENT COHESION
ϕ_u	APPARENT ANGLE OF SHEARING RESISTANCE, OR FRICTION
μ	COEFFICIENT OF FRICTION
S_t	SENSITIVITY

IN TERMS OF
EFFECTIVE STRESS
 $\tau_f = c' + \sigma' \tan \phi'$

IN TERMS OF
TOTAL STRESS
 $\tau_f = c_u + \sigma \tan \phi$

GENERAL

π	= 3.1416
e	BASE OF NATURAL LOGARITHMS 2.7183
$\log_e \sigma$ OR $\ln \sigma$	NATURAL LOGARITHM OF σ
$\log_{10} \sigma$ OR $\log \sigma$	LOGARITHM OF σ 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
σ	NORMAL STRESS
σ'	NORMAL EFFECTIVE STRESS ($\bar{\sigma}$ IS ALSO USED)
τ	SHEAR STRESS
ϵ	LINEAR STRAIN
γ	SHEAR STRAIN
ν	POISSON'S RATIO (μ IS ALSO USED)
E	MODULUS OF LINEAR DEFORMATION (YOUNG'S MODULUS)
G	MODULUS OF SHEAR DEFORMATION
K	MODULUS OF COMPRESSIBILITY
η	COEFFICIENT OF VISCOSITY

EARTH PRESSURE

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

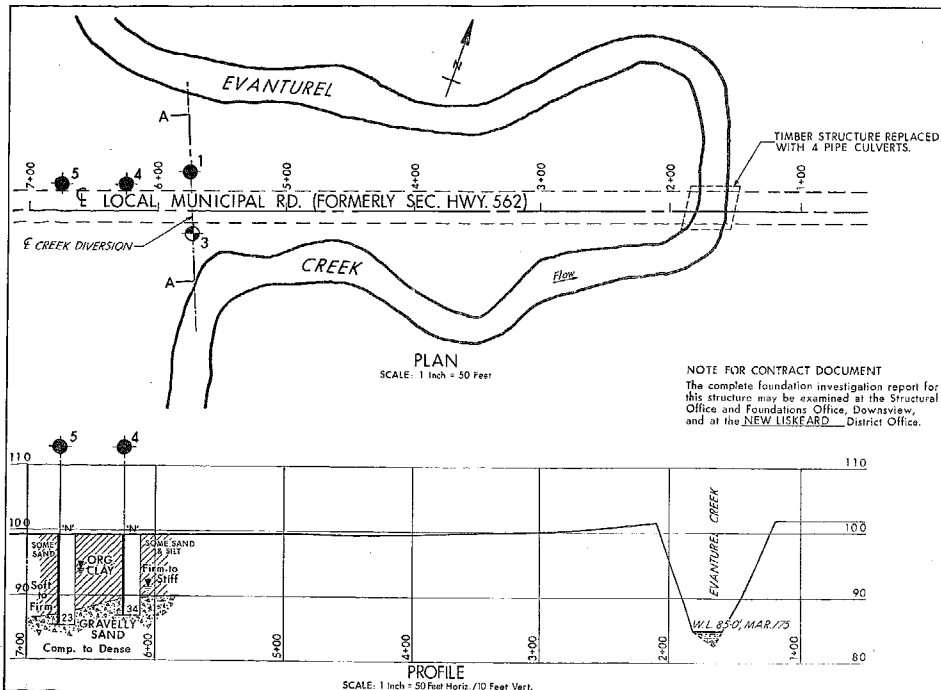
FOUNDATIONS

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
β	ANGLE OF SLOPE TO HORIZONTAL

OVERSIZE DRAWING

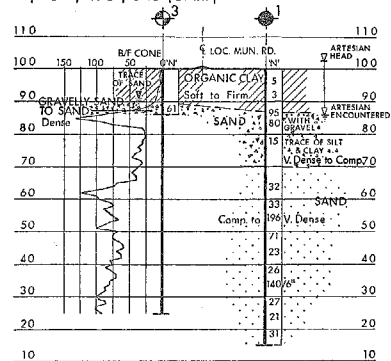


NOTE FOR CONTRACT DOCUMENT

The complete foundation investigation report for this structure may be examined at the Structural Office and Foundations Office, Downsview, and at the NEW LISKFORD District Office.

- Bore Hole
⊕ Bore & Cone Penetration Hole

NO.	ELEV.	STATION	OFFSET
1	100.0	5+75	30' RT.
3	100.0	5+73	17' LT.
4	99.±	6+25	21' RT.
5	99.±	6+75	21' RT.



SITE NO. 47-155



DATE 31 OCTOBER 1975

DISTRICT 14
LOCAL MUNICIPAL ROAD TOWNSHIP OF BEAUCHAMP & HENWOOD
EVANTUREL CREEK
LOT 6 CON. 1

APPROVED

W.O. 75 - 50120

