

DOCUMENT MICROFILMING IDENTIFICATION

G.I.-30 SEPT. 1976

GEOCRES No. 30M4-62

DIST. 4 REGION

W.P. No. 55-75-11

CONT. No. 81-64

W. O. No.

STR. SITE No. 9-133

HWY. No. 6 New

LOCATION Downton Rd. Overpass

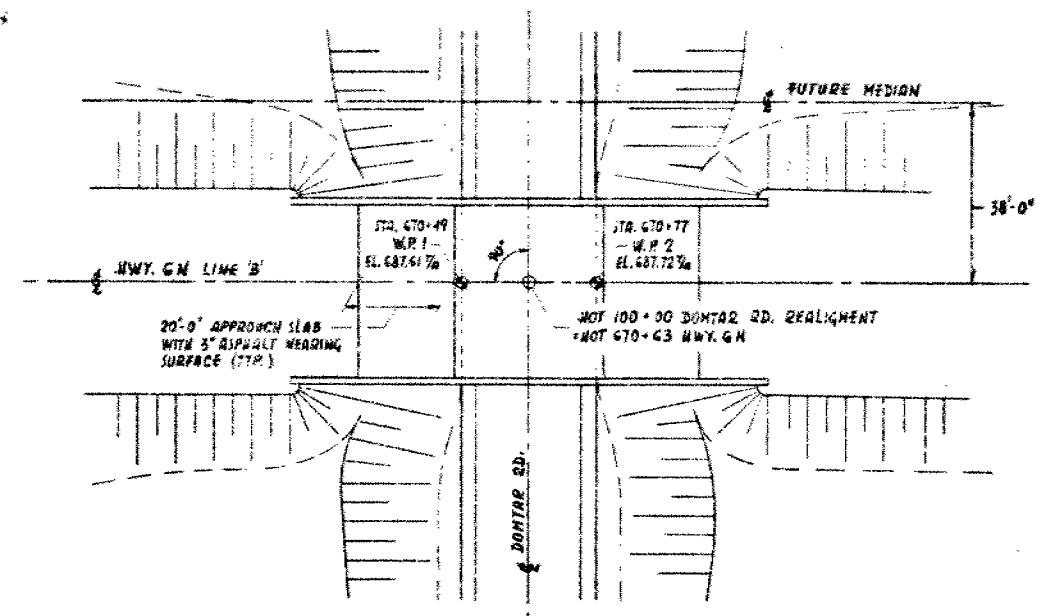
No of PAGES -

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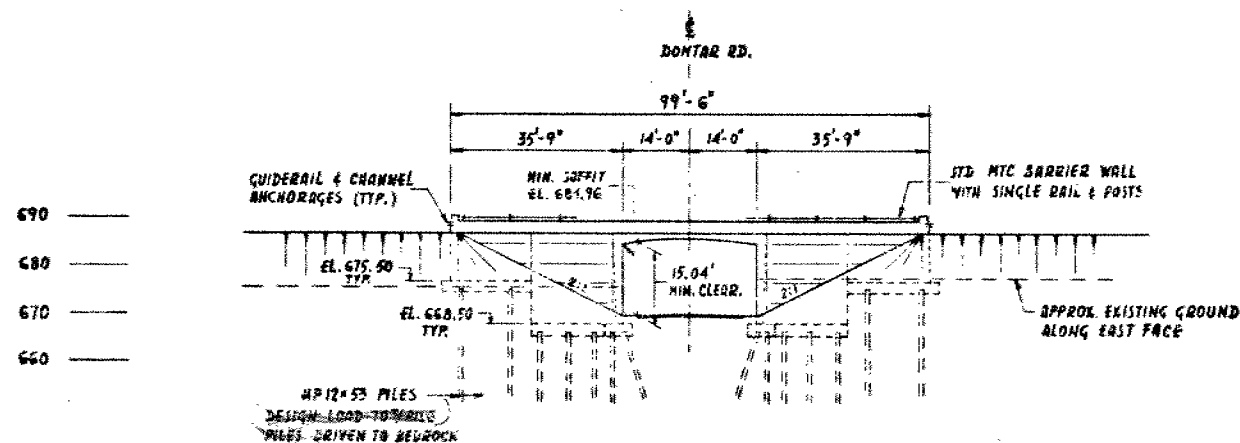
OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT.

REMARKS:

NORTH FOR
CONST.

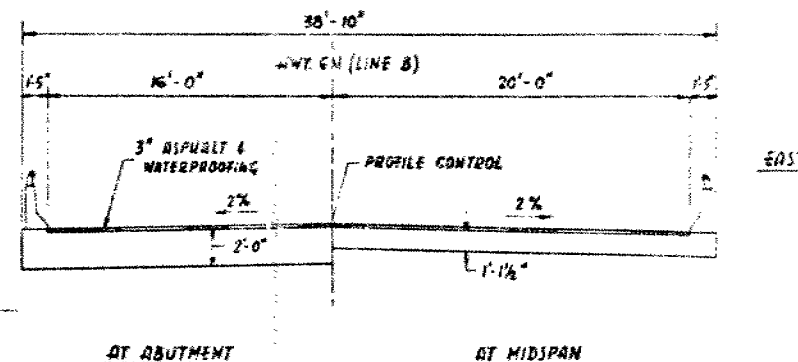


PLAN
SCALE: 1" = 20'-0"

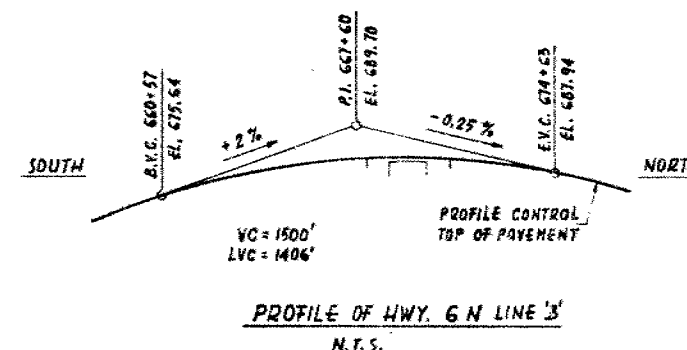


ELEVATION
SCALE: 1" = 20'-0"

NOTES:
W.P. DENOTES WORKING POINT
T.O. DENOTES TOP OF ASPHALT

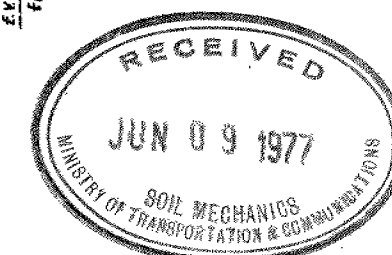


DECK SECTION
SCALE: 3/4" = 1'-0"

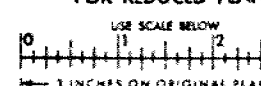


PROFILE OF HWY. 6 N LINE B
N.T.S.

TO BE USED
FOR ESTIMATING
PURPOSES ONLY
DATE JUN 7 1977
PROFILE OF DUNTAR RD.
N.T.S.



FOR REDUCED PLAN



CONT No
WP No 55-75-11
SHEET

B.M. 676.14
GEODETIC DATUM
N. & W. 1/4 W. 200' OF 1-8 ASH
40' RT. 105+82

GENERAL NOTES
CLASS OF CONCRETE
FOOTINGS, RET. WALLS & APPROACH SLABS — 3000 PSI
REMAINDER — 1000 PSI
GRADE OF REINFORCING STEEL
ALL STEEL — GRADE 50
CLEAR COVER TO REINFORCING STEEL
FOOTINGS, RET. WALLS & ABUTMENTS — 3"
DECK, TOP — 2", BOTTOM — 1 1/2"
OR AS NOTED ON THE DRAWINGS

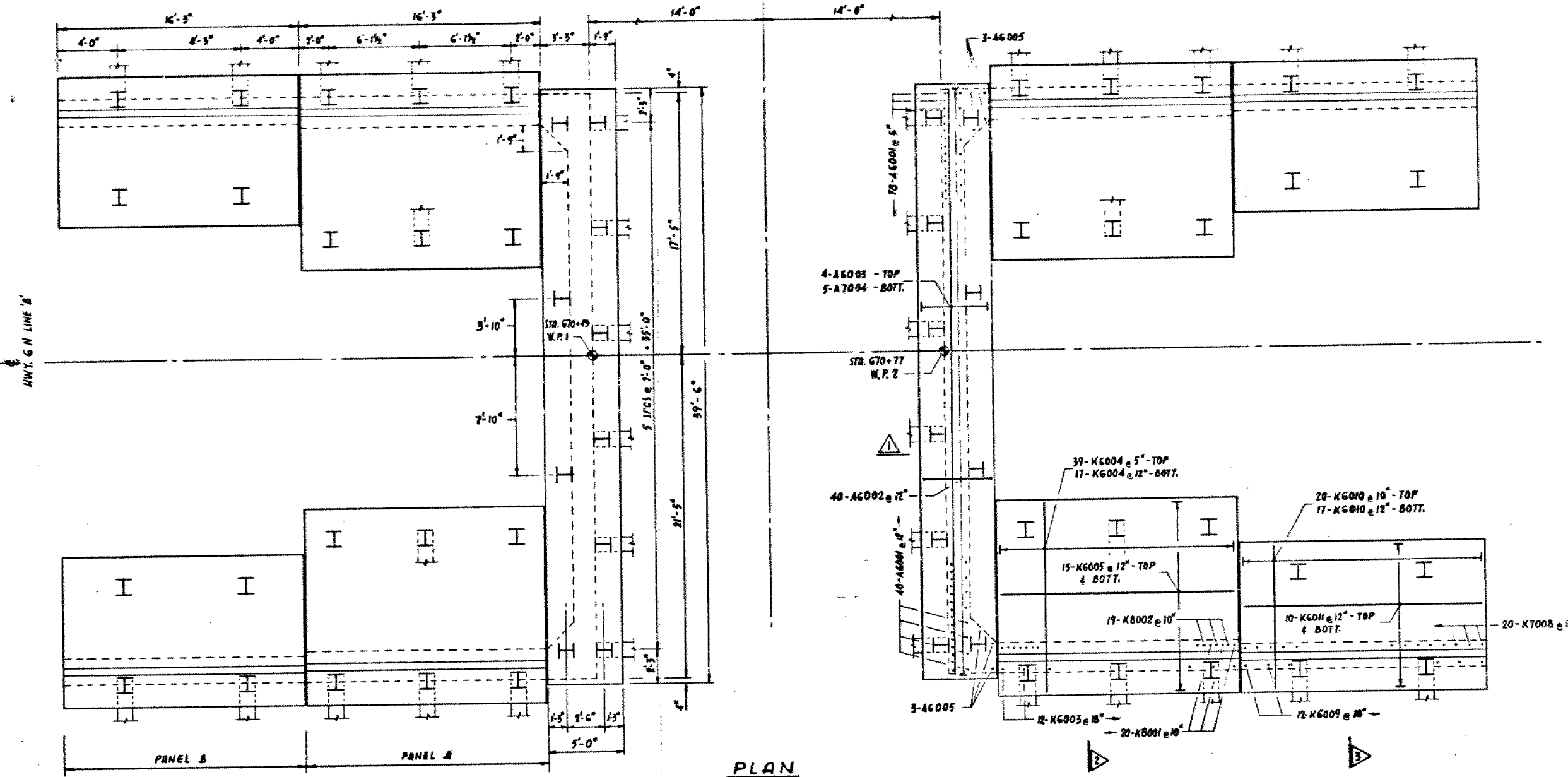
CONSTRUCTION NOTES
BACKFILL SHALL BE PLACED SIMULTANEOUSLY BEHIND BOTH ABUTMENTS, KEEPING THE HEIGHTS OF THE BACKFILL APPROXIMATELY THE SAME. AT NO TIME SHALL THE DIFFERENCE IN ELEVATIONS BE GREATER THAN 2 FEET.
FALSEWORK, SUPPORTING THE DECK, SHALL NOT BE REMOVED UNTIL AFTER THE BACKFILL HAS BEEN PLACED BEHIND THE ABUTMENTS.

- LIST OF DRAWINGS
1. GENERAL LAYOUT
 2. BORE HOLE LOCATIONS & SOIL STRATA
 3. FOOTING LAYOUT & DETAILS
 4. RIGID FRAME
 5. RETAINING WALLS
 6. BARRIER WALL
 7. STEEL RAILING (SINGLE TUBE)
 8. 20 FT. APPROACH SLAB
 9. AS CONSTRUCTED ELEV. & DIM
 10. STANDARD DETAILS I
 11. STANDARD DETAILS II

CONCRETE QUANTITIES
CONCRETE QUANTITIES ARE LISTED BELOW FOR THE APPROPRIATE CONCRETE LUMP SUM TENDER ITEMS
CONCRETE IN STRUCTURES — 153 C.Y.
CONCRETE IN RETAINING WALLS — 122 C.Y.
CONCRETE IN BARRIER WALLS — 15 C.Y.
CONCRETE IN APPROACH SLABS — 45 C.Y.

REVISIONS	DATE	BY	DESCRIPTION

DOMTAR RD. & SYMMETRY

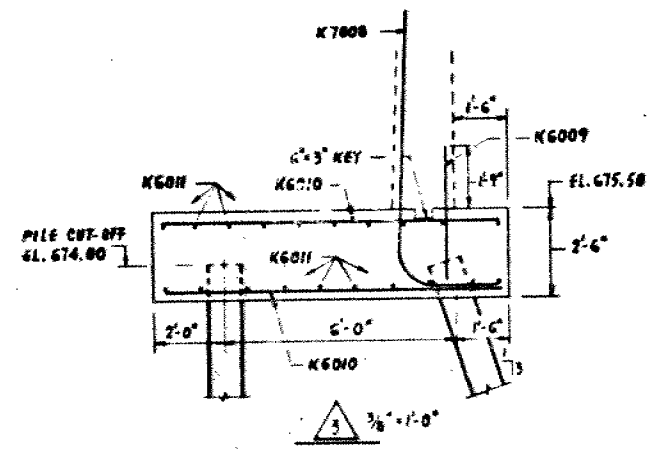
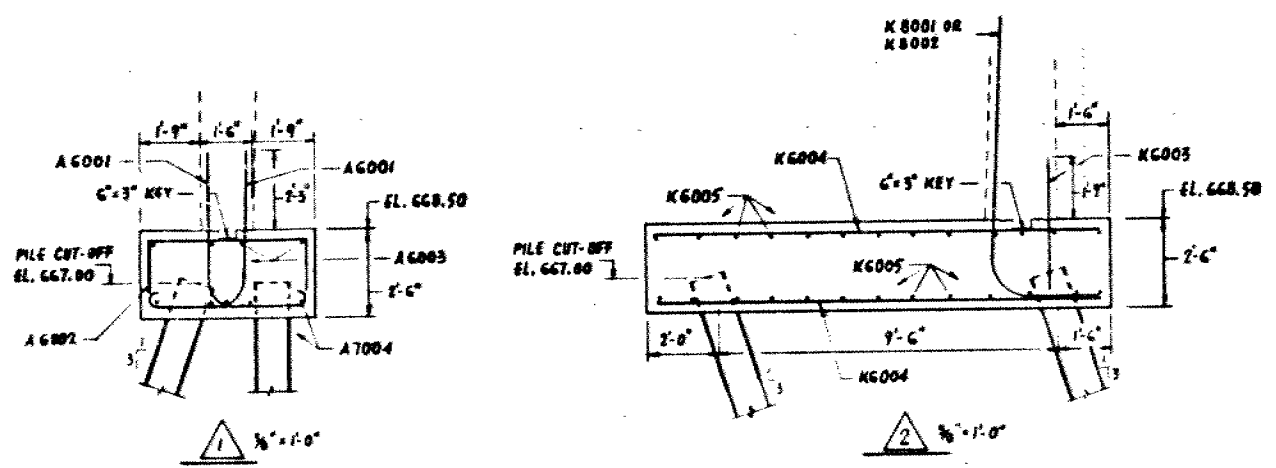


PLAN
SCALE: 3/4" = 1'-0"

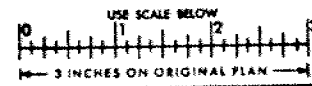
NOTE:
DIMENSIONS & REINFORCING
SIMILAR FOR EACH FOOTING

HP 12x53 PILE DATA

LOCATION	BATTER	TOTAL No. REQ'D	LENGTH
RET. WALL PANELS A	3:1	16	56'-0"
	STRAIGHT	8	53'-0"
RET. WALL PANELS B	3:1	8	64'-0"
	STRAIGHT	8	60'-0"
STRUCTURE	3:1	12	56'-0"
	STRAIGHT	8	53'-0"



FOR REDUCED PLAN
USE SCALE BELOW

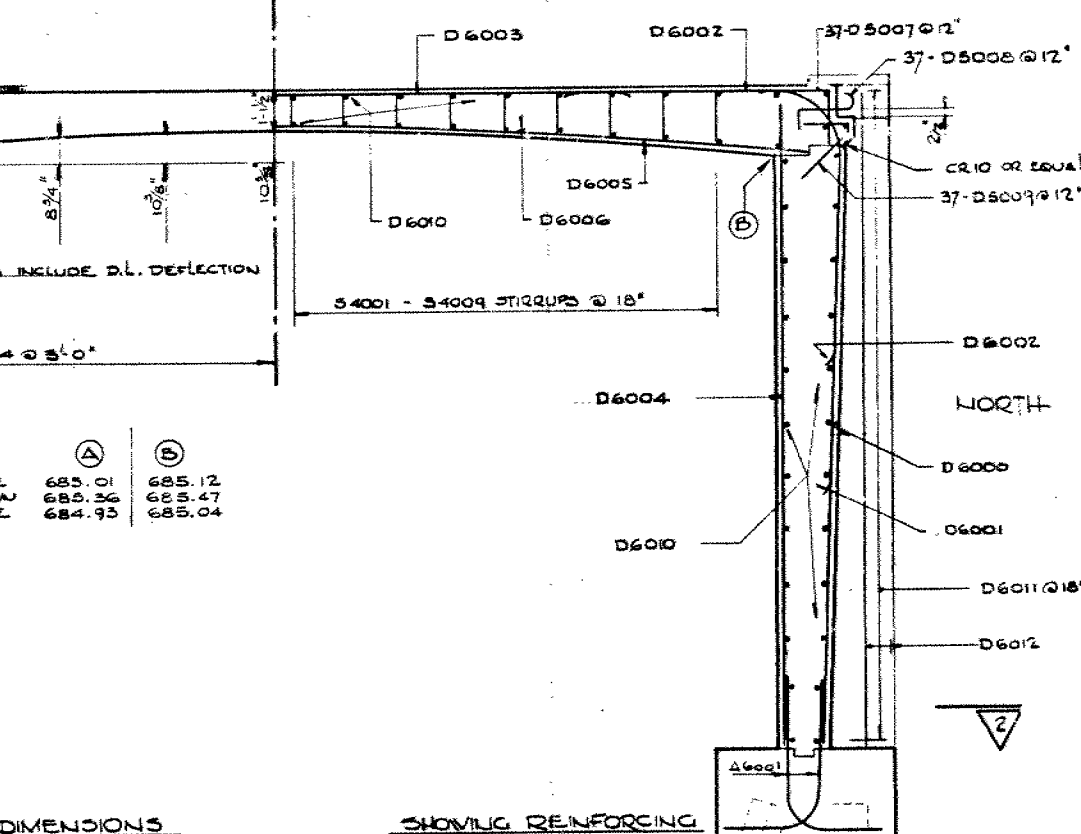
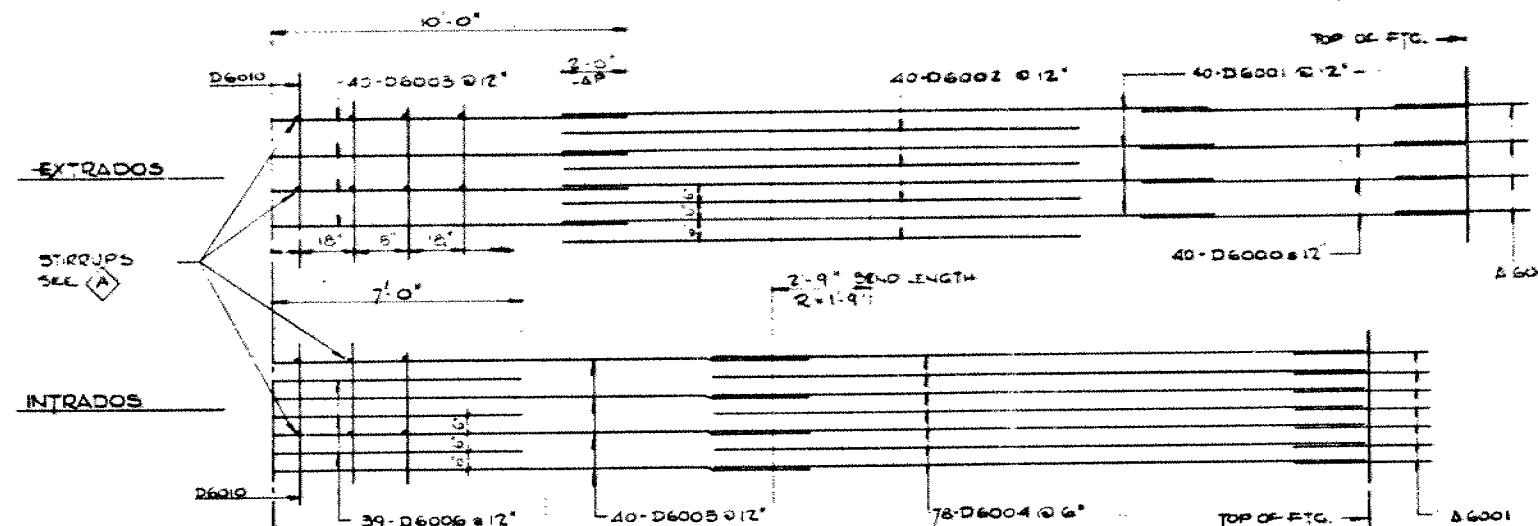


REVISIONS	DATE	BY	DESCRIPTION

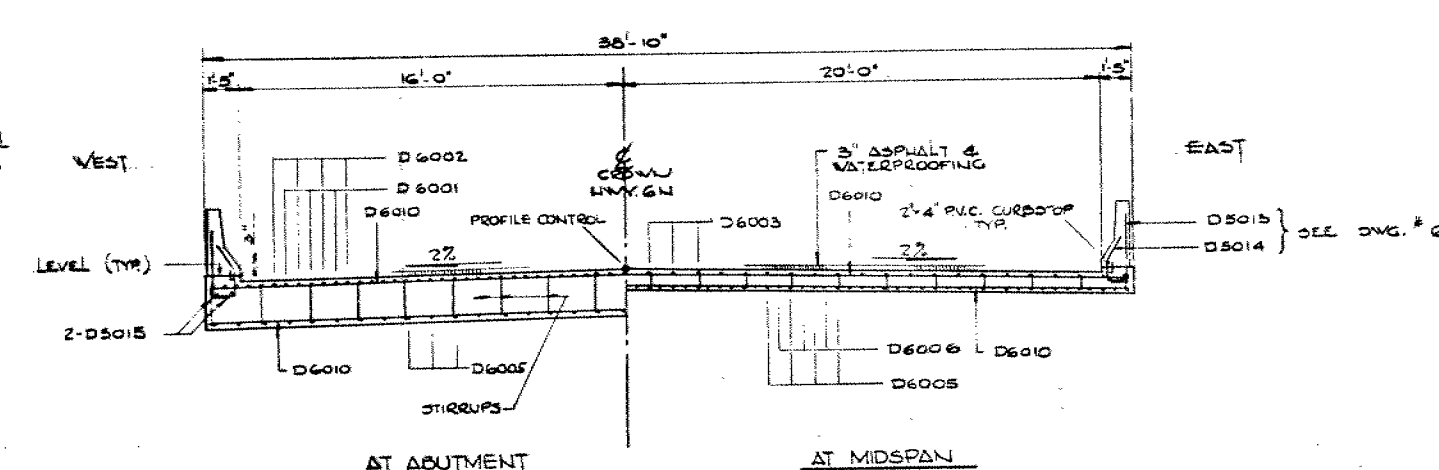
DESIGN	CHECK	LOADING	DATE
DRAWING	CHECK	SITE No	DWG

NOTE

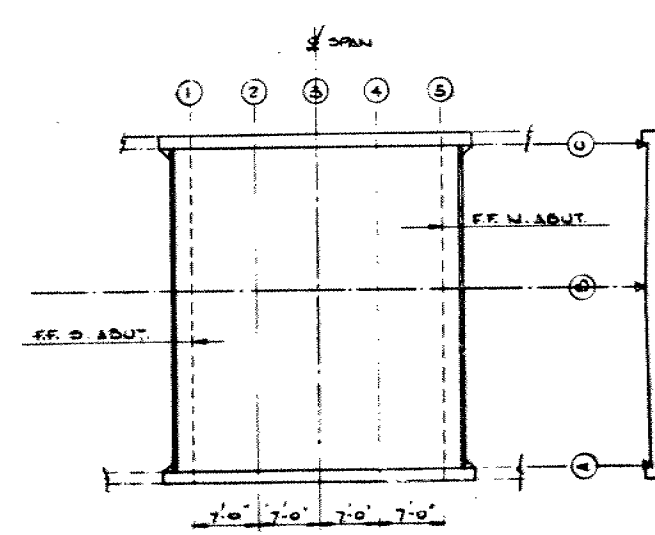
TO ACHIEVE THE MINIMUM CLEAR COVER OF 2" SPECIFIED, THE TOP LAYER OF REINFORCING SHALL BE PLACED, PRIOR TO CONCRETING, WITH A CLEAR COVER OF $2\frac{1}{2} \pm \frac{1}{2}$ " TOLERANCE.



LONGITUDINAL SECTION
 $\frac{3}{8}'' = 1'-0''$



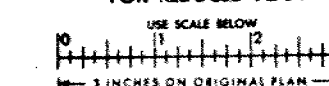
SECTION THROUGH DECK
 $\frac{1}{4}'' = 1'-0''$



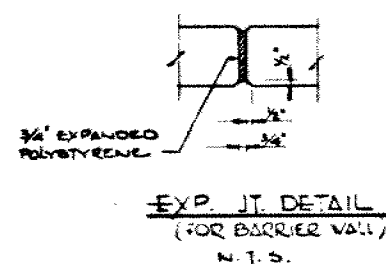
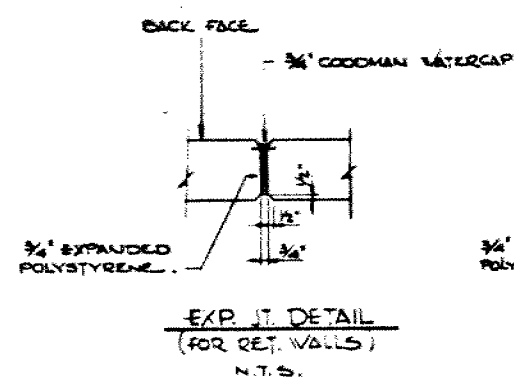
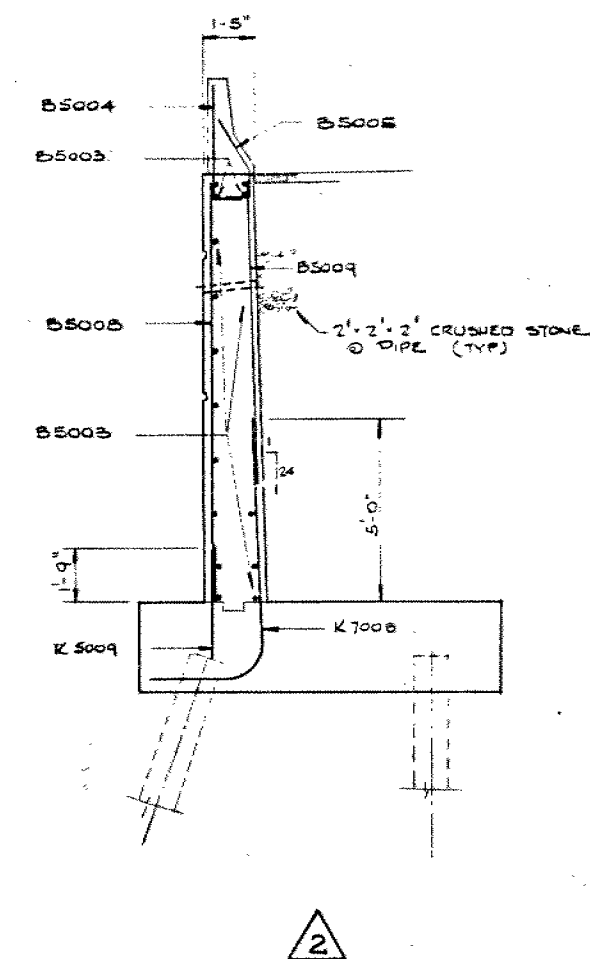
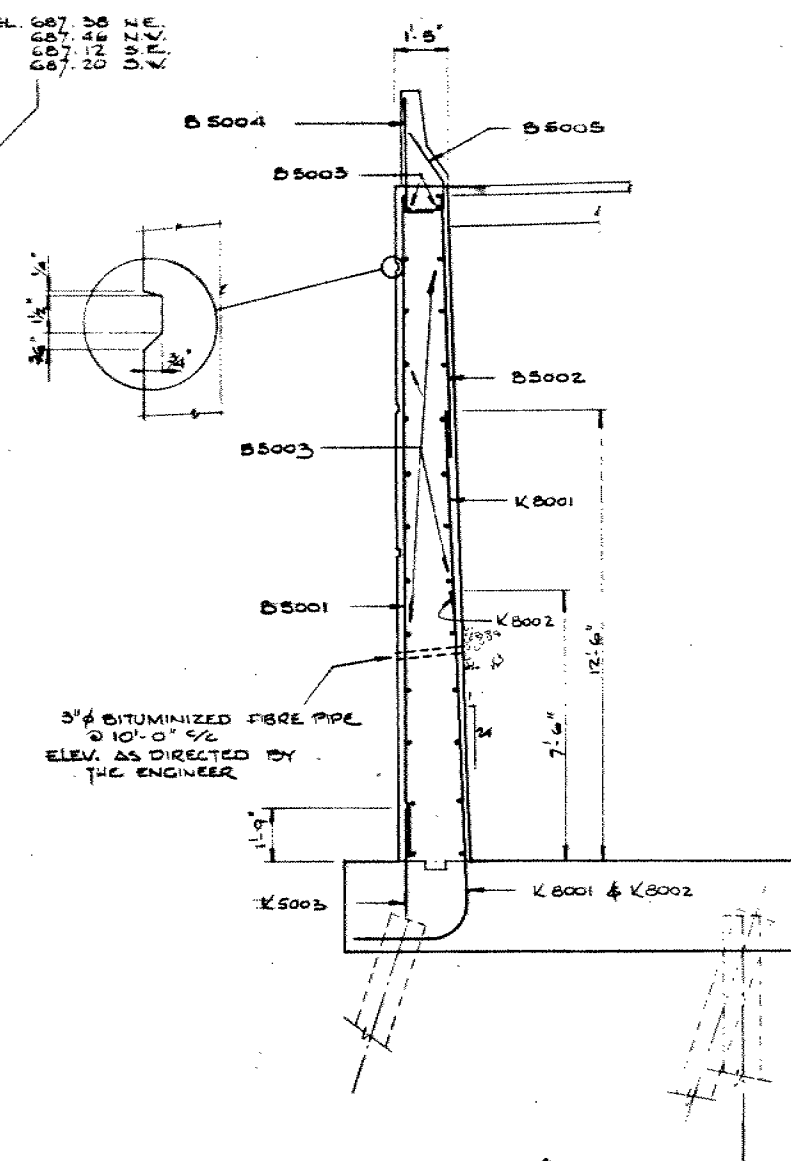
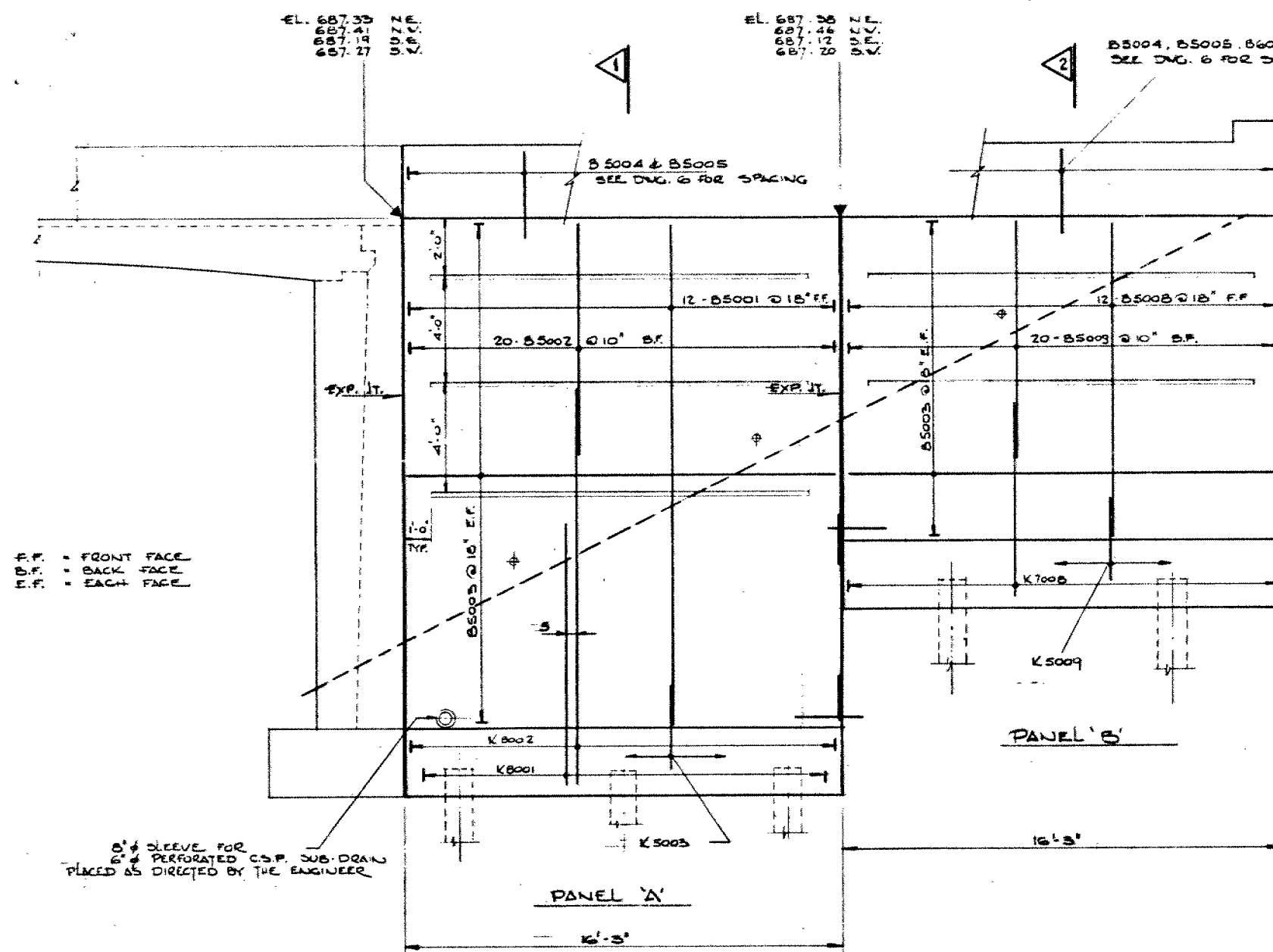
KEY PLAN
 $\frac{3}{8}'' = 1'-0''$

SCREED ELEVATIONS TOP OF CONCRETE			
	A	B	C
1	686.96	687.36	687.04
2	687.08	687.48	687.16
3	687.29	687.69	687.37
4	687.14	687.54	687.22
5	687.06	687.46	687.14

FOR REDUCED PLAN



REVISIONS	DATE	BY	DESCRIPTION	DATE	BY
DESIGN			CHECK		
DRAWING			CHECK		


$$3/8'' = 1'-0''$$


FOR REDUCED PLAN

REVISIONS					
	DATE	BY	DESCRIPTION		
DESIGN	CHECK	X	LOADING	AND UNLOADING	DATE MAY
DRAWING	CHECK		SITE No.	9-25	DWG #

ENGINEERING MATERIALS OFFICE
SOIL MECHANICS SECTION

WP 55-75-11

DIST 4

HWY 6N

STR SITE 9-133

Domtar Road Overpass
on the Caledonia By-Pass

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SAMPLE DISPOSITION NOTICE		
TYPE	DISCARD AFTER	RECOMM. BY
JARS	77-04-19	1288
TUBES	"	1288
ROCK CORES	CONTRACT MATERIAL	1288

FOUNDATION INVESTIGATION REPORT

For

Domtar Road Overpass
on the Caledonia By-Pass
W.P. 55-75-11, Site 9-133
Highway 6 New, District 4, Hamilton

INTRODUCTION

A foundation investigation was carried out at the site of the above mentioned project to determine the subsurface conditions. The fieldwork was carried out during the period of February 3 to February 28, 1977. A total of four sampled boreholes were advanced by means of 3½" I.D. hollow stem flight augers. Bedrock was proven by obtaining BXL size rock core samples.

SITE DESCRIPTION

The site is located in the vicinity of the Town of Caledonia on the Domtar Limited property. The terrain adjacent to the proposed structure site is flat to gently rolling. The land is being used for grazing purposes. Underground mining (gypsum) operations are being carried out in the vicinity of the future structure site.

Physiographically, the area lies in the region referred to as the Haldimand Clay Plain. This region in most part is covered by a somewhat irregular intermixture of clays and till.

SUBSURFACE CONDITIONS

General

The subsoil at the site was found to consist of cohesive type deposits of clayey silt to silt and/or silty clay to clayey silt (stratified), followed by a basically granular type zone of glacial till (heterogeneous mixture of gravel, sand, silt and clay) followed by (in most part) weathered bedrock (gypsum, shale and dolomite). The extent (vertical and horizontal) of the various deposits varies at this location.

The boundaries of the different deposits are shown on the Record of Borehole Sheets attached to the Appendix. The estimated stratigraphical profile shown on Drawing 557511-A is based upon this information.

From ground level downwards the various soil types encountered are described as follows:

Clayey Silt to Silt

This deposit was encountered in boreholes #1 and #4 to an approximate depth of 7 to 9.5 feet. The material may be classified as clayey silt to silt. The consistency was found to be very stiff.

Clayey Silt to Silty Clay

This stratum was intersected at all boring locations immediately at ground surface or below the clayey silt to silt zone. The thickness was found to vary from 29.5 to 53.0 feet in boreholes #1 and #3 respectively. Reference should be made to the Record of Borehole Sheets for the lower boundary elevations.

The material in the deposit consists mainly of stratified clayey silt and silty clay. Numerous, irregular silt laminations up to $\frac{1}{2}$ inch thick were also encountered within the deposit. The consistency or undrained shear strength of the overall deposit was found to vary randomly from stiff to very stiff.

Physical properties of the deposit as determined from laboratory and field tests are as follows:

Plastic Limit	(%)	14 - 26
Liquid Limit	(%)	29 - 57
Natural Moisture Content	(%)	18 - 38
Bulk Density	(PCF)	116 - 123
Undrained Shear Strength	(PSF)	
Unconfined Compression:		1370 - 3985
Quick Triaxial:		995 - 2345
Field Vane Test:		1200 - 2000 and over
Sensitivity		2.5 - 6.0

Grain size distribution curves are plotted on Figure 1.

Heterogeneous Mixture of Gravel, Sand, Silt and Clay (Glacial Till)

Immediately beneath the clayey silt to silty clay is a glacial till stratum composed of a heterogeneous mixture of gravel, sand, silt and clay. The thickness of the deposit ranges from 7 feet (B.H. #4) to 24 feet (B.H. #2). The matrix of this till is basically granular in nature. There are random localized zones within this material; where the matrix is cohesive, i.e., clayey silt binding coarser sized particles. Grain size distribution tests carried out on samples from the stratum are plotted on Figure 2.

Standard Penetration Tests carried out within the deposit gave 'N' values ranging from 19 blows per foot to 100 blows per 2 inches. Based on these results, it is estimated that the relative density of the stratum varies from compact to very dense.

Dolomite Bedrock

Dolomite bedrock with gypsum and shale intrusions was encountered at all boring locations immediately below the glacial till deposit, at depths ranging from 53 to 62 feet below the ground level. The bedrock surface across the site varies between elevation 614± and elevation 626±. The upper 2-6 foot portion of the bedrock was found to be weathered.

Groundwater Conditions

During the period of investigation groundwater level observations were carried out in the open boreholes and gave the following information:

B.H. #1	Not observed
B.H. #2	Not observed
B.H. #3	Elev. 660± (16' below ground level)
B.H. #4	Elev. 649± (27' below ground level)

DISCUSSION AND RECOMMENDATIONS

General

The field investigation at this site was requested by Mr. C.F. Farrell, Acting Regional Structural Planning Engineer in a memorandum dated December 1, 1976. Upon completion of the fieldwork we have been advised that Domtar Road will be realigned some 44 feet from its present location. After a careful review of the proposed new structure location and available soil data, we have concluded that our information is satisfactory for present design purposes. Some additional borings, however, will be carried out at a later date to confirm the length of piles.

The present proposal calls for the construction of one single span (28' in length) rigid frame structure. The proposed profile grade of the overpass structure will be at elevation 687± and the profile grade of Domtar Road is set at elevation 670±, some 7 to 8 feet below the existing ground level.

Structure Foundations

Piled foundations: All footings may be founded on end bearing steel 'H' piles driven to bedrock. It is estimated that the pile tips will reach refusal or bedrock between elevation 614± and elevation 626±. The maximum allowable load for the particular steel section may be assumed (e.g. 12BP74 steel 'H' piles may be designed for 95 tons/pile). Hard driving is expected through the glacial till stratum, therefore, it is recommended that the pile tips be reinforced with standard flange plates.

Spread footings in original ground: As an alternative, the structure may be founded on spread footing type foundations placed at or below elevation 660± within the original ground. An allowable bearing value of 2.0 TSF is recommended for design purposes. A frictional resistance to sliding for the footing bases of 1200 PSF is to apply. It is estimated that total settlements of about 2 inches will take place at the footing locations due to the superimposed loads of the fill and structure. Differential settlements should, however, be of a negligible order.

Approaches

Fills up to 10 feet and cuts about 8 feet deep will be required to realize the profile grades of Hwy. 6N and Domtar Road. No stability problems are anticipated provided the slopes are constructed with 2:1 slopes.

Other Considerations

The type of foundation support selected should be based on economical considerations.

Pile caps or spread footings should be protected against frost action by at least 4 feet of earth cover.

The base of footing excavations will be located above the encountered groundwater level, therefore, no dewatering problems are anticipated. If spread footing type foundations are selected the base of excavations should be protected against softening (run-off water) by a suitable concrete slab poured immediately upon exposure.

MISCELLANEOUS

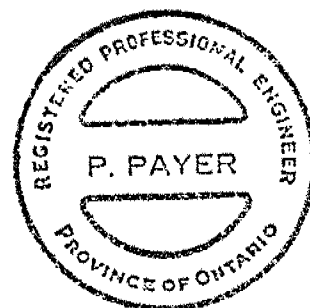
Dominion Soil Investigation Ltd. supplied the equipment for the field investigation which was carried out under the supervision of Mr. J. Murray, Student Technician. This report was prepared by Mr. P. Payer and Mr. J. Murray.

J. Murray

J. Murray
Student Technician

P. Payer

P. Payer, P. Eng.
Senior Engineer



K.G. Selby

K.G. Selby, P. Eng.
Supervising Engineer

PP/KGS/gs
April, 1977

APPENDIX

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 1

WP 55-75-11 LOCATION St. 670+00 o/s 95' Lt C Line 'B' Hwy. 6N ORIGINATED BY R.V.V.
 DIST 4 HWY 6 New BORING DATE February 28, 1977 COMPILED BY J.M.
 DATUM Geodetic BOREHOLE TYPE Hollow Stem 3 1/2" I.D. CHECKED BY [Signature]

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		
679.2	Ground Level															
0.0	Clayey Silt to Silt		1	SS	25											
672.2	Very Stiff		2	SS	16											0 0 76 24
7.0	Silty Clay to Clayey Silt		3	SS	17	670										
			4	TW	PH											
			5	SS	12											
	Brown Grey		6	SS	13											
			7	SS	17	660										
	(Stratified) occ. Silt Seams		8	TW	PH											
			9	SS	10											
	Stiff to Very Stiff		10	SS	10											
			11	SS	7	650										
			12	TW	PH											
642.7			13	SS	9											
36.5	Heterogeneous Mixture of Gravel, Sand, Silt & Clay (Glacial Till)		14	SS	91/0"	640										
	Very Dense		15	SS	100/6"											
			16	SS	100/2"	630										
626.2			17	SS	100/1"											
53.0	Dolomite Weathered Bedrock Sound		18	RC	93% red	620										
619.2	Bands of Gypsum															
60.0	End of Borehole															

OFFICE REPORT ON SOIL EXPLORATION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 2

WP 55-75-11 LOCATION Sta. 670+36 o/s 55' Lr C Line 'B' Hwy. 6N ORIGINATED BY JM
 DIST 4 HWY 6 New BORING DATE February 3, 4 1977 COMPILED BY JM
 DATUM Geodetic BOREHOLE TYPE Power Auger H.S 3 1/2 I.D. Cone Test CHECKED BY e.f.

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 P.C.F.	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	W_P	W	W_L		
676.4	Ground Level															
0.0	Silty Clay		1	SS	18											
	to		2	SS	10	670									53	0 0 28 72
	Brown		3	TW	PH											
	Grey		4	SS	12											
	Clayey Silt		5	TW	PH											
	(Stratified) occ.		6	SS	12	660										
	Silt Seams		7	TW	PH											
	Stiff to		8	SS	15											
	Very Stiff		9	TW	PH											
			10	SS	13	650										
			11	TW	PH											
			12	SS	19											
641.9			13	TW	PH											
34.5	Heterogeneous Mixture		14	SS	88	640										
	of Gravel, Sand,		15	SS	100	4"										
	Silt and Clay															
	(Glacila Till)															
	occ. Shale & Gypsum		16	RC	0%	630										
	Fragments		17	SS	100	6"										
			18	SS	100	5"										
620.0	Very Dense					620										
56.4	Dolomite Bedrock		19	SS	100	2"										
615.9	Weathered															
	Gypsum Modules		20	RC	34%											
60.5	End of Borehole															

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 3

WP 55-75-11 LOCATION Sta. 670+00 o/s 20' Lt. G Line "B" Hwy. 6 N AM & ORIGINATED BY R. V.V.
 DIST 4 HWY 6 New BORING DATE Feb. 22, 23, 23, 25. 1977 COMPILED BY JM
 DATUM Geodetic BOREHOLE TYPE H.S. Power Auger, Cone Test CHECKED BY sh.f.

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 P.C.F.	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	W_P	W	W_L		
676.3	Ground Level															GR SA SI CL
0.0			1	SS	10											
			2	SS	17											
			3	SS	15											
			4	SS	10											
			5	TW	PH											
			6	SS	6											
			7	TW	PH											
			8	SS	9											
			9	TW	PH											
			10	SS	8											
			11	TW	PH											
			12	SS	8											
			13	TW	PH											
			14	SS	8											
			15	TW	PH											
			16	SS	9											
			17	SS	8											
623.3			18	SS	57											
53.0	Heterogeneous Mixture of Gravel, Sand, Silt and Clay (Glacial Till)		19	SS	25/4"											
614.3	Very Dense		20	SS	100/1"											
62.0	Bedrock		21	SS	25/1/2"											
	Weathered layers of Gypsum, shale & Dolomite		22	RC	100/2"											
606.9			23	RC	75/2"											
70.4	End of Borehole															

OFFICE REPORT ON SOIL EXPLORATION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

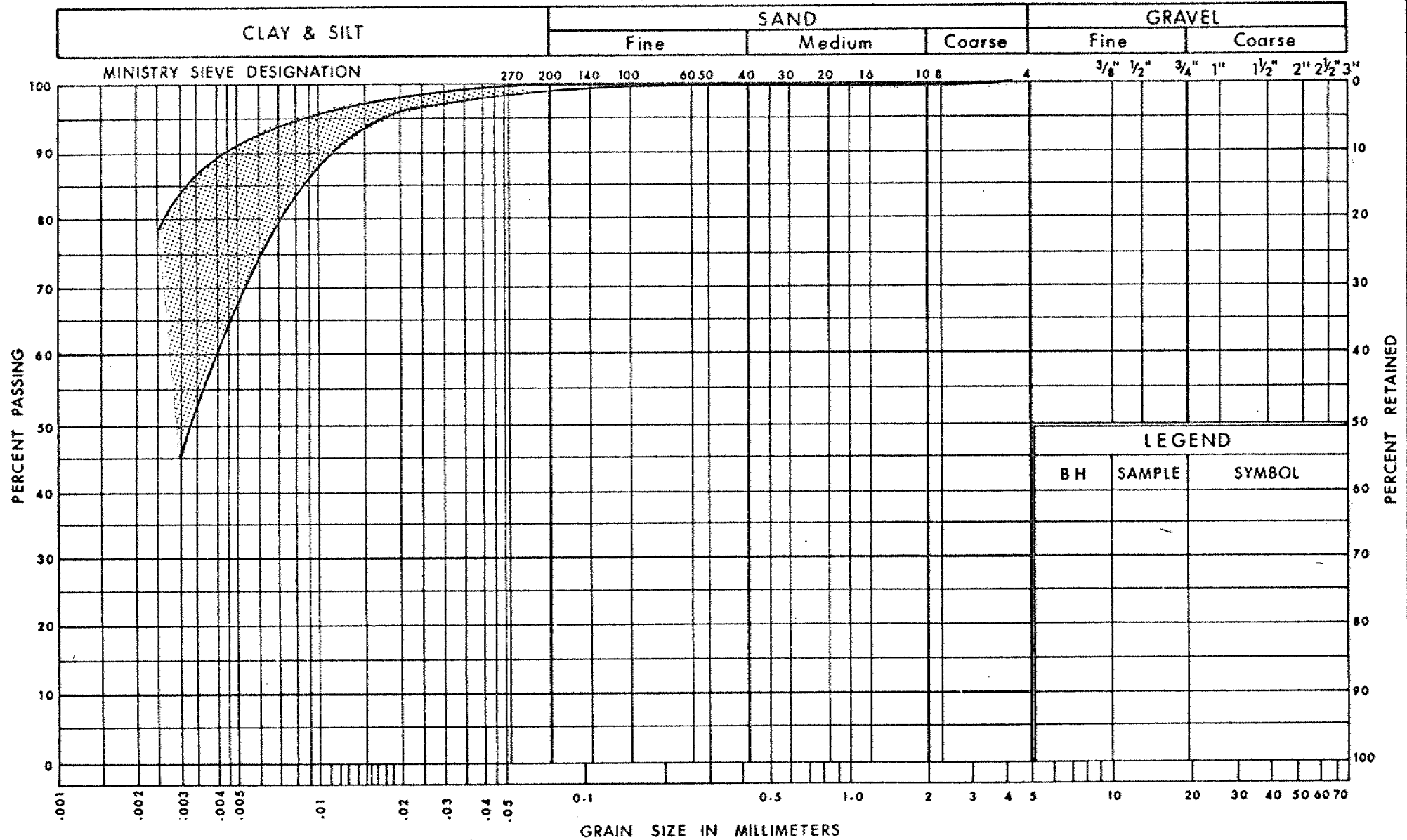
RECORD OF BOREHOLE NO 4

WP 55-75-11 LOCATION Sta. 670+52 o/s 25' Rt of Line 'B' Hwy. 6 N ORIGINATED BY JM
DIST 6 HWY 6 New BORING DATE February 15, 1977 COMPILED BY JM
DATUM Geodetic BOREHOLE TYPE Power Auger H.S. 3 1/4 I.D., Cone Test CHECKED BY

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 P.C.F.	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	W_P	W	W_L		
676.0	Ground Level															
0.0	Clayey silt to Silt		1	SS	16	670										0 0 89 11
	Very Stiff		2	SS	29											
666.5			3	SS	28											0 0 54 46
9.5	Silty Clay to Clayey Silt (stratified) occ. silt seams	Brown Grey	4	SS	18											
			5	SS	14											
			6	TW	PH	660										
			7	SS	13											
			8	TW	PH											
			9	SS	13											
	Stiff to Very Stiff		10	TW	PH	650										
			11	SS	11											
			12	SS	8											
			13	TW	PH											
			14	SS	9	640										0 0 52 48
			15	TW	PH											
			16	SS	10	630										
			17	TW	PH											116
623.0																
53.0	Het. Mixture of gravel, sand, silt & clay (Glacial Till)		18	SS	19	620										22 61 (17)
616.0	Compact		19	SS	100	1"										
60.0	Bedrock Weathered layers of Shale and Gypsum		20	SS	100	1/2"										
			21	SS	100	3/4"										
			22	SS	100	0"										
600.0	Dolomite		23	RC	21%	600										
76.0	End of Borehole															

OFFICE REPORT ON SOIL EXPLORATION

UNIFIED SOIL CLASSIFICATION SYSTEM



Ministry of
Transportation and
Communications

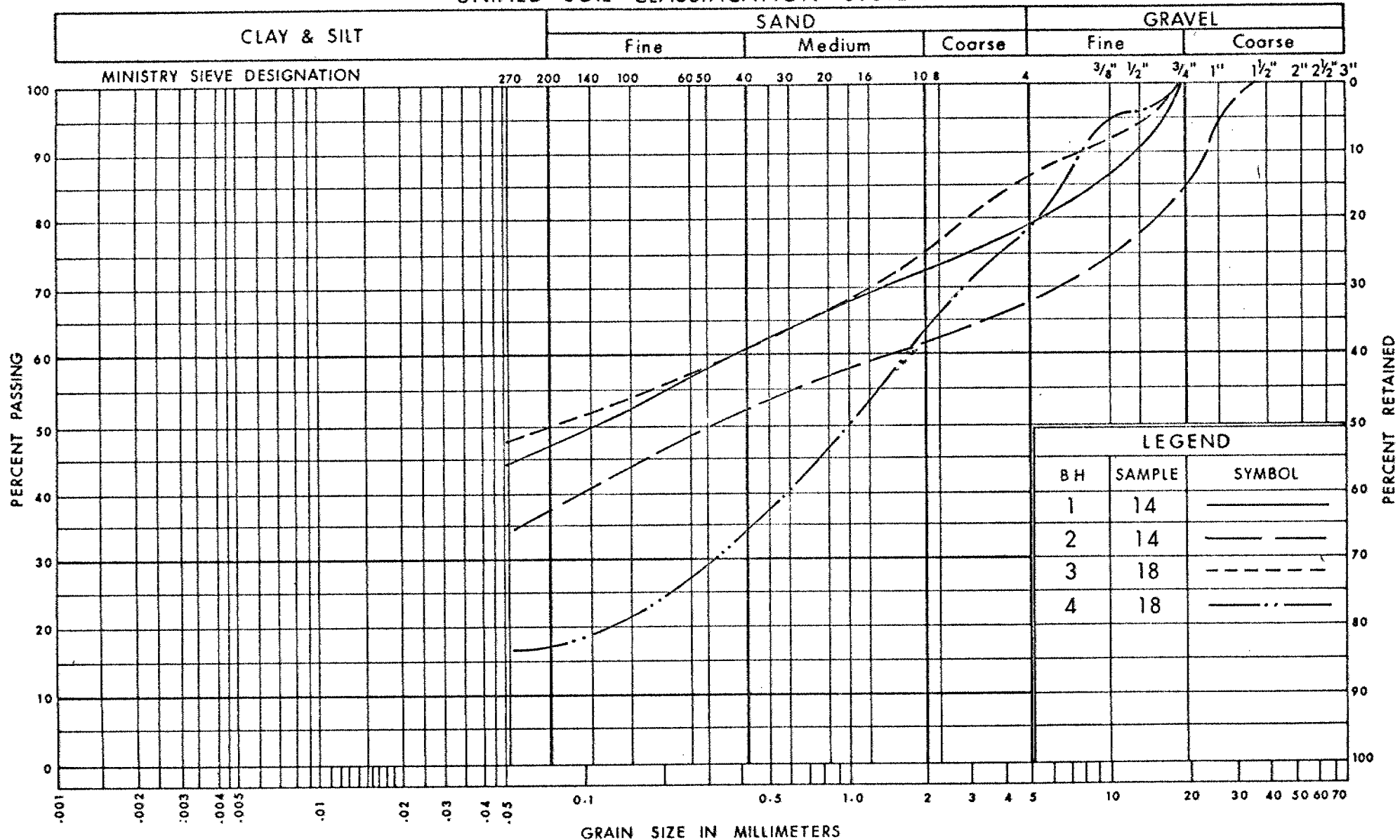
Ontario
ENGINEERING SERVICES BRANCH

GRAIN SIZE DISTRIBUTION SILTY CLAY TO CLAYEY SILT

FIG No 1

W P 55-75-11

UNIFIED SOIL CLASSIFICATION SYSTEM



Ministry of
Transportation and
Communications
Ontario
ENGINEERING SERVICES BRANCH

GRAIN SIZE DISTRIBUTION
GLACIAL TILL
HET MIXTURE OF GRAVEL SAND SILT & CLAY

FIG No 2

W P 55-75-11

ABBREVIATIONS & SYMBOLS USED IN THIS REPORT

PENETRATION 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
CU	CONSOLIDATED ISOTROPIC UNDRAINED TRIAXIAL	C	CONSOLIDATION
CID	" " DRAINED "	S	SENSITIVITY
CAU	" ANISOTROPIC UNDRAINED "		
CAD	" " DRAINED "		

ABBREVIATIONS & SYMBOLS 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
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_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_i	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

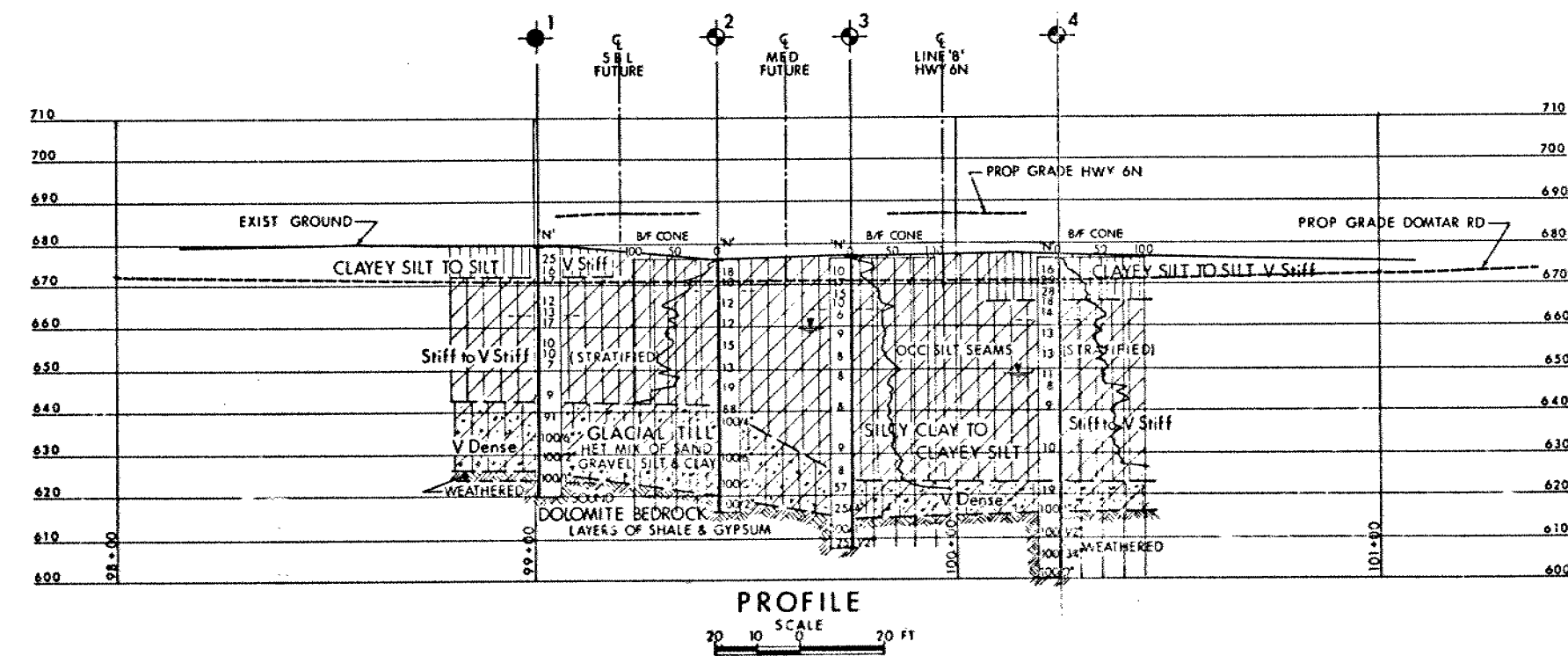
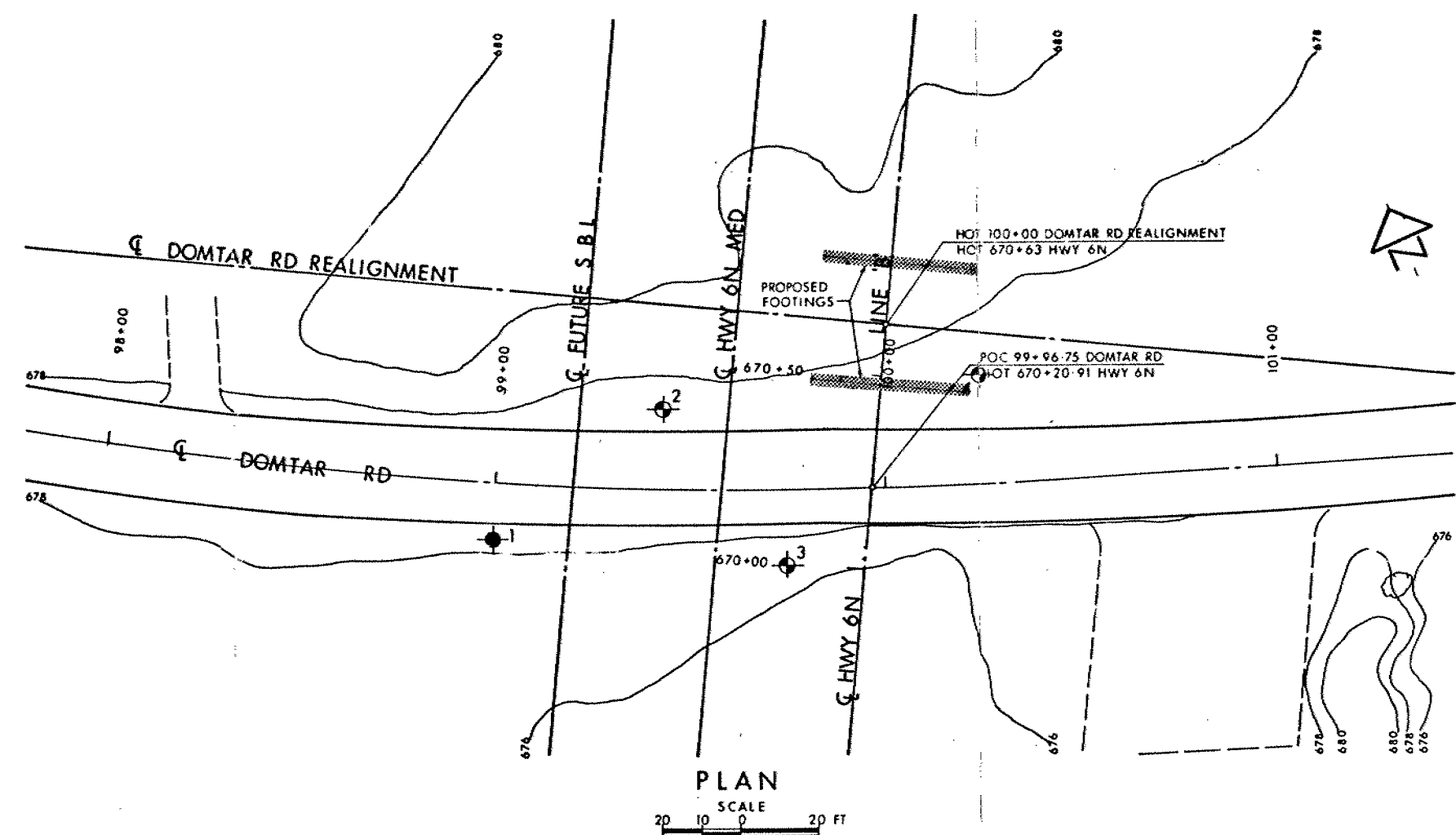
FOUNDATIONS

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

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ON-MT-308 10-75

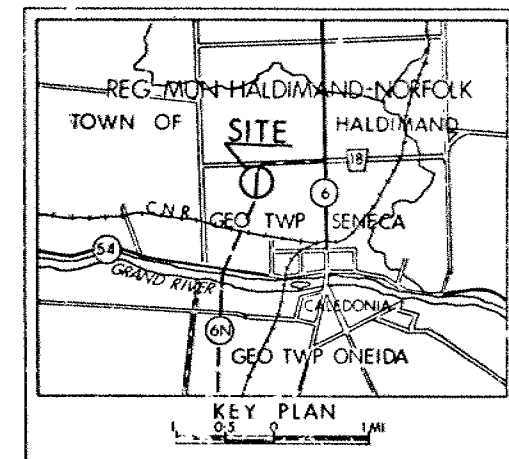


CONT No
WP No 55-75-11

DOMTAR RD OVERPASS

BORE HOLE LOCATIONS & SOIL STRATA

SHEET



LEGEND

- Bore Hole
- Dynamic Cone Penetration Test (Cone)
- Bore Hole & Cone
- Blows/ft (Std Pen Test 350 ft lbs energy)
- Blows/ft (60° Cone, 350 ft lbs energy)
- WL at time of investigation FEB 1977
- NO WL established BH No 1 & 2

No.	ELEVATION	STATION	OFFSET LINE 'B'
1	679.2	670+00	95' LT
2	676.4	670+36	55' LT
3	676.3	670+00	20' LT
4	676.0	670+52	25' RT

-NOTE-

The boundaries between soil strata have been established only at Bore Hole locations. Between Bore Holes the boundaries are assumed from geological evidence.

REVISIONS	DATE	BY	DESCRIPTION

GEOCRE No 30M4-62

REF PLAN E-5437-1 NOV 1976

HWY No. 6 NEW

SLIPMENTS CHECKED DATE APR 15 1977

GRAVITY OL 1 CHECKED

DIST 4

SITE 9-133

DWG 557511-A

FOUNDATIONS OFFICE

REVIEW OF DESIGN DRAWINGS: W.P. ... 55-75-11
 W.O.
 Foundation Report By: P.P. & J. MURRAY
 Review of Design Drawings By: P.P.
 Design Drawing No.'s: 9-133-71

1. Does footing design comply with our report or subsequent memos? No
2. If answer to 1. is No, is present design acceptable? No
3. Has sufficient field work been done?
 ADDITIONAL FIELD WORK THAT BE REQUIRED
4. Are estimated pile lengths shown on Drawings correct?
 If not, make a new list. N/A.
5. If excavation of unsuitable soil is recommended, is this shown on Drawings? N/A
6. Are approaches designed in accordance with our report? Check slopes and berm lengths. YES
7. Do you anticipate any construction problems?
 i.e., dewatering, stability of temporary slopes or excavations. No
8. Summarize your comments; on separate sheet if necessary.

- 1.) PILED FOUNDATIONS ARE RECOMMENDED,
 (12 BP 74 STEEL 'H' PILES DRIVE TO BEDROCK
 EL. 614± - EL. 626±, 95 T/PILE)
- 2.) SPREAD FOOTINGS ^{AT EL.} BELOW EL. 660±, 2 TSF.
 (DRAWING SHOWS SPREAD FOOTINGS AT EL. 665.5)

Drawings Received ... APRIL 11 19.77.
 Reviewed ... APRIL 26 19.77.

Signed P. Payer

To: G.C.E. Burkhardt
Reg. Structural Planning Eng.
Structural Planning Office
3501 Dufferin Street
Downsview, Ont.

From: S. M. S.
E.M.O.
West Building Downsview

Date: 77-03-22

Subject: Downton Road Overpass
on the Caledonia Bypass
W.P. 55-75-11 Site 9-133
Highway 6 New, District 4.

The following letter includes both a review of soil conditions and preliminary recommendations for the Duntan Road overpass on the Caledonia Bypass.

A surface layer varying in depth from 3.5 to 7.0 feet in depth is made up of topsoil underlain by brown silty clay. This material is very stiff to hard in consistency with standard Penetration 'N' values ranging from 10-23 blows per foot. Below this, a grey silty clay with occasional silt seams extends from elevation 660 to elevations varying from 642 at the western limit of the foundation to 622 at the eastern limit. The consistency of this material varies from firm to stiff with shear strengths from 700 pounds per square foot to greater than 2240 pounds per square foot.

2

Sensitivity ranges from 1.4 to 7.6 in this material.

A till material of approximately 20 foot thickness with 'N' values ranging from 57 blows per foot to 1,000 blows for $\frac{1}{2}$ inch of penetration lies above the bedrock. This material is made up of clayey silt, some sand, some gravel and some weathered gypsum.

Bedrock elevation ranges from 623 at the western foundation limit to 605 at the eastern limit. The bedrock is made up of shale and dolomite with intrusions of gypsum.

Water table elevations range from 654 to 645 so that water should pose no problem during excavation.

The proposed structure is a concrete rigid frame with a clear span of 28' and vertical

clearance of 14'6" there will be a 10' foot cut for Downton Road bringing the road surface to elevation 670. Ramped fills of approximately 10 feet will be required behind the abutments.

Steel H Piles driven to refusal in the very hard till material are recommended for this site. Refusal should be expected around elevation 630 at the western end of the abutment and around 615 at the eastern end. The maximum allowable load for the particular steel section may be assumed (e.g. 12BP74 steel H piles may be designed for 95 tons/pile). In this case negligible differential settlements will result.

Alternatively spread footings placed within the original ground may be used with allowable bearing capacity of approximately 2 tons per square foot. The shearing resistance of the material at the proposed footing elevation of 666 is approximately 1,200 lbs. Differential settlements of magnitude 1 inch may be expected.

Approach fills should have side slopes of 2:1 and Coptoul should be removed before placing the fill.

Choice of footing for this site should be based on economic criteria.

Mr. W. Killin
Structural Planning Supervisor
Structural Office
Central Region, 3501 Dufferin St.

Soil Mechanics Section
Engineering Materials Office
West Building, Downsview

77 03 25

Re: Preliminary Recommendations For
Domtar Access Road Overpass Under
the Caledonia By-Pass
Hwy. #6N, Line 'B'
W.P. 55-75-11, Site 9-133
District 4, Hamilton

A concrete rigid frame structure with a clear span of 28 feet is proposed at this location.

Borings carried out in the vicinity of the south abutment indicate that the subsoil consists of an approximate 55 foot deep deposit of stiff to very stiff silty clay to clayey silt with silt seams, followed by a very dense (approximate 20 foot thick) stratum of heterogeneous mixture of gravel, sand, silt and clay silt (glacial till), followed by a dolomite type bedrock with shale and gypsum intrusions at elevation 600±.

The observed groundwater level is at elevation 650± (26' below existing ground level). The profile grade of the Hwy. #6N will be at elevation 687± which is some 10-11 feet above the existing ground level. The grade of Domtar Access Road is set some 6-7 feet below existing ground surface (elev. 670±).

Considering a minimum of 4 feet of earth cover for frost protection, the base of the footings will be located at elevation 660±. At this level, the subsoil is competent to support spread footing type foundations designed for 2.0 T.S.F. A frictional resistance to sliding for the abutment footings of 1200 P.S.F. is recommended. Up to 2 inches of settlements are anticipated due to the embankment and structure loading. An approximate 1 inch maximum of differential settlement is expected. As an alternative, the abutments may be founded on end bearing steel 'H' piles driven to bedrock (elev. 610±). The maximum allowable load for the particular steel section may be assumed.

No dewatering problems are anticipated.


2:1 slopes are recommended.

Additional fieldwork will be carried out to verify our recommendations and will be reported in a complete foundation investigation and design report.

cont'd.....

The above recommendations should enable you to prepare a comparative cost estimate and proceed with the structure design.

Should further information be required, please contact our Office.


for

P. Payer
Senior Engineer

For: K.G. Selby
Supervising Engineer

PP/gs

cc: J. Anderson
R. Fitzgibbon
C.S. Grebski
Files ✓
Record Services