

#68-F-15-1

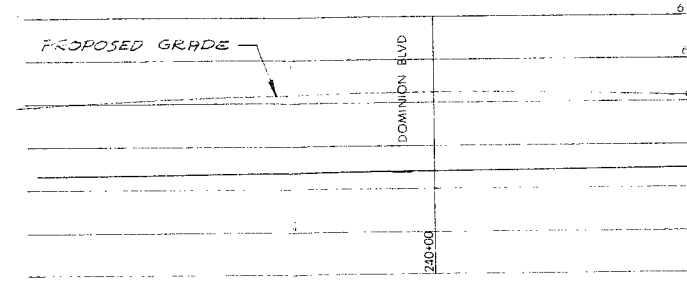
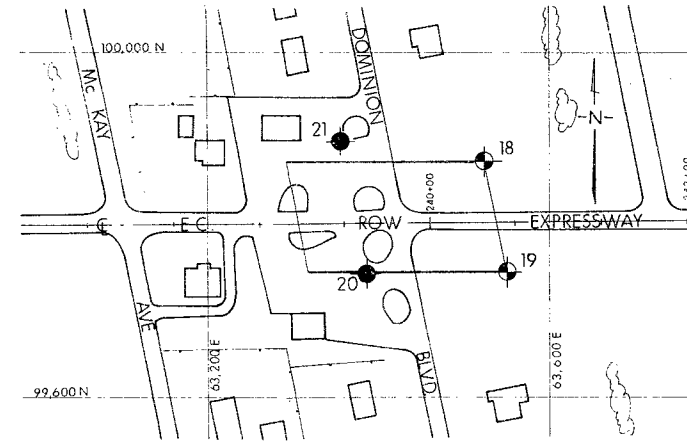
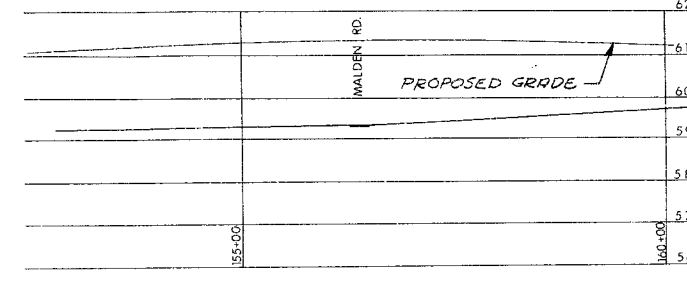
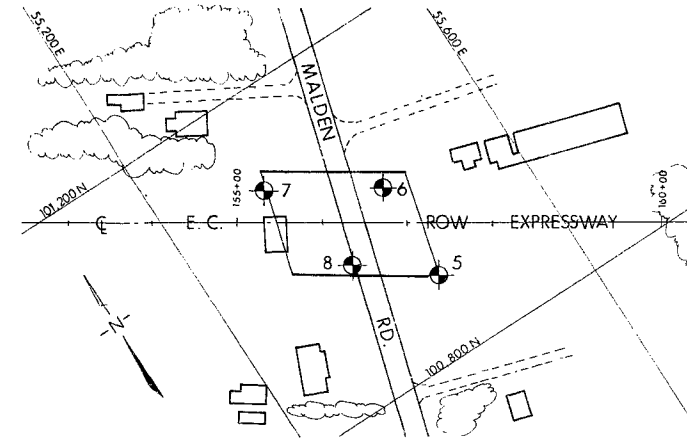
W.P. #257-66-2

HWY #18 TO

DOMINION BLVD.

E.C. ROW

EXPRESSWAY



DEPARTMENT OF HIGHWAYS - ONTARIO MATERIALS & TESTING DIVISION - FOUNDATION SECTION			
HWY. NO <u>18</u> TO DOMINION BLVD.			
KING'S HIGHWAY NO. <u>E.C. ROW EXPRESSWAY</u>		DIST. NO. <u>1</u>	
CO. <u>ESSEX</u>		CITY OF <u>WINDSOR</u>	
TWP. _____		LOT _____ CON. _____	
GENERAL LAYOUT			
SUBM'D A P	CHECKED _____	W.P. NO. <u>68-F-15-1</u>	M.B.T. DRAWING NO. <u>68-F-15-1A</u>
DRAWN S O	CHECKED <u>SK</u>	JOB NO. <u>68-F-15-1</u>	BRIDGE DRAWING NO.
DATE <u>11 FEB 1969</u>		SITE NO. _____	
APPROVED <u>A. G. Thomas</u> <small>PRINCIPAL, FOUNDATION ENGINEER</small>		CONT NO. _____	

MEMORANDUM

To: Mr. B. R. Davis,
Bridge Engineer,
Bridge Office,
Admin. Bldg.

FROM: Foundation Section,
Materials & Testing Office,
Room 107, Lab. Bldg.

ATTENTION: Mr. S. McCombie

DATE: July 10, 1969

OUR FILE REF:

IN REPLY TO: JUL 10 1969

SUBJECT:

FOUNDATION INVESTIGATION REPORT
For

Proposed E. C. Row Expressway
Hwy. 18 to Dominion Blvd.
District No. 1 (Chatham)

W.J. 68-F-15-1 -- W.P. -

Enclosed please find our Foundation Investigation Report for the section of the proposed E. C. Row Expressway from Hwy. 18 to Dominion Blvd. The report contains factual information only, and has been compiled so as to provide you with information relating to subsoil conditions. No attempt has been made to interpret our findings and make specific recommendations, since the design stage is still some time in the future and present proposals may well be subject to substantial change. A complete report will therefore be submitted at an appropriate time in the future.

AGS/WdcF
Attach.

cc: Messrs. B. R. Davis (2)
H. A. Tregaskes
D. W. Farren
W. Zonnenberg
F. C. Brown
A. P. Watt
J. Roy
B. A. Singh

Foundations File
Gen. FilesV

A. G. Sternac
A. G. Sternac
PRINCIPAL FOUNDATION ENGINEER

FOUNDATION SECTION

CHECKED BY AK

SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT ——— W _L PLASTIC LIMIT ——— W _P WATER CONTENT ——— W			BULK DENSITY P.C.F.	REMARKS	
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT	ELEV SCALE	BLOWS / FOOT 20 40 60 80 100					WATER CONTENT % 10 20 30				
592.8	Ground Level						SHEAR STRENGTH P.S. + Field Vane o Unconfined					W _P ——— W _L				
0.0	Silty sand						500 1000 1500 2000 2500									Gr. Sa. Si. Cl
588.8																
4.0			1	SS	5											
			2	SS	20											
			3	SS	18										1 16 44 39	
			4	SS	9											
			5	TW	PH											
	Clayey silt		6	TW	PH										130	
	some sand		7	TW	PH											
	trace of gravel.		8	TW	PH										128	
			9	TW	PH											
	Firm to very stiff.		10	TW	PH										128 1 21 48 30	
			11	TW	PH											
			12	TW	PH											
			13	TW	PH										127 2 17 47 34	
			14	TW	PH											
499.8																
93.0	Sandy silt															
	Some gravel															
490.0	Very dense.															
102.8	Limestone		15	AXT	Rec.											
484.6	Bedrock			Re	100%											
108.2	End of Borehole															

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 6

FOUNDATION SECTION

JOB 68-F-15 LOCATION Co-ords. 101,015 N; 55,440 E. ORIGINATED BY AMS
W.P. 260-66-6 BORING DATE Feb. 23, 1968 COMPILED BY AMS
DATUM Geodetic BOREHOLE TYPE Cont. flight auger (bombardier) CHECKED BY [Signature]

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT 20 40 60 80 100 SHEAR STRENGTH P.S.F. + Field Vane o Unconfined 500 1000 1500 2000 2500	LIQUID LIMIT ——— W _L PLASTIC LIMIT ——— W _P WATER CONTENT ——— W W _P ——— W _L WATER CONTENT % 10 20 30	BULK DENSITY P.C.F. γ	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT					
593.0	Ground Level									
0.0	Silty sand.					590				590.5
4.0	Clayey silt some sand trace of gravel. Firm.		1	SS	6					
			2	TW	PH					
			3	TW	PH				124	1 11 38 50
			4	TW	PM					
			5	TW	PM				127	
			6	TW	PM					
			7	TW	PM					
551.5			8	TW	PM					3 17 45 35
41.5	End of Borehole						20 15 \div 5 % strain at failure 10			

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 7

FOUNDATION SECTION

JOB 68-F-15-1

LOCATION Co-ords. 101,090 N; 55,320 E.

ORIGINATED BY AMS

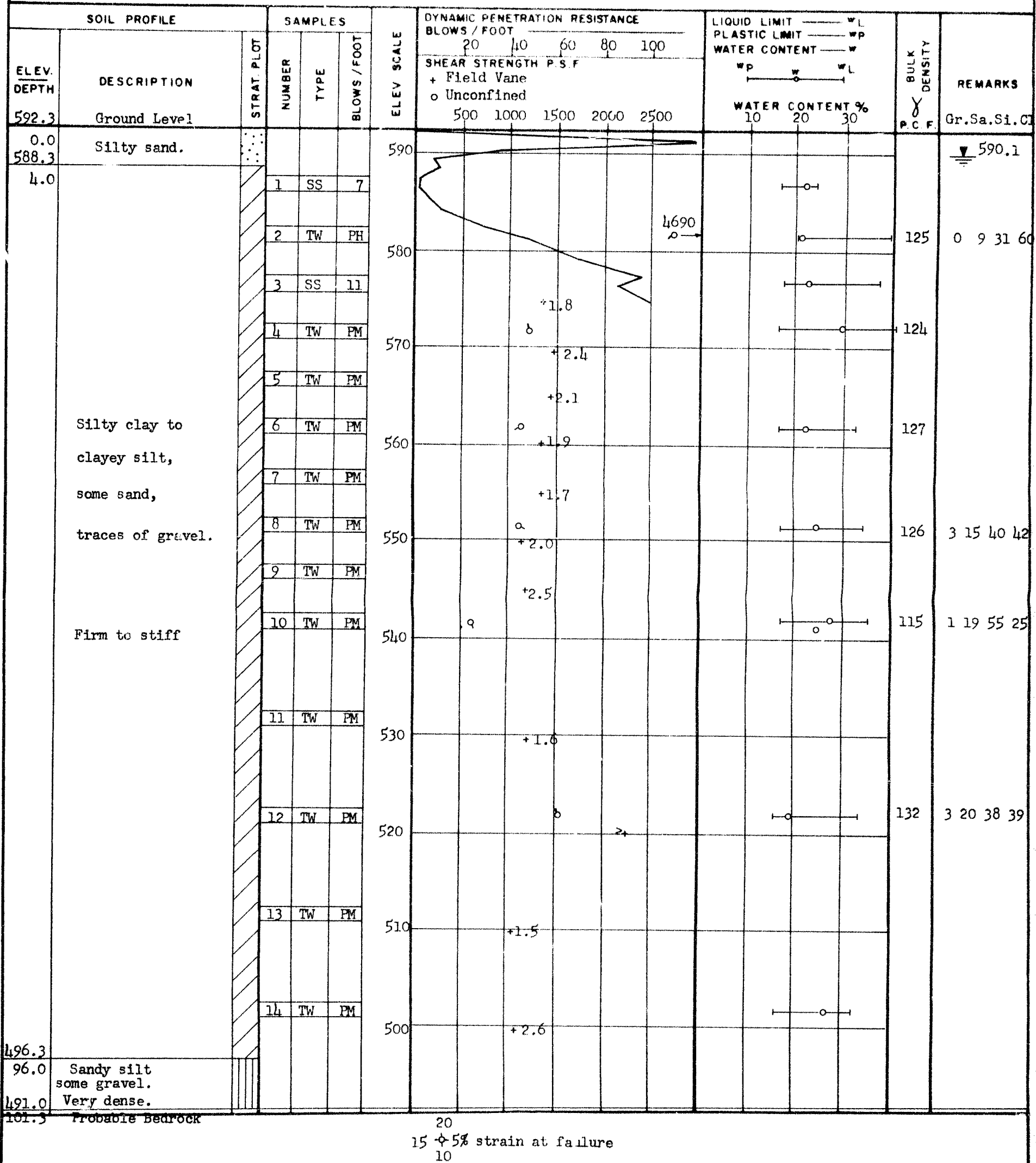
W.P. 260-66-030

BORING DATE Feb. 26 & 27, 1968

COMPILED BY AMS

DATUM Geodetic

BOREHOLE TYPE Cont. flight auger (bombardier)

CHECKED BY *KL*

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING DIVISION
JOB 68-F-15-1
W.P. 260-66-030
DATUM Geodetic

RECORD OF BOREHOLE NO. 8

FOUNDATION SECTION

LOCATION Co-ords. 100,964 N; 55,361 E. ORIGINATED BY AMS
BORING DATE Feb. 27, 1968 COMPILED BY AMS
BOREHOLE TYPE Cont. flight auger (bombardier) CHECKED BY AMS

SOIL PROFILE			SAMPLES			ELEV SCALE	DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT — WL PLASTIC LIMIT — WP WATER CONTENT — W		BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. FLOT	NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT	SHEAR STRENGTH P.S.F. + Field Vane o Unconfined	WATER CONTENT %			
593.6	Ground Level											
0.0	Silty sand											
589.6												
4.0			1	SS	4							
			2	TW	PH						129	
			3	TW	PH							
	Silty clay		4	TW	PH			+2.5			123	0 13 41 46
	Some sand		5	TW	PH			+2.2				
	trace of gravel.		6	TW	PH			+2.0			124	
	Firm		7	TW	PH			+2.6				
			8	TW	PH			+2.1				
550.6								+2.2			127.5	1 16 44 39
43.0	End of Borehole							20 15 5 5 10 % strain at failure				

DEPARTMENT OF HIGHWAYS - ONTARIO						RECORD OF BOREHOLE NO.9								FOUNDATION SECTION			
MATERIALS & TESTING DIVISION																	
JOB 68-F-15-1		LOCATION Co-ords. 102,944 N; 52,478 E.		ORIGINATED BY AMS													
W.P. 260-66-020		BORING DATE Feb. 28 & 29, 1968		COMPILED BY AMS													
DATUM Geodetic		BOREHOLE TYPE Cont. flight auger (bombardier)		CHECKED BY													
SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT				LIQUID LIMIT ——— WL PLASTIC LIMIT ——— WP WATER CONTENT ——— W				BULK DENSITY		REMARKS	
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT	ELEV SCALE	SHEAR STRENGTH P.S.F. + Field Vane o Unconfined				WATER CONTENT % wp — w — WL 10 20 30				P.C.F.		
585.5	Ground Level																
0.0	Silty sand															Gr.Sa.Si.Cl	
581.5																583.5	
4.0			1	SS	5	580	+ 2.1				52.8				117		
			2	TW	PH		+ 2.9										
			3	TW	PH	570	+ 2.4								115		
			4	TW	PH		+ 2.5								124		
			5	TW	PH	560	+ 1.8										
	Silty clay to clayey silt, some sand, trace of gravel.		6	TW	PH		+ 2.0								137		
			7	TW	PH	550	+ 5.1								118		
			8	TW	PH		+ 3.0								122		
			9	TW	PH	540	+ 2.0										
	Firm		10	TW	PH		+ 1.4								130.5	3 21 48 28	
			11	TW	PH	530	+ 1.6								131		
513.5			12	TW	PH		>								144		
72.0	Sandy silt, some gravel & clay. Very dense.		13	SS	150	510										17 24 41 18	
508.5																	
77.0	Probable Bedrock																

FOUNDATION SECTION

ORIGINATED BY AMS

COMPILED BY _____, AMS

BOREHOLE TYPE Cont. flight auger (bombardier)

CHECKED BY

[illegible]

DEPARTMENT OF HIGHWAYS - ONTARIO							RECORD OF BOREHOLE NO. 11								FOUNDATION SECTION					
MATERIALS & TESTING DIVISION																				
JOB	68-F-15-1						LOCATION	Co-ords. 102,993 N; 52,370 E.								ORIGINATED BY	AMS			
W.P.	260-66-020						BORING DATE	March 1, 1968								COMPILED BY	AMS			
DATUM	Geodetic						BOREHOLE TYPE	Cont. flight auger (bombardier)								CHECKED BY	<i>[Signature]</i>			
SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT — WL PLASTIC LIMIT — WP WATER CONTENT — W			BULK DENSITY		REMARKS				
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT	ELEV SCALE	SHEAR STRENGTH P.S.F. + Field Vane o Unconfined					WATER CONTENT % wp — w — WL			P.C.F.					
585.5	Ground Level						500	1000	1500	2000	2500	10	20	30		Gr. Sa. Si. Cl.				
0.0	Silty sand																		583.0	
581.5			1	SS	6	580														
4.0	Silty clay to clayey silt some sand trace of gravel Firm		2	TW	PH										117	0 6 23 71				
			3	TW	PH	570														
			4	TW	PH										123					
			5	TW	PH	560														
			6	TW	PH										127					
			7	TW	PH	550														
			8	TW	PH	540									132	4 22 51 23				
537.5																				
48.0	End of Borehole						20 15-φ 5% strain at failure 10													

DEPARTMENT OF HIGHWAYS - ONTARIO

RECORD OF BOREHOLE NO. 12

FOUNDATION SECTION

MATERIALS & TESTING DIVISION

JOB 68-F-15-1

LOCATION Co-ords. 102,908 N; 52,275 E.

ORIGINATED BY AMS

W. P. 266-66-020

BORING DATE March 4, 1968

COMPILED BY _____ AMS

DATUM Geodetic

BOREHOLE TYPE Cont. flight auger (bombardier), AXT Rock Core

CHECKED BY 4A

[illegible]

FOUNDATION SECTION

ORIGINATED BY AMS

COMPILED BY AMS

CHECKED BY AK

[illegible]

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 15

FOUNDATION SECTION

JOB 68-F-15-1 LOCATION Co-ords. 99,767 N; 58,285 E. ORIGINATED BY AMS
W.P. 258-66-020 BORING DATE March 7, 1968 COMPILED BY AMS
DATUM Geodetic BOREHOLE TYPE Cont. flight auger (bombardier) CHECKED BY HR

SOIL PROFILE			SAMPLES			ELEV SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT — WL PLASTIC LIMIT — WP WATER CONTENT — W			BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		20	40	60	80	100	wp	w	WL		
599.3	Ground Level															
0.0	Silty sand															
595.3																
4.0			1	SS	18											
			2	SS	22	590										
			3	TW	PH											
	Clayey silt		4	TW	PH	580										
	some sand		5	TW	PH											
	trace of gravel		6	TW	PH	570										
			7	TW	PH											
			8	TW	PH	560										
			9	TW	PH	550										
546.3																
53.0	End of Borehole															

20
15-5 % strain at failure
10

MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 16

FOUNDATION SECTION

JOB 68-F-15-1

LOCATION _____ Co-ords. 99,876 N; 58,404 E.

ORIGINATED BY AMS

W. P. 258-66-020

BORING DATE March 7 & 8, 1968

COMPILED BY _____ AMS

DATUM Geodetic

BOREHOLE TYPE Cont. flight auger (bombardier)

CHECKED BY AK

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT ——— w _L		BULK DENSITY	REMARKS				
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT		PLASTIC LIMIT ——— w _p							
							20	40	60	80			100	10	20	30
							SHEAR STRENGTH P.S.F.						WATER CONTENT %			
							+ Field Vane		w _p ——— w ——— w _L							
							o Unconfined									
600.0	Ground level						500	1000	1500	2000	2500		Gr.Sa.Si.Cl			
0.0	Silty sand												598.1			
596.0																
4.0			1	SS	10											
			2	SS	30	590							3 19 48 30			
			3	SS	22											
	Clayey silt		4	TW	PH	580							133			
	some sand		5	SS	13											
	trace of		6	TW	PH	570							129			
	gravel.		7	SS	13											
			8	TW	PH	560							134			
			9	TW	PH	550							5 27 39 29			
547.0	End of Bcorehole															
53.0																

FOUNDATION SECTION

ORIGINATED BY AMS

COMPILED BY AMS

CHECKED BY AK

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT ——— w _L PLASTIC LIMIT ——— w _P WATER CONTENT ——— w			BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT					WATER CONTENT %				
							20	40	60	80	100	10	20	30		
601.0	Ground Level															
0.0	Silty sand					600										Gr. Sa. Si. Cl
597.0																599.6
4.0			1	SS	16											
			2	SS	22	590										0 19 46 35
			3	TW	PH											
			4	TW	PH	580										134
			5	TW	PH											
	Clayey silt		6	TW	PH	570										126
	some sand		7	TW	PH											
	trace of gravel		8	TW	PH	560										131
			9	TW	PH											
			10	TW	PH	550										132
			11	TW	PH	540										127.5
			12	TW	PH	530										
			13	TW	PH	520										133
			14	SS	15	510										11 21 41 27
			15	SS	12	500										
498.6	Sandy silt															
103.0	Some gravel															
494.5	Probable Bedrock															

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

JOB 68-F-15-1

W.P. 258-66-030

DATUM Geodetic

LOCATION Co-ords. 99,879 N; 63,525 E.

BORING DATE March 12 & 13, 1968

BOREHOLE TYPE Cont. flight auger (bombardier)

RECORD OF BOREHOLE NO. 18

FOUNDATION SECTION

ORIGINATED BY AMS

COMPILED BY AMS

CHECKED BY

SOIL PROFILE

SAMPLES

DYNAMIC PENETRATION RESISTANCE

BLOWS / FOOT
20 40 60 80 100

SHEAR STRENGTH P.S.F.

+ Field Vane
o Unconfined

500 1000 1500 2000 2500

LIQUID LIMIT WL

PLASTIC LIMIT WP

WATER CONTENT W

WP W WL

WATER CONTENT %

10 20 30

BULK DENSITY
P.C.F.

REMARKS

ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE	LIQUID LIMIT WL	PLASTIC LIMIT WP	WATER CONTENT W	BULK DENSITY P.C.F.	REMARKS
602.5	Ground Level											
	Clayey silt		1	SS	38	600						
			2	SS	32	590						3 30 41 26
			3	TW	PH						138	
			4	TW	PH							
	Some sand		5	TW	PH	580	+1.9				134	
			6	TW	PH		+2.0					
			7	TW	PH	570	+1.9				134.5	
			8	TW	PH		+1.9					
	Traces of gravel		9	TW	PH	560	+1.8				134.5	1 29 43 27
			10	TW	PH							
			11	TW	PH	550	+1.9					
			12	TW	PH						131	
			13	TW	PH	540	+4.0					
			14	SS	22	530	+2.4					
			15	SS	16	520	+1.8				137	
492.5	Sandy silt					510						
110.0	Some gravel					500						9 12 45 34
483.5	Probable Bedrock					490						
119.0							20 15% strain at failure 10					

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

RECORD OF BOREHOLE NO. 19

FOUNDATION SECTION

JOB 68-F-151

LOCATION _____ Co-ords. 99,750 N; 63,551 E.

ORIGINATED BY AMS

W. P. 258-66-030

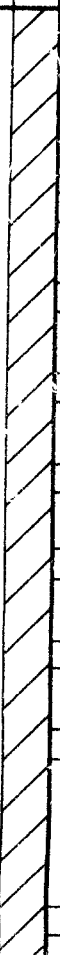
BORING DATE March 13, 1968

COMPILED BY _____ AMS

DATUM Geodetic

BOREHOLE TYPE Cont. flight auger (bombardier)

CHECKED BY AL

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT ——— WL PLASTIC LIMIT ——— WP WATER CONTENT ——— W			BULK DENSITY P.C.F.	REMARKS	
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		SHEAR STRENGTH P.S.F.					WATER CONTENT %					
							+ Field Vane					wp ——— w ——— WL					
							o Unconfined										
						500	1000	1500	2000	2500							
602.6	Ground Level														Gr. Sa. Si. Cl.		
0.0	Clayey silt some sand trace of gravel Hard		1	SS	36	600										3 28 42 29	
			2	SS	43	590											
			3	Tw	PH												138
			4	TW	PH												
			5	TW	PH												136
			6	TW	PH												
			7	TW	PH												140
			8	TW	PH												3 31 51 15
			9	TW	PH												
549.6						550									132		
53.0	End of Borehole																
							20										
							15 + 5% strain at failure										
							10										

RECORD OF BOREHOLE NO. 20

FOUNDATION SECTION

JOB 68-F-15-1

LOCATION _____ Co-ords. 99,744 N; 63,385 E.

ORIGINATED BY AMS

W.P. 258-66-030

BORING DATE March 14, 1968

COMPILED BY _____ AMS

DATUM Geodetic

BOREHOLE TYPE Cont. flight auger (bombardier)

CHECKED BY

[illegible]

DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS & TESTING DIVISION

JOB 68-F-15-1

LOCATION Co-ords. 99,894 N; 63,350 E.

ORIGINATED BY AMS

W.P. 258-66-030

BORING DATE March 15, 1968

COMPILED BY AMS

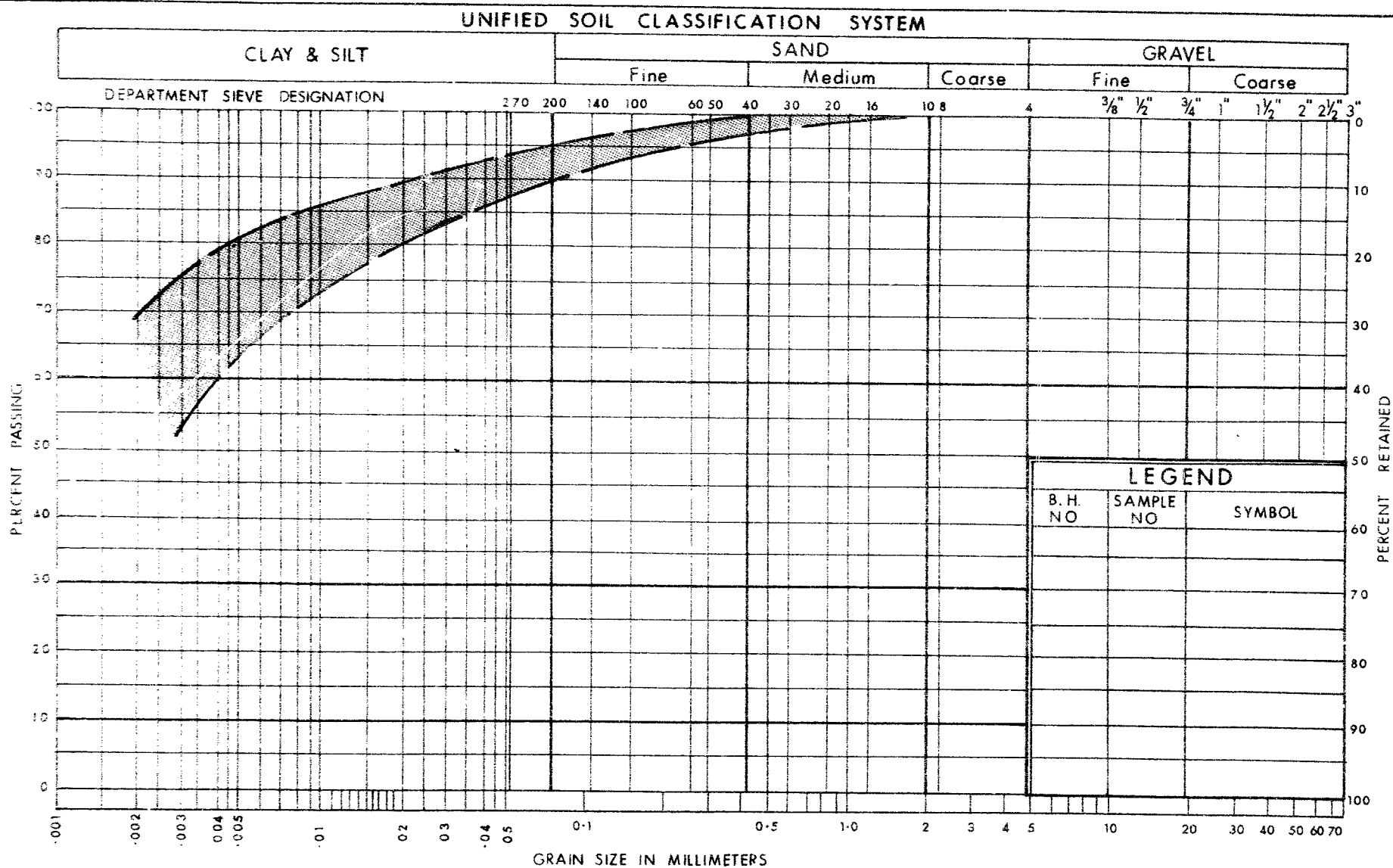
DATUM Geodetic

BOREHOLE TYPE Cont. Flight Auger (Bombardier)

CHECKED BY

SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT ——— WL PLASTIC LIMIT ——— WP WATER CONTENT ——— W			BULK DENSITY γ P.C.F.	REMARKS		
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE	SHEAR STRENGTH P.S.F. + Field Vane o Unconfined 500 1000 1500 2000 2500					WATER CONTENT % WP ——— W ——— WL 10 20 30					
603.0	Ground Level														Gr. Sa. Sl. Cl.		
0.0	Clayey silt some sand trace of gravel. Very stiff to hard.					600									136	1 28 45 26	
			1	SS	15												
			2	SS	18		590										
			3	SS	18												
			4	TW	PH												
			5	TW	PH		580										
			6	TW	PH												
			7	TW	PH		570										
	8	TW	PH											133			
560.0	End of Borehole					560											
43.0							20 15 10	5	% strain at failure								

APPENDIX I



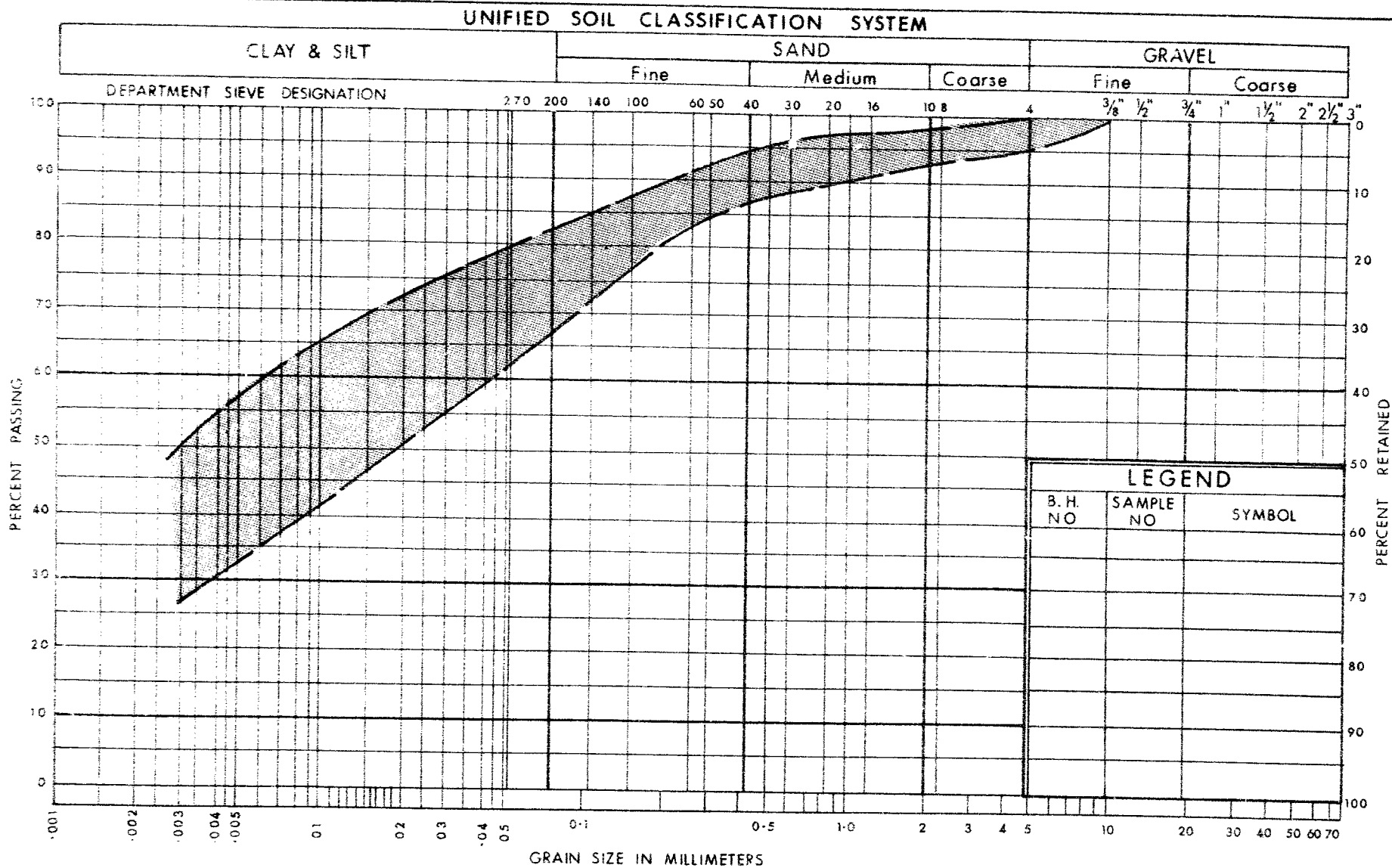
DEPARTMENT OF HIGHWAYS
MATERIALS and
TESTING
DIVISION

GRAIN SIZE DISTRIBUTION ENVELOPE OF SILTY CLAY

W.P. No. ~~260-66-030~~

JOB No. 68-F-15-1

FIG. 1



DEPARTMENT OF HIGHWAYS
MATERIALS and
TESTING
DIVISION

GRAIN SIZE DISTRIBUTION ENVELOPE OF CLAYEY SILT

W.P. No. ~~269-66-030~~

JOB No. 68-F-15-1

FIG. 2

UNCONFINED COMPRESSION TESTS

TYPICAL STRESS STRAIN CURVES

68-F-15-1

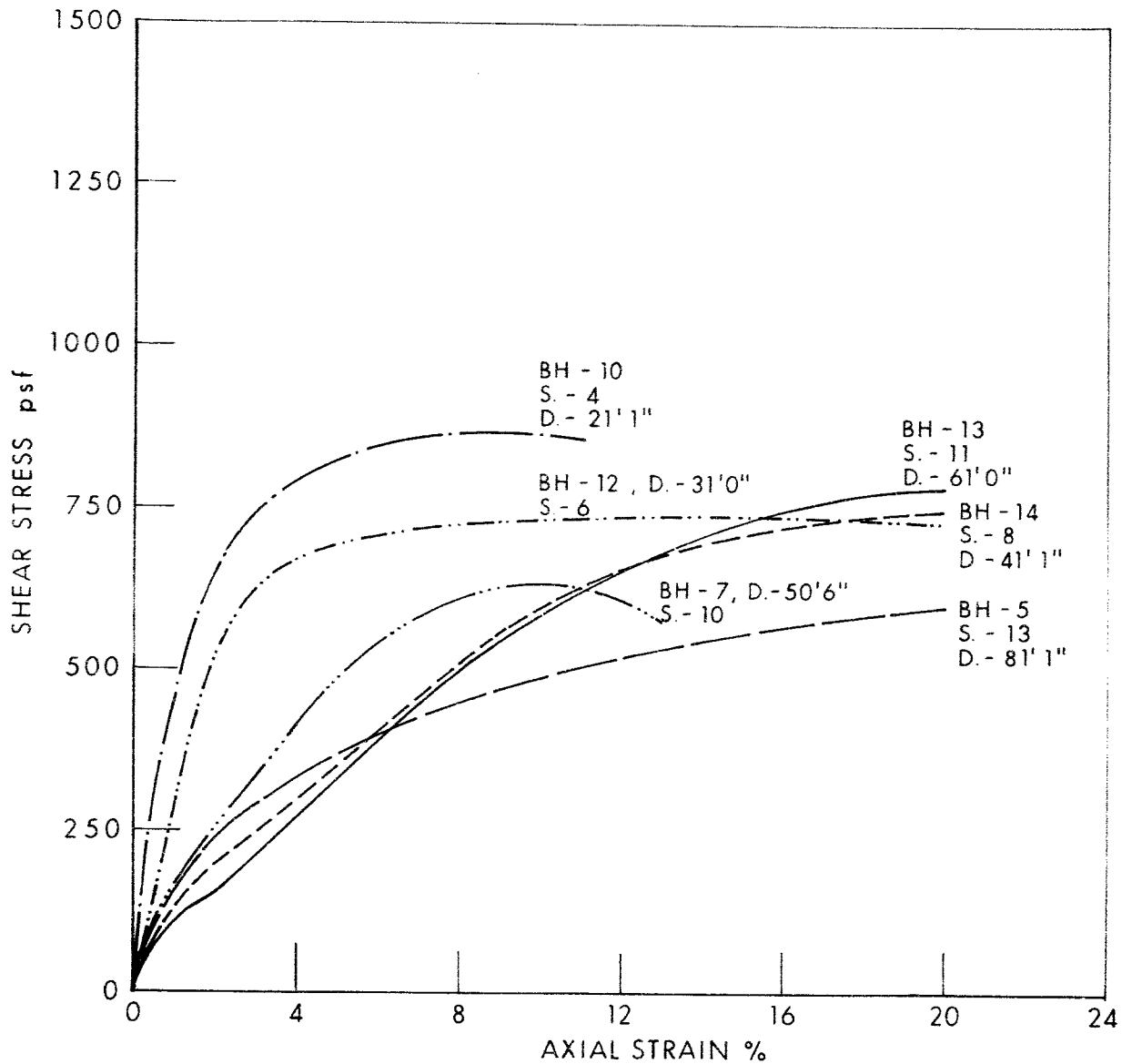
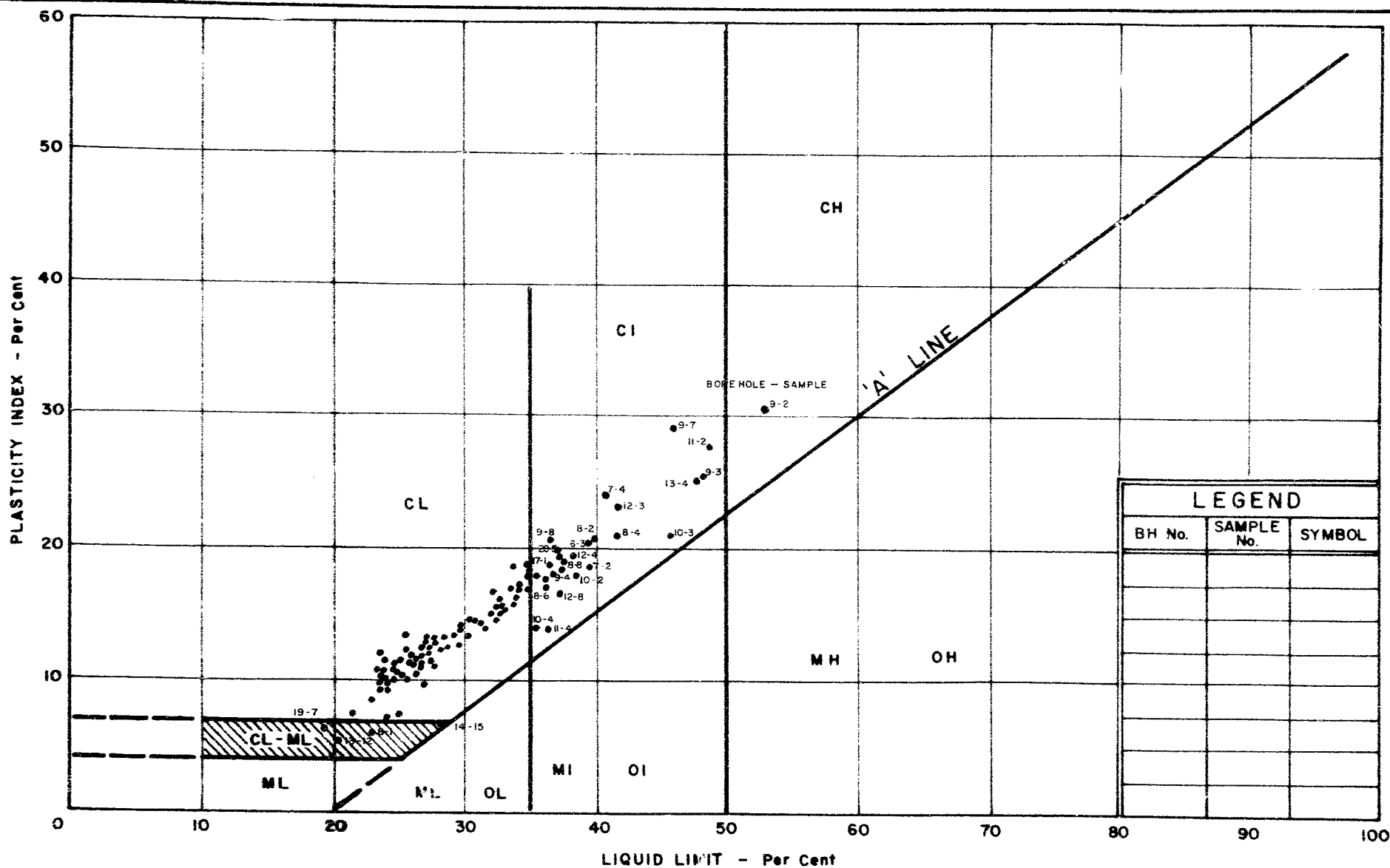


FIG. 3



DEPARTMENT OF HIGHWAYS
MATERIALS and
TESTING
DIVISION

PLASTICITY CHART

W.P. No.

JOB No. 68-F-15-1

FIG. No. 4

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

SS	SPLIT SPOON	TW	THINWALL OPEN
WS	WASHED SAMPLE	TP	THINWALL PISTON
SB	SCRAPER BUCKET SAMPLE	OS	OESTERBERG SAMPLE
AS	AUGER SAMPLE	FS	FOIL SAMPLE
CS	CHUNK SAMPLE	RC	ROCK CORE
ST	SLOTTED TUBE SAMPLE		
	PH	SAMPLE ADVANCED HYDRAULICALLY	
	PM	SAMPLE ADVANCED MANUALLY	

SOIL TESTS

Qu	UNCONFINED COMPRESSION	LV	LABORATORY VANE
Q	UNDRAINED TRIAXIAL	FV	FIELD VANE
Qcu	CONSOLIDATED UNDRAINED TRIAXIAL	C	CONSOLIDATION
Qd	DRAINED TRIAXIAL	S	SENSITIVITY

ABBREVIATIONS USED IN THIS REPORT

SOIL 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
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
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_r	SENSITIVITY

GENERAL

π	= 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
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_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
β	ANGLE OF SLOPE TO HORIZONTAL