

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: December 2, 1969

OUR FILE REF.

IN REPLY TO DEC-4-1969

SUBJECT:

FOUNDATION INVESTIGATION REPORT  
For Proposed Crossing at Hwy. 417  
Eastbound and Westbound Lanes  
And County Rd. No. 5 Relocation  
Twps. of Cambridge and Russell  
County of Russell  
District No. 9 (Ottawa)  
W.J. 69-F-84 -- W.P. 35-66-09

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 do not hesitate to contact our Office.

AGS/MdeF  
Attach.

cc: Messrs. B. R. Davis (2)  
H. A. Tregaskes  
D. W. Parren  
S. J. Markiewicz  
C. R. Robertson  
T. C. Kingsland (2)  
J. E. Gruspier  
B. A. Singh

Foundations Files  
Gen. Files

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

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FOUNDATION INVESTIGATION REPORT  
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District No. 9 (Ottawa)  
W.J. 69-F-84    --    W.P. 35-66-09

1. INTRODUCTION:

The Foundation Section was requested to carry out a subsurface investigation at the site of the above mentioned proposed crossing. The request was contained in a memo from the Bridge Section (Mr. T. C. Kingsland, Regional Bridge Planning Engineer), dated September 19, 1969. An investigation was subsequently carried out by this Section in order to determine the subsoil and groundwater conditions at the site. This report contains the results of this investigation, together with our recommendations pertaining to the foundations of the proposed structure and the stability of the approach embankments.

2. DESCRIPTION OF THE SITE AND GEOLOGY:

The site is located on County Rd. No. 5 about 1 mile south of the Town of Limoges. At this site, County Rd. 5 is a paved 2-lane roadway, approximately 22 ft. wide with the grade between elevations 220 and 222. Drainage ditches, some 5 to 6 ft. deep and up to 20 ft. wide at the top, are located on either side of the roadway. The surrounding area, which is used for agricultural purposes, is generally flat-lying to gently undulating. Some 100 ft. east of the centre-line of the existing roadway, South Indian Creek flows almost parallel to the roadway in a southerly direction. This creek is about 5 ft. deep and 15 to 20 ft. in width at the top. During the period of this investigation, the water in the creek was about 1 ft. deep. Towards the north, in the vicinity of Station 33+00 (Centre-line Co. Rd. 5 Relocation), the creek makes a right-angle turn towards the west and flows beneath Co. Rd. 5 through a

2. DESCRIPTION OF THE SITE AND GEOLOGY: (cont'd.) ...

20' x 7½' x 56' standard open concrete culvert.

Physiographically, the site is situated within the "Russell and Prescott Sand Plains" region. In this area, a sand mantle, some 15 ft. in thickness, overlies an extensive deposit of marine clay ("Leda" clay). The clay is underlain by a thin deposit of glacial till which is directly followed by shale bedrock of the Lorraine formation, Ordovician Period. Bedrock outcrops were observed to occur approximately 1¼ miles south of the site location, immediately to the west of Co. Rd. 5.

3. FIELD AND LABORATORY WORK:

Nine sampled boreholes, five of which were accompanied by dynamic cone penetration tests, were carried out during the course of the field investigation. In addition, one borehole (B.H. 4A) put down previously at this site during a preliminary foundation investigation (refer Foundation Report 68-F-83), has been incorporated into this report. The borings were advanced by means of two standard diamond drill rigs adapted for soil sampling purposes.

Samples of the surficial sand and the lower glacial till were obtained in a 2-inch O.D. split-spoon sampler which was hammered into the soil in accordance with the specifications for the Standard Penetration Test. The same method was used to advance the dynamic cone penetration tests. The cohesive overburden was sampled with 2-inch I.D. Shelby tubes, which were manually pushed into the soil. In addition, field vane tests were carried out to determine the undrained shear strength characteristics of the clay stratum. Bedrock was proven at three borehole locations by obtaining AXT size rock core samples.

The locations and elevations of all the boreholes were surveyed by personnel from the Kingston Region Engineering Surveys Section, and are shown on Drawing 69-F-84A, together with an estimated stratigraphical profile across the site. The elevations given in this report are referenced to a geodetic datum.

3. FIELD AND LABORATORY WORK: (cont'd.) ...

All the samples were subjected to a careful visual examination in the field and subsequently in the laboratory. Following this inspection, laboratory tests were carried out on certain samples to determine the physical properties of the various soil types, namely:

Natural Moisture Contents  
Atterberg Limits  
Bulk Densities  
Grain-Size Distributions  
Undrained Shear Strengths  
Consolidation Characteristics  
Organic Matter Contents

The results of the laboratory tests are plotted on the Record of Borelog sheets and are summarized on Figures 1 to 5 inclusive, all contained in the Appendix to this report.

4. SUBSOIL CONDITIONS:

4.1) General:

The surficial deposit across the site is a 10 to 16 ft. thick stratum of silty fine sand containing occasional seams of organic silt and organic matter. This surficial sand mantle is followed by the predominant stratum across the site - an extensive deposit of clay ranging in thickness between 134 and 158 ft. The clay deposit contains silty clay layers throughout, as well as random seams of silt and very fine sand in the lower portions. Underlying the clay stratum is a glacial till deposit of about 4 to 12 ft. thickness which is followed by sound black shale bedrock, encountered across the site at depths of 160 to 178 ft. below the ground surface.

The various soil strata encountered at this site, are discussed in greater detail, as follows:

4. SUBSOIL CONDITIONS: (cont'd.) ...

4.2) Silty Fine Sand with Occasional Seams of Organic Silt:

A surficial deposit of silty fine sand was encountered at all the borehole locations. The thickness of this deposit ranges randomly between 10 and 16 ft. across the site. Occasional seams of organic silt some 4 to 6 inches in thickness, are present throughout the deposit. In addition, the deposit contains decayed wood fragments and other organic substances.

The natural moisture content of the overall deposit averaged about 34 per cent. Chemical tests indicate that the organic content of the deposit ranges between 0.5 and 6.2 per cent (dry weight basis). The higher values apply to the organic silt seams within the deposit. The grain-size distribution curves are shown on Figure 1 in the Appendix. Standard Penetration Resistance 'N' values for the overall deposit ranged between 1 and 9 blows/ft., in a random fashion. Based on these 'N' values, it is estimated that the relative density of the deposit varies from very loose to loose.

4.3) Clay, with Silty Clay Layers:

Directly underlying the surficial sand deposit is the predominant stratum across the site, consisting of clay with silty clay layers throughout. The thickness of the overall cohesive stratum ranges between 134 and 158 ft. across the site and increases in a northerly direction. The deposit is generally grey in colour with random reddish-brown zones. Silt partings are present throughout the deposit. In addition, seams of silt and fine sand up to 4 inches in thickness, were encountered below about elevation 140 to 100 (i.e., at depths ranging from 80 to 120 ft. below the ground surface).

The physical properties of this deposit, as determined by field and laboratory testing, are summarized on Figure 2 in the Appendix, and are tabulated, as follows, for the overall cohesive deposit:

4. SUBSOIL CONDITIONS: (cont'd.) ...

4.3) Clay, with Silty Clay Layers: (cont'd.) ...

	<u>Range:</u>	<u>Average:</u>
Natural Moisture Content - %	40 - 84	53
Liquid Limit - %	35 - 76	56
Plastic Limit - %	18 - 36	25
Liquidity Index	0.2 - 2.2	1.0
Bulk Density - PCF	95 - 116	100

Undrained Shear Strength - PSF:	<u>Range:</u>	<u>(Sensitivity)</u>
Field Vanes	480 - 1760	3 - 28
Lab. Vanes	420 - 1450	3 - 10
Lab. Tests	350 - 950	-

Consolidation Tests:	<u>Range:</u>
Initial Void Ratio ( $e_0$ )	1.22 - 1.84
Compression Index ( $C_c$ )	0.62 - 1.42

The Atterberg limit tests are plotted on the Plasticity Chart, Figure 3, in the Appendix. These indicate that the deposit is mainly an inorganic soil of high plasticity (CH) with layers of intermediate plasticity (CI).

As shown on the summary plot of Figure 2, the natural moisture content of the deposit is generally higher than the liquid limit, resulting in a liquidity index of about 1.0 for the overall deposit, which indicates that the soil is sensitive to remoulding. This is corroborated by the undrained shear strength measurements of the natural and remoulded material which resulted in sensitivities as high as 28 for the field vane tests and 10 for the laboratory vane tests. The consistency of the overall deposit, as determined from the undrained shear strength testing, increases from soft at the surface of the deposit to stiff below about

4. SUBSOIL CONDITIONS: (cont'd.) ...

4.3) Clay, with Silty Clay Layers: (cont'd.) ...

elevation 150. This increase in the undrained shear strength with depth is represented by an average  $C_u/P_o$  ratio of 0.3 for the overall deposit. The undrained shear strength values obtained from the laboratory tests, were generally lower than those obtained from the field testing. It is considered that this is primarily due to the unavoidable sample disturbance caused by the field and laboratory handling and subsequent testing of the sensitive clay.

The consolidation characteristics of the stratum were determined by carrying out four laboratory consolidation tests, the results of which are shown as Void Ratio ( $e$ ) versus Logarithm of Pressure ( $\log - p$ ) curves on Figure 4 in the Appendix. The results are summarized on Figure 2, and indicate that the clay is normally consolidated - i.e., the stratum has not been subjected in the past to any pressure in excess of the existing effective overburden pressure ( $P'_c = P'_o$ ). The relatively high values for the initial void ratio ( $e_o$ ) and the compression index ( $C_c$ ) are within the normal range for "Leda" clay.

4.4) Heterogeneous Mixture of Silt, Sand and Gravel - (Glacial Till):

A deposit consisting of a heterogeneous mixture of silt, sand and gravel (glacial till), was encountered immediately below the clay stratum, between elevations 52 and 73. This deposit was fully penetrated only at the locations of Boreholes 1, 4A, and 8 and was found to vary randomly in thickness between 4 and 12 ft. across the site.

The glacial till is essentially of a granular nature; however, at some locations, slightly cohesive zones were encountered in the lower portions of the deposit. The gravel sizes present within the glacial till deposit were found to be predominantly of shale origin.

4. SUBSOIL CONDITIONS (cont'd.) ...

4.4) Heterogeneous Mixture of Silt, Sand and Gravel -  
(Glacial Till): (cont'd.) ...

Laboratory tests on representative samples indicate an average moisture content for the overall deposit of about 10 per cent. Atterberg limits for the cohesive portions of the glacial till indicate liquid and plastic limits of about 20 and 14 per cent, respectively. The grain-size distributions of the overall deposit are shown on Figure 5 in the Appendix.

The Standard Penetration Resistance 'N' values in this deposit generally increased with depth and ranged from 46 to 165 blows/ft. These 'N' values indicate the non-cohesive glacial till to be very dense, the cohesive zones being of hard consistency.

4.5) Shale Bedrock:

Black shale bedrock was encountered across the site (at Boreholes 1, 4A and 8) immediately below the glacial till deposit at depths of 160 to 178 ft. below the ground surface, indicating that the surface of the bedrock slopes in a northerly direction. Core recoveries averaged about 85 per cent; an examination of the core samples indicates that the shale is basically sound from the surface.

5. GROUNDWATER CONDITIONS:

Water level observations were carried out in the open boreholes during the period of the investigation. These observations indicate that the water level across the site is approximately 3 to 4 ft. below the ground surface - i.e., at about elevation 218. This water level is slightly higher than that observed in South Indian Creek.

In a 5-day period of precipitation during the time of this investigation, an increase in the creek water level of about 18 inches, was observed.

6. DISCUSSION AND RECOMMENDATIONS:

6.1) General:

It is proposed to construct an underpass to carry relocated County Rd. No. 5 over the East and Westbound lanes of Hwy. 417, about 1 mile south of Limoges. Based on a preliminary foundation investigation carried out by this Section (refer Foundation Report W.J. 68-F-83, Site #4), the Bridge Planning Section proposed two alternate schemes, one incorporating stabilizing berms in the longitudinal direction and the other where fill heights would be restricted to a height at which berms would not be required. The respective structure spans for these schemes are shown on Drawing 69-F-84A.

The investigation has revealed the presence of a surficial deposit of silty fine sand, with organic silt seams, some 15 ft. in thickness and of very loose to loose relative density, followed by an extensive deposit of clay of soft to stiff consistency. The clay deposit, which is some 134 to 158 ft. thick, contains silty clay layers and is followed by a granular type of glacial till deposit of 4 to 12 ft. thickness. Sound shale bedrock was encountered across the site at depths of 160 to 178 ft. below the ground surface - i.e., between elevations 45 and 52.

The presence of an extensive deposit of soft and highly compressible clay at a relatively shallow depth below ground surface requires that steps must be taken to ensure overall stability of the approach embankments, and that the structure must be supported on piled foundations. As the stability and settlement of the approach fills are the major problems at this site, they will be discussed first.

6.2) Approach Embankments:

6.2.1) Stability Considerations:

The critical condition for stability of an embankment on normally consolidated clays, as is the case with the clay stratum at this site, generally occurs during or immediately

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

6.2) Approach Embankments: (cont'd.) ...

6.2.1) Stability Considerations: (cont'd.) ...

after construction. This being the case, a total stress analysis ( $\phi = 0$  condition) provides a suitable means of assessing the stability of the embankment sections. In this method of analysis, stability is governed by the applied loads and by the stress-strain and undrained shear strength properties of the foundation and embankment soils.

Analyses have been carried out, therefore, in terms of total stresses, by the use of the electronic computer, to determine the stability of the fill sections. The assumptions made with regards to the physical properties of the fill material and overburden, are shown on Figure 6 in the Appendix. A minimum factor of safety of 1.3 with respect to stability, has been used in these computations for circular arc type failure surfaces. The results of the analyses indicate that:

(a) fills up to 15 ft. in height will be stable if constructed with standard 2:1 slopes;

(b) fills in excess of 15 ft. in height will require half-height stabilizing berms in both the longitudinal and transverse directions. For example, fills 21 ft. in height, will require half-height berms of 45 ft. in length.

(c) The berm length requirements for various heights of fill are given on Figure 6 in the Appendix, which also shows a typical profile for the North approach and a section in the transverse direction. Since the subsoil conditions across the site are fairly uniform, insofar as stability is concerned, the results shown on Figure 6 are equally applicable to the South approach embankment.

(d) The surface of all berms should slope away from the fill at a gradient of 20:1 for drainage purposes. Smooth transitions between different berm requirements should be affected as the height of fill varies.

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

6.2) Approach Embankments: (cont'd.) ...

6.2.2) Settlement Considerations:

The very loose to loose surficial sand stratum will undergo settlements, due to the imposed embankment loading. However, it is believed that such settlements will be of an immediate nature. In addition, elastic settlements (immediate settlements) will take place within the clay stratum due to the imposed embankment loads. No attempt was made to compute such immediate settlements, since these will be realized during construction of the embankments.

The underlying highly compressible clay stratum will undergo excessive settlement due to consolidation over the long term under the weight of the approach fills. Computations have been carried out to determine the amount and time rate of consolidation settlements for various fill heights. The results of these computations are summarized on Figure 6 in the Appendix and are tabulated below:

Height of Fill	Total Consolidation Settlement (in inches) For Various Time Periods					
	<u>6 Mos.</u>	<u>1 Yr.</u>	<u>2 Yrs.</u>	<u>7 Yrs.</u>	<u>15 Yrs.</u>	<u>30 Yrs.</u>
15 ft. (No Berm)	6	9	14	21	30	42
21 ft. (45' Berm Required)	9	13	22	33	48	66
Percentage Consolidation:	15%	20%	30%	50%	72%	90%

Since the clay deposit is normally consolidated ( $P'_c = P'_o$ ), consolidation settlements over the long term will take place regardless of the height of fill. Therefore, the choice of a suitable fill height, and hence the length of the structure, will depend on economic and other considerations.

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

6.2) Approach Embankments: (cont'd.) ...

6.2.2) Settlement Considerations: (cont'd.) ...

In order to minimize post-construction settlements, it would be advantageous to construct the approach fills well in advance of the structure foundations. For example, if a 15-ft. high fill is left in place for a period of 2 years, settlements of up to 14 inches can be recovered. This would mean that the additional 23 inches of settlement would be realized over a period of about 28 years after completion of the structure.

6.3) Structure Foundations:

Because of the soft and compressible nature of the subsoil, the structure piers and abutments should be supported on end-bearing piles driven to practical refusal within the lower portion of the competent glacial till deposit. For estimating purposes, it can be assumed that the piles would meet practical refusal at between elevations 45 and 63. The allowable pile load would be dependent on the section chosen - for example, 12 BP 74 steel H-piles, driven to practical refusal, could be designed to carry 90 tons/pile. End-bearing piles would be unusually long; they would, however, reduce the settlement of the structure components to a negligible amount. A continuous structure could, therefore, be employed.

As an alternative, the structure could be supported on friction piles driven into the clay stratum. In order to assess the bearing capacity of such piles, a pile load test would be required at the site. It should be noted that if friction piles are considered, a simply supported structure should be designed in order to tolerate any differential settlements between the abutments and the piers.

Movement of the subsoil due to strain imposed by the embankment loading will generally tend to displace the long slender piles laterally and can cause rotation of the abutments. In view of this, we recommend that consideration be given to

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

6.3) Structure Foundations: (cont'd.) ...

supporting the extreme ends of the wing walls on end-bearing piles founded as aforementioned. It is considered that this will improve the stability of the abutment in the longitudinal direction. No bouldery or rock fill should be placed in areas where piles are to be driven.

Pile caps should be founded at a sufficient depth below finished grade so as to ensure adequate frost protection.

A temporary dewatering scheme will be required if pile caps are constructed below the groundwater level within the permeable surficial sand stratum.

7. MISCELLANEOUS:

The field work for this project was carried out during the periods October 21 - November 3, and November 12 - 14, 1969.

Supervision of the field work was carried out by Mr. C. Mirza, Project Foundation Engineer, who also wrote this report.

General supervision of the project was undertaken by Mr. M. Devata, Supervising Foundation Engineer, who also reviewed the report.

Equipment used was owned and operated by F. E. Johnston Drilling Co. Ltd.

December 1969

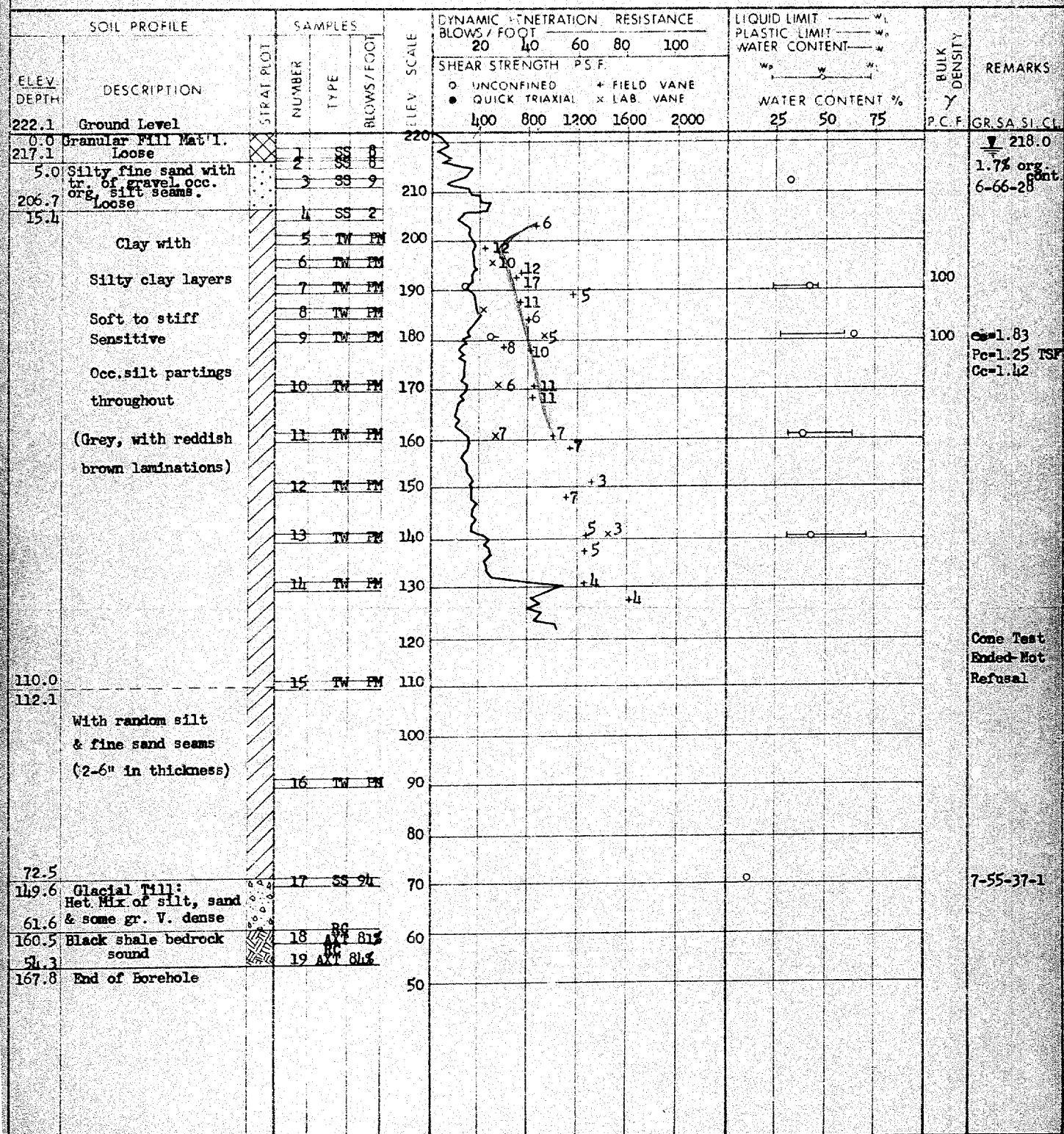
DEPARTMENT OF HIGHWAYS - ONTARIO  
MATERIALS & TESTING OFFICE

## RECORD OF BOREHOLE No. 1

FOUNDATION SECTION

JOB 69-P-84 LOCATION Co. Rd. 5 Relocation Sta 27+34 O/S 17' Lt.  
 W.P. 35-66-09 BORING DATE October 21-24, 27, 1969  
 DATUM Geodetic BOREHOLE TYPE Washboring, NX & BX Casing; Cone

ORIGINATED BY CM  
 COMPILED BY GP  
 CHECKED BY



+ s=sensitivity

20  
15-5 % STRAIN AT FAILURE  
10

+5  
x3 Sensitivity

DEPARTMENT OF HIGHWAYS- ONTARIO  
MATERIALS & TESTING OFFICE

## RECORD OF BOREHOLE No. 2

FOUNDATION SECTION

JOB 69-F-84 LOCATION Co. Rd. 5 Relocation; Sta. 28+38 O/S 13' Rt.

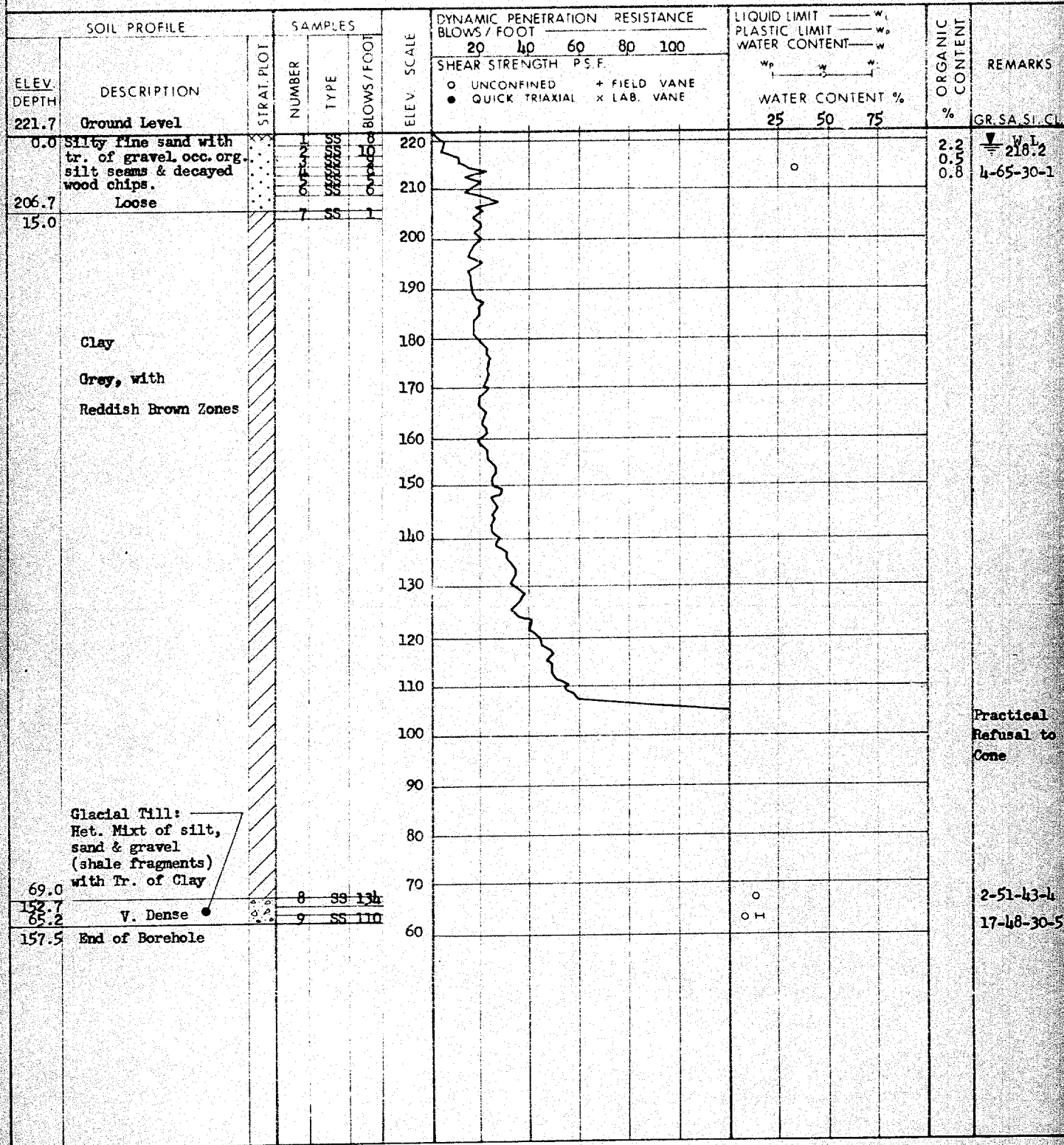
ORIGINATED BY CM

W.P. 35-66-09 BORING DATE Oct. 28, and Nov. 12, 1969

COMPILED BY GP

DATUM Geodetic BOREHOLE TYPE Washboring, NX Casing; Cone

CHECKED BY



DEPARTMENT OF HIGHWAYS - ONTARIO  
MATERIALS & TESTING OFFICE

## RECORD OF BOREHOLE No. 3

FOUNDATION SECTION

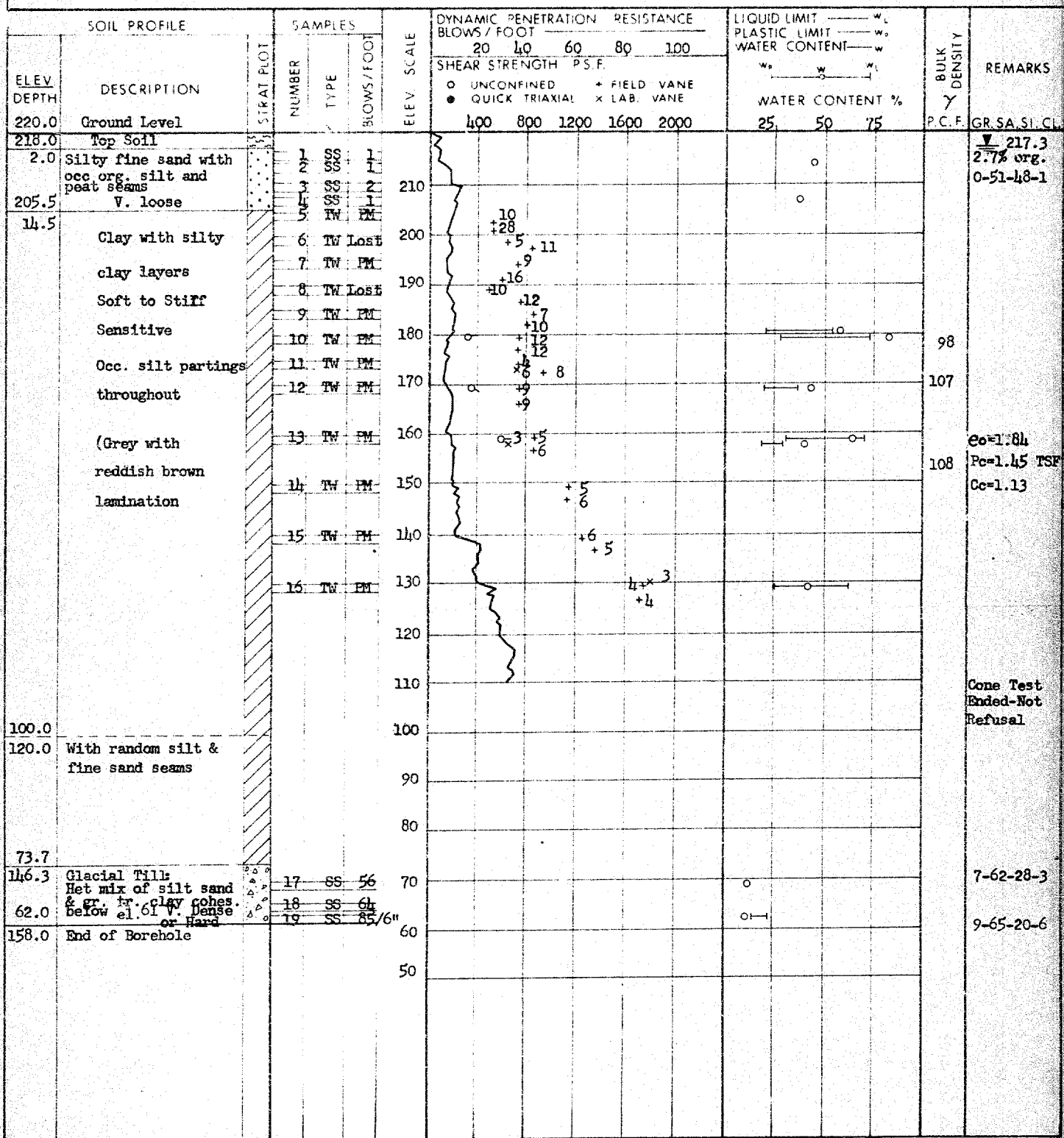
JOB 69-F-84 LOCATION Co. Rd. 5 Relocation Sta. 29+00 O/S 46' Rt.

ORIGINATED BY CM

W.P. 35-66-09 BORING DATE October 21-23, 1969

COMPILED BY GP

DATUM Geodetic BOREHOLE TYPE Washboring, NX Casing; cone

CHECKED BY *SR*20  
10 5 % STRAIN AT FAILURE9  
x3 Sensitivity

DEPARTMENT OF HIGHWAYS- ONTARIO  
MATERIALS & TESTING OFFICE

## RECORD OF BOREHOLE No. 3 A

FOUNDATION SECTION

JOB 69-F-84 LOCATION Co. Rd. 5 Relocation Sta. 29+05 O/S 20' Lt. ORIGINATED BY CM  
 W.P. 35-66-09 BORING DATE October 24 & 27, 1969 COMPILED BY GP  
 DATUM Geodetic BOREHOLE TYPE Washboring, NX Casing; CHECKED BY *LL*

SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT — % PLASTIC LIMIT — % WATER CONTENT — %		ORGANIC CONTENT %	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLT	NUMBER TYPE	BLOWS/FOOT	ELEV. SCALE	SHEAR STRENGTH P S F ○ UNCONFINED    + FIELD VANE ● QUICK TRIAXIAL    x LAB VANE			
221.6	Ground Level								
0.0	Silty fine sand with occ. org. silt seams & decayed wood chips throughout.				220				GR. SA. SI. CL. 218.4 2-55-42-1
205.6	V. Loose to Loose				210				0-34-65-1
16.0					200				
	Clay				190				
	Grey, with				180				
	Reddish brown				170				
	zones				160				
					150				
					140				
					130				
					120				
					110				
					100				
					90				
					80				
					70				
62.1	Glacial Till				60				1-52-46-1
59.5	Het. Mixt. of silt, sand & gravel; tr. of clay		10 SS 165						No recovery
58.3	V. Dense		11 100/4"						
163.3	End of Borehole Probably Bedrock				50				

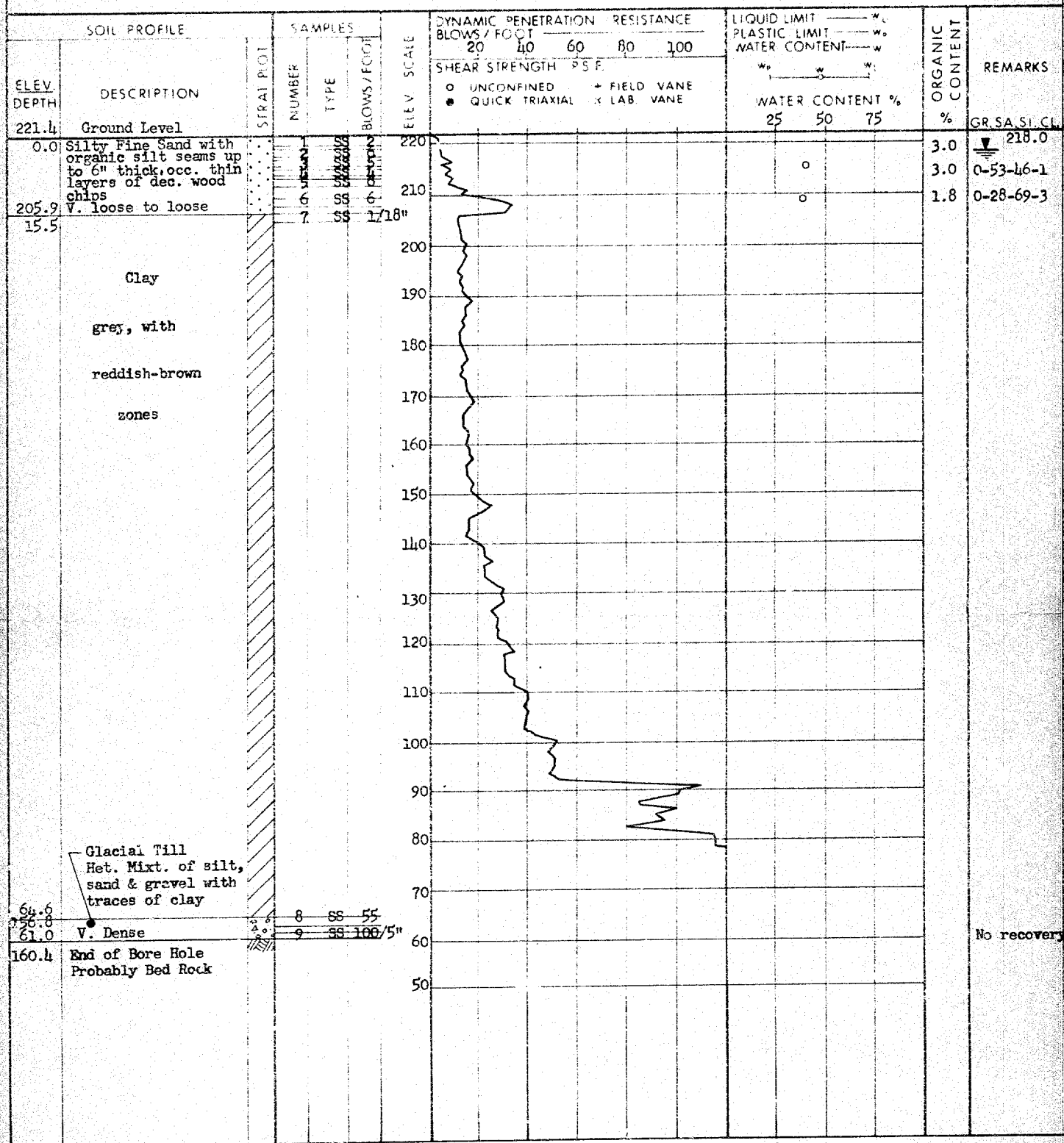
DEPARTMENT OF HIGHWAYS - ONTARIO  
MATERIALS & TESTING OFFICE

## RECORD OF BOREHOLE No. 4

FOUNDATION SECTION

JOB 69-F-84 LOCATION Co. Rd. 5 Relocation Sta 29+50 O/S 14' Rt  
 W.P. 35-66-09 BORING DATE Oct. 28 and Nov. 13, 1969  
 DATUM Geodetic BOREHOLE TYPE Washboring, NX Casing; Cone

ORIGINATED BY CM  
 COMPILED BY GP  
 CHECKED BY

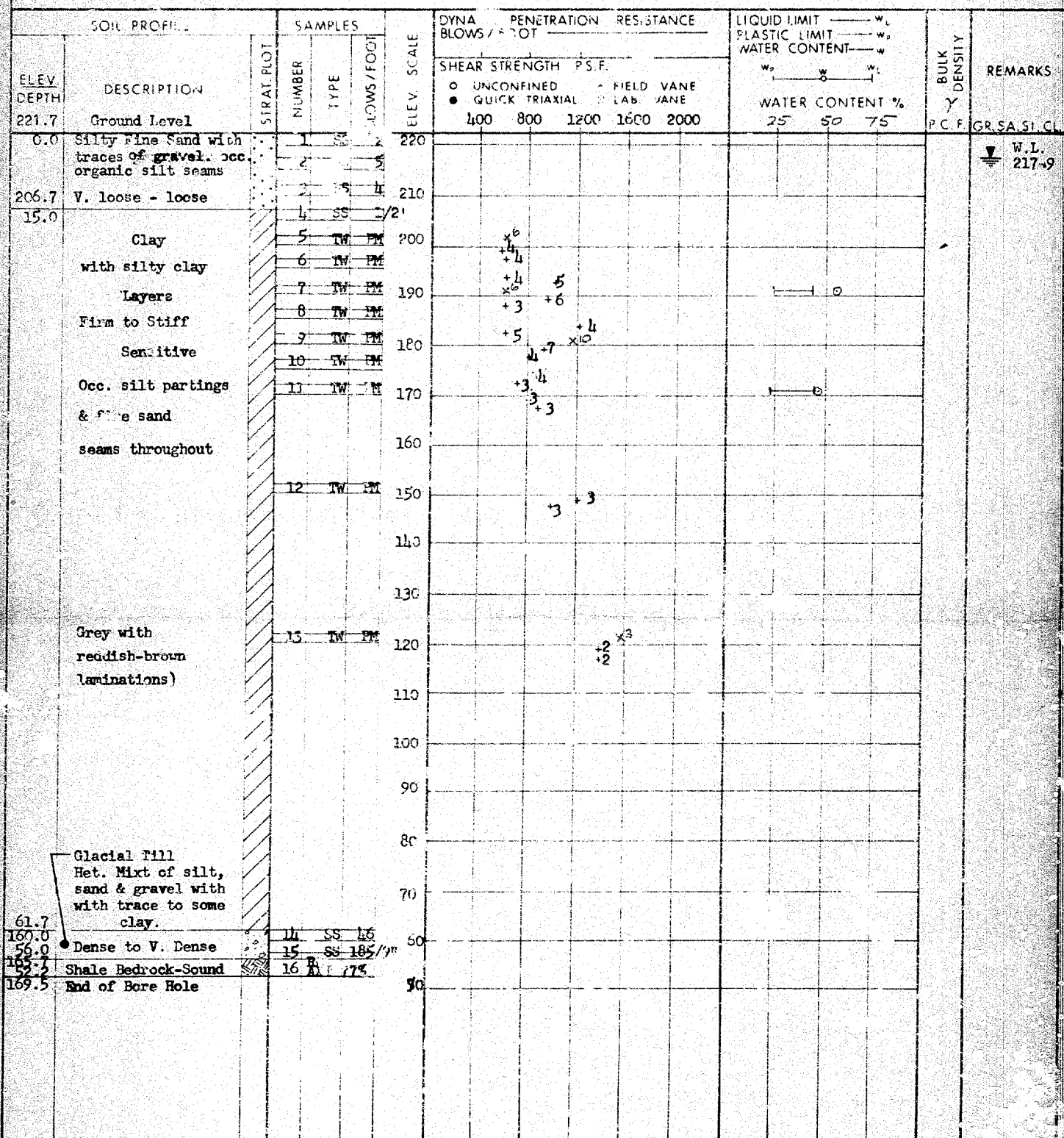


DEPARTMENT OF HIGHWAYS - ONTARIO  
MATERIALS & TESTING OFFICE

## RECORD OF BOREHOLE No. 4 A

FOUNDATION SECTION

JOB 69-T-8 LOCATION Co. Rd. 5 Reclamation Sta. 16 O/S 13' Rt. ORIGINATED BY DP  
 W.P. 35-56-12 BORING DATE June 27 July 2-4, 1969 COMPILED BY GP  
 DATUM Geodetic BOREHOLE TYPE Washboring, NX & BX Casing CHECKED BY





DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS &amp; TESTING OFFICE

## RECORD OF BOREHOLE No. 6

FOUNDATION SECTION

JOB 69-P-011

LOCATION Co. Rd. 5 Relocation Sta 31+68 0/5 22' Rt.

ORIGINATED BY CM

W.P. 35-66-02

BORING DATE October 29, 1969

COMPILED BY GP

DATUM Geodetic

BOREHOLE TYPE Washboring, NX Casing;

DRAWN BY

SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT — %		ORGANIC CONTENT	REMARKS
ELEV DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS/FOOT	ELEV	SHEAR STRENGTH — PS	WATER CONTENT — %		
219.9	Ground Level					UNCONFINED      FIELD VANE QUICK TRIAXIAL      LAB. VANE	* — * — * WATER CONTENT % 25    50    75		
0.0	Silty fine sand with tr. of Gravel occ. org. silt seams throughout	93	SS	12				3.2	W.L. 217.3
205.1	V. loose to Loose	93	SS	12	210				1-75-23-1
14.5		93	SS	12					
	Clay				200				
	Grey, with				190				
	reddish-brown				180				
	zones				170				
					160				
					150				
					140				
					130				
					120				
					110				
					100				
					90				
					80				
					70				
					60				
55.9	Glacial Till								
164.0	Het. mixt. of silt, sand & gravel; random clayey silt zones								
165.2	V. Dense or Hard								
165.2	End of Bore hole				50				

DEPARTMENT OF HIGHWAYS- ONTARIO  
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 7

FOUNDATION SECTION

JOB 69-7-84 LOCATION Co. Rd. 5 Relocation Sta. 32+25 O/S 24' Lt.  
W.P. 35-66-09 BORING DATE October 29-31, 1969  
DATUM Geodetic BOREHOLE TYPE Washboring, NX Casing

ORIGINATED BY OM  
COMPILED BY GP  
CHECKED BY

SOIL PROFILE		STRAT PILOT	SAMPLES		BLOWS / FOOT	ELEV SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT — % PLASTIC LIMIT — % WATER CONTENT — %			BULK DENSITY P.C.F.	REMARKS
ELEV DEPTH	DESCRIPTION		NUMBER	TYPE			SHEAR STRENGTH P.S.F.					WATER CONTENT %				
							400	800	1200	1600	2000	25	50	75		
222.2	Ground Level															
0.0	Silty fine sand with numerous org. silt seams occ. dec wood chips V. loose-loose		1	SS	1	220										W.L. 217.6
209.7			2	SS	2	210										3.8% org cont
12.5			3	SS	3											
			4	SS	4											
			5	SS	5											
			6	TM	6	200										
			7	TM	7											
			8	TM	8											
			9	TM	9	190										
			10	TM	10	180										
			11	TM	11	170										
			12	TM	12	160										
			13	TM	13	150										
			14	TM	14	140										
			15	SS	15	130										
			16	TM	16	120										
			17	TM	17	100										
			18	TM	18	80										
			19	SS	19	70										
			20	SS	20	50										
52.2																
170.0																
173.3	End of Borehole															

20  
15-5 % STRAIN AT FAILURE  
10

+5  
x4 Sensitivity

27-48-20

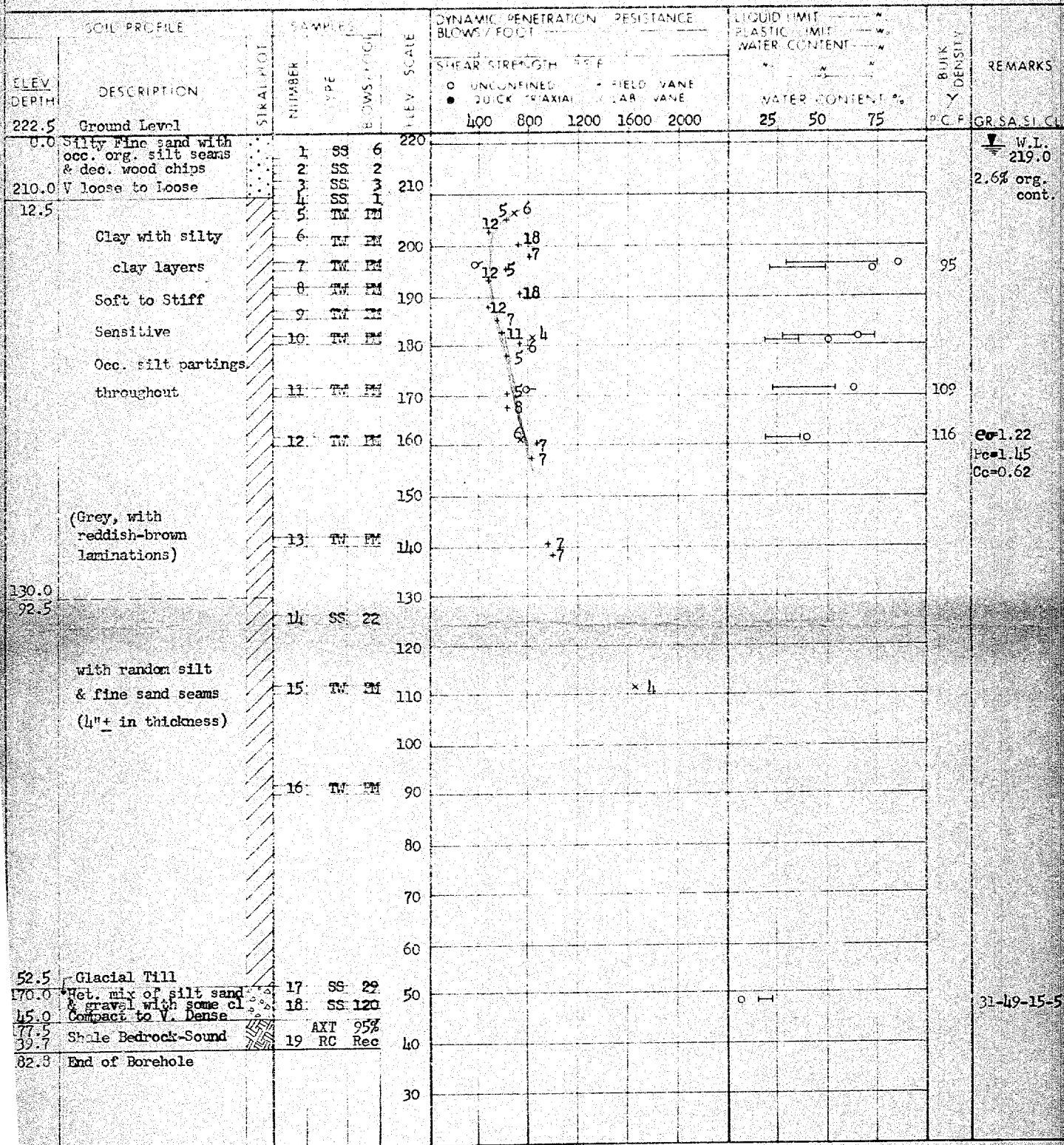
DEPARTMENT OF HIGHWAYS - ONTARIO  
MATERIALS & TESTING OFFICE

## RECORD OF BOREHOLE No. 8

FOUNDATION SECTION

JOB 69-F-84 LOCATION Co. Rd. 5 Relocation Sta. 32+90 O/S 14' Rt.  
 W.P. 35-66-09 BORING DATE October 30-31, and November 3, 1969  
 DATUM Geodetic BOREHOLE TYPE Washboring, NY & AX Casing

ORIGINATED BY CM  
 COMPILED BY CP  
 CHECKED BY



20  
 15  
 10

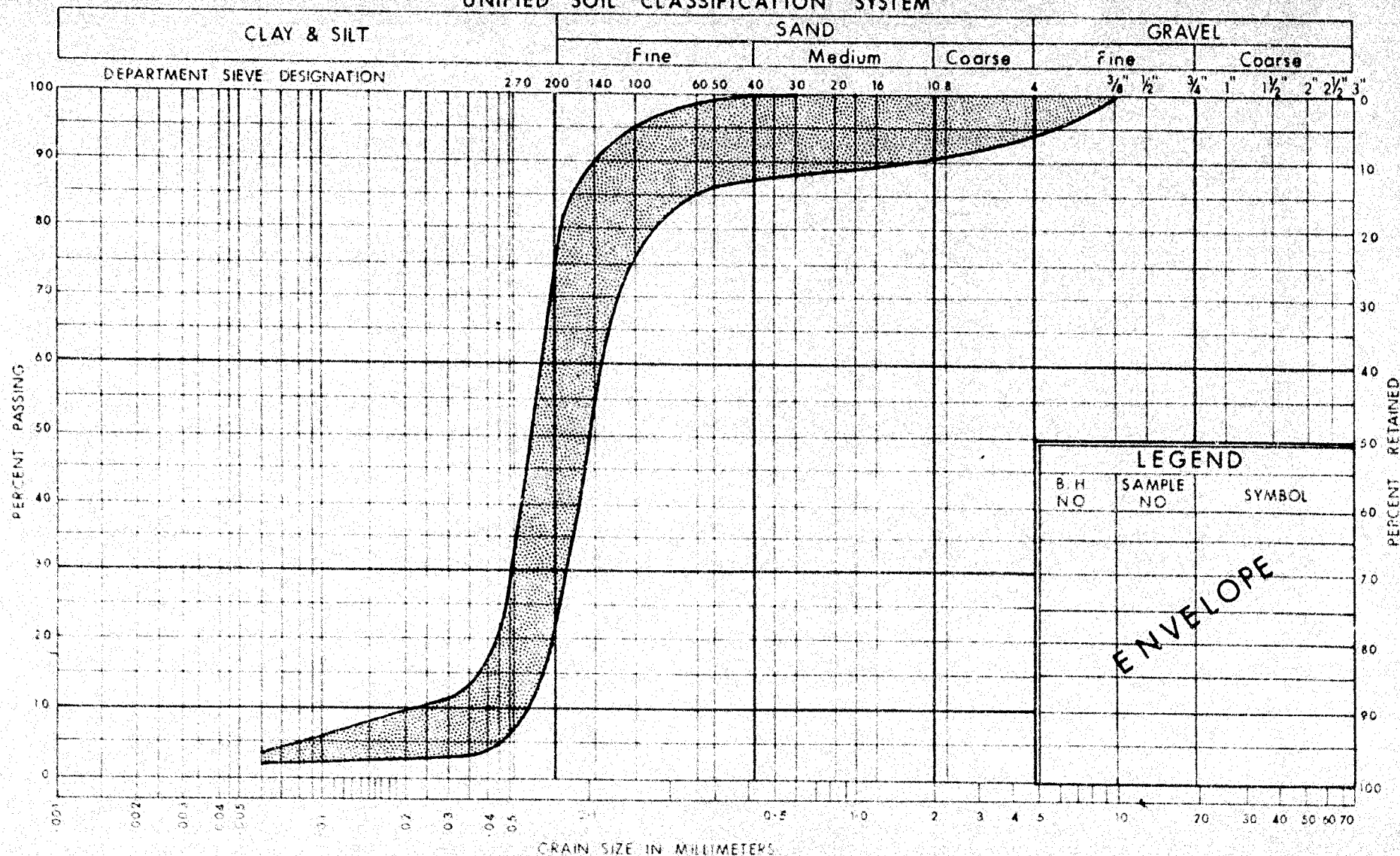
5 % STRAIN AT FAILURE

+5  
 x6

Sensitivity

31-49-15-5

## UNIFIED SOIL CLASSIFICATION SYSTEM



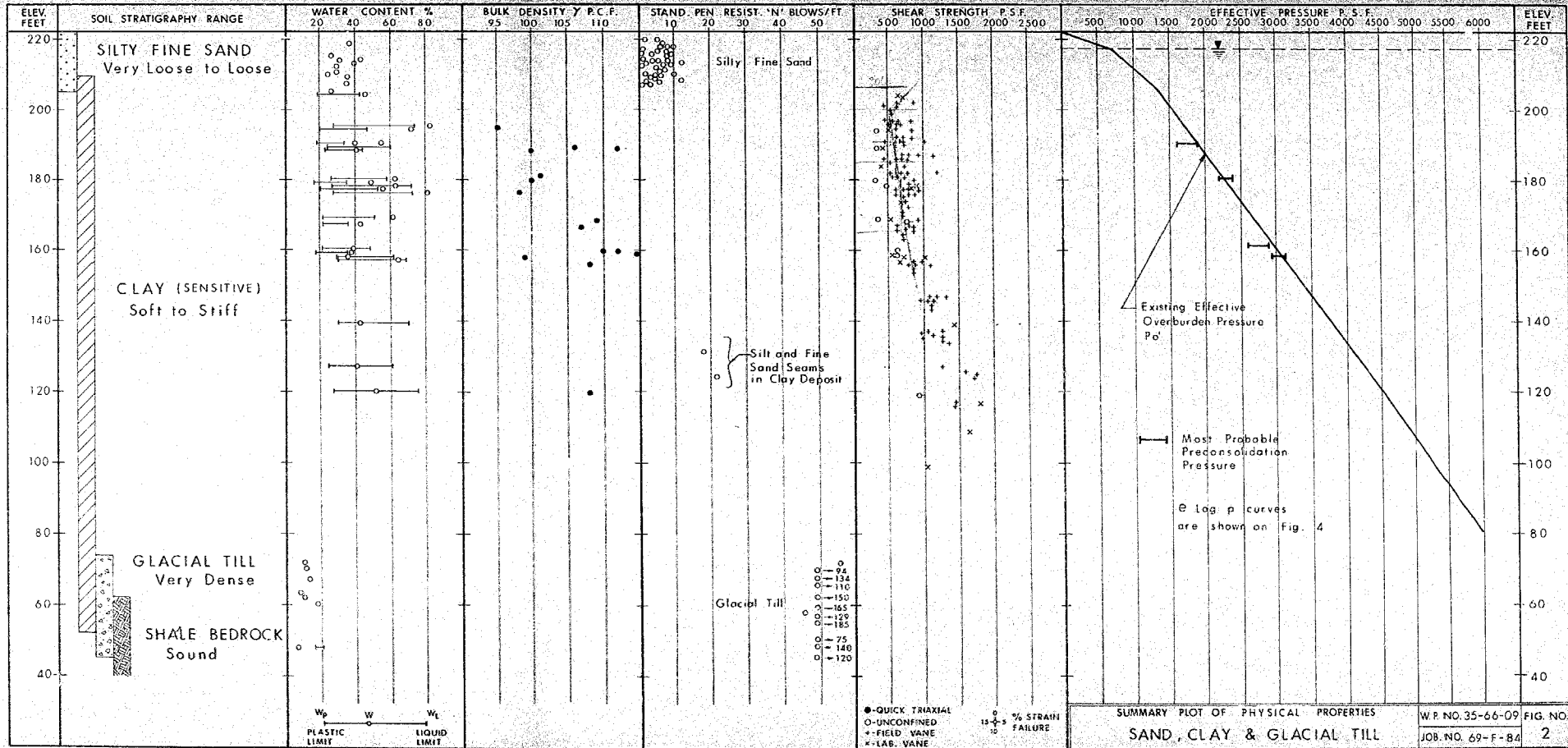
DEPARTMENT OF HIGHWAYS  
MATERIALS and  
TESTING  
DIVISION

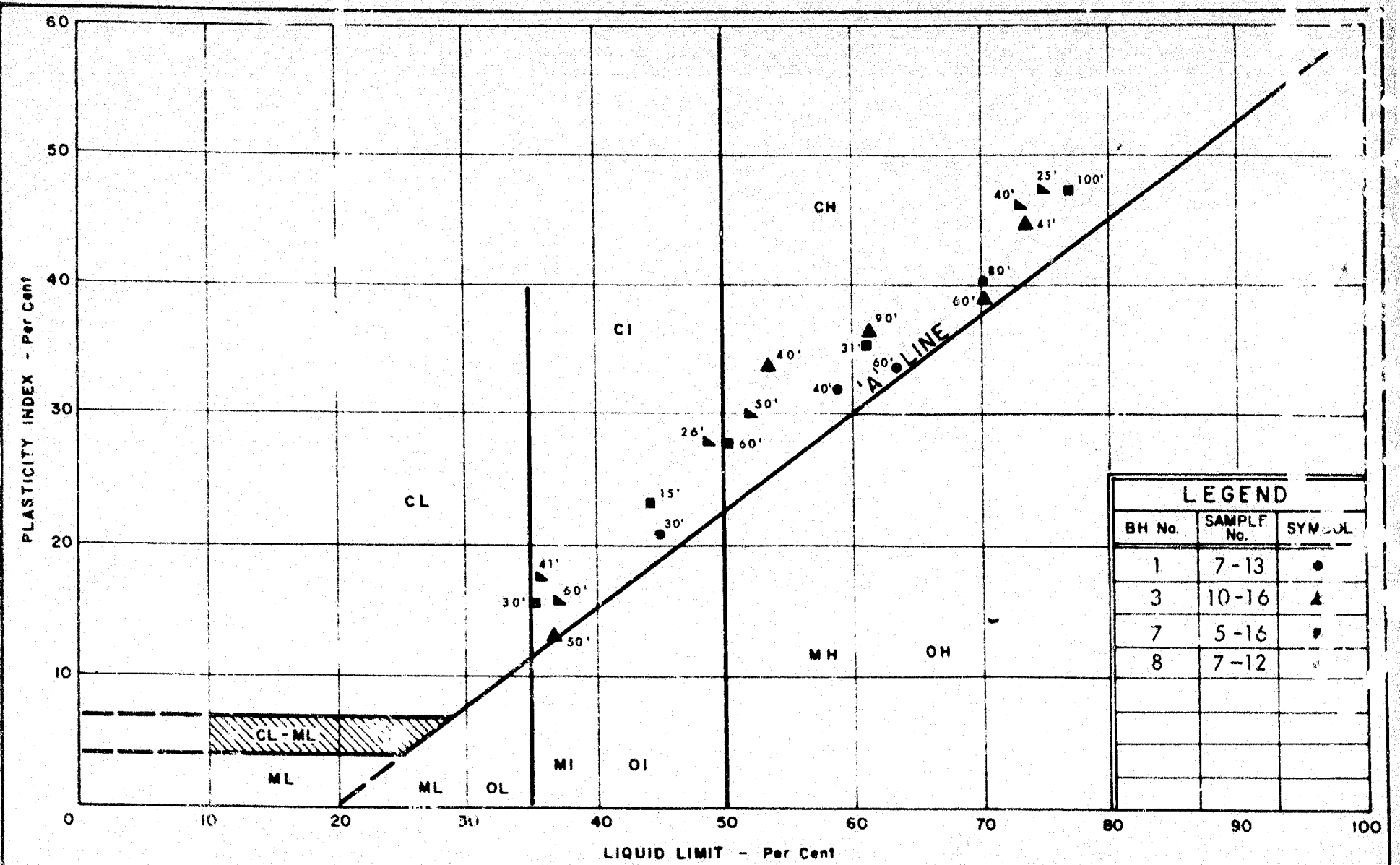
GRAIN SIZE DISTRIBUTION  
SILTY FINE SAND

W.P. No. 35-66-09

JOB No. 69-F-84

Fig. NO. 1





LEGEND		
BH No.	SAMPLE No.	SYMBOL
1	7-13	●
3	10-16	▲
7	5-16	■
8	7-12	■



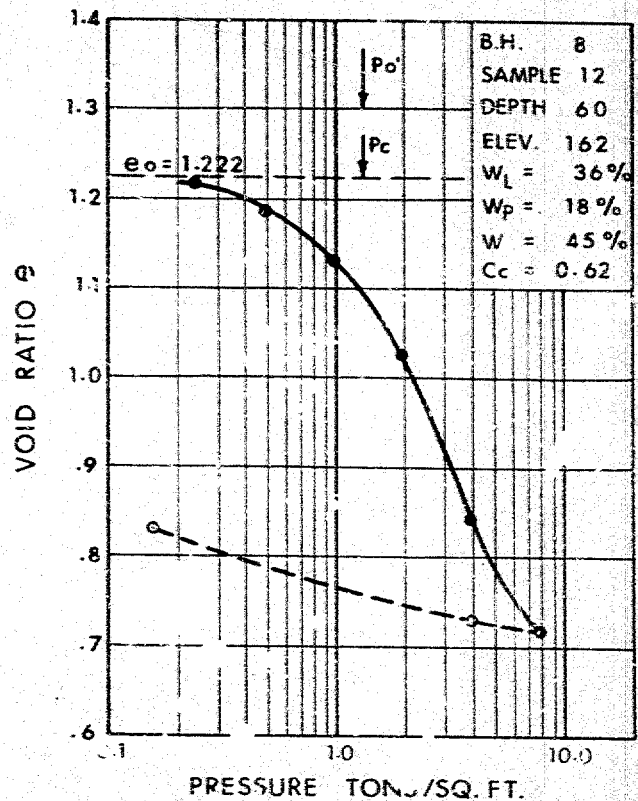
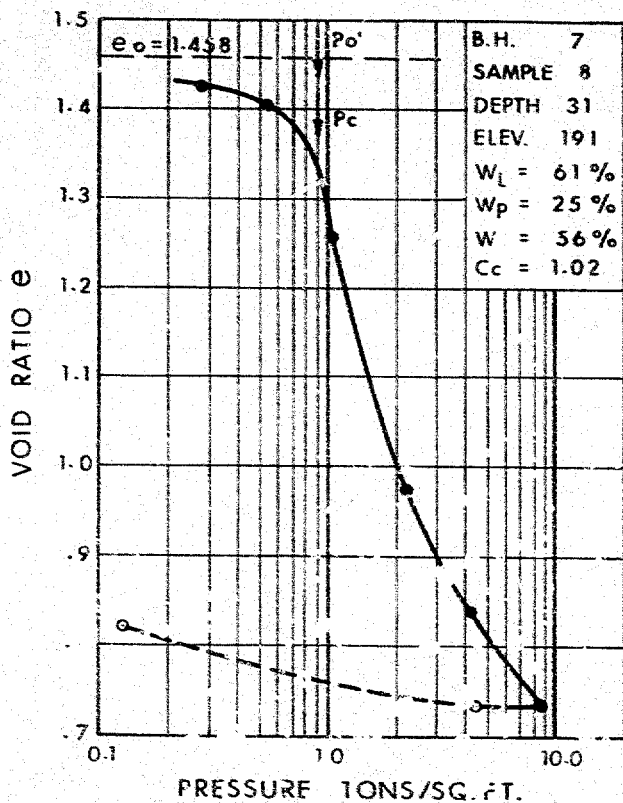
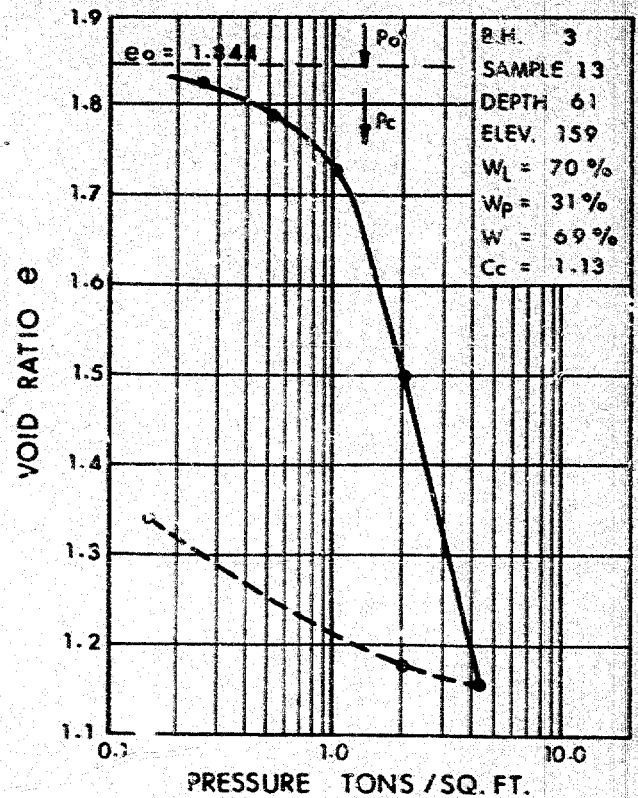
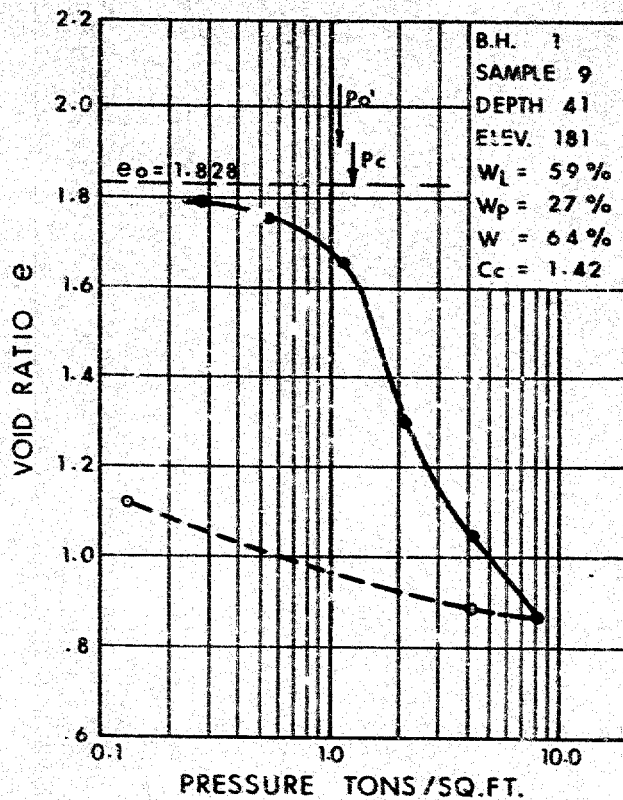
DEPARTMENT OF HIGHWAYS  
MATERIALS and  
TESTING  
DIVISION

PLASTICITY CHART  
CLAY  
WITH SILTY CLAY LAYERS

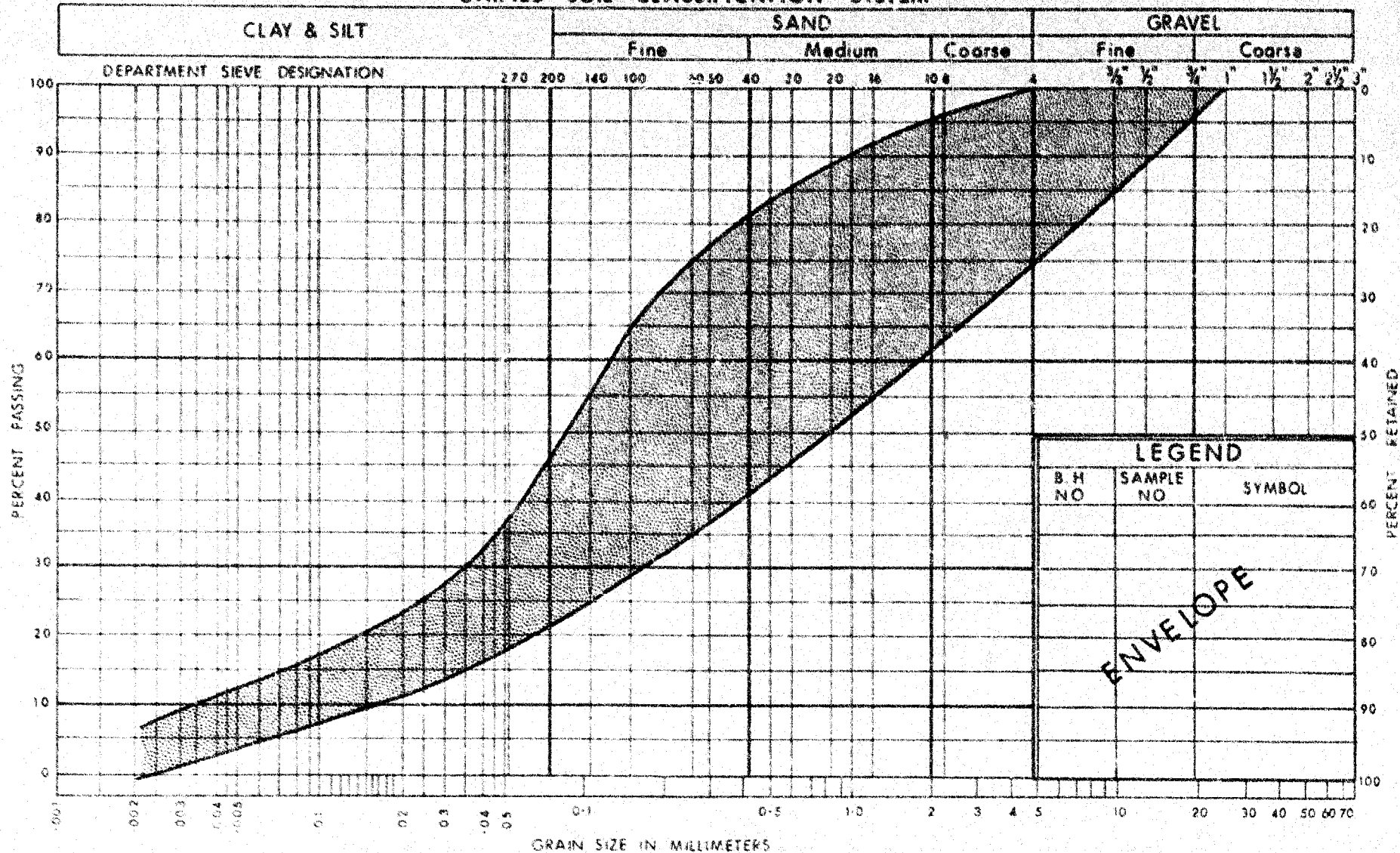
WP No. 35-66-09  
JOB No. 69-F-84  
Fig NO. 3

# VOID RATIO - PRESSURE CURVES

JOB NO. 69 - F - 84



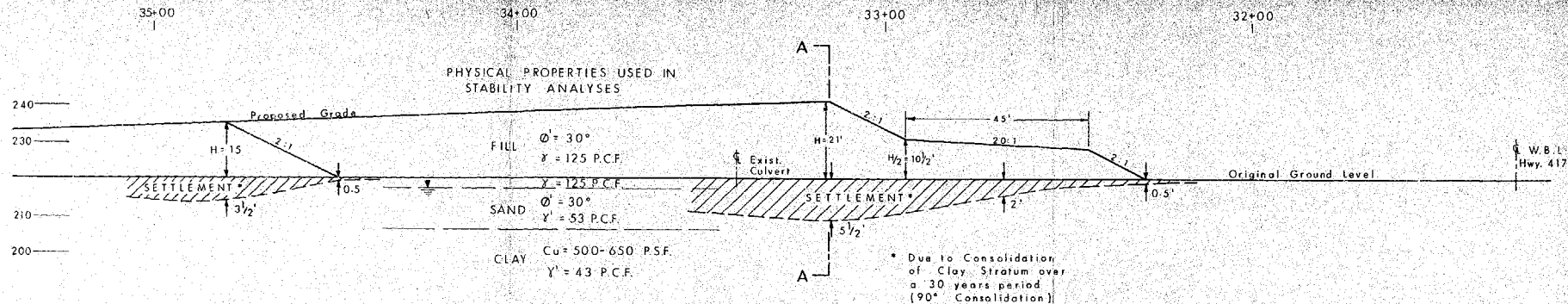
# UNIFIED SOIL CLASSIFICATION SYSTEM



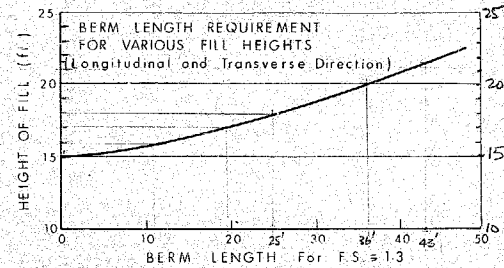
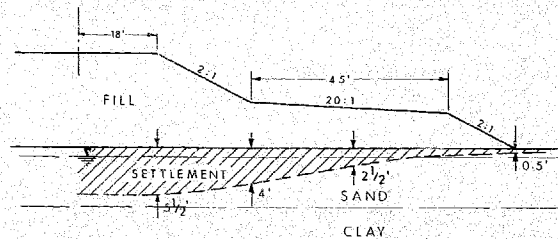
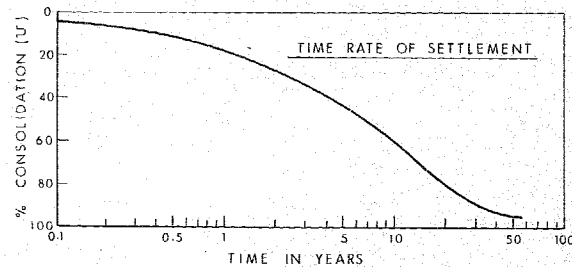
DEPARTMENT OF HIGHWAYS  
MATERIALS and  
TESTING  
DIVISION

## GRAIN SIZE DISTRIBUTION GLACIAL TILL

WP No. 35-66-09  
JOB No. 69-F-84  
Fig. NO. 5



TYPICAL PROFILE NORTH APPROACH  
SCALE 1"=20'



## 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>G 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

# ABBREVIATIONS USED IN THIS REPORT

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$m_v$	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)
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$\tau$	SHEAR STRENGTH
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$\phi_u$	APPARENT ANGLE OF SHEARING RESISTANCE, OR FRICTION
$\mu$	COEFFICIENT OF FRICTION
$S_t$	SENSITIVITY

## GENERAL

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

## STRESS AND STRAIN

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$\tau$	SHEAR STRESS
$\epsilon$	LINEAR STRAIN
$\gamma$	SHEAR STRAIN
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E	MODULUS OF LINEAR DEFORMATION (YOUNG'S MODULUS)
G	MODULUS OF SHEAR DEFORMATION
K	MODULUS OF COMPRESSIBILITY
$\eta$	COEFFICIENT OF VISCOSITY

## EARTH PRESSURE

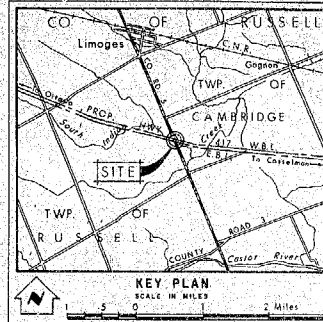
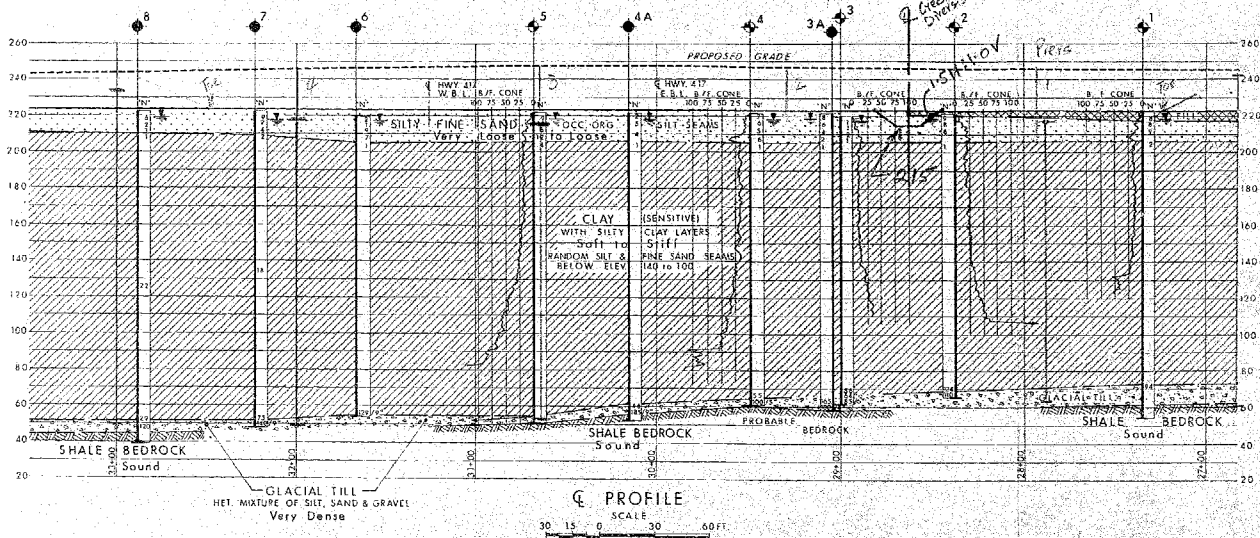
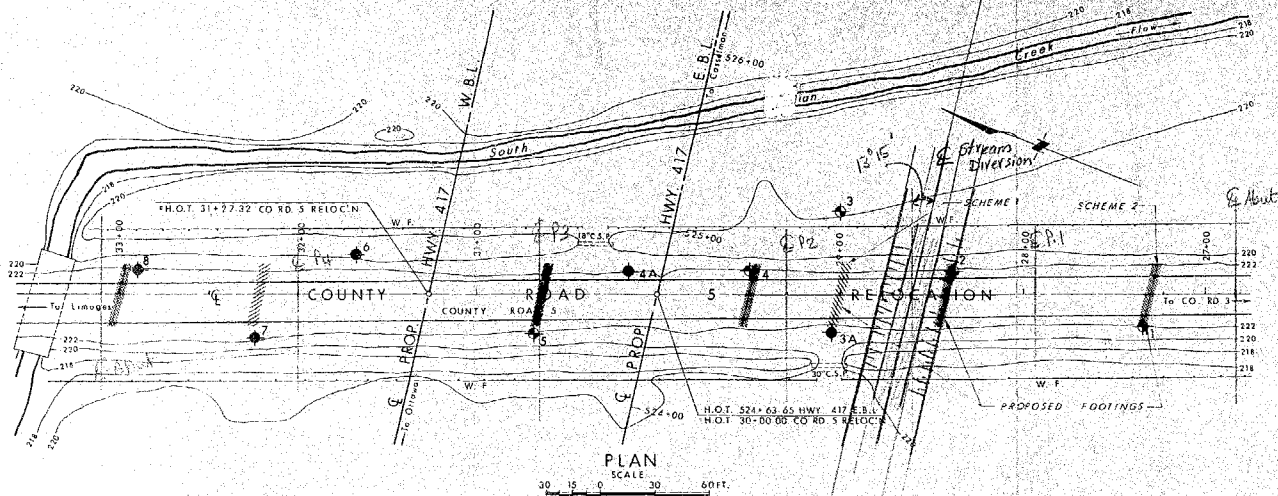
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$\delta$	ANGLE OF WALL FRICTION
K	DIMENSIONLESS COEFFICIENT TO BE USED WITH VARIOUS SUFFIXES IN EXPRESSIONS REFERRING TO NORMAL STRESS ON WALLS
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L	LENGTH OF FOUNDATION
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$k_s$	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 Level established at time of field investigation Oct. 1969		
NO.	ELEVATION	STATION	OFFSET
1	222.1	27+34	17' LT
2	221.7	28+38	13' RT
3	220.0	29+00	46' RT
3A	221.6	29+05	20' LT
4	221.4	29+50	14' RT
4A	221.7	30+16	13' RT
5	222.0	30+68	21' LT
6	219.9	31+08	22' RT
7	222.2	32+25	24' LT
8	222.5	32+90	14' 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.

*1970*  
*James R. & Associates - See sketch & memo of Jan 1970*  
*to Station Division - see memo of Jan 1970*

DEPARTMENT OF HIGHWAYS - ONTARIO			
MATERIALS & TESTING OFFICE - FOUNDATION SECTION			
COUNTY RD. 5 RELOCATION			
KING'S HIGHWAY NO. 417	DIST. NO. 2		
CO. RUSSELL	TWP. CAMBRIDGE		
	LOTS 30 & 17 CONS. IV & V		
BORE HOLE LOCATIONS & SOIL STRATA			
SUBMITTED BY	CHECKED BY	W.F. NO. 35-60-09	W.F. DRAWING NO.
DRAWN BY	CHECKED BY	JOB NO. 69-F-84	69-F-84A
DATE NOV. 27, 1969	SITE NO.	BRIDGE DRAWING NO.	
APPROVED	DESIGNED	DRAWN	

MEMORANDUM

69-F-83  
-84  
-85 } 280

TO: Mr. A. G. Stermac,  
Principal Foundation Engineer,  
Downsview, Ontario.

FROM: Bridge Section,  
Kingston, Ontario.

ATTENTION: Mr. M. Devata,  
Supervising Foundation Engineer

DATE: October 20, 1969.

OUR FILE REF. IN REPLY TO

SUBJECT: W.P. 35-66-07, Site 27-207 - Co. Rd. 17 Interchange Underpass  
W.P. 35-66-09, Site 27-206 - Co. Rd. 5 Interchange Underpass  
W.P. 34-66-16, Site 27-198 - Sideroad to Vars Underpass  
Highway 417, District 9

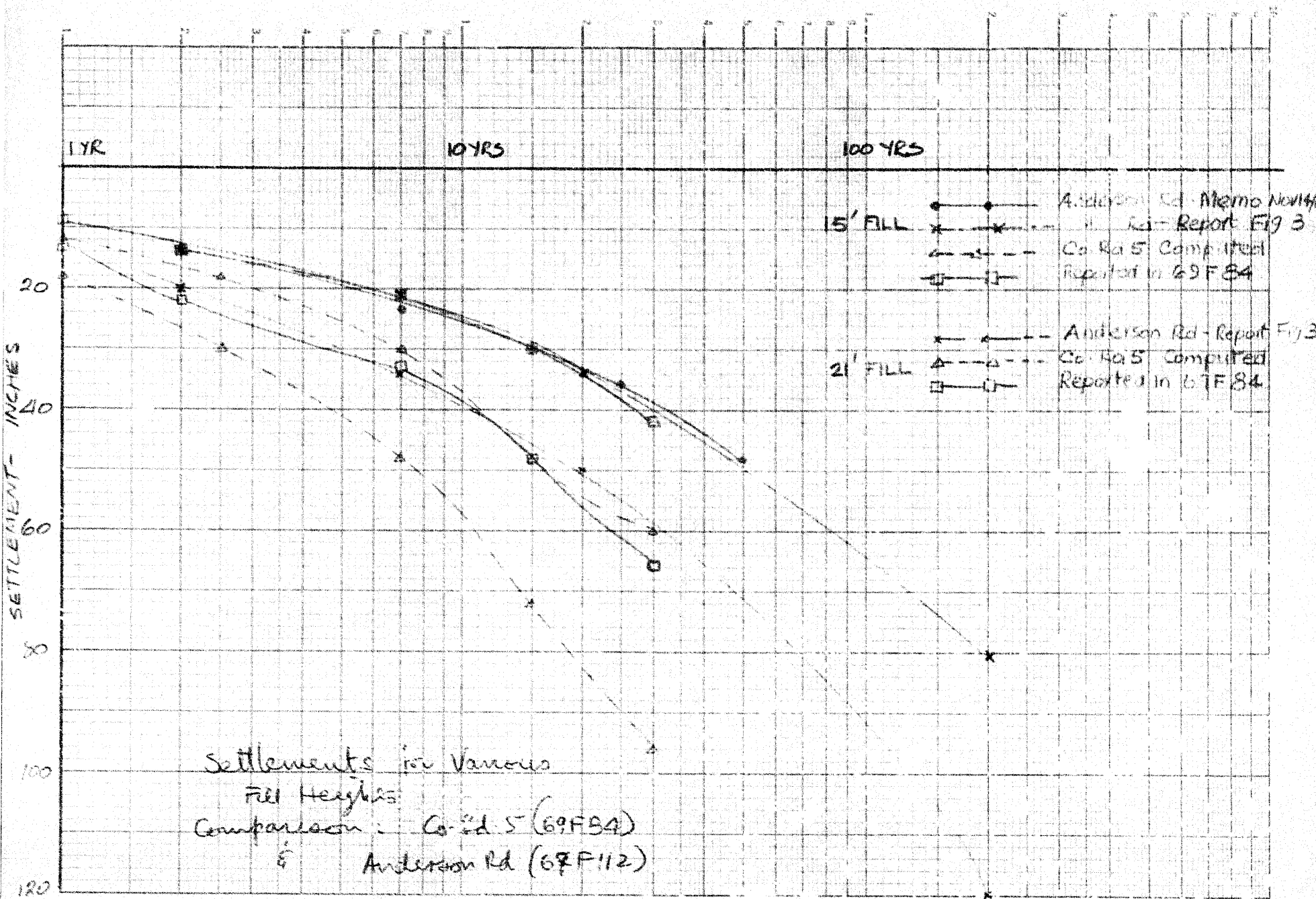
Further to my foundation requests dated September 19, 1969, I confirm that the following are the revised locations for the required boreholes at the above structures. I shall be glad if you will amend your copies of the plans accordingly. The chainages listed relate to the respective centre lines of the structures.

	Borehole Chainage	Borehole Chainage	
		Str. with Berms	Str. without Berms
W.P. 35-66-07 (Plan E-4677-1)	29 + 27 30 + 64 31 + 91		
W.P. 35-66-09 (Plan E-4678-1)		29 + 01 30 + 64 32 + 22	27 + 30?? 28 + 43 29 + 56 30 + 64 31 + 72 33 + 00
W.P. 34-66-16 (Plan E-4676-1)		28 + 44 29 + 35 30 + 80 32 + 12 32 + 97	26 + 40 27 + 44 28 + 44 29 + 35 30 + 80 32 + 12 32 + 97 33 + 87 34 + 85

T. C. Kingsland  
Regional Bridge Planning Engineer

TCK/hl  
c.c.

Bridge Office Files Section (Mr. S. McCombie)  
Mr. K. Bassi



WP 35-66-01 G.D.  
WF 35-66-02 PAV

STR 8 INTERCHANGE  
35-66-09

INTERCHANGE DESIGN  
NOT FINAL

R E E S

## MEMORANDUM

69-P-84 *Also*

To: Mr. M. Devata,  
Supervising Foundation Engineer,  
Foundation Section,  
Downsview, Ontario.

From: Bridge Section,  
Kingston, Ontario.

Date: January 12, 1970.

Attention:

Our File Ref.

In Reply To

Subject: W.P. 35-66-09, Site 27-206,  
County Road 3 Interchange Underpass,  
(1 Mile South of Limoges),  
Highway 417, District 9 - Ottawa

Further to my telephone conversation with you today, I now enclose a copy of a sketch plan showing the proposed realignment of the north branch of South Indian Creek in the area of the above interchange. You will see that the stream now passes between piers 1 and 2 on the south side of the freeway instead of between pier 4 and the north abutment. It is hoped that this will eliminate the possible instability problem arising from the latter arrangement.

I shall be glad to have your comments on the possible effects of the realignment from the Foundation's point of view in due course.

*T. C. Kingsland*

T. C. Kingsland  
Regional Bridge Planning Engineer

TCK/hl

c.c. (with encl.)

Mr. K. Bassi

Bridge Office Files Section (Mr. S. McCombie)

69-P-84

Department of Highways Ontario

Copy for the information of

MR. M. DEVATA

Mr. S. J. Markiewicz,  
Regional Road Design Engineer,  
Kingston, Ontario.

Bridge Section,  
Kingston, Ontario.

Mr. M. J. MacMaster

January 19, 1970.

W.P. 35-66-00, Site 27-206,  
County Road 5 Interchange Underpass,  
(1 Mile South of Limoges),  
Highway 417, District 9 - Ottawa

This is to confirm that for stability reasons it is considered desirable to divert the north branch of the South Indian Creek away from the north end of the structure and to divert it to a position between two of the south piers of the structure as shown on the sketch enclosed.

*Foundation*  
In order that the Bridge Office can carry out stability calculations with the stream in its diverted position, I have given them the following data relating to the diverted position of the stream:

Bed width - 15 ft. with  $1\frac{1}{2}$ :1 side slopes

Bed elevation - 215.00

Intersection of centre line of stream with  
centre line of relocated County Road 5 at  
Station 28+62.

Diverted stream makes skew angle of  
13° 15' with centre line relocated County  
Road 5.

I shall be glad to receive your comments as early as possible on the diversion and on the dimensions and other data given above.

TCK/hl  
Encl.

T. C. Kingsland  
Regional Bridge Planning Engineer

c.c. K. G. Bassi  
M. Devata  
A. J. Percy  
Bridge Office Files Section (Mr. S. McCombie)

69F-4

10

SITE Hwy 417 & Co Rd #5

HAMMER TYPE GRAVITY DROP WEIGHT 2.5 TON <sup>FALL</sup> ENERGY 5-6 FT.

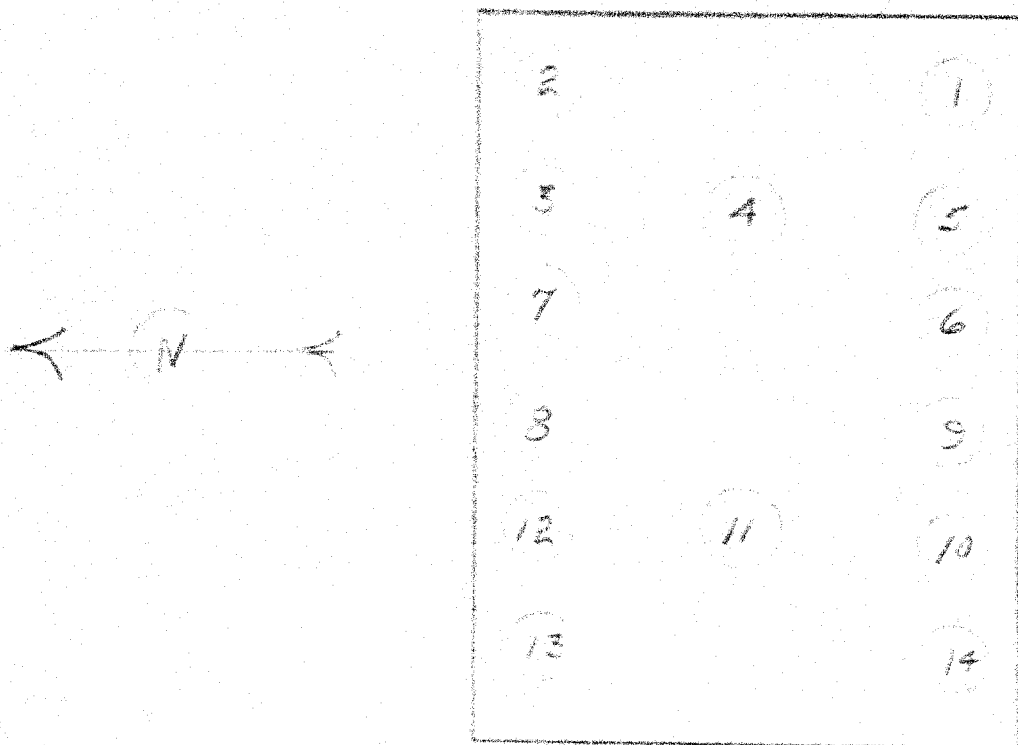
DRIVEN TO  
BROCK

COUNTY ROAD

NO 5

PIER NO 1

CONT 7B-6B



OVER

## DEPARTMENT OF HIGHWAYS - ONTARIO

Sheet 1 of 1

MATERIALS AND TESTING OFFICE

## FOUNDATION SECTION

## BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 2 CONTRACT NO. 72-62 STRUCTURE COUNTY ROAD NO. 5  
 CONTRACTOR PEER CONSULTING DESIGN LOAD OF PILE 90 TONS PER PILE  
 HAMMER DETAILS: TYPE GRAVITY DROP WEIGHT 3 1/2 TONS HEIGHT OF FALL OR ENERGY 5'-6"  
 TYPE OF ANVIL OR CAP \_\_\_\_\_ WEIGHT OF ANVIL OR CAP 500 LBS  
 PILE DETAILS 12 H.P. 77 H. PILES  
 PILE NO. 11 LOCATION PIER NO. 1 DATE DRIVEN OCT. 17, 1972

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	4		26	1		81	1		76	1
	2	3		27	1		82	1		77	1
	3	2		28	1		83	1		78	1
	4	2		29	1		84	1		79	1
	5	2		30	1		85	1		80	1
	6	1		31	1		86	1		81	1
	7	1		32	1		87	1	SPIN	82	1
	8	1		33	1		88	1		83	1
	9	1		34	1		89	1		84	1
	10	1		35	1		90	1		85	1
	11	1		36	1		91	1		86	2
	12	1		37	1		92	1		87	2
	13	1		38	1		93	1		88	2
	14	1		39	1		94	1		89	2
	15	1		40	1		95	1		90	2
	16	1		41	3		96	1		91	2
	17	1	SPIN	42	3		97	1		92	2
	18	1		43	2		98	1		93	2
	19	1		44	2		99	1		94	2
	20	1		45	2		100	1		95	2
	21	1		46	1			1		96	2
	22	1		47	1			1		97	2
	23	1		48	1			1		98	2
	24	1		49	1			1		99	2
	25	1		50	1			1		100	2

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH						
MEASURED REBOUND IN INCHES						
FINAL LENGTH OF PILE	FINAL CUT OFF ELEVATION <u>218.09</u>					

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

SIGNED [Signature]  
 NAME (PRINT) C. J. VAN DUSSON  
 DATE OCT 19/72

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

Sheet 2052

MATERIALS AND TESTING OFFICE  
FOUNDATION SECTION

## BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 2 CONTRACT NO. 12-43-59 STRUCTURE County Road No 5  
 CONTRACTOR Reh Co. Inc. DESIGN LOAD OF PILE 20 Tons Test Pile  
 HAMMER DETAILS: TYPE Gravity Drop WEIGHT 200 HEIGHT OF FALL OR ENERGY 5' 00"  
 TYPE OF ANVIL OR CAP \_\_\_\_\_ WEIGHT OF ANVIL OR CAP 500  
 PILE DETAILS 12 H.P. 74 H.Piles  
 PILE NO. 11 LOCATION Pile No 1 DATE DRIVEN Oct 17, 18, 19

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.
	101	3		126	5		151	5		76	
	102	3		127	5		152	5		77	
	103	6		128	4		153	5		78	
	104	4		129	4		154	31		79	
	105	4		130	5		155	37		80	
	106	5		131	4		156			81	
	107	4		132	4		157			82	
	108	4		133	5		158			83	
	109	4		134	5		159			84	
	110	3		135	4		160			85	
	111	4		136	4		161			86	
	112	3		137	5		162			87	
	113	3		138	5		163			88	
	114	3		139	4		164			89	
	115	3		140	5		165			90	
	116	3		141	4		66			91	
	117	5		142	4		67			92	
	118	4		143	4		68			93	
	119	5		144	4		69			94	
	120	3		145	4		70			95	
	121	4		146	4		71			96	
SPURSED	122	5		147	5		72			97	
	123	6		148	5		73			98	
	124	5		149	5		74			99	
	125	5		150	5		75			100	

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH	6	6	6	6	7	7
MEASURED REBOUND IN INCHES						
FINAL LENGTH OF PILE	155' 5"			FINAL CUT OFF ELEVATION		

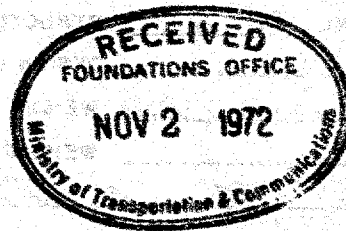
REPORT TO BE SENT TO: - PRINCIPAL FOUNDATION ENGINEER  
 MATERIALS & TESTING DIVISION  
 DEPARTMENT OF HIGHWAYS  
 DOWNSVIEW, ONTARIO

SIGNED [Signature]  
 NAME (PRINT) G. H. Van Dusen

DATE Oct 19/72

ATTACH SKETCH OF PILE NUMBERING SYSTEM

218.00  
 155.5  
 62.50



RECEIVED

**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.

REPORT MISSING

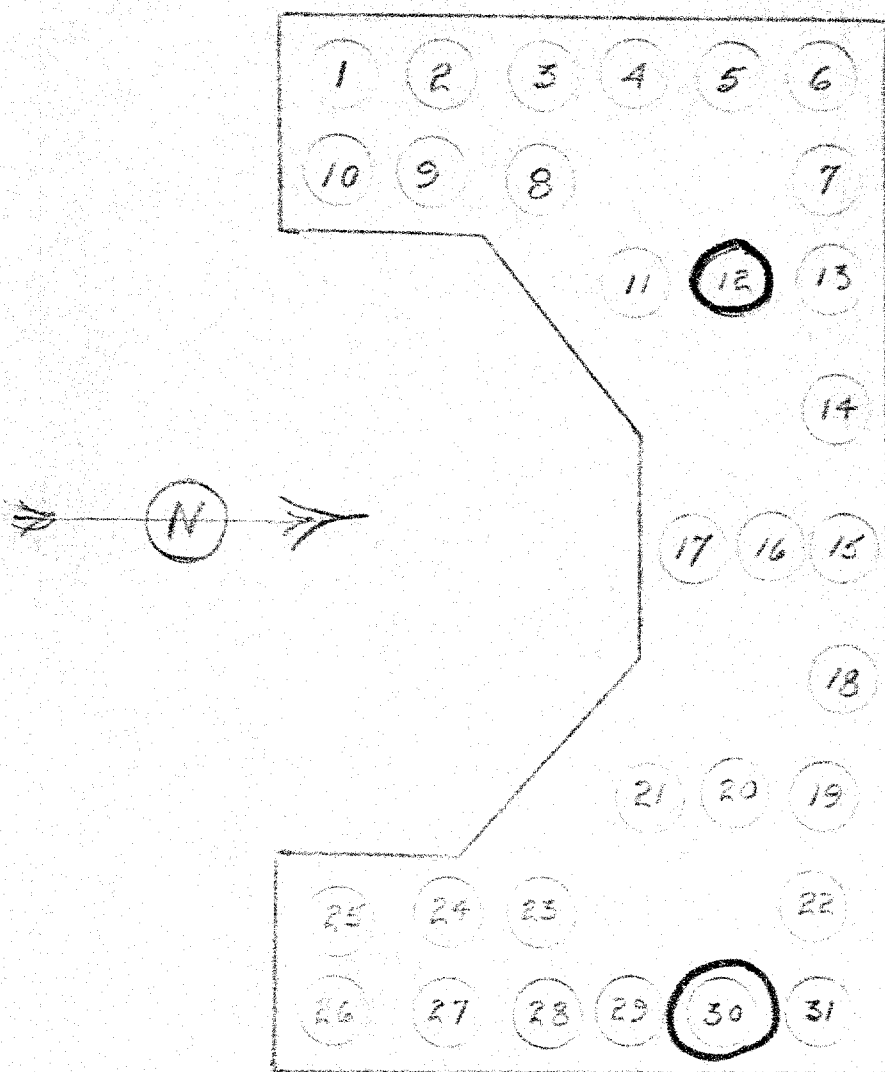
34-66-16  
W.P. 35-66-09  
35-66-02 & 07

69-7-25  
69-7-24  
62-7-1

COUNTY ROAD  
No. 5

SOUTH ABUTMENT

CONT 72-62



## BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 9 CONTRACT NO. 72-62 STRUCTURE County Road No. 2CONTRACTOR Richmond & Co. Ltd. DESIGN LOAD OF PILE 90 tons Per PileHAMMER DETAILS: TYPE Crawley Drop WEIGHT 3 1/2 tons HEIGHT OF FALL OR ENERGY 25' 0"TYPE OF ANVIL OR CAP \_\_\_\_\_ WEIGHT OF ANVIL OR CAP 3' 0" x 75PILE DETAILS 12 H.P. 74 LBS. 11.7' x 5 1/2" x 27.0' x 14.0'PILE NO. 30 LOCATION South of Port Hope DATE DRIVEN SEP 27, 1974

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.
174.2'	1	1		26	2		61	6		76	2
	2	1		27	2	SPACED	52	2		77	3
	3	1		28	2		53	4		78	2
	4	1		29	2		54	4		79	2
	5	1		30	1		55	4		80	3
	6	2		31	2		56	4		81	2
	7	2		32	2		57	3		82	3
	8	2		33	1		58	3		83	2
	9	2		34	1		59	3		84	2
	10	2		35	1		60	3		85	2
	11	2		36	1		61	2		86	3
	12	2		37	2		62	3		87	2
	13	2		38	2		63	2		88	3
	14	2		39	2		64	3		89	3
	15	2		40	2		65	2		90	3
	16	2		41	2		66	2		91	6
	17	2		42	1		67	3	SPACED	92	4
	18	2		43	1		68	2		93	4
	19	2		44	1		69	3		94	3
	20	2		45	2		70	2		95	4
	21	2		46	2		71	3		96	3
	22	2		47	1		72	3		97	2
	23	2		48	2		73	2		98	3
	24	2		49	2		74	2		99	3
	25	2		50	2		75	3		100	3

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH						
MEASURED REBOUND IN INCHES						
FINAL LENGTH OF PILE <u>169.9'</u>	FINAL CUT OFF ELEVATION <u>230.60</u>					

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

SIGNED C. P. Van Der SchootNAME (PRINT) C. P. Van Der SchootDATE Oct 2/74

ATTACH SKETCH OF PILE NUMBERING SYSTEM

T.O.

**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  $\frac{1}{4}$ " 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

MATERIALS AND TESTING OFFICE  
FOUNDATION SECTION

## BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 9 CONTRACT NO. 72-62 STRUCTURE COUNTY ROAD NO. 5  
 CONTRACTOR PERL CONSTRUCTION DESIGN LOAD OF PILE 50 TONS PER PILE  
 HAMMER DETAILS: TYPE GRAVITY DROP WEIGHT 3 1/2 TONS HEIGHT OF FALL OR ENERGY 5'00"  
 TYPE OF ANVIL OR CAP \_\_\_\_\_ WEIGHT OF ANVIL OR CAP 500 LBS  
 PILE DETAILS 12 HP 74 LBS H PILES 16012 BATTER  
 PILE NO. 30 LOCATION SOUTH ABUTMENT FTG. DATE DRIVEN SEP 27, OCT 4, 1972

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.
	101	3		126	3		151	5		76	
	102	3		127	3		152	4		77	
	103	3		128	4		153	4		78	
	104	3		129	4		154	5		79	
	105	3		130	7		155	4		80	
	106	3		131	8		156	5		81	
	107	3	SPARE	132	7		157	5		82	
	108	3		133	6		158	4		83	
	109	2		134	6		159	5		84	
	110	3		135	6		160	5		85	
	111	3		136	6		161	12		86	
	112	3		137	6		162	25		87	
	113	3		138	5		163	37		88	
	114	3		139	6		164	37		89	
	115	2		140	6		165			90	
	116	3		141	5		166			91	
	117	3		142	4		167			92	
	118	3		143	3		168			93	
	119	2		144	5		169			94	
	120	3		145	4		170			95	
	121	3		146	5		171			96	
	122	3		147	4		172			97	
	123	4		148	5		173			98	
	124	5		149	4		174			99	
	125	4		150	4		175			100	

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH	7	7	7	7	8	8
MEASURED REBOUND IN INCHES						
FINAL LENGTH OF PILE	164.4'			FINAL CUT OFF ELEVATION 230.50		

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

SIGNED APRIL DUNN  
 NAME (PRINT) G. R. ANDERSON  
 DATE OCT 5/72

ATTACH SKETCH OF PILE NUMBERING SYSTEM

230.5  
 14.3

66.2  
 TIP

**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

Sheet of 2

Form OB-MT-285

MATERIALS AND TESTING OFFICE

## FOUNDATION SECTION

## BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 9 CONTRACT NO. 72-43 STRUCTURE COUNTY ROAD NO. 5  
 CONTRACTOR TRAIL CONSTRUCTION CO. DESIGN LOAD OF PILE 96 TONS PER PILE  
 HAMMER DETAILS: TYPE CRAVITY DROP WEIGHT 3 1/2 TONS HEIGHT OF FALL OR ENERGY 5' 2" 6'  
 TYPE OF ANVIL OR CAP \_\_\_\_\_ WEIGHT OF ANVIL OR CAP 500 LBS  
 PILE DETAILS 12 H.P. 71 LBS H PILES  
 PILE NO. 12 LOCATION SOUTH ABUTMENT F70 DATE DRIVEN SEPT 27 1972

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.
174.1	1	2	26	2	2	61	2	2	76	2	2
	2	1	27	2	2	52	2	2	77	2	2
	3	1	28	2	2	53	1	1	78	2	2
	4	1	29	2	2	54	1	1	79	2	2
	5	2	30	1	1	55	1	1	80	2	2
	6	2	31	2	2	56	3	3	81	2	2
	7	1	32	2	2	57	3	3	82	2	2
	8	2	33	1	1	58	3	3	83	2	2
	9	3	34	1	1	59	3	3	84	2	2
	10	2	35	2	2	60	3	3	85	2	2
	11	2	36	1	1	61	3	3	86	2	2
	12	2	37	2	2	62	2	2	87	3	3
	13	2	38	2	2	63	2	2	88	3	3
	14	2	39	2	2	64	3	3	89	3	3
	15	2	40	2	2	65	3	3	90	3	3
	16	2	41	2	2	66	2	2	91	3	3
	17	2	42	1	1	67	2	2	92	3	3
	18	2	43	1	1	68	2	2	93	3	3
	19	2	44	1	1	69	2	2	94	3	3
	20	2	45	1	1	70	2	2	95	3	3
	21	2	46	2	2	71	2	2	96	3	3
	22	2	47	1	1	72	2	2	97	3	3
	23	2	48	2	2	73	1	1	98	3	3
	24	2	49	2	2	74	2	2	99	3	3
	25	2	50	2	2	75	1	1	100	3	3

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH						
MEASURED REBOUND IN INCHES						
FINAL LENGTH OF PILE <u>167.1</u>	FINAL CUT OFF ELEVATION <u>230.50</u>					

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

SIGNED

NAME (PRINT)

DATE

ATTACH SKETCH OF PILE NUMBERING SYSTEM

230.5  
 167.1  
 63.4

**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

5/1007 2.0 F 2

MATERIALS AND TESTING OFFICE

## FOUNDATION SECTION

## BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 9 CONTRACT NO. 72-62 STRUCTURE COUNTY ROAD NO 5  
 CONTRACTOR PAUL CONST CO DESIGN LOAD OF PILE \_\_\_\_\_  
 HAMMER DETAILS: TYPE GRAVITY DROP WEIGHT 3/2500 HEIGHT OF FALL OR ENERGY 5'6"  
 TYPE OF ANVIL OR CAP \_\_\_\_\_ WEIGHT OF ANVIL OR CAP 500 LBS  
 PILE DETAILS 12 H.P. 74 LBS H PILES  
 PILE NO. 12 LOCATION SOUTH ABUTMENT FACING DATE DRIVEN SEP 27, 1972

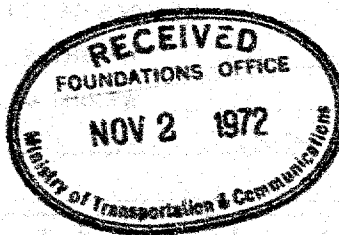
TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS/FT.
	101	3		126	3		151	4		76	
	102	3		127	3		152	4		77	
	103	3		128	3		153	4		78	
	104	3		129	3		154	5		79	
	105	3		130	3		155	5		80	
	106	2		131	3		156	4		81	
	107	2	SPACED	132	3		157	10		82	
	108	2		133	3		158	11		83	
	109	2		134	3		159	11		84	
	110	2		135	3		160	13		85	
	111	2		136	3		161	13		86	
	112	2		137	3		162	13		87	
	113	2		138	4		163	12		88	
	114	2		139	4		164	13		89	
	115	2		140	4		165	12		90	
	116	2		141	4		166	26		91	
	117	2		142	4		167	51		92	
	118	2		143	4		68			93	
	119	2		144	4		69			94	
	120	2		145	4		70			95	
	121	2		146	4		71			96	
	122	3		147	4		72			97	
	123	3		148	4		73			98	
	124	3		149	4		74			99	
	125	3		150	4		75			100	

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH	6	6	7	7	7	8
MEASURED REBOUND IN INCHES						
FINAL LENGTH OF PILE <u>167.1</u>	FINAL CUT OFF ELEVATION <u>230.50</u>					

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

SIGNED [Signature]  
 NAME (PRINT) G. J. VAN DUSEN  
 DATE SEPT 27/72

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.

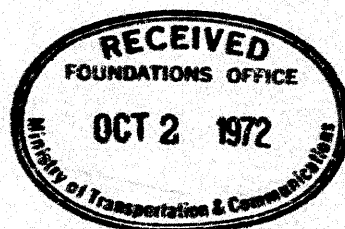
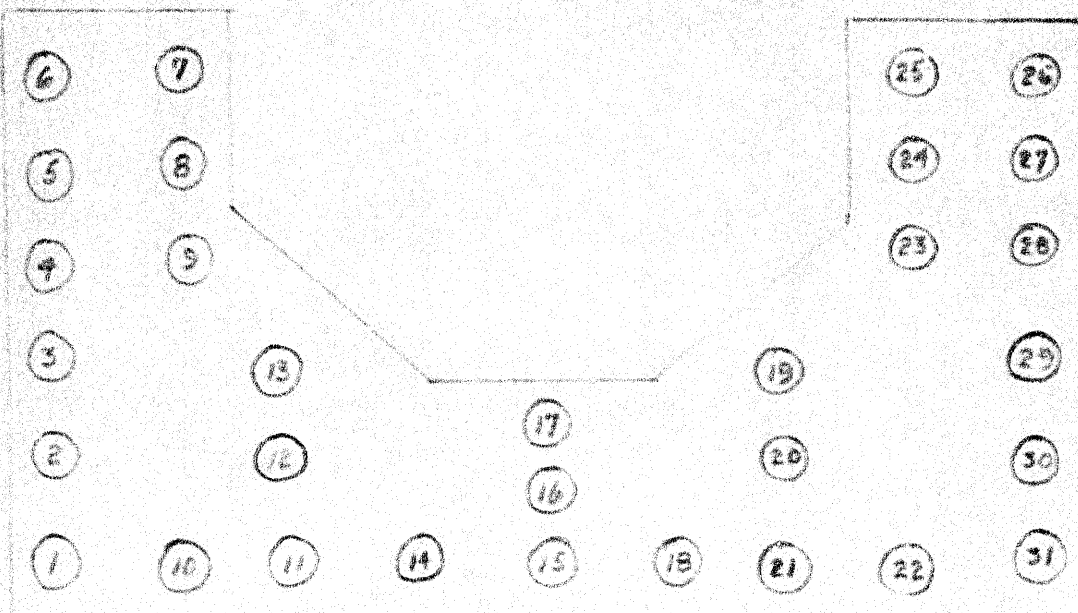
The penetration in blows per foot must be recorded for every foot of penetration of the pile.

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

COUNTY ROAD

No 5

NORTH ABUTMENT



DEPARTMENT OF HIGHWAYS - ONTARIO  
MATERIALS AND TESTING OFFICE  
FOUNDATION SECTION

OVER

BRIDGE CONSTRUCTION - PILE DRIVING RECORD

NOTE: FIRST SECTION  
USED (2) 2 1/2 TON HAMMER  
THEN BROUGHT IN (2) 4 TON  
HAMMER TO DRIVE PILES

DISTRICT NO. 9 CONTRACT NO. 72-62 STRUCTURE COUNTY ROAD NO 5  
CONTRACTOR PERK CONSTRUCTION DESIGN LOAD OF PILE 90 TONS  
HAMMER DETAILS: TYPE GRAVITY DROP WEIGHT 2 1/2 TON HEIGHT OF FALL OR ENERGY 5' 6"  
TYPE OF ANVIL OR CAP \_\_\_\_\_ WEIGHT OF ANVIL OR CAP 500 LBS  
PILE DETAILS 12 IN PILES 74 LBS PER FOOT  
PILE NO. 16 LOCATION NORTH ABUTMENT DATE DRIVEN SEP 18/72

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.
190	1	1	26	1	1	81	2	2	76	2	2
	2	1	27	1	1	82	2	2	77	2	2
	3	3	28	1	1	83	2	2	78	2	2
	4	2	29	1	1	84	2	2	79	2	2
	5	3	30	1	1	85	2	2	80	2	2
	6	4	31	3	3	86	1	1	81	2	2
	7	2	32	3	3	87	2	2	82	2	2
	8	4	33	3	3	88	2	2	83	2	2
	9	7	34	3	3	89	2	2	84	2	2
	10	10	35	3	3	90	1	1	85	2	2
	11	8	36	3	3	91	1	1	86	2	2
	12	7	37	3	3	92	2	2	87	2	2
	13	5	38	3	3	93	2	2	88	2	2
	14	5	39	3	3	94	1	1	89	2	2
	15	4	40	3	3	95	1	1	90	2	2
	16	5	41	4	4	96	1	1	91	3	3
	17	3	42	3	3	97	1	1	92	3	3
	18	5	43	3	3	98	1	1	93	3	3
	19	5	44	4	4	99	1	1	94	3	3
	20	5	45	3	3	100	1	1	95	3	3
	21	4	46	4	4	101	1	1	96	3	3
	22	4	47	3	3	102	1	1	97	4	4
	23	4	48	3	3	103	2	2	98	4	4
	24	4	49	3	3	104	2	2	99	4	4
	25	5	50	3	3	105	2	2	100	3	3

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH						
MEASURED REBOUND IN INCHES						
FINAL LENGTH OF PILE	FINAL CUT OFF ELEVATION <u>233.00</u>					

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

SIGNED: [Signature]  
NAME (PRINT) P. R. VAN DERSEN  
DATE SEPT 18/72

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.

Sheet  
2 of 2

Form OS-MT-285

DEPARTMENT OF HIGHWAYS - ONTARIO

OVER

MATERIALS AND TESTING OFFICE  
FOUNDATION SECTION

BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 9 CONTRACT NO. 72-62 STRUCTURE COUNTY ROAD No 5  
CONTRACTOR PERL CONSTRUCTION DESIGN LOAD OF PILE 30 TONS  
HAMMER DETAILS: TYPE GRAVITY DROP WEIGHT TONS HEIGHT OF FALL OR ENERGY 5 TO 6  
TYPE OF ANVIL OR CAP \_\_\_\_\_ WEIGHT OF ANVIL OR CAP 500 LBS  
PILE DETAILS 12" H. PILES 74 LBS PER FOOT  
PILE NO. 16 LOCATION NORTH ABUTMENT DATE DRIVEN AUG. 31 5:00 PM '76  
SEPT 18/76

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.
	101	6		126	3		101	11		176	6
	102	7		127	2		102	6		177	7
	103	7		128	3		103	6		178	7
	104	3		129	2		104	7		179	7
	105	3		130	3		105	8		180	7
	106	3		131	2		106	8		181	27
	107	3		132	3		107	6		182	37
	108	3		133	3		108	6		183	30
	109	3		134	3		109	6		184	
	110	3		135	3		110	7		185	
	111	3		136	3		111	7		186	
	112	3		137	3		112	6		187	
	113	3		138	3		113	7		188	
	114	3		139	2		114	6		189	
	115	3		140	3		115	6		190	
	116	3		141	3		116	5		191	
	117	3		142	3		117	2		192	
	118	2		143	2		118	6		193	
	119	3		144	3		119	7		194	
	120	3		145	3		120	6		195	
	121	3		146	2		121	7		196	
	122	3		147	3		122	6		197	
	123	3		148	3		123	7		198	
	124	3		149	4		124	6		199	
	125	2		150	4		125	6		200	

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH	3	3	3	7	7	7
MEASURED REBOUND IN INCHES						

FINAL LENGTH OF PILE 183.9

FINAL CUT OFF ELEVATION 233.00

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

233.0  
183.9

SIGNED M. F. [Signature]

NAME (PRINT) ER Van [Signature]

DATE SEPT 18/76

ATTACH SKETCH OF PILE NUMBERING SYSTEM

49.1

**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 - FILE DRIVING RECORD

DISTRICT NO. 2 CONTRACT NO. 72-62 STRUCTURE Crossing Road No 5  
CONTRACTOR TECH CONSTRUCTION CO DESIGN LOAD OF PILE 90 TONS  
HAMMER DETAILS: TYPE CRANEY DROP WEIGHT 4 TONS HEIGHT OF FALL OR ENERGY 5' 0" 6"  
TYPE OF ANVIL OR CAP \_\_\_\_\_ WEIGHT OF ANVIL OR CAP 500 LBS  
PILE DETAILS 12" x 14" PILES 74 LBS PER FOOT  
PILE NO. 20 LOCATION NORTH ABUTMENT DATE DRIVEN SEP 31 5 PM '72

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.
	101	6		126	2		151	3		76	5
	102	3		127	2		152	8		77	2
	103	3		128	2		153	7		78	5
	104	2		129	2		154	6		79	9
	105	2		130	2		155	6		80	9
	106	3		131	2		156	6		81	11
	107	2		132	3		157	6		82	11
	108	3		133	2		158	6		83	2+
	109	3		134	2		159	6		84	
	110	4		135	2		160	6		85	
	111	4		136	3		161	5		86	
	112	3		137	2		162	5		87	
	113	2		138	2		163	5		88	
	114	2		139	2		164	5		89	
	115	2		140	3		165	6		90	
	116	2		141	2		166	6		91	
	117	2		142	2		167	6		92	
	118	2		143	2		168	6		93	
	119	2		144	2		169	5		94	
	120	3		145	2		170	6		95	
	121	2		146	3		171	6		96	
	122	2		147	2		172	5		97	
	123	2		148	3		173	6		98	
	124	2		149	2		174	6		99	
	125	2		150	9		175	6		100	

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH	2	4	4	4	5	9
MEASURED REBOUND IN INCHES						
FINAL LENGTH OF PILE	184.4'					FINAL CUT OFF ELEVATION 233.00

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

SIGNED [Signature]  
NAME (PRINT) G. R. VAN DUSEN  
DATE SEPT 18/72

ATTACH SKETCH OF PILE NUMBERING SYSTEM

233.0  
184.4

TIP 48.6

DRIVEN TO 100 FT

**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  $\frac{1}{4}$ " 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

BRIDGE CONSTRUCTION - PILE DRIVING RECORD

NOTE: FIRST SECTION  
USED 2 1/2 TON HAMMER THEN  
BROUGHT IN @ 4 TON HAMMER  
TO DRIVE PILES

DISTRICT NO. 9 CONTRACT NO. 72-62 STRUCTURE SCOTT ROAD NO. 5

CONTRACTOR PAUL CONSTRUCTION DESIGN LOAD OF PILE 90 TONS

HAMMER DETAILS: TYPE CRANEY DROP WEIGHT 2 1/2 HEIGHT OF FALL OR ENERGY 5 to 6

TYPE OF ANVIL OR CAP \_\_\_\_\_ WEIGHT OF ANVIL OR CAP 500 LBS

PILE DETAILS 12" H. PILES 79 LBS PER FOOT

PILE NO. 20 LOCATION NORTH A. BENTLEY DATE DRIVEN SEP 18/72

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.
192	1	1	26	3		51	2		76	1	
	2	1	27	4		52	2		77	1	
	3	2	28	4		53	2		78	1	
	4	2	29	3		54	2		79	1	
	5	2	30	3		55	2		80	1	
	6	3	31	3		56	2		81	2	
	7	3	32	3		57	2		82	2	
	8	3	33	3		58	2		83	1	
	9	3	34	3		59	2		84	2	
	10	3	35	3		60	2		85	2	
	11	5	36	3		61	2		86	1	
	12	4	37	4		62	2		87	2	
	13	3	38	3		63	2		88	2	
	14	3	39	3		64	2		89	1	
	15	5	40	3		65	2		90	1	
	16	5	41	3		66	2		91	2	
	17	3	42	3		67	1		92	2	
	18	4	43	4		68	1		93	2	
	19	5	44	4		69	1		94	2	
	20	5	45	4		70	1		95	2	
	21	4	46	4		71	1		96	2	
	22	3	47	4		72	1		97	6	
	23	4	48	3		73	1		98	3	
	24	4	49	3		74	1		99	3	
	25	4	50	2		75	1		100	2	

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH						
MEASURED REBOUND IN INCHES						
FINAL LENGTH OF PILE	FINAL CUT OFF ELEVATION <u>233.60</u>					

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

SIGNED G. R. Van Dusen  
NAME (PRINT) G. R. VAN DUSEN  
DATE SEP 18/72

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.

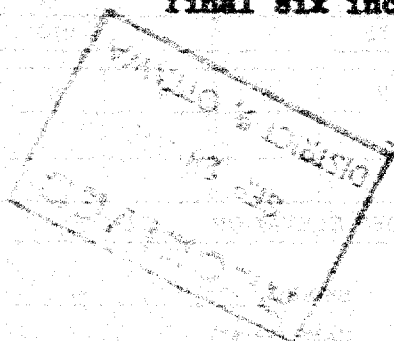
Pile Details must include type, dimensions and weight per foot, details of shoe, and slope of batter: e.g. 12 $\frac{1}{2}$ " O.D. steel tube x 0.251" @ 33 lbs. per ft. Vertical. 12 $\frac{1}{2}$ " x  $\frac{1}{4}$ " steel plate shoe.

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.



COUNTY ROAD No 5  
PIER No 3



CONT. 7B-62

①	②	③	④
I	I	I	I
⑧	⑦	⑥	⑤
I	I	I	I
⑨	⑩	⑪	⑫
I	I	I	I
⑯	⑮	⑭	⑬
I	I	I	I



OVER

# DEPARTMENT OF HIGHWAYS - ONTARIO

## MATERIALS AND TESTING OFFICE

### FOUNDATION SECTION

## BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 9 CONTRACT NO. 72-62 STRUCTURE COUNTY ROAD NO 5 INTERCHANGING  
 CONTRACTOR PERI CONSTRUCTION CO DESIGN LOAD OF PILE 90 TONS  
 HAMMER DETAILS: TYPE GRAVITY DROP WEIGHT 2 1/2 TONS HEIGHT OF FALL OR ENERGY 4' 5"  
 TYPE OF ANVIL OR CAP \_\_\_\_\_ WEIGHT OF ANVIL OR CAP 500 LBS.  
 PILE DETAILS 12 H. P. 74. H. PILES  
 PILE NO. 11 LOCATION PIER NO 3 DATE DRIVEN AUG 10, 1976

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

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH						
MEASURED REBOUND IN INCHES						
FINAL LENGTH OF PILE	FINAL CUT OFF ELEVATION <u>216.59</u>					

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

SIGNED [Signature]  
 NAME (PRINT) G. R. VAN DUSEN  
 DATE AUG.

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

## FOUNDATION SECTION

## BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 9 CONTRACT NO. 72-62 STRUCTURE COUNTY ROAD No 5CONTRACTOR PRIOR CONSTRUCTION CO DESIGN LOAD OF PILE 20 tonsHAMMER DETAILS: TYPE GRAVITY DROP WEIGHT 4 tons HEIGHT OF FALL OR ENERGY 5' 6"TYPE OF ANVIL OR CAP \_\_\_\_\_ WEIGHT OF ANVIL OR CAP 500 LBSPILE DETAILS 12" H PILES 74 LBS PER FOOTPILE NO. 11 LOCATION PIER No 3 DATE DRIVEN AUG 10, 15, 16, 18

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.
	101	6		26	9		51	8		76	
	102	6		27	9		52	7		77	
	103	5		28	11		53	9		78	
	104	6		29	10		54	2		79	
	105	7		30	7		55	8		80	
	106	5		31	7		56	10		81	
	107	5		32	7		57	10		82	
	108	7		33	6		58	10		83	
	109	7		34	8		59	15		84	
	110	6		35	6		60	10		85	
	111	6		36	6		61	21		86	
	112	6		37	5		62	20		87	
	113	6		38	8		63	32		88	
	114	7		39	7		64			89	
	115	6		40	6		65			90	
	116	6		41	7		66			91	
	117	6		42	7		67			92	
	118	7		43	8		68			93	
	119	6		44	7		69			94	
	120	25		45	7		70			95	
	121	18		46	8		71			96	
	122	12		47	7		72			97	
	123	12		48	9		73			98	
	124	9		49	7		74			99	
	125	9		50	9		75			100	

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH	5	5	6	6	7	8
MEASURED REBOUND IN INCHES						
FINAL LENGTH OF PILE	164.4					
FINAL CUT OFF ELEVATION	216.50					

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

SIGNED [Signature]NAME (PRINT) GRANT D. S. L.DATE AUG. 16/72

ATTACH SKETCH OF PILE NUMBERING SYSTEM

216.5  
164.4

TIP 52.1

**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.

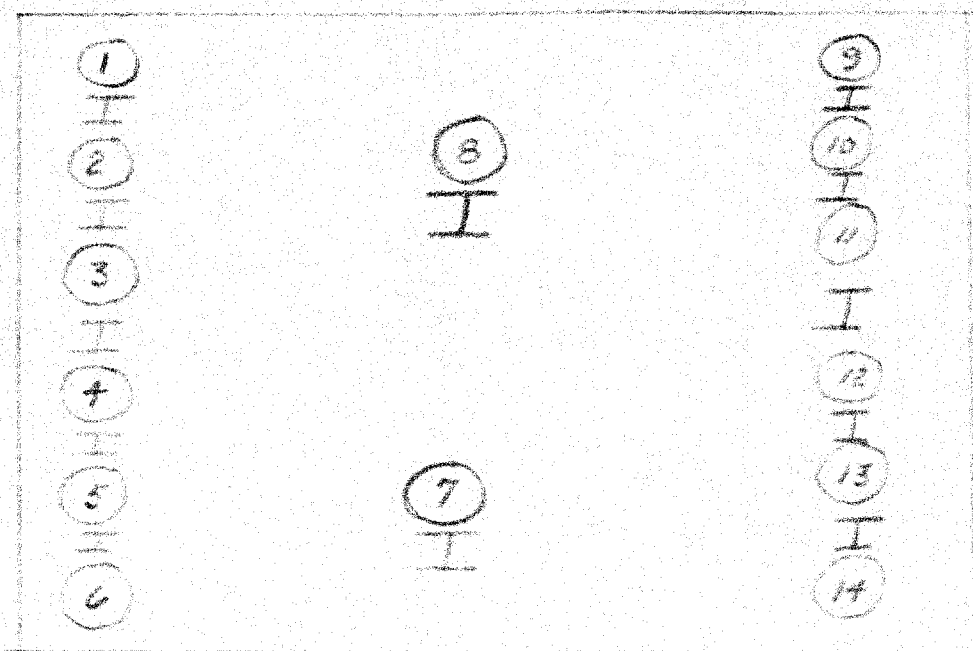
The penetration in blows per foot must be recorded for every foot of penetration of the pile.

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

COUNTY ROAD No 5

PIER No 4

CONT 7262



OVER

## DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS AND TESTING OFFICE

## FOUNDATION SECTION

## BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 9 CONTRACT NO. 72-62 STRUCTURE COUNTY ROAD No 5  
 CONTRACTOR PER CONSTRUCTION CO DESIGN LOAD OF PILE 90 TON  
 HAMMER DETAILS: TYPE GRAVITY DROP WEIGHT 2 1/2 TON <sup>THEN A 4 TON HAMMER</sup> HEIGHT OF FALL OR ENERGY 5' to 6'  
 TYPE OF ANVIL OR CAP \_\_\_\_\_ WEIGHT OF ANVIL OR CAP 500 LBS  
 PILE DETAILS 12" H. P. PILES 74 LBS PER FOOT  
 PILE NO. 8 LOCATION PER No. 9 DATE DRIVEN AUG 13, SEPT 12

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.
177'	1	2	26	3	51	1	76	1			
	2	2	27	2	52	1	77	1			
	3	2	28	2	53	1	78	1			
	4	3	29	2	54	1	79	1			
	5	2	30	2	55	1	80	1			
	6	3	31	2	56	1	81	1			
	7	2	32	3	57	1	82	2			
	8	2	33	3	58	1	83	2			
	9	3	34	2	59	1	84	3			
	10	3	35	2	60	1	85	2			
	11	3	36	3	61	1	86	3			
	12	3	37	2	62	1	87	3			
	13	3	38	2	63	1	88	2			
	14	5	39	3	64	1	89	2			
	15	6	40	2	65	1	90	2			
	16	5	41	2	66	1	91	3			
	17	6	42	2	67	1	92	3			
	18	5	43	2	68	1	93	2			
	19	4	44	2	69	1	94	2			
	20	5	45	2	70	1	95	3			
	21	3	46	1	71	1	96	2			
	22	3	47	1	72	1	97	3			
	23	2	48	1	73	1	98	2			
	24	3	49	1	74	1	99	3			
	25	2	50	2	75	1	100	2			

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH						
MEASURED REBOUND IN INCHES						
FINAL LENGTH OF PILE	FINAL CUT OFF ELEVATION <u>218.00'</u>					

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

SIGNED G. R. Van Dusen  
 NAME (PRINT) G. R. VAN DUSEN  
 DATE SEPT 18/72

ATTACH SKETCH OF PILE NUMBERING SYSTEM

# BRIDGE CONSTRUCTION - PILE DRIVING RECORD

## 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.

File 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  $\frac{1}{4}$ " 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.

Sheet 2 of 2

Form OS-MT-285

OVER

# DEPARTMENT OF HIGHWAYS - ONTARIO

MATERIALS AND TESTING OFFICE

## FOUNDATION SECTION

### BRIDGE CONSTRUCTION - FILE DRIVING RECORD

DISTRICT NO. 9 CONTRACT NO. 72-62 STRUCTURE County Road 5

CONTRACTOR Park Construction Co DESIGN LOAD ON PILE 20 Tons

HAMMER DETAILS: TYPE CRAWLEY DROP WEIGHT 4 Tons HEIGHT OF FALL OR ENERGY 5 ft

TYPE OF ANVIL OR CAP \_\_\_\_\_ WEIGHT OF ANVIL OR CAP 500 LBS

PILE DETAILS 12" H.P. PILES 74 LBS PER FT

PILE NO. 8 LOCATION PIER No 4 DATE DRIVEN AUG 15 1962

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.
	101	2		126	5		151	5		76	
	102	2		127	10		152	4		77	
	103	2		128	9		153	5		78	
	104	2		129	7		154	5		79	
	105	2		130	6		155	6		80	
	106	2		131	6		156	8		81	
	107	2		132	5		157	8		82	
	108	2		133	5		158	8		83	
	109	2		134	4		159	7		84	
	110	2		135	4		160	7		85	
	111	2		136	4		161	5		86	
	112	2		137	4		162	9		87	
	113	2		138	5		163	7		88	
	114	2		139	5		164	10		89	
	115	2		140	5		165	11		90	
	116	2		141	5		166	10		91	
	117	2		142	5		167	12		92	
	118	2		143	6		168	30		93	
	119	2		144	5		169			94	
	120	2		145	5		170			95	
	121	3		146	5		171			96	
	122	2		147	5		172			97	
	123	2		148	5		173			98	
	124	2		149	5		174			99	
	125	2		150	4		175			100	

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH	6	6	6	6	7	7
MEASURED REBOUND IN INCHES						
FINAL LENGTH OF PILE	165.0					FINAL CUT OFF ELEVATION 218.00

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

SIGNED \_\_\_\_\_

NAME (PRINT) \_\_\_\_\_

DATE \_\_\_\_\_

ATTACH SKETCH OF PILE NUMBERING SYSTEM

218  
169

710-119

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.

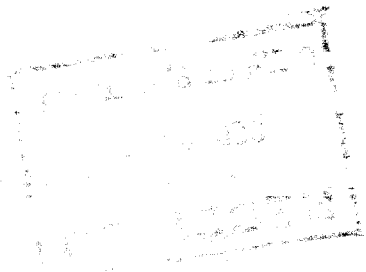
Pile Details must include type, dimensions and weight per foot, details of shoe, and slope of batter: e.g. 12 $\frac{1}{2}$ " O.D. steel tube @ 0.251" @ 33 lbs. per ft. Vertical. 12 $\frac{1}{2}$ " x  $\frac{1}{4}$ " steel plate shoe.

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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.



W.O. 69-F-24

MAR 9 AM 8:53

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MX KINR MARCH 9/72 8.55 AM

TORD I K BASSI STRUCTURAL DESIGN OFFICE

DOWN 1 COPY TO A G STERMAC

ATT M DEVATA FOUNDATIONS OFFICE

KINR COPIES TO:

S J MARKIEWICZ SYSTEMS DESIGN

D B THOMAS FUNCTIONAL PLANNING

E R SAINT M AND T

RE WP 35-66-09 COUNTY ROAD 5 INTERCHANGE HWY 417

IT HAS NOW BEEN AGREED BETWEEN REGIONAL SYSTEMS DESIGN,

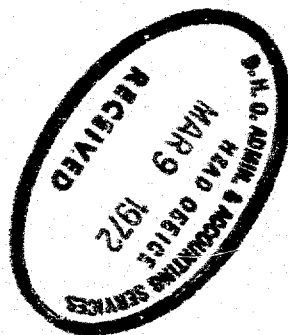
FOUNDATIONS SECTION AND OURSELVES TO REVERT TO ORIGINAL BERM LAYOUT

IN PLACE OF CONTOURED SLOPES AT APPROACHES TO STRUCTURE.

PLEASE AMEND DRAWINGS ACCORDINGLY.

T C KINGSLAND STRUCTURAL PLANNING

JM



Mr. A. J. Percy,  
Regional Manager, Systems Design,  
Kingston, Ontario.

Structural Planning Office,  
Kingston, Ontario.

Mr. D. B. Thomas

April 14, 1972.

W.P. 35-66-09, Site 27-206,  
County Road 5 Interchange Underpass,  
Highway 417, District 9 - Ottawa

I enclose copy of letter dated April 7, 1972, from Mr. K. G. Bassi, Regional Structural Design Engineer, on the subject of revisions to the approach fills at the abutments. Your attention is drawn to the fact that Foundations Office will be supplying the details of the transition between the berm configuration at the abutments and the originally recommended berms shown on the grading drawings.

I confirm that one copy of revised General Layout Drawing No. D-6789-1 has been handed to Mr. D. B. Thomas.

I. C. Kingsland  
Regional Structural Planning Engineer

TCK/hl  
Enc.

c. c. M. Devata  
C. S. Grebski

Department of Highways Ontario

Copy for the information of

M. Devata

T.C. Kingsland,  
Reg. Bridge Planning Engr.,  
Kingston Region.

Structural Office,  
West Bldg., Downsview.

April 7, 1972.

Re: Co. Rd. #5, Interchange Underpass,  
W.P. 35-66-09, Site 27-206,  
Hwy. 417, District #9, Ottawa.

69-784

Enclosed are three prints of General Layout Drawing D 5789-1 showing the revised berms in place of the contoured slopes at the approaches.

Please note that the berms at the abutments are not located at midheight as originally recommended. The 45' berms have been located vertically at the elevations shown to avoid revision to the abutments, and have been checked by the Foundation Office for stability. Systems Design should show a transition from the berms shown to the originally recommended berms at midheight on the grading drawings. I understand the Foundation Office will supply the details of this transition to Regional Systems Design.



K.G. Bassi,  
Reg. Structural Design Engr.

RGB:sr  
Encls.

c.c. M. Devata.

Transition details were discussed by B.T. Darch to  
Regional Systems Design Section by Telephone

M. Devata  
20th April/72

Department of Transportation and Communications  
XXXXXXXXXXXXXXXXXXXX

Mr. S. J. Markiewicz,  
Regional Systems Design Engineer,  
Eastern Region,  
Kingston, Ontario.

Foundations Office,  
Design Services Branch,  
Central Region, Downsview.

February 9, 1972.

Mr. D. B. Thomas

Further to your memo of January 28, 1972, we have reviewed the cross-sections submitted by your Office for Prescott and Russell County Road #5 and our comments are as follows.

Berm requirements recommended in our Foundation Report (W.O. 69-F-34) have not been complied with on the cross-section submitted by your Office.

It should be noted that flatter slopes proposed for various fill sections may not provide adequate stability, as those with mid-height berm sections. If a scheme adopting flatter slopes will be required at this location, this Office will carry out additional stability analyses in order to provide the safe slopes for various embankment sections.

*Shaheen Ahmad*

SA/so

cc: E. R. Saint  
T. C. Kingsland

For:

Shaheen Ahmad,  
Project Foundation Engineer,  
M. Devata,  
Supervising Foundation Engineer.

Foundations Files  
Documents

## DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS

## MEMORANDUM

69-F-84

TO: Mr. A. G. Stermac  
Principle Foundations Engineer  
West Building, Downsview Ontario

FROM: Functional Planning  
Kingston, Ontario

DATE: 28 January, 1972

ATTENTION:

IN REPLY TO

OUR FILE REF.

SUBJECT: W. P. 35-66-02 Highway 417, District 9 Vars to Limoges.

Please find attached one roll of cross-sections for Prescott & Russell County Road #5 on which the existing preloading is plotted in blue and the final proposed cross-section is plotted in red for the south structure approach.

As noted on the roll the preloading starts at Station 25+66 and the forward toe of slope is at Station 27+78.

Could we have your comments regarding the stability of the slope and possible need for berms in the final condition.

DBT/mea

c. c. S. J. Markiewicz

E. S. 'nt

T. Kingsland

*D. B. Thomas*  
D. B. Thomas  
Project Planning Engineer

## MEMORANDUM

TO: Mr. J. E. Callaghan  
District Engineer  
District 9, Ottawa

FROM: Materials and Testing Office  
Kingston

ATTENTION: Mr. L. M. Peverett

DATE: May 14, 1971

OUR FILE REF.

IN REPLY TO

SUBJECT:

Highway 417, Contract 70-175, W.P. 35-66-01  
Regional Road 8 to Limoges  
District 9, Ottawa

69-F-84

Regarding the use of shale rock fill for the approach fills to the proposed structure at Regional Road No. 8, it is recommended as follows:

1. The shale rock fill should not be placed in the areas of the future abutment piles.
2. In the remainder of the embankment, the shale rock fill should be placed to one foot below profile grade.

*H. A. Meyer*  
H. A. Meyer

for: A. M. Batten  
Senior Soils Supervisor

HAM:mgm

cc: H. B. McKay  
A. Sternac ✓  
G. A. Wrong

07-F-84  
Mr. M. R. Ernesaks,  
Regional Functional Planning Engineer,  
Kingston, Ontario.

AGB  
Bridge Section,  
Kingston, Ontario.

Mr. A. J. Percy

October 8, 1970.

W.P. 35-66-01, Highway 417.  
Vars to Limoges, Road Closing Hearing.  
Proposed Structure between Cons. VIII & IX,  
District 9 - Ottawa

With reference to your memorandum of October 8, 1970,  
the following are preliminary estimates for the cost of an  
underpass structure at the above site, based on the pre-  
liminary profile supplied by you and an assumed cross  
section of 30 ft. between handrails.

- 1) Limiting fill height - 17 ft.

Estimated cost of structure.....\$490,000

- 2) Limiting fill height - 14 ft.

Estimated cost of structure.....\$559,000

It is probable that at this site the fill height will have to be  
limited to 14 ft. Even with this limitation and the placing  
of approach fills two years in advance of the construction  
of the bridge, the residual settlements in the approach fills  
are expected to be very large.

T. C. Kingsland  
Regional Bridge Planning Engineer

TCK/hl

c.c. Mr. B. R. Davis

✓Mr. M. Devata

Mr. S. J. Markiewicz

Mr. R. Forrest

Bridge Office Files Section (Mr. S. McCombie)

## MEMORANDUM

To: Mr. S. J. Markiewicz,  
Regional Road Design Engineer,  
Kingston, Ontario.

FROM: Bridge Section,  
Kingston, Ontario.

ATTENTION: Mr. A. E. Irving

DATE: May 25, 1970.

OUR FILE REF.

IN REPLY TO

SUBJECT: W.P. 35-66-09, Site 27-206,  
County Road 5 Interchange Underpass,  
Highway 417, District 9 - Ottawa

With reference to the grading and drainage project W.P. 35-66-01 at the above structure, I note from your contract drawings, sheets 19 and 20, that some differences now exist between the details of the South Indian Creek diversion under the structure shown on bridge drawing D-6789-P and your contract drawings.

The location of the CL of the diversion shown on the bridge preliminary plan as Sta. 28+62.0 was intended to be a limiting position in relation to the toe of the fill in front of the south abutment. I note that the location of the CL has been moved south to Sta. 28+44 approx. and that the channel bed width has been widened from 15 ft. to 30 ft. These two alterations place the edge of the channel diversion 25½ ft. closer to the toe of the fill slope than is shown on the bridge drawing.

In addition, on the east side of the south abutment, this widened channel now encroaches to within 10 ft. of the toe of the fill. The stream was diverted originally from the north side of the freeway in order to avoid a stability problem which would have existed had the stream remained on its existing alignment. We would therefore wish to avoid a similar problem occurring at the new location.

A copy of your contract drawings, sheets 19 and 20, is being sent to Foundations Section so that they may assess the effects of your modifications and I hope to let you have their comments shortly.

*T. C. Kingsland*  
T. C. Kingsland  
Regional Bridge Planning Engineer

TCK/hl

c.c. M. R. Ernesaks - Att. A. J. Percy  
A. G. Stermac - Att. M. Devata  
C. S. Grebski - Att. K. Bassi  
Bridge Office Files Section (S. McCombie)

DEPARTMENT OF HIGHWAYS ONTARIO

## MEMORANDUM

T. C. Kingsland  
Regional Bridge Planning Engineer  
Eastern Region  
Kingston, Ontario

From: Foundation Section  
Materials and Testing Office  
Rm. 107, Lab. Bldg.

ATTENTION:

DATE: July 4, 1970

OUR FILE REF.

IN REPLY TO

SUBJECT:

County Rd. #5 Interchange Underpass  
Hwy. 417, Dist. #9 (Ottawa)  
W.P. 35-66-09, Site 27-206, W.J. 69-R-84

Further to your recent memo in respect of the South Indian Creek diversion at the above mentioned structure, we have carried out additional stability analyses for the proposed approach fills.

In our stability analyses, as indicated by you, the ~~4~~ of the diversion is at Sta 28+44 having a channel bed width of 30 ft. with side slopes of 1 1/2:1. In addition on the east side of the south abutment, the proposed channel encroaches to within 10 ft. of the toe of the approach fill.

The results of the stability analyses concluded that the aforementioned proposal will endanger the stability of the south approach embankment. In view of this it is our recommendation that a minimum distance of 40 ft. be maintained between the toe of approach fill and the top of the channel side slope.

MD:lm

*M. Devate*  
M. Devate  
SUPERVISING FOUNDATION ENGINEER

For: A. G. Stermac  
PRINCIPAL FOUNDATION ENGINEER

cc: Messrs. S. McCombie  
R. Bassi  
S. J. Markiewicz  
M. R. Ernesaks  
J. Gruspier

Foundations Files ✓  
Gen. Files

MEMORANDUM

TO: Mr. A. Stermac,  
Principal Foundation Engineer,  
Room 107, Lab. Building

FROM: C. S. Grebski,  
Bridge Office

ATTENTION:

DATE:

OUR FILE REF.

IN REPLY TO

SUBJECT:

County Rd. #5 Interch. Underpass  
1 mile south of Limoges  
W. P. 35-66-09, Site No. 27-206'  
King's Highway No. 417, Dis. No. 9

64-F-84

Attached herewith we are submitting the final  
bridge drawings which show the foundation design for  
this structure.

Kindly give us your comments at your earliest  
convenience.

  
C. S. Grebski,  
Bridge Design Engineer

CSG:DE

Attach

c.c. Foundation Office

3 May 1970

NO COMMENTS

L. K. B.

M. D.



#69-F-84

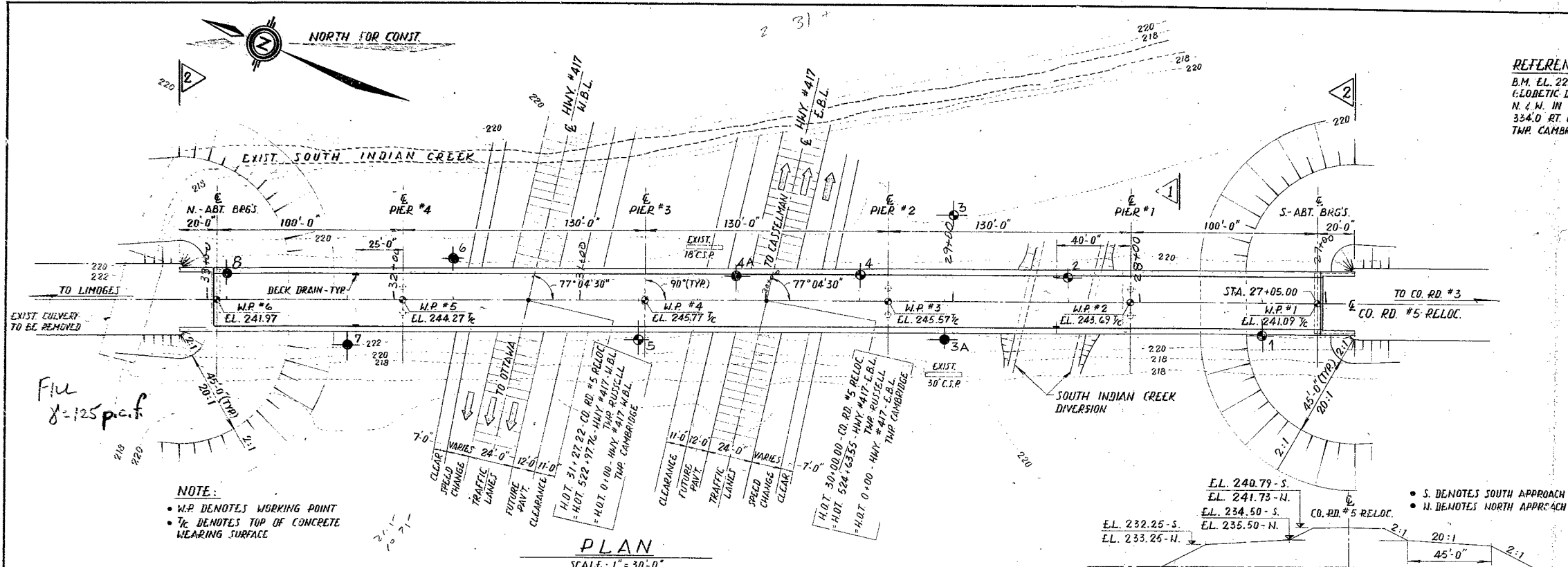
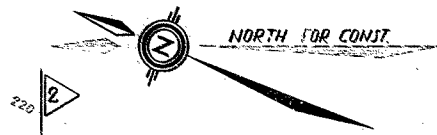
W.P. 35-66-09

HWY #417 (E.B.L. AND W.B.L.)

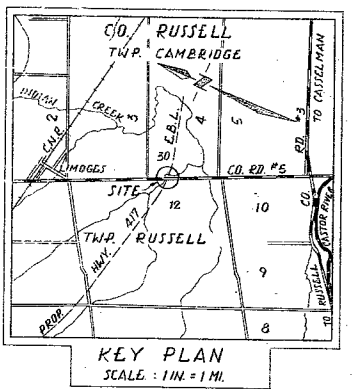
COUNTY ROAD #5

INTERCHANGE

UNDERPASS.



REFERENCE BENCH MARK  
B.M. EL. 221.43  
GLOBE DATUM  
N. & W. IN ROOT OF 2'-0" ELM  
334.0 RT. OF 2+58.00 E.B.L.  
TWP. CAMBRIDGE



- LIST OF DRAWINGS**
- D-6789-1 GENERAL LAYOUT
  - 2 BORE HOLE LOCATIONS & SOIL STRATA
  - 3 FOUNDATION LAYOUT
  - 4 ABUTMENTS
  - 5 PIERS
  - 6 DECK DETAILS
  - 7 CABLE DETAILS I
  - 8 CABLE DETAILS II
  - 9 DECK REINFORCEMENT I
  - 10 DECK REINFORCEMENT II
  - 11 BEARINGS & EXPANSION JT. DETAILS
  - 12 PARAPET WALL DETAILS
  - 13 STANDARD STEEL PARAPET RAIL
  - 14 STANDARD DETAILS I
  - D-6789-15 STANDARD DETAILS II

**NOTES**

**CLASS OF CONCRETE**

- DECK, CURBS & PARAPET WALLS - 5000 P.S.I.
- PIER COLUMNS - 5000 P.S.I.
- REMAINDER - 3000 P.S.I.
- AND/OR AS NOTED

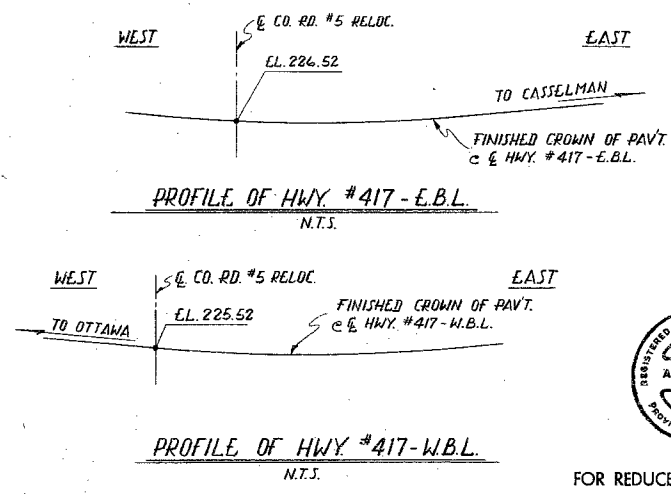
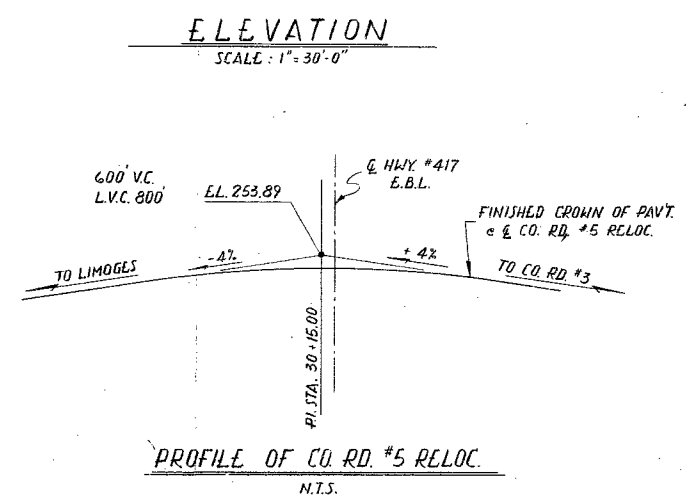
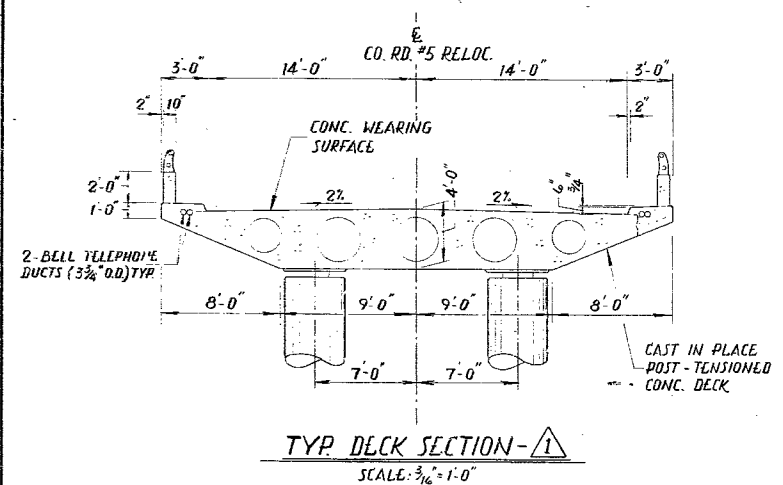
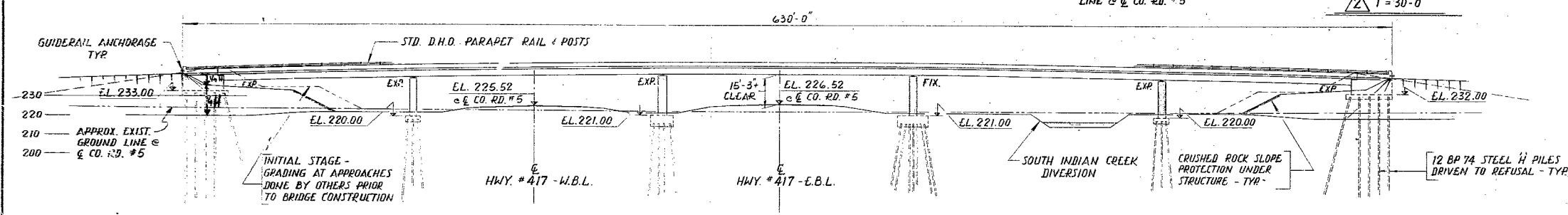
**CLEAR COVER ON REIN. STEEL**

- FOOTINGS & ABUTMENTS - 3"
- PIERS, CURBS - 2"
- TOP OF DECK 2", BOT. 1 1/2"
- PARAPET WALL 1 1/2"

**CONSTRUCTION NOTES**

THE CONTRACTOR IS RESPONSIBLE FOR FINISHING THE BEARING SEATS TO THE SPECIFIED ELEVATIONS WITH A TOLERANCE OF  $\pm 1/8$ ".

NO CONCRETE SHALL BE PLACED ABOVE THE ABUTMENT BEARING SEATS UNTIL THE CONCRETE IN THE DECK HAS BEEN PLACED, STRESSED AND GROUTED.

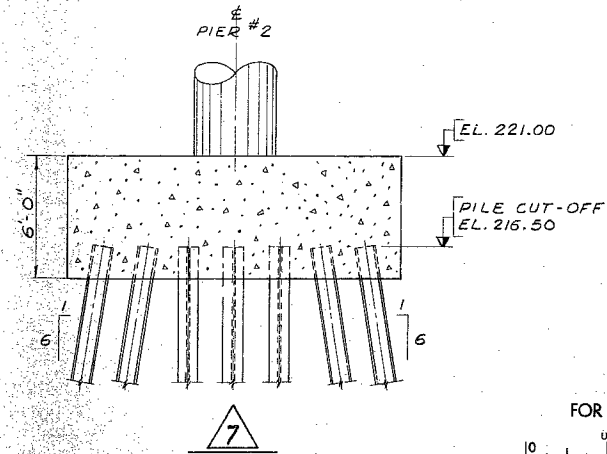
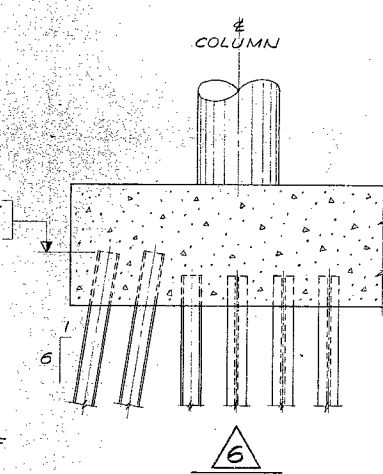
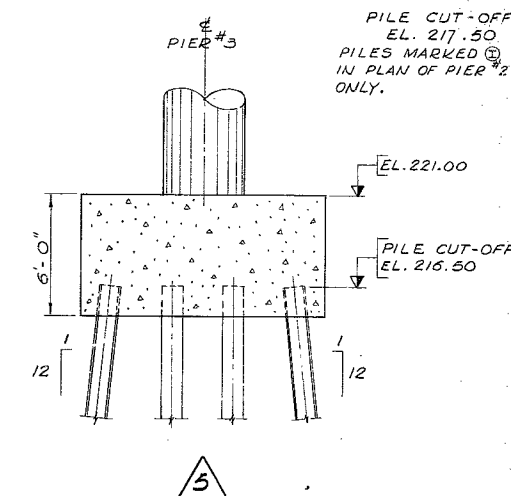
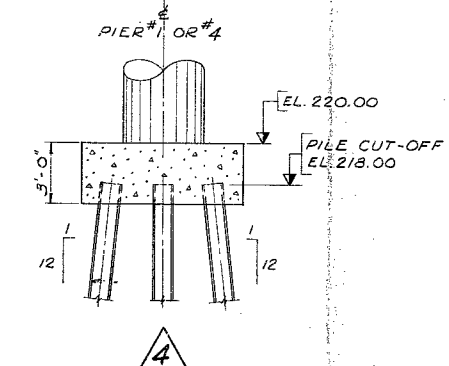
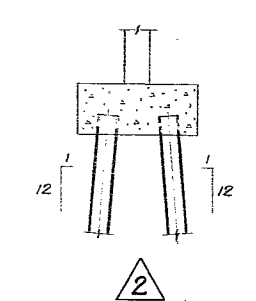
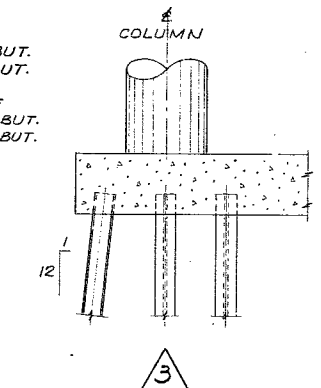
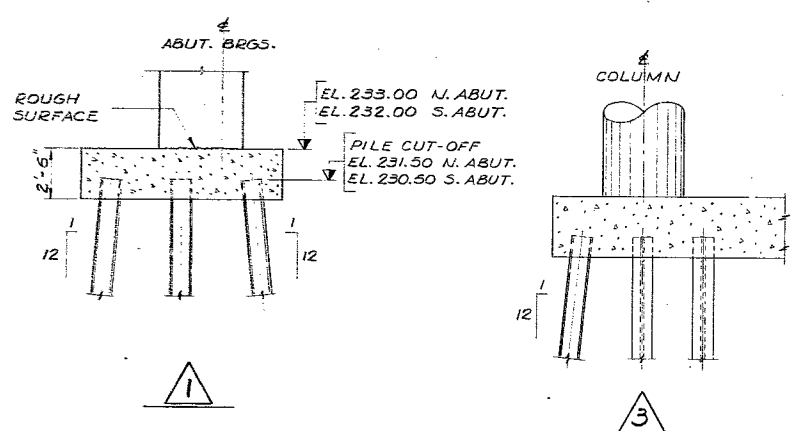
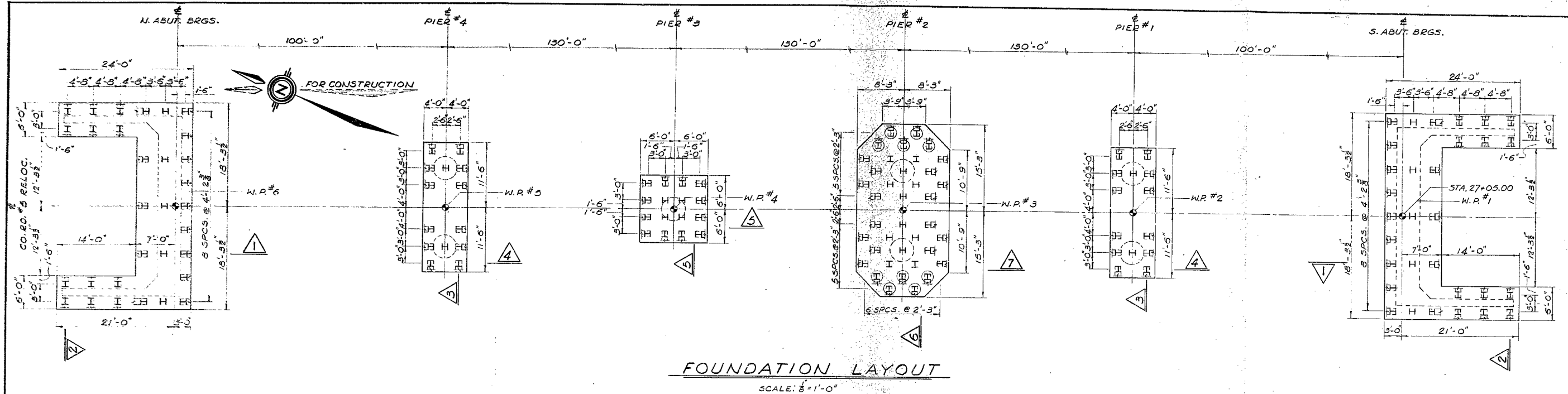


REVISIONS	
DATE	DESCRIPTION

69-F-84	
COUNTY RD. #5 INTERCH. UNDERPASS	
1 MILE SOUTH OF LIMOGES	
KING'S HIGHWAY No. 417	DIST. No. 9
CO. RUSSELL	TWP. CAMBRIDGE & RUSSELL
LOT 30 & 12	CON. 6 & 8
GENERAL LAYOUT	
APPROVED	DATE 27-206
DESIGN	CHECK
DRAWING	CHECK
DATE	LOADING

PRINT RECORD		
No.	FOR	DATE



LOCATION	QUANTITY	LENGTH	TYPE	DESIGN LOAD
S. ABUT.	31	172'-0"	( )	
PIER #1	14	162'-0"	( )	
PIER #2	28	160'-0"	( )	
PIER #3	16	168'-0"	( )	
PIER #4	14	174'-0"	( )	
N. ABUT.	31	190'-0"	( )	

- NOTES:**
- PILE SPACING TO BE MEASURED AT UNDERSIDE OF FOOTINGS.
  - PILES TO BE DRIVEN TO REFUSAL IN ACCORDANCE WITH STD. 30 B2-7
  - IN PIER #2 PILES MARKED (X) ARE EMBEDDED 30' INTO CONCRETE FOOTING.

SCALE: 1/8" = 1'-0" UNLESS OTHERWISE NOTED.

REVISIONS	DATE	BY	DESCRIPTION

DEPARTMENT OF HIGHWAYS ONTARIO  
BRIDGE DIVISION

69-F-84

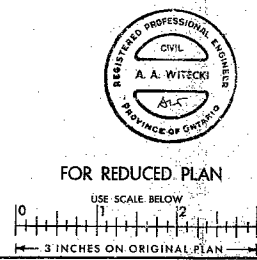
COUNTY RD. #3 INTERCH. UNDERPASS  
1 MILE SOUTH OF LIMOGES

KING'S HIGHWAY No. 417 DIST. No. 9  
CO. RUSSELL  
TWP. CAMBRIDGE & RUSSELL LOT 30 & 12 CON. IV & X

FOUNDATION LAYOUT

APPROVED: [Signature] SITE No. 27-206 W.P. No. 35-66-09

DESIGN: A.W. CHECK: A.W. CONTRACT No. [Blank]  
DRAWING: B.S. CHECK: A.S. DRAWING No. D-6789-3  
DATE: JULY 1970 LOADING: HS20-44



FOR REDUCED PLAN  
USE SCALE BELOW  
0 1 2 3  
3 INCHES ON ORIGINAL PLAN