

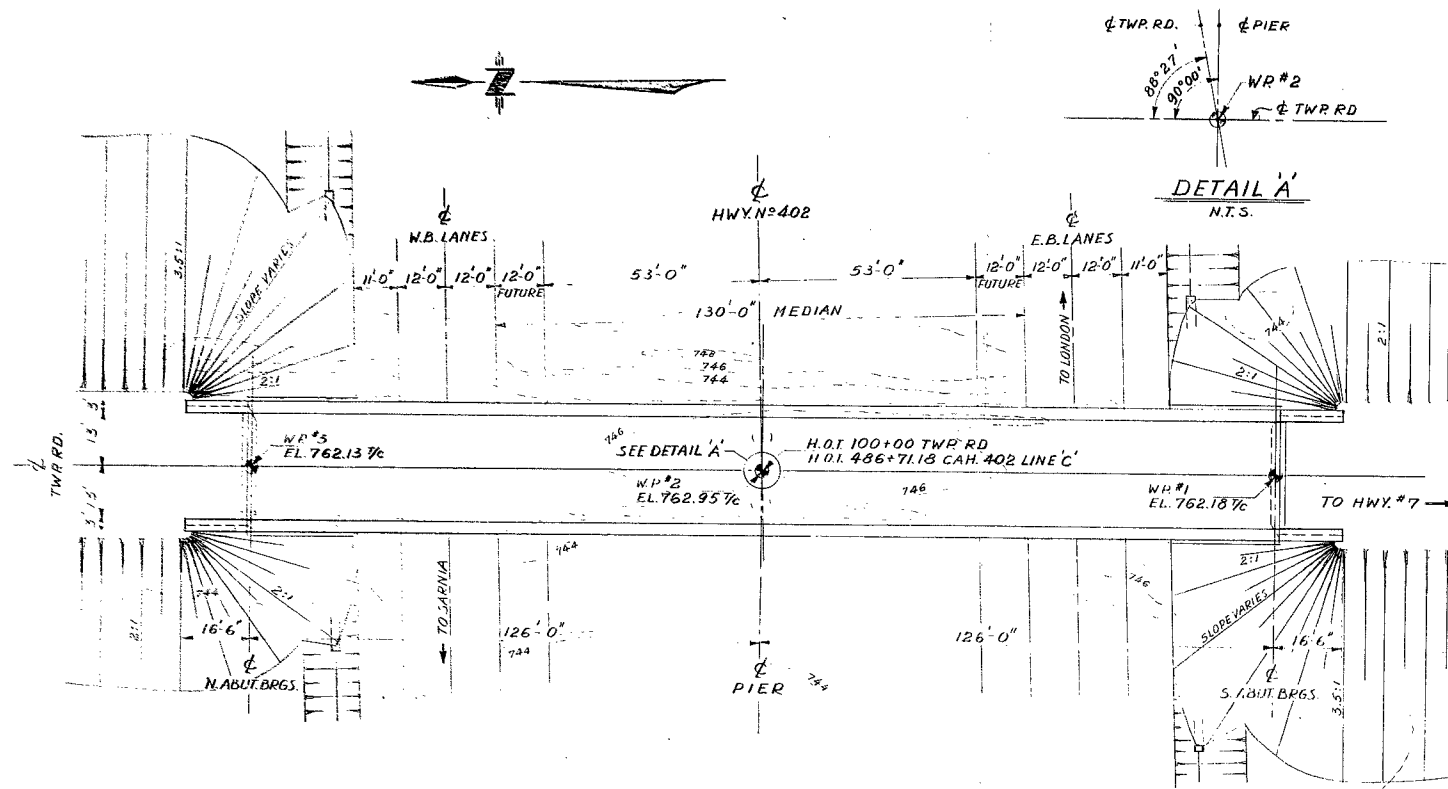
#69-F-95

W.P. 42-66-05

HWY. #402, LINE 'C',

AND C.A.H.

TOWNSHIP ROAD.



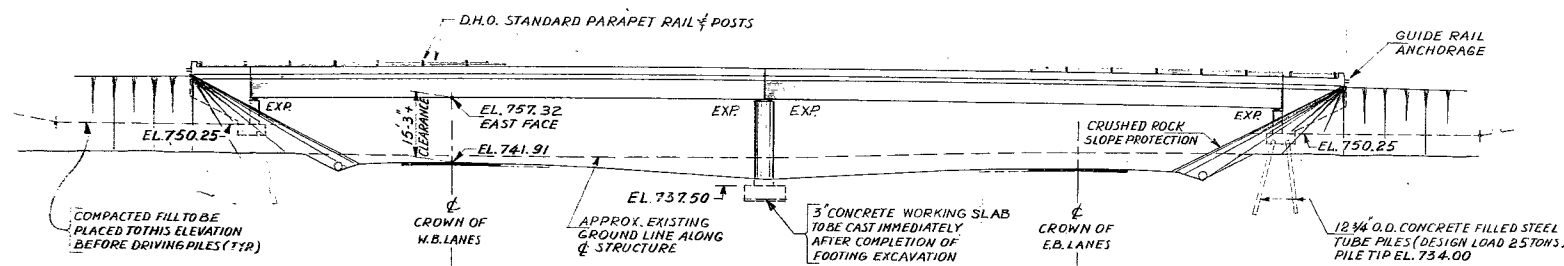
#### NOTE

- 7/8" DENOTES ELEVATIONS ARE TO TOP OF CONCRETE WEARING SURFACE
- WP DENOTES WORKING POINT

#### PLAN

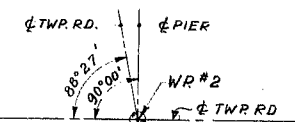
SCALE: 1" = 20'-0"

NORTH 285'-0" SOUTH



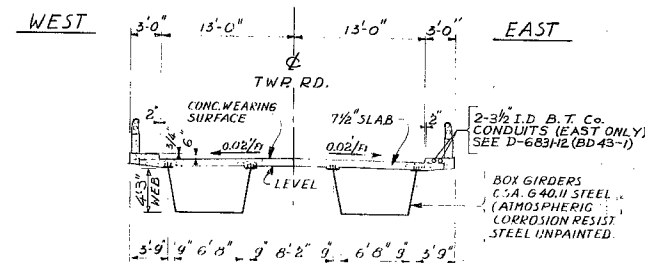
#### ELEVATION

SCALE: 1" = 20'-0"



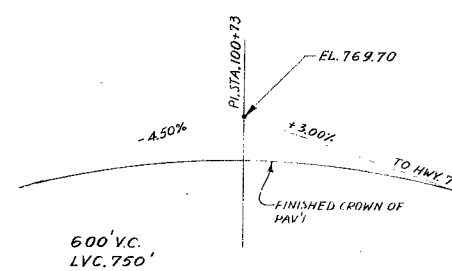
#### DETAIL A'

N.T.S.



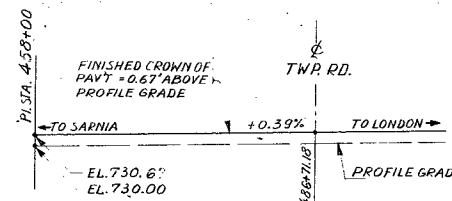
#### TYP. DECK SECTION

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



#### PROFILE OF TOWNSHIP RD.

N.T.S.



#### PROFILE OF HWY. NO. 402

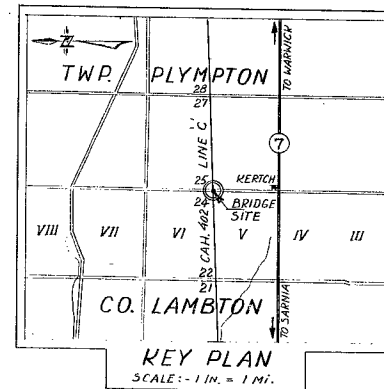
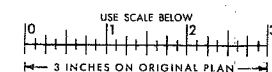
N.T.S.

#### LIST OF DRAWINGS.

- D-6831-1 GENERAL LAYOUT
- 2 BOREHOLE LOCATIONS AND SOIL STRATA
- 3 FOUNDATION LAYOUT
- 4 ABUTMENTS
- 5 PIER
- 6 STRUCTURAL STEEL I
- 7 STRUCTURAL STEEL II AND BEARING DETAILS
- 8 DECK
- 9 PARAPET WALL DETAILS
- 10 STANDARD STEEL PARAPET RAIL
- 11 STANDARD DETAILS I
- 12 STANDARD DETAILS II



FOR REDUCED PLAN



#### NOTES

- CLASS OF CONCRETE**
- DECK, CURBS AND PARAPET WALLS 4000 P.S.I.
  - PIER COLUMNS 4000 P.S.I.
  - REMAINDER 3000 P.S.I.
- AND/OR AS NOTED ON DRAWINGS
- CLEAR COVER ON REIN. STEEL**
- FOOTINGS, ABUTMENTS, PIER COLUMNS, DECK: TOP BOT. 3"
  - CURBS, PARAPET WALLS, APPROACH SLABS, 2"
- AND/OR AS NOTED ON DRAWINGS
- CONSTRUCTION NOTES**
- THE CONTRACTOR IS RESPONSIBLE FOR FINISHING THE BEARING SEATS DEAD LEVEL TO THE SPECIFIED ELEVATIONS WITH A TOLERANCE OF  $\pm 1/8$  INCH.
- NO CONCRETE SHALL BE PLACED ABOVE THE ABUTMENT BEARING SEATS UNTIL THE CONCRETE IN THE DECK HAS BEEN PLACED.

B.M. ELEV. 747.48  
GEODETIC DATUM: N.E.W. IN W. ROOT 1.5' BEECH 233' RT. 4.87+07 LINE 'C'

REVISIONS	DATE	BY	DESCRIPTION

DEPARTMENT OF HIGHWAYS ONTARIO BRIDGE DIVISION			
69-F-95			
TOWNSHIP RD. TO UTTOXETER UNDERPASS			
3.4 MILES EAST OF COUNTY RD. #21			
KING'S HIGHWAY No. 402 LINE 'C'		DIST. No. 1	
CO. LAMBTON		TWP. PLYMPTON	
LOT 24 & 25		CON. 5 & 6	
GENERAL LAYOUT			
APPROVED		SITE No. 14-350 W.P. No. 42-66-05	
DESIGN J.L.K. CHECK J.S.K.		CONTRACT No.	
DRAWING J.S.K. CHECK J.L.K.		DRAWING No. D-6831-1	
DATE DEC. 1970		LOADING HS20-44	



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: February 5, 1970

OUR FILE REF.

IN REPLY TO

FEB 13 1970

SUBJECT:

FOUNDATION INVESTIGATION REPORT  
For  
Proposed Crossing of  
Township Road, 3.4 Miles East  
Of Lambton County Rd. #21 and  
C.A.H. #402, Line 'C'  
District No. 1 (Chatham)  
W.J. 69-F-95 -- W.P. 42-66-05

Attached, we are forwarding to you our detailed foundation investigation report on the subsoil conditions existing at the above structure site.

We believe that the factual data and recommendations contained therein, will prove adequate for your design requirements. Should additional information be required, please feel free to contact our Office.

AGS/MdeP  
Attach.

*Afternoon*  
A. G. Stermac  
PRINCIPAL FOUNDATION ENGINEER

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

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FOUNDATION INVESTIGATION REPORT  
For

Proposed Crossing of  
Township Road, 3.4 Miles East  
Of Lambton County Rd. #21 and  
C.A.H. #402, Line 'C'  
District No. 1 (Chatham)  
W.J. 69-F-95 -- W.P. 42-66-05

1. INTRODUCTION:

A request for a foundation investigation at the crossing of the proposed C.A.H. #402, Line 'C' and Plympton Township, 3.4 miles east of County Road #21, was received from Mr. A. P. Watt, Regional Bridge Planning Engineer, in a memorandum dated November 7, 1969.

A field investigation was subsequently carried out by the Foundation Section to determine the subsoil conditions existing at the site. This report contains the results of this investigation and our recommendations pertaining to the design of the proposed structure foundations and approach embankments.

2. DESCRIPTION OF THE SITE:

The site of the proposed underpass structure is situated about 20 miles east of Sarnia, 3.4 miles east of County Rd. #21, and approx. 3/4 mi. north of Hwy. #7 on the Township Road, locally known as Uttoxeter Road.

The surrounding area is flat. On the east side the land is cultivated farmland, but on the west side the land is covered with trees.

Physiographically, the site is located on the approximate boundary of the regions referred to as the St. Clair Clay Plain, and Horseshoe Moraines.

### 3. FIELD AND LABORATORY INVESTIGATION PROCEDURES:

A total of six sampled boreholes and nine dynamic cone penetration tests was carried out during the course of the field work. Boring was achieved by means of a continuous flight auger machine, and conventional diamond drilling equipment adapted for soil sampling purposes. During the field work, disturbed samples were obtained by means of a standard split-spoon sampler; the energy used in driving it, conformed to the requirements of the Standard Penetration Test. Undisturbed samples were recovered using 2-inch I.D. Shelby tubes which were pushed into the soil hydraulically.

Dynamic cone penetration tests were carried out adjacent to each borehole with the exception of B.H.'s #2 and 11, and also at five other locations. Driving energy to advance the cone was 350 ft.-lbs. per blow.

The bedrock was proved at one borehole location using BXL rock coring equipment.

All boreholes were surveyed in the field by personnel from London Region Engineering Surveys Section. The locations and elevations of the borings are shown on Drawing No. 69-F-95A which accompanies this report.

All samples were visually examined and classified at the site as well as in the laboratory. Following this inspection laboratory tests were carried out on selected samples to determine the following physical properties:

- Atterberg Limits
- Moisture Content
- Grain-size Distribution
- Undrained Shear Strength
- Bulk Density

The test results are summarized on the Record of Borehole sheets contained in the Appendix of this report.

#### 4. SOIL TYPES AND SOIL CONDITIONS:

##### 4.1) General:

Generally uniform subsoil conditions were found to prevail over the site area. The subsoil consists of a deep deposit of cohesive material - clayey silt - with some sand and traces of gravel, underlain by shale and limestone bedrock. The boundaries between different deposits are shown on the Record of Borehole sheets attached to the Appendix. The estimated stratigraphical profile of Drawing 69-F-95A is based upon this information.

From ground level downward, the various strata are described in some detail with regard to soil types and soil properties, as follows:

##### 4.2) Fine Sand with some Silt and Clay:

This material was encountered in B.H.'s #7 and 10 from ground level down to 4.0 and 7.0 ft., respectively. The material consists of fine sand, some silt and clay. The only grain-size analysis carried out on a sample from this stratum showed the following distribution, and is plotted on Fig. 2.

Sand	:	79%
Silt and Clay	:	21%

The relative density may be described as compact.

##### 4.3) Clayey Silt to Silt with Sand and traces of Gravel:

This material was found in B.H.'s #7 and 11. In B.H. #7 this extended from 4.0 down to 35.0 ft., and in B.H. #11 from ground level to 17.0 ft. The material consists of clayey silt to silt with sand and traces of gravel. On the Plasticity Chart it falls within the CL-ML zone and is plotted on Fig. 1. The two grain-size analyses showed the following distribution, and are plotted on Fig. 2.

Gravel	:	5	-	9%
Sand	:	40	-	49%
Silt	:	36	-	38%
Clay	:	8	-	15%



4. SOIL TYPES AND SOIL CONDITIONS: (cont'd.) ...

4.3) Clayey Silt to Silt with Sand and traces of Gravel:

(cont'd.) ...

The consistency of the material, based on 'N' values, ranged from stiff to hard.

4.4) Clayey Silt with some Sand and traces of Gravel:

This deposit was intersected in all boreholes. In B.H. #10 it underlies the fine sand layer, in B.H. #11 it underlies a clayey silt to silt with sand stratum, and in B.H. #7 it underlies both of the above mentioned layers. The material in the deposit consists of clayey silt with some sand and traces of gravel. There are some silt seams distributed randomly. A plot of Plasticity Index versus Liquid Limit (Fig. 1) shows the points to fall within the CL zone.

The undrained shear strength of the deposit is, in general, more than 2000 p.s.f. as determined by unconfined compression tests. The shear strength increases with depth - from about 2000 p.s.f. at El. 735 to about 5000 p.s.f. at El. 675, indicating a very stiff to hard consistency. The natural moisture content is, in general, close to the plastic limit.

In B.H. #11 refusal to augering was met at a depth of 75 ft. (El. 669.0). At that time it was thought that the refusal was due to underlying bedrock or a boulder. Therefore, a diamond drill was placed over the hole and a 4-ft. long BXL core was obtained. Upon extraction it was found to be clayey silt, with some sand and traces of gravel, but with a very hard consistency. The recovery was almost 100%. In B.H. #6, refusal to augering was met at a depth of 88.0 ft. (El. 657.6) due to the same very hard deposit.

Boreholes #3 and 10 were terminated in the very stiff to hard clayey silt stratum.

4. SOIL TYPES AND SOIL CONDITIONS: (cont'd.) ...

4.4) Clayey Silt with some Sand and traces of Gravel: (cont'd.)

The test results are plotted on the Record of Borehole sheets and also on Figs. 1, 2 and 3 of the Appendix. The physical properties of the material are as follows:

Liquid Limit	:	18	-	37%
Plastic Limit	:	12	-	25%
Moisture Content	:	8	-	24%
Bulk Density	:	135	-	140 p.c.f.

The grain-size analysis indicated the following distributions:

Gravel	:	1	-	4%
Sand	:	13	-	18%
Silt	:	47	-	53%
Clay	:	28	-	36%

4.5) Silty Clay:

This deposit was encountered in B.H. #7 only, between El. 625.2 and El. 615.7. It is overlain by the clayey silt deposit and is underlain by bedrock. The material consists of grey silty clay. The only sample obtained indicated the following physical properties, which are plotted on Figs. 1, 2 and 3.

Liquid Limit	:	48%
Plastic Limit	:	21%
Moisture Content	:	26%

The only grain-size analysis showed the following composition:

Silt	:	35%
Clay	:	65%

Standard Penetration Test 'N' value of 34 blows per ft. indicates a hard consistency.

4. SOIL TYPES AND SOIL CONDITIONS: (cont'd.) ...

4.6) Bedrock:

The bedrock was proven in B.H. #2 by obtaining a BXL core. The rock core shows the bedrock to be limestone in sound condition, as indicated by almost 100% recovery. In B.H. #7 the bedrock was assumed to be the level at which refusal to augering was reached. The bedrock surface in B.H.'s #2 and #7 is at El. 615.3 and 615.7, respectively.

5. GROUNDWATER CONDITIONS:

Because of rain, the water level in the boreholes rose to the ground surface. Therefore the water levels shown on the drawing may not represent the true groundwater levels. It may be assumed, however, that the groundwater level is relatively close to the ground surface, i.e., 2 to 5 ft. below it.

6. DISCUSSION AND RECOMMENDATIONS:

6.1) General:

It is proposed to built a five-span (35'-67.7'-67.7'-67.7'-35') underpass structure at this site. The proposed profile grade of the township road will be approximately 20 ft. above the proposed Hwy. #402 grade of elevation 745.

As described in the previous paragraphs of this report, the subsoil at the site, in general, consists of a deep deposit of very stiff to hard clayey silt, containing some sand and traces of gravel. Conditions, therefore, are suitable for spread footing type foundations. Due to the low compressibility of the subsoil strata, settlements due to imposed loads, will be of a very minor nature. Different aspects of the proposed project are discussed as follows, under the appropriate heading.

6. DISCUSSION AND RECOMMENDATIONS: (cont'd.) ...

6.2) Foundations:-

(a) Spread Footings in Original Ground:

The entire structure may be supported on spread footings placed at or below El. 740. A safe net pressure of 2.0 t.s.f. may be assumed for design purposes if footings are located at El. 740<sup>±</sup>. If footings are placed at El. 738.0 a net safe pressure of 3 t.s.f. may be assumed. The subsoil is susceptible to softening on contact with water, therefore, it is recommended that the base of the footing excavations be protected by a concrete working slab, immediately on exposure.

All foundations should be protected against frost action by at least 4 feet of earth cover. No dewatering problems are anticipated.

The estimated maximum settlement over a long-term period will be in the order of 1.0 inch under the pier footings, and 2 inches under the abutment footings.

(b) Spread Footings on Compacted Fill:

As an alternative, the abutments may be supported on spread footings placed on well compacted, suitable granular material within the approach fills. A safe design load of 2.0 t.s.f. may be assumed. The granular material should consist of G.B.C. Class 'A' and should be fully compacted according to the current D.H.O. Standards. A detailed construction scheme is outlined on Figure 4 of the Appendix.

(c) Perched Abutments on Short Piles:

As a second alternative, the abutments may be constructed within the approach fills and supported on short piles driven through the fill and some 10.0 ft. into the original ground. In the case of 12-3/4" O.D. and 1/4" thick wall steel tube piles, a safe design load of 25 tons per pile may be used.

6. DISCUSSION AND RECOMMENDATIONS: (cont'd.) ...

6.2) Foundations: (cont'd.) ...

(c) Perched Abutments on Short Piles: (cont'd.) ...

It should be pointed out, that this latter recommendation is based on experience with similar structures and similar subsoil conditions in the same general area. To obtain more detailed information about pile lengths, pile types and design loads, a full-scale pile loading test would be advantageous and it has been decided that such tests will be carried out. Therefore, the recommendations given for this type of foundation are subject to change, depending on the results of the pile loading tests.

6.3) Approach Embankments:

The shear strength of the subsoil is such that it will be able to safely support the 20-ft. high approach embankments constructed with 2:1 side slopes. The fill should consist of well compacted acceptable material. Care should be taken to ensure that no bouldery fill is placed within the approaches through which piles have to be driven, and it is recommended that this portion of the fill contain no larger grain sizes than 3 inches.

Based on the performance of structures and embankments built in the same general area and with somewhat similar subsoil conditions, it is our opinion that maximum long-term settlement of about 2 inches will occur adjacent to the abutments. The topsoil and the soft organic material should be removed in accordance with the pertinent D.H.O. Standards within the construction area.

7. MISCELLANEOUS:

The field investigation was carried out during the period November 13 - November 20, 1969, under the supervision of Messrs. P. Payer and G. Allen, Project Foundation Engineers, and Mr. H. Szymanski, Engineering Technician.

Equipment was owned and operated by George Wimpey & Co. Ltd., and Dominion Soil Investigation Ltd.

This report was prepared by Mr. A. Prakash, and reviewed by Mr. K. G. Selby, Supervising Foundation Engineer.

January, 1970

APPENDIX I

DEPARTMENT OF HIGHWAYS - ONTARIO  
MATERIALS & TESTING OFFICE

# RECORD OF BOREHOLE No. 1

## FOUNDATION SECTION

08 69-F-95

### LOCATION

Sta. 98 + 63 20' Lt.

ORIGINATED BY **ES**

V P 42-66-05

BORING DATE

Nov. 17, 1969

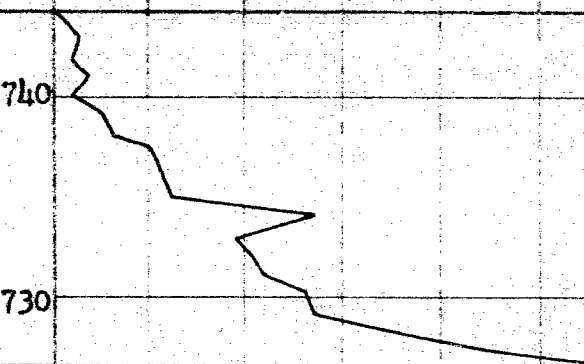
COMPILED BY AF

DATUM                      Geodetic

BOREHOLE TYPE

## Cone Penetration Test

CHECKED BY *LL*

SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION		RESISTANCE		LIQUID LIMIT		PLASTIC LIMIT		WATER CONTENT		BULK DENSITY	REMARKS			
ELEV	DEPTH	NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE	20	40	60	80	100	W <sub>p</sub>	W <sub>L</sub>	W					
DESCRIPTION						SHEAR STRENGTH P.S.F.		○ UNCONFINED		+ FIELD VANE		● QUICK TRIAXIAL		x LAB. VANE		WATER CONTENT %		
744.2	Ground Level																	
																		
726.4	End of Cone Test																	



DEPARTMENT OF HIGHWAYS - ONTARIO  
MATERIALS & TESTING OFFICE

## RECORD OF BOREHOLE No. 2

FOUNDATION SECTION

JOB 69-F-95

LOCATION

Sta. 98 + 63 36' Rt.

ORIGINATED BY

PP

W.P. 42-66-05

BORING DATE

Nov. 14-17, 1969

COMPILED BY

AP

DATUM Geodetic

BOREHOLE TYPE

Cont. Flight Auger

CHECKED BY

AP

SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT ——— % PLASTIC LIMIT ——— % WATER CONTENT ——— %			BULK DENSITY P.C.F.	REMARKS
ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	BLWS / FOOT	SHEAR STRENGTH P.S.F.	WATER CONTENT %				
					○ UNCONFINED ● QUICK TRIAXIAL	+ FIELD VANE x LAB. VANE				
744.3	Ground Level				2000	4000	10	20	30	
0.0										
		1	SS	15						1 22 54 23
		2	TW	PH						
		3	SS	35						
		4	TW	PH						
		5	SS	25						
		6	TW	PH						135
		7	SS	34						
	Clayey silt, some sand, traces of gravel (till)	8	TW	PH						135 1 14 50 35
	Very stiff to hard	9	TW	PH						
		10	TW	PH						
		11	SS	67						

20  
10-5 % STRAIN AT FAILURE  
10

DEPARTMENT OF HIGHWAYS - ONTARIO  
MATERIALS & TESTING OFFICE

## RECORD OF BOREHOLE No. 3

FOUNDATION SECTION

JOB 69-F-95

LOCATION

Sta. 99 + 01 21' Lt.

ORIGINATED BY HS

W.P. 42-66-05

BORING DATE

Nov. 17, 1969

COMPILED BY AP

DATUM Geodetic

BOREHOLE TYPE

Washboring, NX Casing and Cone

CHECKED BY

SOIL PROFILE		SAMPLES		ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT — % PLASTIC LIMIT — % WATER CONTENT — %			BULK DENSITY Y G.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	NUMBER	TYPE		20	40	60	80	100	W <sub>c</sub>	W <sub>p</sub>	W		
744.2	Ground Level													
		1	SS	19										
		2	SS	38										
		3	SS	52										
		4	SS	47										
		5	SS	57										
		6	TW	PH										
		7	SS	33										
		8	SS	32										
		9	SS	37										
		10	SS	36										
702.7														
41.5	End of Borehole													

Clayey silt, some  
sand, traces of  
gravel

(M11)

Very stiff to hard

1 14 51 34

2 17 49 32





DEPARTMENT OF HIGHWAYS - ONTARIO  
MATERIALS & TESTING DIVISION

## RECORD OF BOREHOLE No. 6

FOUNDATION SECTION

JOB 69-X-95

DATE 42-66-05

DATUM Geodetic

LOCATION

DRILL DATE

BOREHOLE NO.

Sta. 99 + 67 38' Rt.

Nov. 19 - 20, 1969

Cont. Flight Auger

ORIGINATED BY HS

COMPILED BY AP

CHECKED BY

ELEV DEPTH	DESCRIPTION	NO.	TYPE	DEPTH FEET	DYNAMIC PENETRATION RESISTANCE BLOWS/FOOT					SHEAR STRENGTH (PSF)	LIQUID LIMIT - % PLASTIC LIMIT - % WATER CONTENT - %			BULK DENSITY PCF	REMARKS
					20	40	60	80	100		W <sub>L</sub>	W <sub>P</sub>	W		
745.6	Ground Level														
0.0															
		1	SS	18											
		2	SS	36											
		3	TW	PM											
		4	SS	36											
		5	TW	PH											
		6	SS	39											
		7	SS	40											
		8	SS	44											
		9	SS	42											
		10	SS	89											
	Clayey silt, some sand, trace of gravel (Till)  Very stiff to hard														
657.6															
88.0	End of Borehole No further augering possible.														



DEPARTMENT OF HIGHWAYS- ONTARIO  
MATERIALS & TESTING OFFICE

## RECORD OF BOREHOLE No. 8

FOUNDATION SECTION

108 69-F-95

LOCATION

Sta. 100 + 37 34' Rt.

ORIGINATED BY GA

W O 42-66-05

BIRING DATE

Nov. 13, 1969

COMPILED BY

DATUM      Geodetic

BOREHOLE TYPE

### Cone Penetration Test

CHECKED BY

SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION		RESISTANCE		LIQUID LIMIT		PLASTIC LIMIT		WATER CONTENT		BULK DENSITY	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. NO.	NUMBER TYPE	BLOWS / FOOT	ELEV SCALE	20	40	60	80	100	W <sub>p</sub>	W <sub>L</sub>	W		
746.0	Ground Level					SHEAR STRENGTH PSF					WATER CONTENT %				
0.0						○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB. VANE					W <sub>p</sub> — W <sub>L</sub> — W				
						100/10"									
730.2					730										
15.8	End of Cone Test														

FOUNDATION SECTION

GA

AF

445 24

[illegible]





DEPARTMENT OF HIGHWAYS - ONTARIO  
MATERIALS & TESTING OFFICE

## RECORD OF BOREHOLE No. 11

FOUNDATION SECTION

JOB 69-F-95

LOCATION

Sta. 101 + 36 20' Lt.

ORIGINATED BY

GA, HS

MP 42-66-05

TEST DATE

Nov. 14 - 18, 1969

COMPILED BY

AP

DATUM Geodetic

EQUIPMENT USED

Cont. Flight Auger, Washboring, NX Casing, Core  
and Cone

CHECKED BY

ELEV. DEPTH	DESCRIPTION	SAMPLE NO.	SOIL TYPE	DEPTH FEET	DYNAMIC PENETRATION BLOWS / FOOT	SHEAR STRENGTH, PSI ○ UNCONFINED    * FIELD VANE ● QUICK TRIAXIAL    * LAB. VANE	LIQUID LIMIT PLASTIC LIMIT WATER CONTENT %	WATER CONTENT % 10    20    30	BULK DENSITY Y P.C.F.	REMARKS
744.0	Ground Level									
0.0										
	Clayey silt to silt with sand, traces of gravel (Till)	1 SS 12		740						9 40 36 15
		2 SS 14								
		3 SS 28								
		4 SS 34								
727.0	Stiff to hard	5 SS 25		730						
17.0		6 SS 33								3 17 52 28
		7 SS 30		720						
		8 TW PH								
		9 TW PH		710						
	Clayey silt, some sand, traces of gravel (Till)	10 TW PH								
	Hard			700						
		11 TW PH		690						
				680						
		12 SS 33								3 58 (39)
669.0				670						
75.0		13 BXL 100%								
665.0	Very Hard									
79.0	End of Borehole			660						

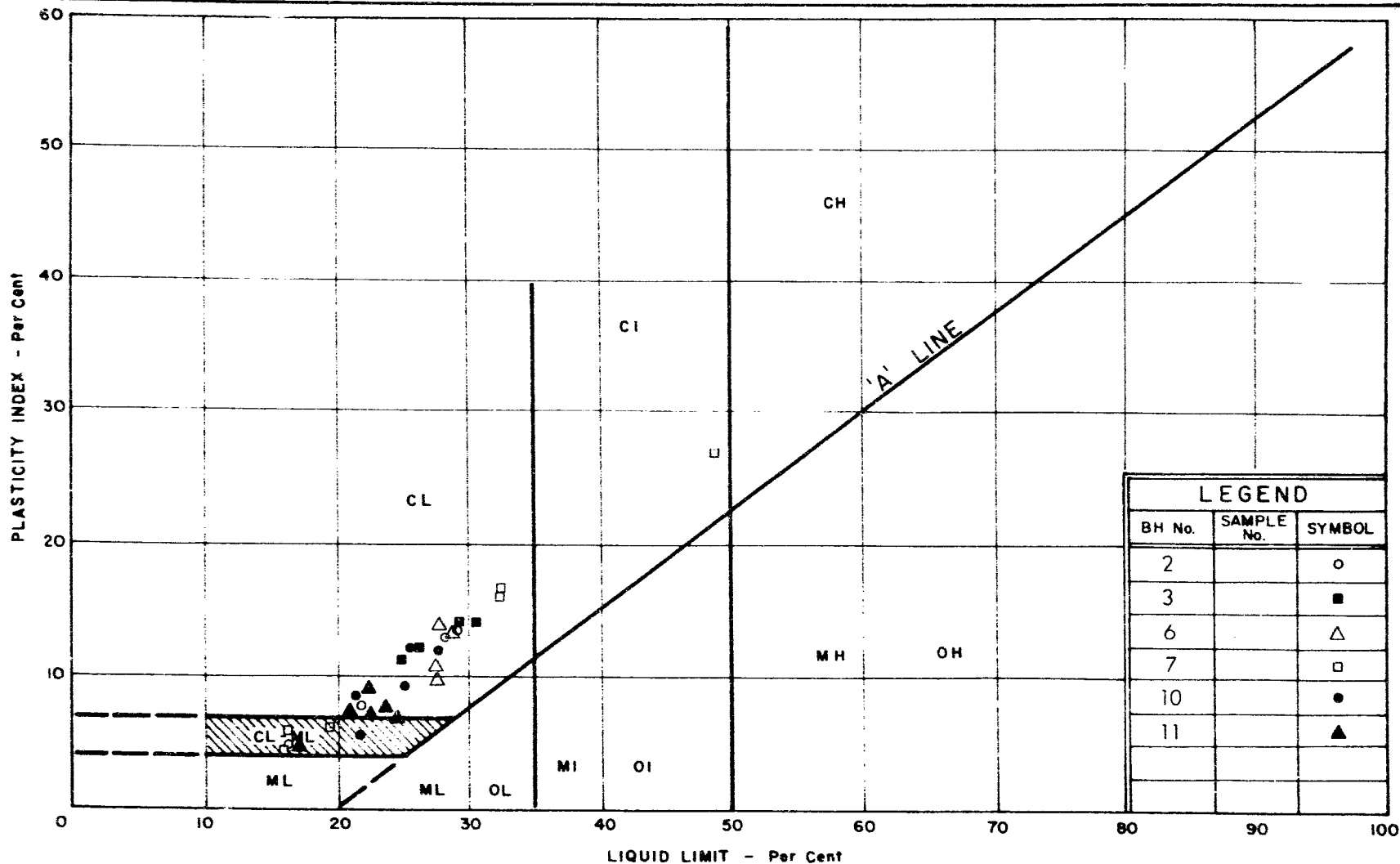
FOUNDATION SECTION

ORIGINATED BY GA

COMPILED BY AP

CHECKED BY

[illegible]



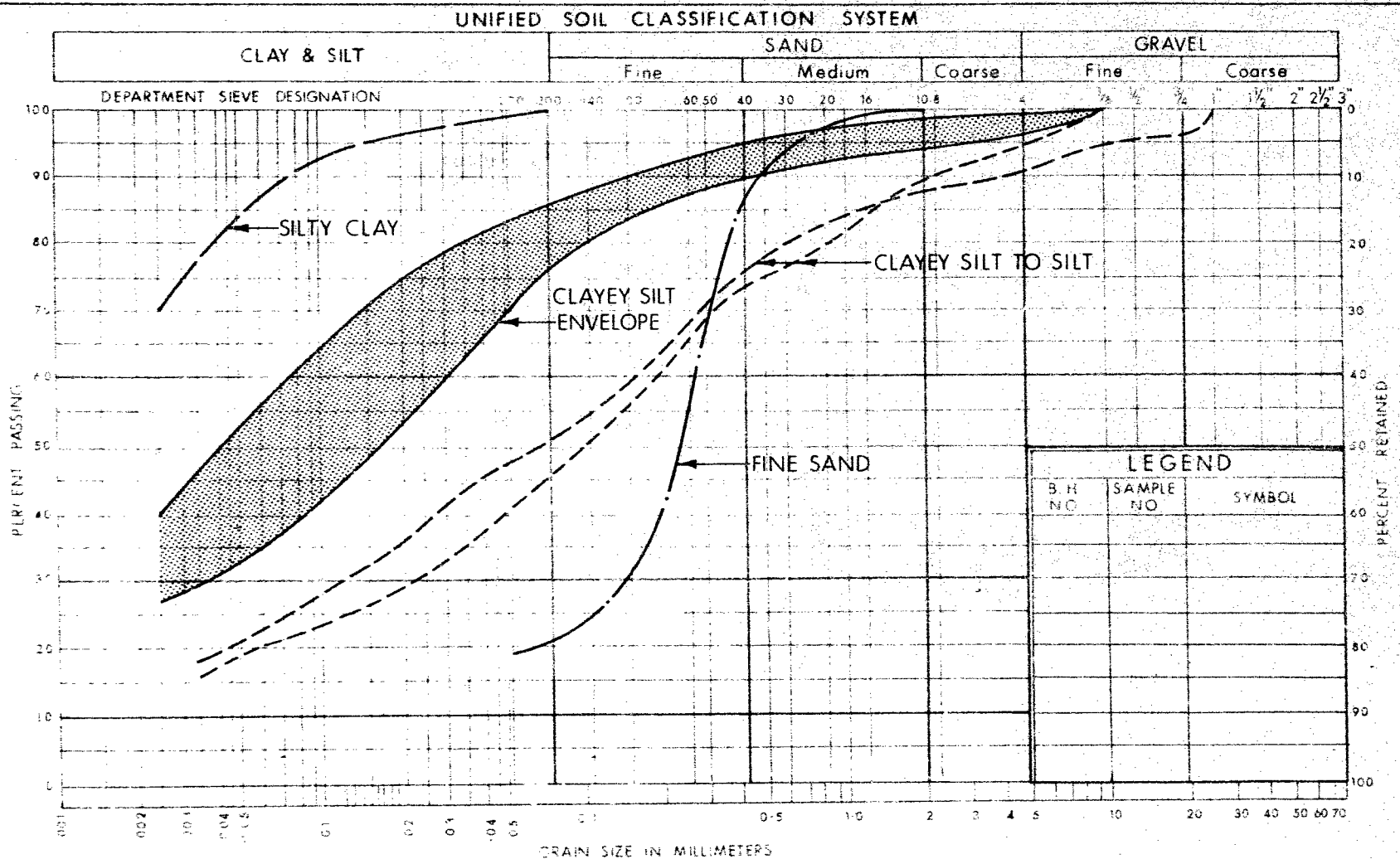
DEPARTMENT OF HIGHWAYS  
**MATERIALS and  
TESTING  
DIVISION**

## PLASTICITY CHART

W.P. No. 42-66-05

JOB No. 69-F-95

FIG. 1



DEPARTMENT OF HIGHWAYS  
MATERIALS and  
TESTING  
DIVISION

## GRAIN SIZE DISTRIBUTION

W.P. No. 42-66-05

JOB No 69-F-95

FIG. 2

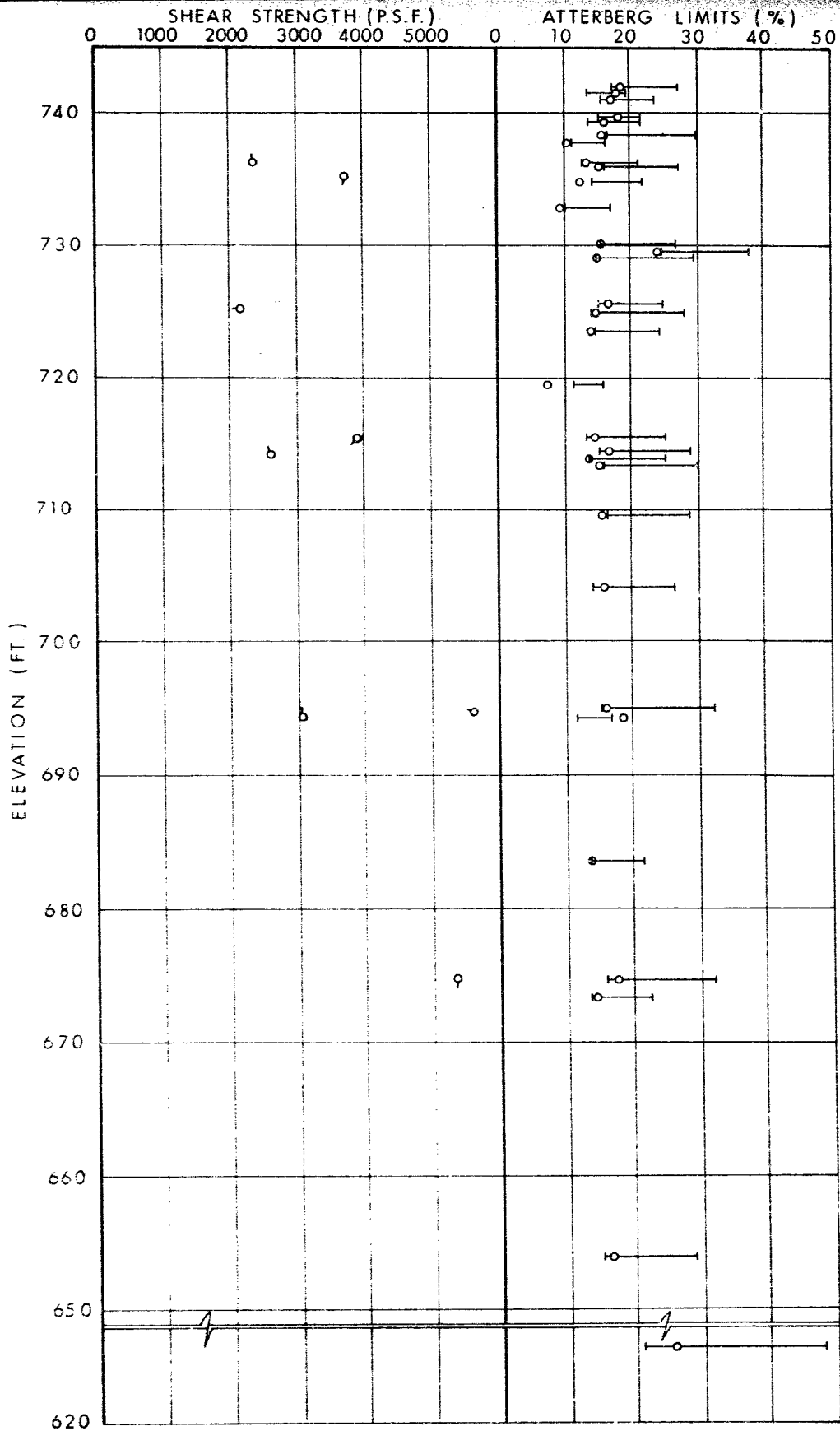
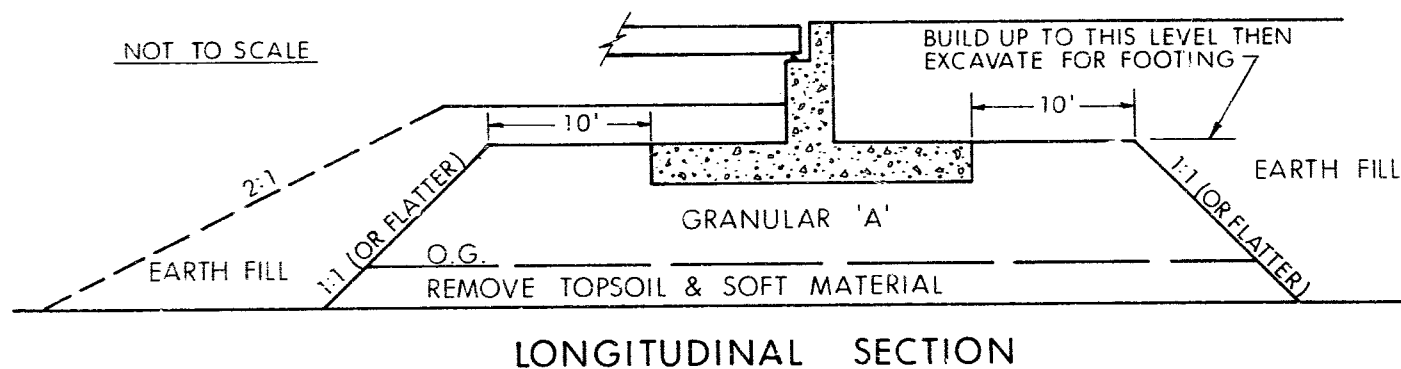
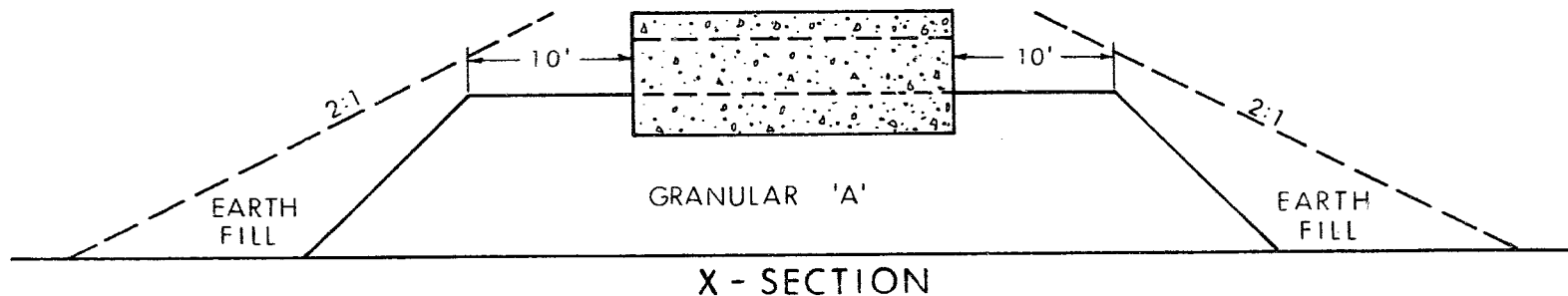


FIG. 3

# ABUTMENT ON COMPACTED FILL SHOWING GRANULAR 'A' CORE



## NOTES

- 1 - REMOVE TOPSOIL &/OR SOFT SUBSOIL UNDER AREA OF COMPACTED GRANULAR 'A'.
- 2 - PLACE GRANULAR 'A' TO TOP OF FOOTING LEVEL, COMPACTED ACCORDING TO CURRENT D.H.O. STANDARDS.
- 3 - EXCAVATE COMPACTED GRANULAR 'A' MATERIAL FOR FOOTING.

## 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

Q <sub>u</sub>	UNCONFINED COMPRESSION	L.V.	LABORATORY VANE
Q	UNDRAINED TRIAXIAL	F.V.	FIELD VANE
Q <sub>cu</sub>	CONSOLIDATED UNDRAINED TRIAXIAL	C	CONSOLIDATION
Q <sub>d</sub>	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 INTERCEPT
$\phi'$	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
$\bar{\sigma}$	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

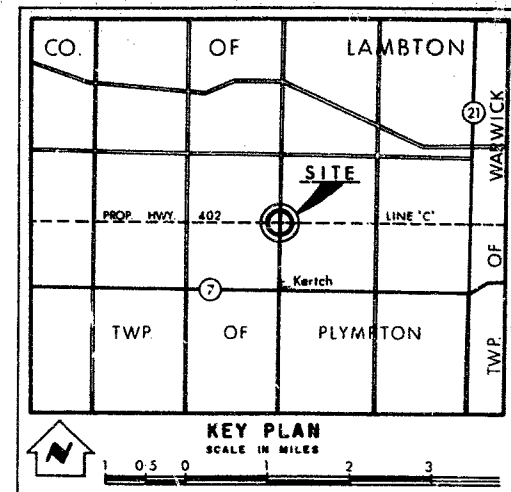
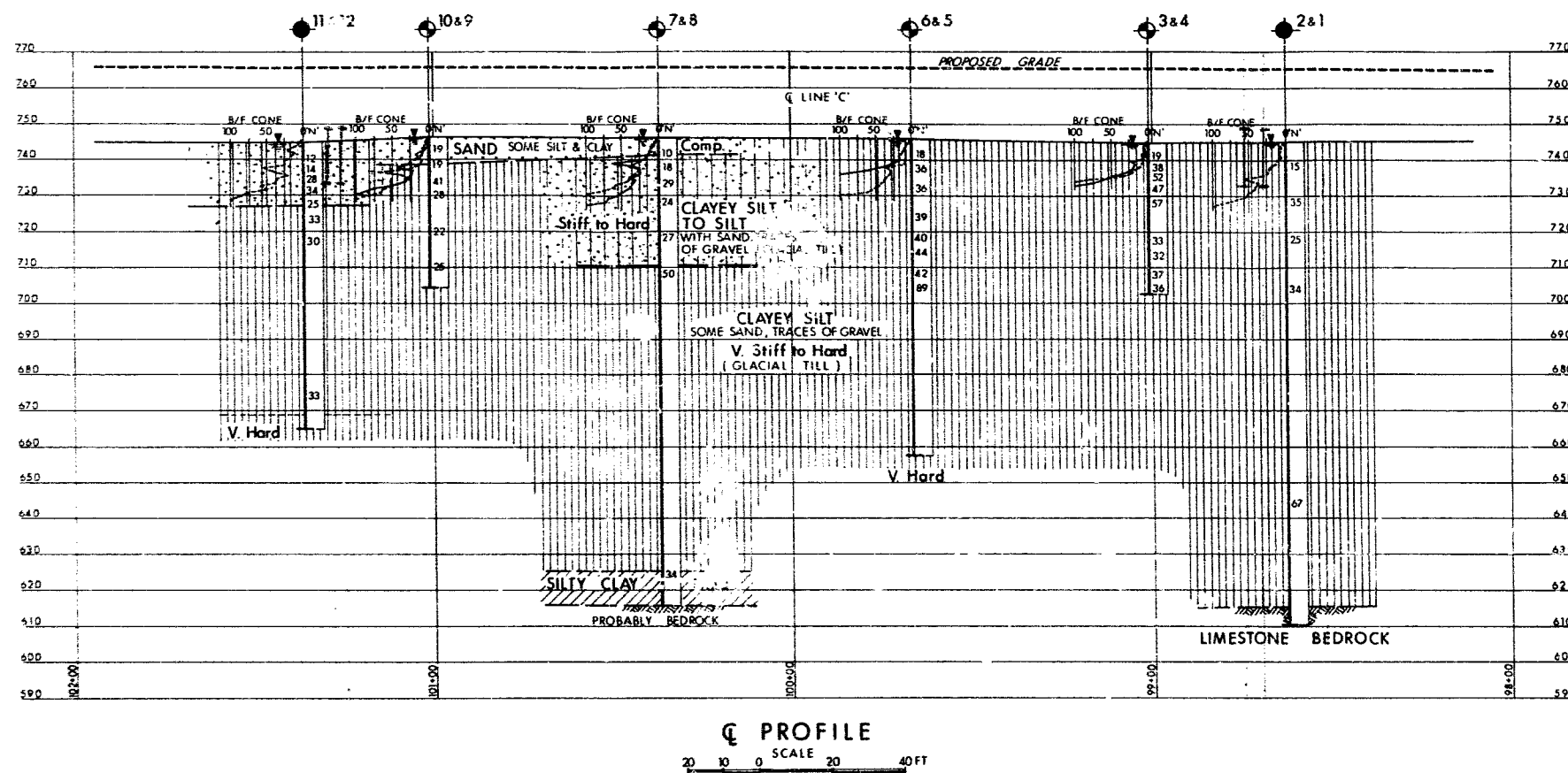
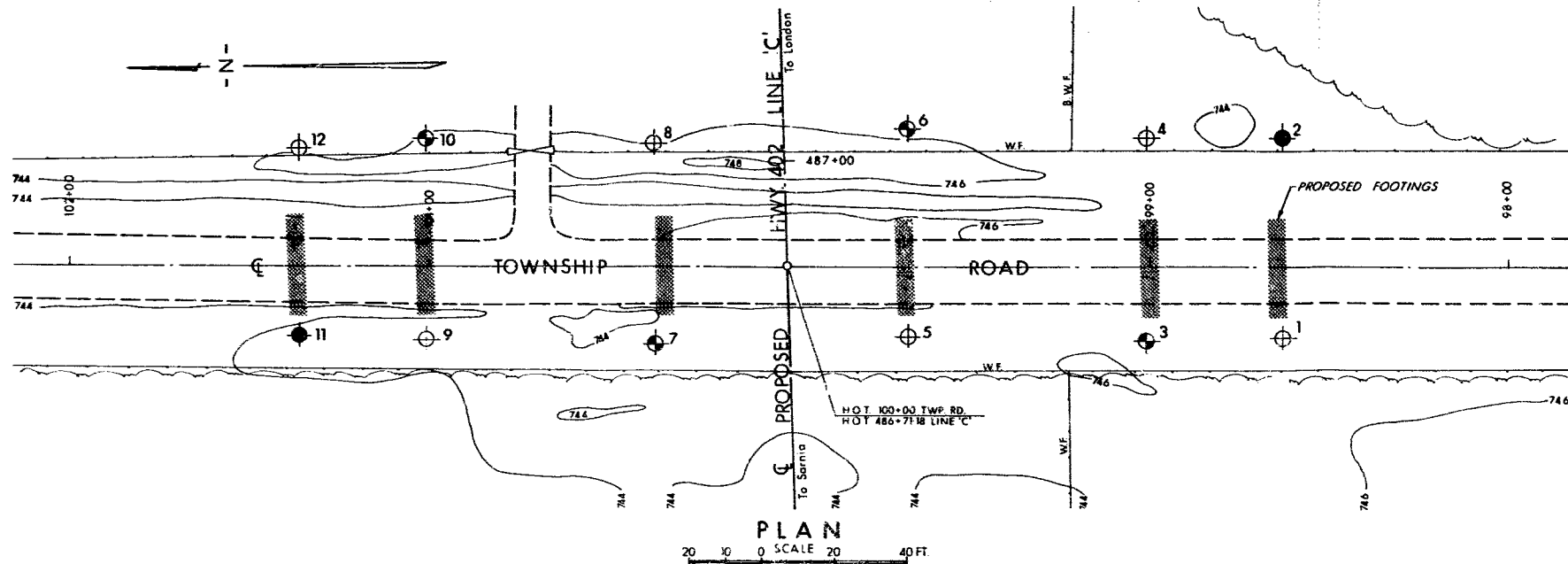
d	DISTANCE FROM TOP OF WALL TO POINT OF APPLICATION OF PRESSURE
$\delta$	ANGLE OF WALL FRICTION
K	DIMENSIONLESS COEFFICIENT TO BE USED WITH VARIOUS SUFFIXES IN EXPRESSIONS REFERRING TO NORMAL STRESS ON WALLS
$K_0$	COEFFICIENT OF EARTH PRESSURE AT REST

## 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



**LEGEND**

- Bore Hole
- Cone Penetration Hole
- Bore & Cone Penetration Hole
- Water Levels established at time of field investigation. NOV. 1969

NO.	ELEVATION	STATION	OFFSET
1	744.2	98+63	20' LT.
2	744.3	98+63	36' RT.
3	744.2	99+01	21' LT.
4	744.4	99+01	36' RT.
5	745.6	99+67	20' LT.
6	745.6	99+67	38' RT.
7	745.2	100+37	22' LT.
8	746.0	100+37	34' RT.
9	744.3	101+01	21' LT.
10	745.9	101+01	35' RT.
11	744.0	101+36	20' LT.
12	745.4	101+36	32' 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 and may be subject to considerable error.

DATE	BY	DESCRIPTION

DEPARTMENT OF HIGHWAYS - ONTARIO  
MATERIALS & TESTING OFFICE - FOUNDATION SECTION

**TOWNSHIP ROAD**  
3.4 MILES EAST OF COUNTY ROAD NO. 21

KING'S HIGHWAY NO. 402 LINE 'C' DIST. NO. 1  
CO. LAMBTON  
TWP. PLYMPTON LOT 24 & 25 CON. 5 & 6

**BORE HOLE LOCATIONS & SOIL STRATA**

SUBMITT. A.P. CHECKED A.P.	W.P. NO. 42-66-05	M.S.T. DRAWING NO.
DRAWN S.O. CHECKED S.O.	JOB NO. 69-F-95	69-F-95 A
DATE 27 JAN. 1970	SITE NO.	BRIDGE DRAWING NO.
APPROVED [Signature]	CONT. NO.	

## SUMMARY OF PILE DRIVING RECORDS

W.O. 68-11095 W.P. 42-66-05 CONT. 72-175 DIST. 1

SITE UTTGETER RD. OVERPASS

DATE DRIVEN June 18/79 - WEIGHT OF ANVIL 1100 LBS

HAMMER TYPE B-225 WEIGHT 6800 LB ENERGY 25000 LB/FT

[illegible]

69-F-095

## DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS - ONTARIO

Form 08-MT-285  
(REVISED NOV. 1971)DESIGN SERVICES BRANCH  
FOUNDATION OFFICE

## BRIDGE CONSTRUCTION - PILE DRIVING RECORD

UTTOXETER RD.  
OVERPASS

DISTRICT NO. 1 CONTRACT NO. 72-125 STRUCTURE OVERPASS  
 CONTRACTOR ANTIKI & BIRMINGHAM DESIGN LOAD OF PILE 25 TONS  
 HAMMER DETAILS: TYPE DIESEL #B-225 WEIGHT 6,800 LB HEIGHT OF FALL OR ENERGY 25,000 Ft Lbs  
 TYPE OF ANVIL OR CAP ANVIL WEIGHT OF ANVIL OR CAP 1,100 Lbs.  
 PILE DETAILS 16' LONG X 12 1/4" O.D. TUBE STEEL (WALL .25")  
 PILE NO. 1 LOCATION NE CORNER, OF S. ABUT. DATE DRIVEN JULY 18/73.

TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.
16	1	1		26			51			76	
	2	1		27			52			77	
	3	2		28			53			78	
	4	3		29			54			79	
	5	3		30			55			80	
	6	4		31			56			81	
	7	4		32			57			82	
	8	5		33			58			83	
	9	7		34			59			84	
	10	9		35			60			85	
	11	9		36			61			86	
	12	10		37			62			87	
	13	15		38			63			88	
	14	14		39			64			89	
	15	16		40			65			90	
	16			41			66			91	
	17			42			67			92	
	18			43			68			93	
	19			44			69			94	
	20			45			70			95	
	21			46			71			96	
	22			47			72			97	
	23			48			73			98	
	24			49			74			99	
	25			50			75			100	

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH	1	2	2	1 1/2	2	2
MEASURED REBOUND IN INCHES						
FINAL LENGTH OF PILE	16					
FINAL CUT OFF ELEVATION	748.75					

REPORT TO BE SENT TO: - PRINCIPAL FOUNDATION ENGINEER  
 DESIGN SERVICES BRANCH  
 DEPARTMENT OF  
 TRANSPORTATION AND  
 COMMUNICATIONS  
 DOWNSVIEW, ONTARIO

SIGNED Larry BreenNAME (PRINT) LARRY BREANDATE JULY 18/73

ATTACH SKETCH OF PILE NUMBERING SYSTEM

**Notes:-**

In general this form should be completed for every tenth pile in a group, but at least one is required for every pier and abutment.

Piles driven vertically should be selected where possible.

Pile Details must include type, dimensions, and weight per foot, details of shoe, and slope of batter: e.g. 12 $\frac{1}{2}$ " O.D. steel tube x 0.251" @ 33 lbs. per ft. Vertical. 12 $\frac{1}{2}$ " x  $\frac{1}{2}$ " steel plate shoe.

Details for the final six inches of penetration must be completed for all piles except in the case of an end bearing pile driven to bedrock. Final length of pile, and final cut off elevation must always be given.

The total length being driven is the full length of the pile and remains unchanged until a length is cut off or spliced on.

The penetration in blows per foot must be recorded for every foot of penetration of the pile.

Measured rebounds recorded on this form must be the average for each individual inch for the final six inches of penetration.

OVER

## DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS AND TESTING OFFICE

## FOUNDATION SECTION

## BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 1 CONTRACT NO. 72-175 STRUCTURE UTTOXETER RD. OVERPASS  
 CONTRACTOR ARTCO. BIRMINGHAM DESIGN LOAD OF PILE 25 TON  
 HAMMER DETAILS: TYPE WELLS 1-22.5 WEIGHT 650 LBS. HEIGHT OF FALL OR ENERGY 25000 F.F.T.  
 TYPE OF ANVIL OR CAP Anvil WEIGHT OF ANVIL OR CAP 1100 LBS.  
 PILE DETAILS 16' LONG X 12 1/4 O.D. TUBE STEEL (WALL = .25")  
 PILE NO. 0 LOCATION 4th from N.W. CORNER S. ADJ. DATE DRIVEN JULY 18/73

TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.
16	1	1		26			51			76	
	2	1		27			52			77	
	3	6		28			53			78	
	4	6		29			54			79	
	5	6		30			55			80	
	6	3		31			56			81	
	7	3		32			57			82	
	8	7		33			58			83	
	9	1		34			59			84	
	10	14		35			60			85	
	11	15		36			61			86	
	12	17		37			62			87	
	13	17		38			63			88	
	14	21		39			64			89	
	15	24		40			65			90	
	16			41			66			91	
	17			42			67			92	
	18			43			68			93	
	19			44			69			94	
	20			45			70			95	
	21			46			71			96	
	22			47			72			97	
	23			48			73			98	
	24			49			74			99	
	25			50			75			100	

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH	1	1 1/2	2	2	2	2
MEASURED REBOUND IN INCHES						
FINAL LENGTH OF PILE	16'					
FINAL CUT OFF ELEVATION	748.75					

REPORT TO BE SENT TO: - PRINCIPAL FOUNDATION ENGINEER  
 MATERIALS & TESTING DIVISION  
 DEPARTMENT OF HIGHWAYS  
 DOWNSVIEW, ONTARIO

SIGNED Larry Brian  
 NAME (PRINT) LARRY BRIAN  
 DATE JULY 18/73

ATTACH SKETCH OF PILE NUMBERING SYSTEM

**Notes:-**

In general this form should be completed for every tenth pile in a group, but at least one is required for every pier and abutment.

Piles driven vertically should be selected where possible.

Pile Details must include type, dimensions and weight per foot, details of shoe, and slope of batter: e.g. 12 $\frac{1}{2}$ " O.D. steel tube x 0.251" @ 33 lbs. per ft. Vertical. 12 $\frac{1}{2}$ " x  $\frac{1}{2}$ " steel plate shoe.

Details for the final six inches of penetration must be completed for all piles except in the case of an end bearing pile driven to bedrock. Final length of pile, and final cut off elevation must always be given.

The total length being driven is the full length of the pile and remains unchanged until a length is cut off or spliced on.

The penetration in blows per foot must be recorded for every foot of penetration of the pile.

Measured rebounds recorded on this form must be the average for each individual inch for the final six inches of penetration.

## DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS AND TESTING OFFICE

## FOUNDATION SECTION

## BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 1 CONTRACT NO. 72-175 STRUCTURE UTTOXETER RD. OVERPASS  
 CONTRACTOR Angus & Birmingham DESIGN LOAD OF PILE 25 Ton.  
 HAMMER DETAILS: TYPE Union 16 225 WEIGHT 6,300 lbs. HEIGHT OF FALL OR ENERGY 2' 000 17/16s  
 TYPE OF ANVIL OR CAP Anvil WEIGHT OF ANVIL OR CAP 1,100 lbs.  
 PILE DETAILS 16 Long x 12 in. O.D. TUBE STEEL (WALL .25)  
 PILE NO. 17 LOCATION 4th Trunk. SW Corner S. Abut. DATE DRIVEN JULY 18/73

TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.
16	1	2		26			51			76	
	2	2		27			52			77	
	3	6		28			53			78	
	4	5		29			54			79	
	5	4		30			55			80	
	6	2		31			56			81	
	7	4		32			57			82	
	8	6		33			58			83	
	9	6		34			59			84	
	10	7		35			60			85	
	11	10		36			61			86	
	12	12		37			62			87	
	13	14		38			63			88	
	14	15		39			64			89	
	15	20		40			65			90	
	16			41			66			91	
	17			42			67			92	
	18			43			68			93	
	19			44			69			94	
	20			45			70			95	
	21			46			71			96	
	22			47			72			97	
	23			48			73			98	
	24			49			74			99	
	25			50			75			100	

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH	1	1 1/2	1	2	1 1/2	2
MEASURED REBOUND IN INCHES						
FINAL LENGTH OF PILE	16					
FINAL CUT OFF ELEVATION	748.75					

REPORT TO BE SENT TO: - PRINCIPAL FOUNDATION ENGINEER  
 MATERIALS & TESTING DIVISION  
 DEPARTMENT OF HIGHWAYS  
 DOWNSVIEW, ONTARIO

SIGNED Larry Breaux  
 NAME (PRINT) LARRY BREAUX  
 DATE JULY 18/73

ATTACH SKETCH OF PILE NUMBERING SYSTEM



**Notes:-**

In general this form should be completed for every tenth pile in a group, but at least one is required for every pier and abutment.

Piles driven vertically should be selected where possible.

Pile Details must include type, dimensions and weight per foot, details of shoe, and slope of batter: e.g. 12 $\frac{3}{4}$ " O.D. steel tube x 0.251" @ 33 lbs. per ft. Vertical. 12 $\frac{3}{4}$ " x  $\frac{1}{2}$ " steel plate shoe.

Details for the final six inches of penetration must be completed for all piles except in the case of an end bearing pile driven to bedrock. Final length of pile, and final cut off elevation must always be given.

The total length being driven is the full length of the pile and remains unchanged until a length is cut off or spliced on.

The penetration in blows per foot must be recorded for every foot of penetration of the pile.

Measured rebounds recorded on this form must be the average for each individual inch for the final six inches of penetration.

## DEPARTMENT OF HIGHWAYS — ONTARIO

OVER

MATERIALS AND TESTING OFFICE  
FOUNDATION SECTION

## BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 1 CONTRACT NO. 72-175 STRUCTURE OTTAWA R.D. OVERPASS  
 CONTRACTOR ARTCO BIRMINGHAM DESIGN LOAD OF PILE 20 Ton.  
 HAMMER DETAILS: TYPE Drop WEIGHT 6,800 lb HEIGHT OF FALL OR ENERGY 25,000 ft-lb  
 TYPE OF ANVIL OR CAP FRUIT WEIGHT OF ANVIL OR CAP 1,000 lbs.  
 PILE DETAILS 16 LONG X 12 1/4 O.D. TUBE STEEL (WALL = .25)  
 PILE NO. 33 LOCATION 2ND FROM N.W. CORNER N. ABUT. DATE DRIVEN JULY 19/73.

TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.
16	1	1		26			51			76	
	2	1		27			52			77	
	3	1		28			53			78	
	4	2		29			54			79	
	5	3		30			55			80	
	6	3		31			56			81	
	7	7		32			57			82	
	8	8		33			58			83	
	9	10		34			59			84	
	10	12		35			60			85	
	11	10		36			61			86	
	12	13		37			62			87	
	13	11		38			63			88	
	14	10		39			64			89	
	15	13		40			65			90	
	16			41			66			91	
	17			42			67			92	
	18			43			68			93	
	19			44			69			94	
	20			45			70			95	
	21			46			71			96	
	22			47			72			97	
	23			48			73			98	
	24			49			74			99	
	25			50			75			100	

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH	1	1 1/2	1 1/2	2	1 1/2	2.
MEASURED REBOUND IN INCHES						
FINAL LENGTH OF PILE	16					
FINAL CUT OFF ELEVATION	748.75					

REPORT TO BE SENT TO: - PRINCIPAL FOUNDATION ENGINEER  
 MATERIALS & TESTING DIVISION  
 DEPARTMENT OF HIGHWAYS  
 DOWNSVIEW, ONTARIO

SIGNED Larry Bean  
 NAME (PRINT) LARRY BEAN  
 DATE JULY 19/73.

ATTACH SKETCH OF PILE NUMBERING SYSTEM

**Notes:-**

In general this form should be completed for every tenth pile in a group, but at least one is required for every pier and abutment.

Piles driven vertically should be selected where possible.

Pile Details must include type, dimensions and weight per foot, details of shoe, and slope of batter: e.g. 12 $\frac{3}{4}$ " O.D. steel tube x 0.251" @ 33 lbs. per ft. Vertical. 12 $\frac{3}{4}$ " x  $\frac{1}{2}$ " steel plate shoe.

Details for the final six inches of penetration must be completed for all piles except in the case of an end bearing pile driven to bedrock. Final length of pile, and final cut off elevation must always be given.

The total length being driven is the full length of the pile and remains unchanged until a length is cut off or spliced on.

The penetration in blows per foot must be recorded for every foot of penetration of the pile.

Measured rebounds recorded on this form must be the average for each individual inch for the final six inches of penetration.

OVER

## DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS AND TESTING OFFICE

## FOUNDATION SECTION

## BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 1 CONTRACT NO. 72-175 STRUCTURE UTTOXETER RD. OVERPASS  
 CONTRACTOR Asic Birmingham DESIGN LOAD OF PILE 25 TON  
 HAMMER DETAILS: TYPE Hydraulic WEIGHT 6800 lb. HEIGHT OF FALL OR ENERGY 25,000 ft. lbs.  
 TYPE OF ANVIL OR CAP Anvil WEIGHT OF ANVIL OR CAP 1100 lbs.  
 PILE DETAILS 16 LONG X 12 1/4" O.D. TUBE STEEL (WALL 2)  
 PILE NO. 21 LOCATION S.W. CORNER OF N. HAVENMENT DATE DRIVEN JULY 19/73

TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.
16	1	1		26			51			76	
	2	1		27			52			77	
	3	1		28			53			78	
	4	3		29			54			79	
	5	4		30			55			80	
	6	5		31			56			81	
	7	8		32			57			82	
	8	9		33			58			83	
	9	1		34			59			84	
	10	17		35			60			85	
	11	19		36			61			86	
	12	12		37			62			87	
	13	13		38			63			88	
	14	14		39			64			89	
	15	18		40			65			90	
	16			41			66			91	
	17			42			67			92	
	18			43			68			93	
	19			44			69			94	
	20			45			70			95	
	21			46			71			96	
	22			47			72			97	
	23			48			73			98	
	24			49			74			99	
	25			50			75			100	

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH	1 1/2	2	1 1/2	1	2	2
MEASURED REBOUND IN INCHES						
FINAL LENGTH OF PILE <u>16'</u>	FINAL CUT OFF ELEVATION <u>748.75</u>					

REPORT TO BE SENT TO: - PRINCIPAL FOUNDATION ENGINEER  
 MATERIALS & TESTING DIVISION  
 DEPARTMENT OF HIGHWAYS  
 DOWNSVIEW, ONTARIO

SIGNED Larry Brean  
 NAME (PRINT) LARRY BREAN  
 DATE JULY 19/73

ATTACH SKETCH OF PILE NUMBERING SYSTEM

**Notes:-**

In general this form should be completed for every tenth pile in a group, but at least one is required for every pier and abutment.

Piles driven vertically should be selected where possible.

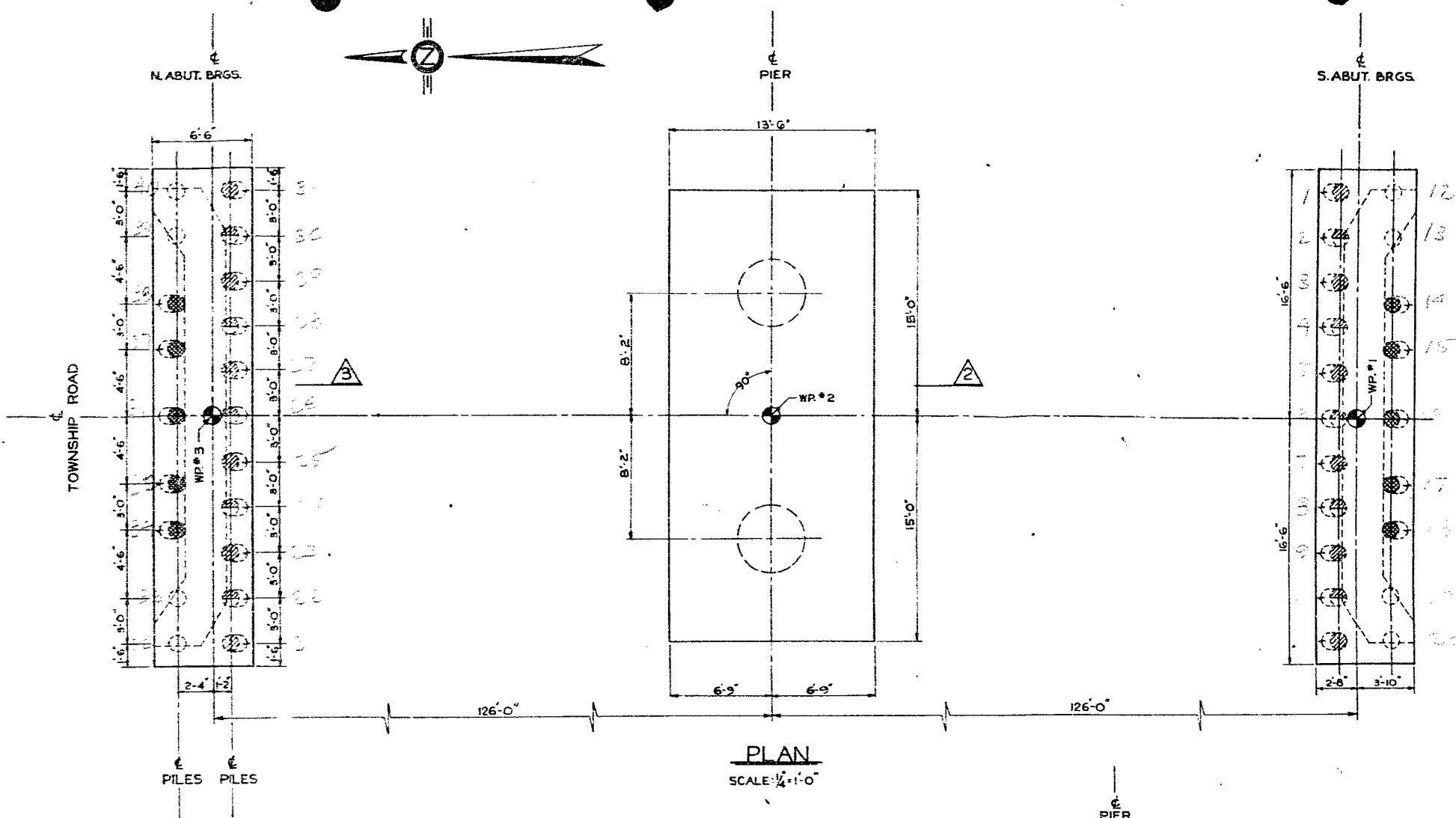
Pile Details must include type, dimensions and weight per foot, details of shoe, and slope of batter: e.g. 12 $\frac{1}{2}$ " O.D. steel tube x 0.251" @ 33 lbs. per ft. Vertical. 12 $\frac{1}{2}$ " x  $\frac{1}{2}$ " steel plate shoe.

Details for the final six inches of penetration must be completed for all piles except in the case of an end bearing pile driven to bedrock. Final length of pile, and final cut off elevation must always be given.

The total length being driven is the full length of the pile and remains unchanged until a length is cut off or spliced on.

The penetration in blows per foot must be recorded for every foot of penetration of the pile.

Measured rebounds recorded on this form must be the average for each individual inch for the final six inches of penetration.



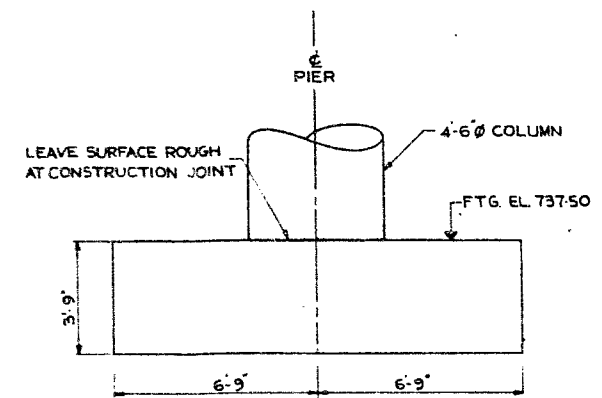
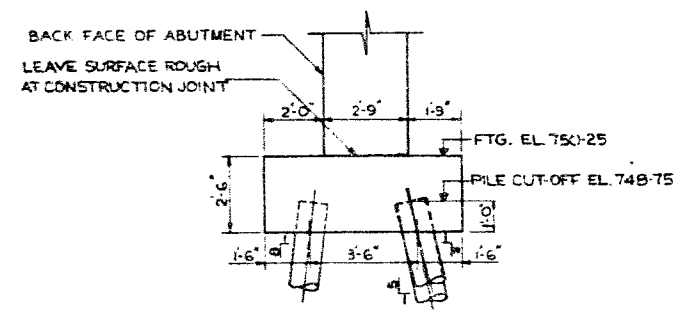
PILES SUPPLIED			
LOCATION	NO.	LENGTH	TYPE
N. ABUTMENT	20	16'-0"	12 1/4" O.D. x .250" WALL
S. ABUTMENT	20	16'-0"	STEEL TUBE PILES

### LEGEND

- PILE BATTER 3:1
- PILE " 5:1
- PILE " 6:1
- PILE DRIVEN VERTICALLY

### NOTES

DIMENSIONS AND PILE LAYOUT SIMILAR FOR BOTH ABUTMENT FOOTINGS.  
 ABUTMENT PILE SPACING TO BE MEASURED AT UNDERSIDE OF FOOTING.  
 ALL PILES ARE 12 1/4" O.D. x .250" WALL, STEEL TUBE PILES.  
 TUBE PILES TO BE FILLED WITH 3000 P.S.I CONCRETE AFTER INSTALLATION AND INSPECTION.  
 PILES TO BE DRIVEN IN ACCORDANCE WITH STANDARD BD 62-7 USING DESIGN LOAD 25 TONS/PILE.  
 FOR BD STANDARDS SEE D-6631-11



REVISIONS	DATE	BY	DESCRIPTION

DEPARTMENT OF HIGHWAYS ONTARIO  
 BRIDGE DIVISION

**TOWNSHIP RD. TO UTTOXETER U'PASS**  
 3.4 MILES EAST OF COUNTY RD. #21

KING'S HIGHWAY No. 402 LINE 'C' DIST. No. 1  
 CO. LAMBTON  
 TWP. PLYMPTON LOT 24125 CON. 515

**FOUNDATION LAYOUT**

APPROVED: J. L. KEEN  
 CONTRACT No. 42-66-05  
 DRAWING No. 72-725  
 DATE DEC. 1970

FOR REDUCED PLAN  
 USE SCALE BELOW  
 1" = 3 INCHES ON ORIGINAL PLAN

D-6831-3

FROM: C.S. Grebski,  
Bridge Office

DATE: December 30, 1970

IN REPLY TO

69-F-95-

Kindly give us your comments at your earliest convenience.

c.c. Foundation Office

Some light steel piles are provided for  
waterways. Some lengths of steel pile are of solid  
material and some are pile head and are a hollow  
type. The piles are spaced 4 ft apart, slopes 2:1 or  
flatter. No pile is to exceed 15

2 Feb 71

171  
172