

67-F-105

W.P.# 211-63

Q.E.W

SOUTH SERVICE

ROAD

16 MILE CREEK

MEMORANDUM

To: Mr. S. K. Hunter,
Regional Road Design Engineer,
Central Region (Toronto),
Central Bldg., Downsview.

From: Foundation Section,
Materials & Testing Div.,
Room 107, Lab. Bldg.

Attention: Mr. A. G. Kelly,
Senior Project
Design Engineer.

DATE: November 24, 1967

Our File Ref.

IN REPLY TO

NOV 28 1967

SUBJECT:

STABILITY OF CUT SECTIONS
From Station 187⁺ to Station 197⁺
Proposed Q.E.W. South Service Road
Twp. of Louth, Lot 1, Con. IX
District No. 4 (Hamilton)
W.J. 67-P-105 -- W.P. 211-63

Attached, we are forwarding to you, the results
of a soils investigation carried out at the above site.

We believe that the factual data and conclusions
drawn will be of some assistance to you regarding your design
requirements. Should additional information be required,
please feel free to contact our Office.

AGS/MdeF
Attach.

cc: Messrs. G. K. Hunter (3)

H. A. Tregaskes

D. W. Farren

B. R. Davis (2)

H. Greenland

W. S. Melnychuk

T. J. Kovich

B. A. Singh

Foundations Files

Gen. Files ✓

A. C. Stermac
A. C. Stermac
PRINCIPAL FOUNDATION ENGINEER

TABLE OF CONTENTS

1. INTRODUCTION.
 2. SITE AND SUBSOIL CONDITIONS.
 3. DISCUSSION AND RECOMMENDATIONS.
 4. MISCELLANEOUS.
-

STABILITY OF CUT SECTIONS
From Station 187⁺ to Station 197⁺
Proposed Q.E.W. South Service Road
Twp. of Louth, Lot 1, Con. IX
District No. 4 (Hamilton)
W.J. 67-F-105 -- W.P. 211-63

1. INTRODUCTION:

The Foundation Section was requested to carry out an investigation at the proposed Q.E.W. South Service Road between Station 187⁺ and Station 197⁺, about 3 miles east of Jordan Station. The request was contained in a memo from the Regional Road Design Section (Mr. A. G. Kelly, Senior Project Design Engineer), dated November 2, 1967.

At this location, in order to minimize property requirements, it is proposed to utilize 1½:1 side slopes rather than 2:1 for the cut sections of the South Service Road. Subsequently, a foundation investigation was carried out by this Section in order to determine the subsoil conditions existing at the site.

Presented in this report are the results of our investigation, together with our recommendations pertaining to the stability of the proposed cut sections.

2. SITE AND SUBSOIL CONDITIONS:

The site is located immediately to the east of the Sixteen Mile Creek and Q.E.W. crossing on the property of Dr. E. J. Blair. The centre-line of the proposed South Service Road runs parallel to and is located 6 to 8 feet north of Dr. Blair's north property line. Between Stations 189⁺ and 193⁺ the proposed construction would involve cuts having a maximum height of about 27 feet. The existing cuts in the area have been determined to have average side slopes of 1.7:1. These slopes appear to be in a satisfactory condition without any stability problems.

Cont'd. /2 ...

2. SITE AND SUBSOIL CONDITIONS: (cont'd.) ...

In order to determine the subsoil conditions and to assess the stability of the proposed cut sections with $1\frac{1}{2}:1$ side slopes, three sampled boreholes were put down with a Penn. drill to depths ranging from 40 to 80 feet between Stations 189+25 and 193+50. The locations and elevations of these boreholes, together with the inferred soil stratigraphy, are shown on the enclosed Drawing 67-F-105A. A summarized description of the soil conditions is given below, followed by our recommendations pertaining to the stability of the proposed cut sections.

All boreholes encountered an average thickness of 1.5 feet of topsoil overlying an average thickness of 13 feet of brown silty sand. The silty sand stratum was encountered between elevations 291 and 278, and was found to contain occasional layers of brown clayey silt. The stratum was found to be water bearing between elevations 281 and 278. The Standard Penetration Resistance 'N' values increased from 15 blows per foot at the surface of the stratum to 45 blows per foot at the base of the stratum, indicating the deposit to be in a compact to dense state of relative density.

At about elevation 278, a deep deposit of stiff grey clayey silt was encountered in all the boreholes, and at the location of Borehole 1, was found to be underlain by a thin stratum of silt followed by glacial till, the lower horizon of the clayey silt stratum being located at about elevation 222.

The engineering properties of the deposit determined from field and laboratory tests, are summarized below:

	<u>Range</u>	<u>Average</u>
Moisture Content	16 - 20%	18% ✓
Bulk Density	130 - 138 PCF	133 PCF
Liquid Limit	28 - 40%	30%
Plastic Limit	15 - 20%	18% ✓
Undrained Shear Strength	1000 - 3100 PSF	2000 PSF
'N' Values	15 - 33 blows/ft.	25 blows/ft.

Based on the above properties, the deposit is considered to be of a stiff consistency.

cont'd. /3 ...

2. SITE AND SUBSOIL CONDITIONS: (cont'd.) ...

Water level observations carried out in Boreholes 2 and 3 indicate the presence of a perched water table at about elevation 280, within the silty sand stratum. It is believed that the groundwater level in the clayey silt deposit corresponds to the water level in the Sixteen Mile Creek Pond.

3. DISCUSSION AND RECOMMENDATIONS:

The investigation reveals that the subsoil conditions are favourable for the construction of $1\frac{1}{2}:1$ side slopes for the proposed cuts. The presence of a perched water level in the upper silty sand stratum, however, requires special measures to prevent "loss of ground" conditions resulting from seepage. The most positive solution would be to provide an interceptor drain, surrounded by selected granular graded filter material, and located at the base of the silty sand stratum.

It is suggested that the interceptor drain consist of a standard 6-inch diameter perforated subdrain pipe installed on a 6-inch thick granular pad between Stations 189⁺ and 194⁺. The perforations of the subdrain pipe should be oriented downwards and the pipe should be provided with a granular cover of at least 3 feet thickness for frost protection. A schematic presentation of the suggested installation is shown on the enclosed Drawing 67-F-105A.

We suggest that the tender item for the installation of the subdrain pipe be per lineal foot of placing, including the required excavation and backfilling with suitable granular material.

4. MISCELLANEOUS:

The field work, performed during November 8 - 10, 1967, was carried out by Mr. C. Mirza, Project Foundation Engineer, who also prepared this report. The investigation was carried out under the supervision of Mr. M. Devata, Supervising Foundation Engineer.

Equipment used was owned and operated by Canadian Longyear Co. Ltd.

November 1967.

APPENDIX I

ABBREVIATIONS USED IN THIS REPORT

PENETRATION RESISTANCE

STANDARD PENETRATION RESISTANCE 'N' - THE NUMBER OF BLOWS REQUIRED TO ADVANCE A STANDARD SPLIT SPOON SAMPLER 12 INCHES INTO THE SUBSOIL, DRIVEN BY MEANS OF A 140 POUND HAMMER FALLING FREELY A DISTANCE OF 30 INCHES.

DYNAMIC PENETRATION RESISTANCE - THE NUMBER OF BLOWS REQUIRED TO ADVANCE A 2 INCH, 60 DEGREE CONE, FITTED TO THE END OF DRILL RODS, 12 INCHES INTO THE SUBSOIL, THE DRIVING ENERGY BEING 350 FOOT POUNDS PER BLOW.

DESCRIPTION OF SOIL

THE CONSISTENCY OF COHESIVE SOILS AND THE RELATIVE DENSITY OR DENSENESS OF COHESIONLESS SOILS ARE DESCRIBED IN THE FOLLOWING TERMS :-

<u>CONSISTENCY</u>	<u>'N' BLOWS / FT.</u>	<u>c LB. / SQ. FT.</u>	<u>DENSENESS</u>	<u>'N' BLOWS / FT.</u>
VERY SOFT	0 - 2	0 - 250	VERY LOOSE	0 - 4
SOFT	2 - 4	250 - 500	LOOSE	4 - 10
FIRM	4 - 8	500 - 1000	COMPACT	10 - 30
STIFF	8 - 15	1000 - 2000	DENSE	30 - 50
VERY STIFF	15 - 30	2000 - 4000	VERY DENSE	> 50
HARD	> 30	> 4000		

TYPE OF SAMPLE

S.S.	SPLIT SPOON	T.W.	THINWALL OPEN
W.S.	WASHED SAMPLE	T.P.	THINWALL PISTON
S.B.	SCRAPER BUCKET SAMPLE	O.S.	OESTERBERG SAMPLE
A.S.	AUGER SAMPLE	F.S.	FOIL SAMPLE
C.S.	CHUNK SAMPLE	R.C.	ROCK CORE
S.T.	SLOTTED TUBE SAMPLE		
	P.H. SAMPLE ADVANCED HYDRAULICALLY		
	P.M. SAMPLE ADVANCED MANUALLY		

SOIL TESTS

Qu	UNCONFINED COMPRESSION	L.V.	LABORATORY VANE
Q	UNDRAINED TRIAXIAL	F.V.	FIELD VANE
Qcu	CONSOLIDATED UNDRAINED TRIAXIAL	C	CONSOLIDATION
Qd	DRAINED TRIAXIAL	S	SENSITIVITY

ABBREVIATIONS USED IN THIS REPORT

SOIL PROPERTIES

γ	UNIT WEIGHT OF SOIL (BULK DENSITY)
γ_s	UNIT WEIGHT OF SOLID PARTICLES
γ_w	UNIT WEIGHT OF WATER
γ_d	UNIT DRY WEIGHT OF SOIL (DRY DENSITY)
γ'	UNIT WEIGHT OF SUBMERGED SOIL
G	SPECIFIC GRAVITY OF SOLID PARTICLES $G = \frac{\gamma_s}{\gamma_w}$
e	VOID RATIO
n	POROSITY
w	WATER CONTENT
S_r	DEGREE OF SATURATION
w_L	LIQUID LIMIT
w_p	PLASTIC LIMIT
I_p	PLASTICITY INDEX
s	SHRINKAGE LIMIT
I_L	LIQUIDITY INDEX = $\frac{w - w_p}{I_p}$
I_c	CONSISTENCY INDEX = $\frac{w_L - w}{I_p}$
e_{max}	VOID RATIO IN LOOSEST STATE
e_{min}	VOID RATIO IN DENSEST STATE
I_D	DENSITY INDEX = $\frac{e_{max} - e}{e_{max} - e_{min}}$
	RELATIVE DENSITY D_r IS ALSO USED
h	HYDRAULIC HEAD OR POTENTIAL
q	RATE OF DISCHARGE
v	VELOCITY OF FLOW
i	HYDRAULIC GRADIENT
k	COEFFICIENT OF PERMEABILITY
j	SEEPAGE FORCE PER UNIT VOLUME
m_v	COEFFICIENT OF VOLUME CHANGE = $\frac{-\Delta e}{(1+e)\Delta\sigma}$
c_v	COEFFICIENT OF CONSOLIDATION
C_c	COMPRESSION INDEX = $\frac{\Delta e}{\Delta \log_{10} \sigma}$
T_v	TIME FACTOR = $\frac{c_v t}{d^2}$ (d, DRAINAGE PATH)
U	DEGREE OF CONSOLIDATION
τ_f	SHEAR STRENGTH
c'	EFFECTIVE COHESION
	INTERCEPT
ϕ'	EFFECTIVE ANGLE OF SHEARING RESISTANCE, OR FRICTION
	IN TERMS OF EFFECTIVE STRESS $\tau_f = c' + \sigma' \tan \phi'$
c_u	APPARENT COHESION
ϕ_u	APPARENT ANGLE OF SHEARING RESISTANCE, OR FRICTION
	IN TERMS OF TOTAL STRESS $\tau_f = c_u + \sigma \tan \phi$
f	COEFFICIENT OF FRICTION
S_t	SENSITIVITY

GENERAL

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

STRESS AND STRAIN

u	PORE PRESSURE
σ	NORMAL STRESS
σ'	NORMAL EFFECTIVE STRESS ($\bar{\sigma}$ IS ALSO USED)
τ	SHEAR STRESS
ϵ	LINEAR STRAIN
γ	SHEAR STRAIN
ν	POISSON'S RATIO (μ IS ALSO USED)
E	MODULUS OF LINEAR DEFORMATION (YOUNG'S MODULUS)
G	MODULUS OF SHEAR DEFORMATION
K	MODULUS OF COMPRESSIBILITY
η	COEFFICIENT OF VISCOSITY

EARTH PRESSURE

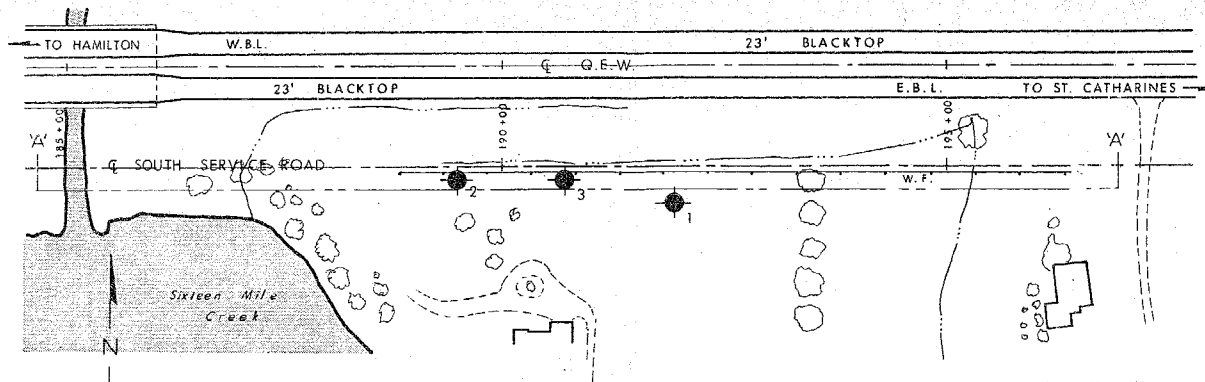
d	DISTANCE FROM TOP OF WALL TO POINT OF APPLICATION OF PRESSURE
δ	ANGLE OF WALL FRICTION
K	DIMENSIONLESS COEFFICIENT TO BE USED WITH VARIOUS SUFFIXES IN EXPRESSIONS REFERRING TO NORMAL STRESS ON WALLS
K_0	COEFFICIENT OF EARTH PRESSURE AT REST

FOUNDATIONS

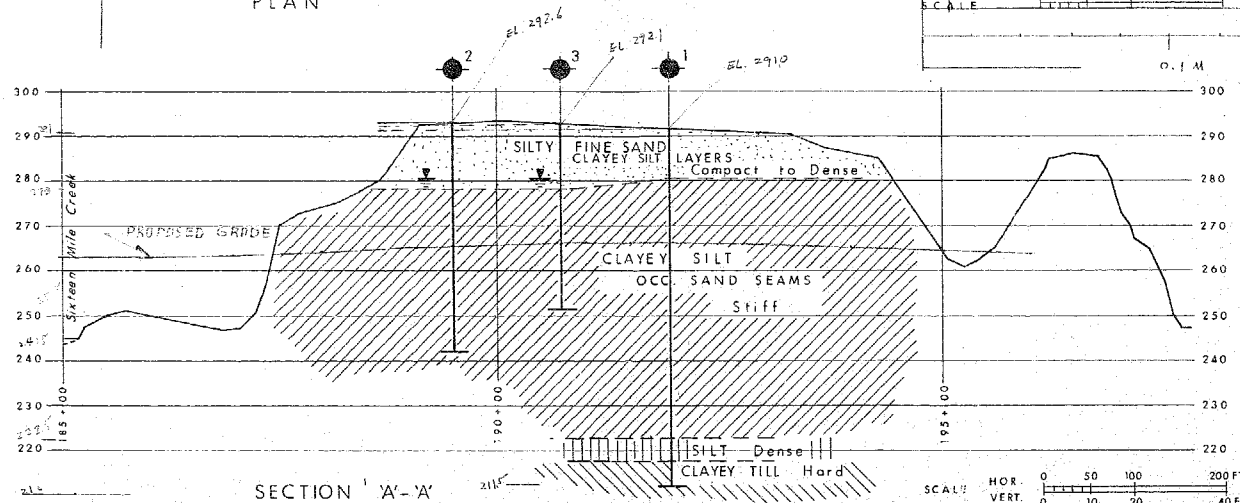
B	BREADTH OF FOUNDATION
L	LENGTH OF FOUNDATION
D	DEPTH OF FOUNDATION BENEATH GROUND
N	DIMENSIONLESS COEFFICIENT USED WITH A SUFFIX APPLYING TO SPECIFIC GRAVITY, DEPTH AND COHESION ETC. IN THE FORMULA FOR BEARING CAPACITY
k_s	MODULUS OF SUBGRADE REACTION

SLOPES

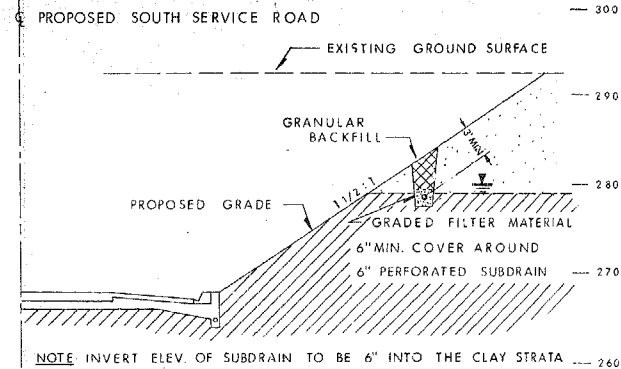
H	VERTICAL HEIGHT OF SLOPE
D	DEPTH BELOW TOE OF SLOPE TO HARD STRATUM
β	ANGLE OF SLOPE TO HORIZONTAL



PLAN



SECTION 'A-A'



TYPICAL SUBDRAIN INSTALLATION

LEGEND

- Bore Hole
- Water Levels established at time of field investigation. NOV. 1967

NO.	ELEVATION	STATION	OFFSET
1	292.5	192+00	40' RT
2	292.7	189+52	15' RT
3	292.8	190+75	15' RT



DEPARTMENT OF HIGHWAYS
MATERIALS and
TESTING
DIVISION

G.E.W. SOUTH SERVICE ROAD
16 MILE CREEK

W.P. 211-63 DIST. 4 JOB. 67-F-105

DATE NOV. 24, 1967

APPROVED *A. J. Schuman*

DRAWING NO. 67-F-105 A

MEMORANDUM

Telephone: 248-3415

To: Mr. A.G. Stermac,
Principal Foundation Engineer,
Materials & Testing,
Laboratory Building

FROM: Mr. A.G. Kelly,
Toronto Regional Road Design

DATE: November 2nd, 1967

Attention: Mr. M. Devata,
Superv. Foundation Eng. IN REPLY TO
OUR FILE REF.


SUBJECT:

Re: W.P. 211-63, C.D. South Service Road,
From 9th Street Louth to 13th Street Louth,
Slope Stability Station 187 $\frac{1}{2}$ to Station
197 $\frac{1}{2}$ South Side South Service Road

In order to minimize property damage, Road Design proposes to modify the grading cross-section by the use of sub-drains and curb and gutter. The attached typical section shows both a 2:1 cut slope and a 1 $\frac{1}{2}$:1 slope.

The Soils information indicates that this cut consists of sandy loam overlying silty clay with pockets of very fine sand and silt together with signs of moisture.

Road Design prefers to employ the 1 $\frac{1}{2}$:1 cut slope and solicits your comments concerning slope stability.


A.G. Kelly,
Senior Project Design Engineer,
FOR: G.K. Hunter,
Regional Road Design Engineer

AGK/bap

c.c. T. Kovich
J. Tamulionis

401 & Keele Street
Downsview, Ontario

November 8, 1967

Canadian Longyear Limited
35 Brydon Drive
Rexdale, Ontario

Dear Sirs:

This is to confirm our request of November 2, 1967 for the supply of a Penn Drill together with all necessary equipment, as specified under the terms of our Contract Agreement, at Sixteen Mile Creek and Q.E.W. on November 7, 1967 @ 10 a.m.

This project bears Job Number 67-F-105.

Yours truly,



M. Devata
Supervising Foundation Engineer
for: A. G. Stermac
Principal Foundation Engineer

MD:mt

cc: H. Konings
Foundation Files //0
General File

4350

B

HAMN DOWN 2 NOV 6/67 427P VR

H GREENLAND DIST ENGR

ATTN D A WALLER

RE STABILITY OF CUT SECTION BETWEEN STATION 187 PLUS 00 AND
197 PLUS 00

SOUTH SERVICE ROAD NEAR 16 MILE CREEK GEM DIST - WP211-83

WJS7-F-105

FOUNDATION INVESTIGATION WORK WILL COMMENCE ON NOV 7/67 FOR THE ABOVE
MENTIONED PROJECT. AFTER COMPLETION OF THIS WORK WE INTEND
TO PUT A BORE HOLE ON THE OLD GEM IN THE VICINITY OF THE EAST
APPROACH EMBANKMENTS OF THE HOMER HIGHWAY. THIS IS FOR YOUR
INFORMATION.

M DEVATA FOR A G STERNAC MAT AND TING

BB

DEFECTS IN NEGATIVE DUE TO
CONDITION OF ORIGINAL DOCUMENT

DOCUMENT MICROFILMING IDENTIFICATION

G.I.-30 SEPT. 1976

GEOCRES No. 30M03-013

DIST. 4 REGION Central

W.P. No. 211-63

CONT. No. 69-151 ~~XXXXXXXXXX~~

W. O. No. _____

STR. SITE No. 18-202 , 18-203

HWY. No. Q.E.W.

LOCATION 15+16 Mile Creek

=====

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT. 4

REMARKS: ~~THE~~ ~~THE~~ DOCUMENTS TO BE

UNFOLDED BEFORE MICROFILM

MEMORANDUM

To: Mr. G. X. Hunter,
Regional Road Design Engineer,
Central Region.

FROM: Materials & Testing Division.

Date: February 3, 1967.

OUR FILE REF.

IN REPLY TO

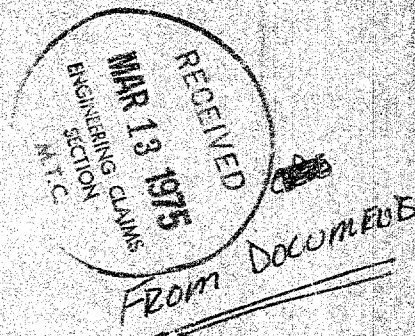
SUBJECT:

Soils Design Report

W.P. #211-63, QEW (Service Rd.)

St. Catharines to Jordan Road

Hamilton District



We are forwarding herewith our Design Report and pertinent soils profile (#QEW T4-10) for the above noted project.

The outstanding feature will be the treatment of the three organic deposits at the three creek crossings. The Foundation reports give detailed recommendations for the treatment required. You will note that it is not intended to carry out full width and full depth excavation (as per DD 406) since this would cause failure of the existing QEW main lanes and also because it is not considered economically justified or completely practical. In the Foundation reports, the swamp backfill material is referred to as "granular". However, in order to prevent confusion in terminology we have referred to this material as "select backfill material" and have suggested an S.P. to cover the requirements.

As on the previous two service road jobs which have been reported, a deep strength design is again recommended. However, the depth of Granular Base Course Class "A" has been increased because of the poor soil conditions (wet and very fine grained) which will be encountered. Unless grading work is scheduled so that most of it will be done in the summer, difficulties during construction and over-runs in granular can be expected.



continued.

Mr. G. K. Hunter,
Regional Road Design Engineer,
Central Region.

February 3, 1967.

SOILS DESIGN REPORT continued:-

All granular material to be used is to consist of Granular Base Course Class "A". The most likely source will be the quarry at Vineland with an average haul distance of seven miles.

Att.,
TJK/js.


T. J. Kovich,
REGIONAL MATERIALS ENGINEER.

cc: G. Celmins ✓
D. W. Farren
H. A. Tregaskes
T. C. Muir
H. Greenland (2)
W. Melinyshyn
M. Stoyanoff
R. Burnfield
W. Wigle
C. Fraser
Z. Katona
G. A. Wrong (2)

SOILS DESIGN REPORT

QEW (Serv. Rds.)

W.P. #211-63

3.7 Miles

West lts. of St. Catharines (Fifth Street) w'ly to
Jordan Station Interchange (Seventeenth Street)

Proposed Contract for G, D, GB, P and Structures

<u>Soils Profile</u>	<u>Survey Profile</u>	<u>Stations</u>	<u>Township</u>	<u>County</u>
QEW T4-10	C-138-15	88+17± (w. lts.) to 267+60± (e. lts.)	Louth	Lincoln

GENERAL DATA:

This work project covers the construction of service roads along the north and south side of the QEW, extending from Seventeenth Street (Jordan Road) to Fifth Street (w. lts. of St. Catharines) and is the third of the projects proposed for the construction of the two-lane service roads along the QEW from the Stoney Creek Traffic Circle to St. Catharines.

Within the limits of this project, the only interchange proposed for construction is at Seventh Street (Co. Sub. Rd. 13).

The following crossing roads will be closed between the QEW and the service roads.

- (1) Fifth Street
- (2) Ninth Street (Gregory Road)
- (3) Eleventh Street (Fairlane Road.)
- (4) Thirteenth Street
- (5) Fifteenth Street

The north service road from station 193± to station 215± (Ninth St.) which provides access to "CHARLES DALY PARK" area was constructed

under contract #60-290 including the structure over Fifteen Mile Creek. The existing grade of this access service road will be revised to fit the proposed new grade. No change is proposed for the structure. Structures will be required for the crossings at Fifteen Mile Creek (S.S.R., W.P. #213-63), Sixteen Mile Creek (W.P. #214-63), Eighteen Mile Creek (W.P. #215-63) and the Seventh Street Underpass (W.P. #212-63). After completion of the construction, the maintenance of these service roads will be transferred to the Township of Louth.

DESIGN CRITERIA:

Highway Class	- Service Road R.C. 50
Minimum Stopping Sight Distance	- 350'
Equivalent Vertical Curve	- 600'
Maximum Grade	- 6%
Maximum Curvature	- 7° (a)
Pavement Width	- 22'
Shoulder Width	- 6' plus 2' roundings
Right-of-Way Width (serv. rds.)	- 66' minimum (b)
(a) - up to 20° to be tolerated at interchange	
(b) - based upon a minimum right-of-way of 180' for the QEW	

Structure at interchange is to be designed to fit future requirements of QEW, when main lanes are to be increased to six lanes.

INVESTIGATION:

The subsoil investigation for this project was carried out in October and November of 1966 using power auger equipment, supplemented by hand auger work at the locations where a power auger could not be utilized. In the cuts deeper than 15', a continuous flight helical

sugar was also used.

The boreholes were placed along the proposed alignment of the service roads at intervals of 100' and 200' in cut and fill sections respectively and were extended to a minimum of 4' below the proposed gradeline. The purpose of this soils survey was to determine the condition and texture of the subsoil materials.

On the existing crossing roads, the boreholes were placed along the inside edge of the shoulders to determine the depth of the granular base and the condition of the subgrade.

Samples were taken of the subsoil materials for laboratory analysis, the results of which are shown on the soils profile along with the borehole notes.

The four proposed structure locations were investigated by our Foundation Section and reports have been submitted between September and December 1966.

PHYSIOGRAPHY AND SOILS DATA:

This project is located in the physiographic region known as the "Iroquois Plain". The area is commonly known as the "Niagara Fruit Belt" and lies in the lowland between Lake Ontario and the Niagara Escarpment. The undulating glacial till plain has been smoothed by lacustrine deposits during the inundation by glacial Lake Iroquois in the late Pleistocene Period. The plain is cut by Fifteen Mile Creek, Sixteen Mile Creek and Eighteen Mile Creek. All of these streams are drowned in their lower courses, producing lagoons. In most instances, this lake plain contains areas of sandy soils, which are never very deep and often overly impervious clay deposits. Where cuts are made in these soils, seepage water is often encountered in the pervious soils.

DEFECTS IN NEGATIVE DUE TO
CONDITION OF ORIGINAL DOCUMENT

Generally, the glacial till overlying the Queenston shale bedrock was disturbed by the retreating ice sheet in the water of a glacial lake and the material is now a heterogeneous mixture of sand, silt and clay with some gravel.

Two distinct soil conditions were encountered during the investigation - one in the high ground above the creeks (ground elevation 290'±) and the other in the low ground of the creeks themselves (ground elevation 245'±). On the high ground, wet silty or medium clay overlain by sandy loam and interbedded with layers of very fine sand and silt was encountered. On the low ground, at the three creek crossings, soft organic silt up to 35' in depth was encountered over firm sandy and silty soils.

Apart from the creek locations, the principal type of soils encountered along the proposed alignment of the service roads is sandy loam underlain by beds of very fine sand and silt and medium to light clay or clayey silt. The field moisture of these subsoil materials at the time of investigation was generally found to be above the optimum.

CUT SECTIONS:

Cut sections from station 140± to station 151± (west of Eighteen Mile Creek - south service road) and from station 170± to station 195± (west and east of Sixteen Mile Creek - south service road) will be dry to wet with very fine sand and silt contents ranging from 50% to 80%. The rest of the cut materials from within the right-of-way will be, in general, suitable for use in fills. However, some difficulties could arise in handling it during the excavation operations because of the high moisture contents.

The borings along the shoulders of the intersecting roads revealed the following depths of granular base and pavement.

- (1) Fifth Street - gravel surface, about 5" gravel
- (2) Seventh Street - surface treated, 1" to 2" mulch over 4" to 6" of gravel
- (3) Ninth Street (Gregory Road) - surface treated, 2" of mulch over 5" to 7" gravel
- (4) Eleventh Street (Fairlane Road) - gravel surface, about 5" of gravel
- (5) Thirteenth Street - gravel surface, about 6" of gravel
- (6) Fifteenth Street - north of the QEW, about 5" of gravel - south of QEW, road surface is mulch over 6" of gravel
- (7) Seventeenth Street (Jordan Road) - hot mix surface over 24" of granular base (recently constructed).

STRUCTURE SITES:

The soils data obtained from the foundation borings are as follows;

- (a) W.P. #212-63, Seventh Street Underpass:

The upper stratum consists of 5' to 9' of firm clayey silt interbedded with sand and some traces of organic material. Underlying this is a 18' to 50' thick layer of stiff clayey silt with traces of sand and glacial till over the bedrock at a depth of 57' to 70'. The ground water level is from 2' to 10' below the surface.

- (b) W.P. #213-63, South Service Road Crossing at Fifteen Mile Creek:

The soil at this structure site consists essentially of a 35' thick deposit of soft to stiff green silt and clay underlain by shale bedrock in approximately 45' below ground level.

in the low areas.

(c) W.P. #214-63, Sixteen Mile Creek Crossing:

Subsoil at the crossing of the north and south service roads consists of a 35' deposit of organic clay and silt underlain by a stiff clay silt with some sand and gravel over shale bedrock at 45' to 50' below the ground surface.

(d) W.P. #215-63, Eighteen Mile Creek Crossing:

At this location, the subsoil consists of a deposit of organic silt ranging from 10' to 20' in depth. Underlying this is a 30' thick layer of stiff clayey silt followed by very dense silty sand with some gravel over the shale bedrock at a depth of 50' to 60' below the ground level.

Generally, the material encountered in the bed of all creeks is brown to grey-brown in colour and relatively uniform. The upper layer of the organic deposit is more fibrous and soft, while the lower part is more decayed and varies from soft to stiff.

PERFORMANCE:

(a) Intersecting Roads:

(1) Seventeenth Street (Jordan Road) - west limits of project:
This road was recently reconstructed under contract 64-569 as the QEW overpass and is in good condition.

(2) Fifteenth Street:

North of the QEW the gravel surface is quite rough and pot-holed. South of the QEW the mulch surface is uneven, pot-holed and in poor to fair condition.

(3) Thirteenth Street:

This road has a gravel surface which is rough with numerous pot holes.

(4) Eleventh Street (Fairlane Road):

This road has a gravel surface and is in poor to fair condition.

(5) Ninth Street (Gregory Road):

This road consists of mulch surface and is in poor to fair shape.

(6) Seventh Street:

The surface of this road is a mulch type. It is occasionally pot-holed, uneven and rough with broken edges and the wheel tracks are noticeably depressed.

(7) Fifth Street (east limits of the project):

This road consists of a gravel surface and is in moderately good condition.

(b) QEW at Intersecting Roads:

The pavement structure of the Queen Elizabeth Way consists of 9" of unreinforced concrete base with 5" of hot mix resurfacing. It is a four lane, divided expressway with a 28' wide median. The width of the pavement is 23' with 10' outside shoulders and 3' to 5' inside shoulders. The significant deficiencies of the pavement in the vicinity of the crossing roads are ravelling and transverse reflection cracks which are particularly noticeable in the outside lanes. The centerline joint has opened in some sections and maintenance consists primarily of spray patching. Ordinary resurfacing is proposed under W.P. #805-66.

EARTH BORROW:

The ground surface in the general area of project is fairly flat to gently rolling, except in the vicinity of the Fifteen, Sixteen and Eighteen Mile Creeks. Here, the proposed grade of the Service Roads will be located in cuts 10 to 25 feet deep. The soils survey indicated that generally this cut material will be suitable for fill construction, but possibly difficult to handle because of the high percentage of very fine sand and silt and excess moisture content. It is expected that if earth borrow is required from outside the right-of-way, similar conditions will be encountered.

The overburden materials from the local quarries may be also used as borrow. The average haul distance would be about 10 miles.

In view of the variation of soil texture in this area, the advance testing of the prospective local borrow would be necessary to determine the suitability of the soils as a construction material.

GRANULAR MATERIAL:

The granular material (class "A") for this project will be available from the commercial sources located in the areas of Vineland, St. Catharines and Fonthill. The average haul distances from these sources will be:

St. Catharines Crushed Stone	- 10 Miles
Walkers Brothers Quarry (St. Catharines)	- 12 Miles
Fonthill	- 17 Miles
Vineland Quarry	- 7 Miles

SWAMP BACKFILL MATERIALS:

Materials used as swamp backfill should be non-plastic; i.e. of



a granular or sandy nature. Material suitable for this purpose is not available in the immediate vicinity of the project. The only material that would be available is rock from the nearby escarpment or material of a granular nature which would be available from the large kame formation at Fonthill. The gradation requirements for this material are outlined under "RECOMMENDATIONS".

In the Foundation reports, this materials is referred to as "granular material". However, to avoid any confusion with Granular Base Course "A" or "B" we will refer to it as "select backfill material" in this report.

RECOMMENDATIONS:

1. Granular Materials:

Granular Base Course Class "A" only, is recommended under an 8" deep strength pavement.

2. Pavement Design:

(a) The deep strength design for the service roads, side road connections and the fly over at Seventh Street should be as follows:

- 3/4" H.M. S.A. over the granular base
- 6" of H.L.6 (2@ 2 1/4" for lower binders and 1 1/2" for upper)
- 1 1/4" of H.L.3

(b) The depth of granular base, consisting of Granular Base Course Class "A" only, should be 12" on fills and 15" in cuts unless otherwise indicated on the soils profile. The granular depth has been increased from that used on W.P.s 206-63-2 and 215-63-2 because of generally wet conditions

and the high, very fine sand-silt content of the soil.

(c) For drainage purposes, the granular base course material should be placed full width.

3. Culverts:

The culverts will be founded on firm clayey or sandy materials and no foundation problems are anticipated. The exception is the proposed twin box culvert at Eighteen Mile Creek. The foundation recommendations for this conduit are included in the Foundation report.

4. Topsoil:

For estimating purposes, the average depths of topsoil along the right-of-way are as follows:

(a) South Service Road:

Stations 94+00 to 105+50	- 12"
" 108+00 to 119+00	- 12"
" 119+00 to 149+00	- 9"
" 162+40 to 180+60	- 10"
" 187+30 to 195+00	- 8"
" 204+60 to 227+50	- 12"
" 236+60 to 267+60	- 9"

(b) North Service Road:

Stations 90+70 to 105+70	- 10"
" 107+70 to 149+00	- 13"
" 155+00 to 180+20	- 9"
" 188+00 to 196+00	- 6"
" 204+00 to 226+00	- 11"
" 229+50 to 267+00	- 11"

These depths are shown on the soils profile.

5. Compaction:

The total estimated time for compaction should be allotted as follows:

- Sheepsfoot Roller - 50%
- Wobbly Wheel Roller - 50%

6. Structure and Culvert Backfill:

- (a) Structure backfill should consist of Granular Base Course Class "A".
- (b) Culvert backfill should consist of Granular Base Course Class "A".

7. Seepage in Cuts:

The borings indicate the possibility of encountering water bearing sand seams in some of the cut backslopes. Since the extent of this condition can only be determined when the cut material is removed, no detailed recommendations regarding exact locations will be made now. However, it is recommended that 1,500' of 6" perforated pipe be included as a tender item for the purpose of draining these areas. Granular Base Course Class "A" should be used for back filling this pipe.

8. Transition Points:

For standard DD-411-A, the following depths should be used:

- t = 2'
- D = 3'

9. Gradeline:

No changes have been made to the gradeline proposed by the Functional Planning Section.

10. Treatment of Organic Deposits:

(a) The treatment of organic materials should be carried out as indicated in the Foundation reports for the structures and approaches at the three creek crossings.

(b) Rock from the Niagara escarpment or material of a "granular" nature will be required for back filling purposes up to 3' above the high water level. In the latter case, the "select backfill material" should consist of sands, gravels or sandy glacial till meeting the following requirements:

- passing #100 sieve - 3% to 40%
- passing #270 sieve - 3% to 15%
- clay fraction - maximum of 10%
- plasticity index - maximum of 5%
- natural moisture - maximum of 5% over the optimum

This should be included as an item in "Special Information to Bidders".

(c) In calculating the amount of select backfill material required on the excavated areas, assume that an additional 5' of settlement through consolidation and displacement will occur. In calculating the quantity of earth fill required for the approaches assume a 3' settlement from consolidation over the unexcavated areas.

11. Structure Foundations: (Excerpts from Foundation reports)

(a) W.P. #212-63, Seventh Street Underpass:

The Foundation report issued on August 31, 1966 recommended end bearing pile footings with a safe design load of 80 tons per pile (12 EP. 73-4 piles). Care should be taken

to ensure that no bouldery fill is placed at the abutment locations through which piles have to be driven. No stability problems are expected for the approach fills having a height of about 25' with the standard 2:1 slopes.

(b) W.P. #213-53, South Service Road - Fifteen Mile Creek:

The Foundation report issued on November 9, 1966 recommended that the bridge piers and abutments should be supported on steel H-piles or concrete caissons. In order to prevent the lateral movement of the piles, the pile caps should be strutted or, as an alternate solution to this, all the soft materials should be excavated from the area between the bridge piers and abutments with an additional 5' wide perimeter area down to approximate elevation 238.0 and backfilled with select backfill materials. It would be desirable to carry out this excavation and backfill it prior to placing the approach embankment. To ensure stability of the last approach fill, it is further recommended that the soft organic silty clay be excavated to a depth of 15 feet. The excavation should start at a point 10' back from the edge of the existing fill and extend to the toe of the new 2:1 embankment slope. The west approach fill is stable and excavation is not recommended except as outlined on page 10 of the Foundation Report. The excavated material should be replaced with suitable select backfill material (as specified earlier). If feasible, paving over the approach fill should be carried out one year after the fills are completed. This will allow for the anticipated initial settlement.

(c) W.P. #214-63, Sixteen Mile Creek:

From the three proposals suggested in the Foundation report issued on November 14, 1966, we have been informed that Bridge Office has chosen a three span structure with approach embankments. The recommendations for this type structure are as follows.

A steel H-pile (14 BP-74) type foundation has been recommended with a safe load of 90 tons per pile or, as an alternative, a lined concrete caisson foundation may be used.

Since the subsoil conditions are similar to those at Fifteen Mile Creek and some measures are required to prevent the lateral movement of the piles by the embankment settlement, the following is proposed.

(1) The pile caps should be strutted. This will require a dewatering scheme.

(2) Prior to the construction of the approach embankment, all materials lying in the area between the bridge abutments plus 5' should be excavated to about elevation 238.0 and backfilled with select backfill material.

The approach embankments should be treated as follows:

(a) North Service Road:

It is recommended that where the toe of the 2:1 embankment slope spills into the pond area, the upper 6 to 8 feet of soft organic material should be excavated and replaced with a select backfill material.

(b) South Service Road:

Excavation of the soft organic material to a depth of 15'

is recommended beneath the approach embankments in the area where the toe of the 2:1 embankment slope extends into the pond. Both embankments should be constructed as much prior to the structure construction as possible to give time for the initial large settlements. Paving over the approaches should be carried out one year after the fills are completed (if feasible).

In all cases the excavation will extend from a point 10' back from the edge of the existing fill to the point where the new 2:1 slope intersects the pond.

(d) W.P. #215-63, Eighteen Mile Creek:

From the two alternative structure designs suggested in the Foundation report issued on December 5, 1966, we have been informed that the Bridge Office has decided to extend the existing twin box culvert under the crossing of the north and south service roads. The twin box culvert will be founded on the select backfill material with an allowable design load of 1 T.S.F.

It is recommended that all organic material in the stream bed under the culvert extension and to a width of 15' beyond the footings of the culvert should be completely excavated and backfilled with select backfill material to the elevations of the bottom slab of the culvert. A dewatering scheme will be required during the construction of the culvert foundations.

For the construction of the embankments the following

procedure has been recommended:

The excavation under the embankment area should extend cross-wise from the centreline of the proposed service roads to the outside toe of the new 2:1 embankment slope.

For the North Service Road this excavation will be between stations 150+90 and 153+65.

For the South Service Road, excavation should be carried out from station 152+80+ to station 158+00.

The feasible depth of excavation in this material will be about 12 feet. For construction purposes the Foundation Report suggested that the excavation be carried out transversely in 12' to 15' wide strips and immediately backfilled with suitable materials before proceeding with the next step. For settlement reasons, it is recommended that the embankments should be constructed as long as possible prior to the beginning of the work on the structures. Also, the paving should be carried out at least one year after the fills have been completed.

12. SLOPE TREATMENT:

In view of the silty nature of the materials in the cuts. The backslopes will be quite susceptible to erosion forces. Possibly the Department's Arboriculturist should be contacted for specific recommendations.

Prepared by: P. Peney.

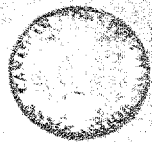
Reviewed & Approved by: P. F. Weber,
SR. PROJ. SOILS SUPERVISOR.

January 31, 1967.

/js.



MOIR CONSTRUCTION COMPANY LIMITED



BOX 470 • ST. CATHARINES • 418 685-7121
418 685-7126

Antici Construction Co., Ltd.,
294, Lake Street,
ST. CATHARINES,
Ontario.

27th August, 1971.

For the attention of Mr. N. Antici

Dear Sirs,

Re - D.H.O. Contract - 69-101

Further to our "notification of intent to claim" dated December 22nd, 1969, we are enclosing the substantiations to the claims specified.

Claim #1 - Foundation Problems at Fifteen Mile Creek Bridge S - Piers A & B	\$9,781.76
Claim #2 - Foundation Problems at Sixteen Mile Creek Bridge S - Piers A & B	6,589.18
Claim #3 - Foundation Problems at Sixteen Mile Creek Bridge N - Pier #7	3,220.86
Total value of claims	<u>\$19,591.80</u>

Kindly forward this information to the Department
for processing and payment.

Yours very truly
MOIR CONSTRUCTION

J.D.

R.J. ROSE

R/S
Enci.



MOIR

CONSTRUCTION COMPANY LIMITED



BOX 476

ST. CATHARINES

416 685-7121
416 685-7123

DEPARTMENT OF HIGHWAYS ONTARIO

CONTRACT NO. 69-151

HAMILTON DISTRICT

Q.E.W. South Service Road

North Service Road

FOUNDATION PROBLEMS

Claim #1. Fifteen Mile Creek Bridge S. - Piers A. & B.

Claim #2. Sixteen Mile Creek Bridge S. - Piers A. & B.

Claim #3. Sixteen Mile Creek Bridge N. - Pier #7

TABLE OF CONTENTS

- Part 1. Letter of December 8th, 1969, advising of soil problems at 15 Mile Creek and 16 Mile Creek on S. Service Road.
- Part 2. Notification of intent to claim.
- Part 3. Substantiation of Foundation Problems at 15 Mile Creek Bridge and 16 Mile Creek Bridge - S. Service Road, along with costs.
- Part 4. Substantiation of Foundation Problems at 16 Mile Creek Bridge, Pier #7, N. Service Road.

PART 1

SEE PAGE TWO FOR CONT.

December 8, 1969

Antici Construction Co.Ltd.
294, Lake Street,
St.Catharines, Ont.

Re: Department of Highways - Contract 69-151
Attention Mr. Nello Antici.

Dear Sirs:

C We are encountering extremely poor soil conditions at the locations of the pier footings at 15 Mile Creek and 16 Mile Creek on the south service road on the subject project. C

O The material being encountered is in a saturated state with virtually no bearing capacity and is not capable of supporting any appreciable weights. It is also impossible to excavate the footings for the piers to neat concrete lines because of the sides caving in. P

Y As a result, we are finding it necessary to temporarily shore the excavations and pour concrete working slabs in order that the footings can be formed and poured. We are having difficulty in controlling the excavation and placing of concrete within the confines of our temporary shoring because of the "fluid" state of the soil. During excavation, the surcharge of the fill surrounding the excavation forces the soil upwards within the shoring. While the working slab is being poured, we are experiencing a displacement downward of the soil by the heavier concrete. Y

C The result of the above is that we are exceeding theoretical quantities for both excavation and concrete by a substantial amount. In view of this fact, we request that this matter be taken up with the Department of Highways. C

O As work on the footings in question is now in progress, we will appreciate prompt attention to this problem. P

Y Yours very truly, Y

MOIR CONSTRUCTION COMPANY LIMITED.

R.J.Roscoe, P.Eng.

RJR/mg

PART 2



ONTARIO
DEPARTMENT OF HIGHWAYS

NOTIFICATION OF INTENT TO CLAIM

CHIEF ENGINEER,
DEPARTMENT OF HIGHWAYS ONTARIO.

Date Dec. 22 19 69

Against Contract No. 69-151

District Hamilton Location O.E.W. Service Roads

Contractor Antici Construction Co. Ltd. 15 and 16 Mile Creek

Moir Construction Co. Ltd.

In accordance with Paragraph 2, Sub-section 104-1 of Section 104 "Control of the Work" of the "General Conditions of the Contract" D.H.O. Form 100, I/We declare my/our intention to file a claim against the above contract due to the following (Give complete details, attaching separate sheets if necessary.)

Locations Involved.

- 1- Fifteen Mile Creek, South Service Road., Piers A and B
- 2- Sixteen Mile Creek, South Service Road., Piers A and B
- 3- Sixteen Mile Creek, North Service Road., Pier #7 X

The information provided on the drawings and in the specifications regarding the soil conditions at the above mentioned locations was not an accurate representation of the actual conditions. The result of this was that the specified unwatering was not effective in providing an acceptable excavated surface on which to place the pier footings.

At locations 1) and 2) the drawings indicated that the areas involved were excavated and backfilled with "Select Backfill Material" under a previous contract. In actual fact the present soil condition is best described as a silty sand to sandy silt in a "quick" condition.

Compensation received under the contract pay items is substantially inadequate to cover the expenses incurred in constructing the footings concerned.

At location 3), the drawings indicate a 2' thick layer of rip rap across the stream bed and up the slope to a point 4' from the edge of the footing for pier #7. In actual fact, rip rap, approximately 8' thick existed over the entire area of the footing.

Again, payment under contract pay items falls far short of actual costs.

The conditions described are beyond the scope of the present contract and we require additional compensation to cover the cost of performing the work.

NOTE: Contractor must give this notice to the Chief Engineer and District Engineer within 7 days of his date of commencement on the work out of which this claim arises—Refer—Section 104-1 "General Conditions of the Contract" D.H.O. Form #100 Revised April 1st, 1958.

Signed _____
Contractor or Authorized Representative.

TO BE MADE IN QUADRUPLICATE BY THE CONTRACTOR.
ONE COPY SENT TO DISTRICT ENGINEER—TWO COPIES SENT TO CHIEF ENGINEER.

(4) CONTRACTOR'S COPY
(TO BE RETAINED BY CONTRACTOR)

PART 3

Foundation Problems at 15 and 16 Mile Creek

LOCATIONS

Fifteen Mile Creek Bridge, O.E.W - South Service Road, 2.3 miles West of St. Catharines - Footings of Piers A & B.

Sixteen Mile Creek Bridge, O.E.W - South Service Road, 2.6 miles West of St. Catharines - Footings of Piers A & B.

DESCRIPTION OF CONDITIONS

Major problems were encountered during the construction of the pier footings on the subject structures. As the conditions involved were identical at all four footing locations, they have been grouped together for purposes of presenting pertinent information. However, costs involved have been allocated to each individual location.

Certain information was presented on the contract drawings concerning the soil conditions at the pier locations. Sections on the drawings indicated that organic material had been sub-excavated under a previous contract and replaced with "Selected Backfill Material".

On the basis of this information, at time of tender, it appeared that a simple clay cofferdam around the pier footing would be effective for purposes of dewatering the pier locations, excavating the footings to neat lines and placing the concrete.

The actual soils condition encountered would be best described as a "silty sand" to "sandy silt" in a "quick" condition. This material had virtually no bearing capacity and was not able to support weight of any significance.

As a result, it was necessary to change our intended construction procedures to more costly methods. This involved temporary sheeting and bracing around the perimeter of the footings, excavating within the sheeting, pouring working slabs and then constructing the actual footings.

As the material inside the cofferdams was being excavated the surcharge of the fill surrounding the cofferdam caused a displacement upward of the "fluid" material. This resulted in an appreciable quantity of extra footing excavation.

Similarly, when the concrete working slabs were poured, the weights of the concrete displaced the fluid soil downward, causing a considerable over run in the yardage of concrete placed.

The conditions outlined above were also instrumental in creating other additional expenses to our operations. Clean-up operations were more costly because of the poor material and the necessity to remove and dispose of the cofferdams. The job overhead expenses were substantially increased because of Engineering Supervision required during installation of the cofferdams. The extra work created delays in our schedule and there was a loss of efficiency in our normal production because of the extra work and its nature. Also, because of the delays created by the conditions encountered, the contract work was set back into more severe winter conditions making for less efficient production.

The costs incurred as a result of the conditions encountered are tabulated and enclosed.

We request compensation for this work which was beyond the scope of the Contract.

COST SUMMARY

Foundation Problems at 15 Mile Creek S Piers A & B

1) Construction of Cofferdams

Items	Date -December																		Total	Rate	
Labour:	1	2	3	4	5	8	9	10	11	12	15	16	17	18	19	22	23				
Foreman	4	4	4	4	4	4	4	4	4		4	4	4	4	4	4	4	64	6.50	416.00	
Carpenter	8	8	8	16	16	16	12		8		16	8	12	12	12	12	8	172	6.04	1,038.88	
Labourer	12	16	16	25	45	24	25	24	16		24	24	24	24	24	24	8	355	3.68	1,306.40	
Equipment:																					
**Hydraulic Clam			8	8	10				8		8	8						50	21.50	1,075.00	
*Dump Truck			8	8	8				8		8	8						48	2.45	117.60	
*Pickup Truck	4	4	4	4	4	4	4	4	4		4	4	4	4	4	4	4	64	1.70	108.80	
*Compressor			8	8	8	8			8		8	8						48	4.10	196.80	
*Pump	8	8	8	8	8	8	8	8	8		8	8	8	8	8	8	8	128	1.25	160.00	
*Generator	4	4	4	4	4	4	4	4	4		4	4	4	4	4	4	4	64	.95	60.80	
**D-7 Bulldozer								2				1	1½					4½	18.00	81.00	
*Misc. Power Tools	3 weeks at \$100/wk																				300.00
Material:																					
3000 B.F.M. Timber Sheeting & Walers @ \$150/m																				450.00	
Misc. Materials.																				100.00	

2) Removal of Cofferdams and Cleanup

	Date - April						
	24	27	28	29			
Labour:							
Foreman	2	2	2	2		8	6.50 52.00
Labourer	16	16	16	16		64	3.6 235.52
Equipment:							
*Dump Truck	8	8	8	8		32	2.45 78.40
*Pickup Truck	2	2	2	2		8	1.70 13.60
*D-8 Bulldozer				3		3	25.00 75.00

- 3) Engineering Supervision 16 hrs @ \$25/hr 400.00
- 4) Lost Profits 16 days @ \$150.00/day 2,400.00

SUMMARY

A)	Labour Cost:	\$3,048.80	
	1000.00 @ 135%	1,350.00	
	2048.80 @ 120%	<u>2,458.56</u>	
	Total Labour Charges		\$3,806.56
B)	Equipment:		
	**Rented Equipment Cost	1,231.00	
	20%	<u>246.20</u>	
	Total	1,477.20	
	*Equipment on 527 Rates	1,036.00	
	Total Equipment Charges		2,513.20
C)	Materials:		
	Cost of Materials	550.00	
	20%	<u>110.00</u>	
	Total Material Charges		660.00
D)	Engineering Charges		400.00
E)	Lost Profits Charges		<u>2,400.00</u>
	Total value of claim:		\$9,781.76
			=====

COST SUMMARYFoundation Problems at 16 Mile Creek S
Piers A. & B.1) Construction of Cofferdams

Items	Date - December										Total	Rate	
	12	13	15	16	17	18	19	22	23				
Labour:													
Foreman	4	4	4	4	4	4	4	4	4	36	6.50	234.00	
Carpenter	16	-	8	16	12	8	16	12	8	96	6.04	579.84	
Labourer	30	8	27	24	20	24	24	24	16	197	3.68	724.96	
Equipment:													
*Hydraulic Clam				8	8	8	8			32	21.50	688.00	
*Dump Truck	8	8				8	8			32	2.45	78.40	
*Pickup Truck	4	4	4	4	4	4	4	4	4	36	1.70	61.20	
*Compressor	8	8	8			8	8	8	8	56	4.10	229.60	
*3" Pump	8	8	8	8	8	8	8	8	8	72	1.25	90.00	
*Generator	4	-	4	4	4	4	4	4	4	32	.95	30.40	
*D-7 Bulldozer						2		2	2½	6½	18.00	117.00	
*Misc. Power Tools	2 weeks at \$100/wk												200.00
Material:													
3000 F.B.M. Timber Sheeting & walers @ \$150/m												450.00	
Misc. Materials.												100.00	

2) Removal of Cofferdams & Cleanup

	Date - April and May						
	30	1	4	5			
Labour:							
Foreman	2	2	2	2	8	6.50	52.00
Labourer	16	16	16	16	64	3.68	235.52
Equipment:							
*Dump Truck	8	8	8	8	32	2.45	78.40
*Pickup Truck	2	2	2	2	8	1.70	13.60
**D-8 Bulldozer				3	3	25.00	75.00

3) Engineering Supervision	16 hrs @ \$25/hr	400.00
4) Lost Profits	9 days @ \$150.00/day	1,350.00

SUMMARY

A)	Labour Cost:	\$1,826.32	
	1000.00 @ 135%	1,350.00	
	826.32 @ 120%	<u>991.58</u>	
	Total Labour Charges		\$2,341.58
B)	Equipment:		
	**Rented Equipment Cost	880.00	
	20%	<u>176.00</u>	
	Total	1,056.00	
	*Equipment on 527 Rates	<u>781.60</u>	
	Total Equipment Charges		1,837.60
C)	Materials:		
	Cost of Materials	550.00	
	20%	<u>110.00</u>	
	Total Material Charges		660.00
D)	Engineering Charges		400.00
E)	Lost Profits Charges		<u>1,350.00</u>
	Total value of claim:		\$6,589.18

PART 4

Foundation Problem at Pier 7, 16 Mile Creek North

LOCATION

Sixteen Mile Creek Bridge, Q.E.W - North Service Road,
2.6 miles West of St. Catharines - Footing of Pier #7.

DESCRIPTION OF CONDITIONS

At Pier #7 of the subject structure, the drawings indicate the bottom of the Creek and a portion of the Creek Bank rip-rapped under a previous contract to a point 4'0" from the face of the Pier.

When excavation was started, it was found that the entire area covered by the footing and the section which should have been earth between the pier footing and the Creek was all rip rap material. The depth of the rip rap was approximately 8'.

We had intended to construct a clay berm cofferdam for dewatering purposes, excavate the pier footing to neat lines and pour the concrete against undisturbed soil as was the case on all the other piers of this structure.

Because the rip rap allowed water to flow freely into the footing excavation, it was necessary to construct a cofferdam of wood sheeting and expend considerable effort in dewatering and cleaning the footing foundation.

Also, for the reasons indicated in our claims covering the structures on the south service road, there were additional costs for cleanup, Engineering Supervision, delays and loss of efficiency.

The costs have been compiled and are attached.

Compensation as detailed is requested as the work was not indicated in the Contract documents.

COST SUMMARY

Foundation Problems at 16 Mile Creek N Pier #7

1) Construction of Cofferdam

Items	Date - January					Total	Rate		
	6	7	8	13	15				
Labour:									
Foreman	2	6	4	2	4	18	6.50	117.00	
Carpenter	6	22	8	-	8	44	6.04	265.76	
Labourer	14	23	13½	16	16	82½	3.68	303.60	
Equipment:									
**Hydraulic Clam	6					6	21.50	129.00	
**Backhoe 22-B		2½	3½			6	18.00	108.00	
*Dump Truck	4	4	4			12	2.45	29.40	
*Pickup Truck	2	6	4	2	4	18	1.70	30.60	
*Compressor		8	8			16	4.10	65.60	
*3" Pump			8	8	8	24	1.25	30.00	
*Generator	4	8	8	8	8	36	.95	34.20	
*Misc. Power Tools	1 week at \$100/wk							100.00	
Material:									
1500 F.B.M. Timber Sheetings and Walers @ \$150/m									225.00
Misc. Materials									50.00

2) Removal of Cofferdam and Cleanup

	Date - May				
	28	29			
Labour:					
Foreman	2	2	4	6.50	26.00
Labourer	16	16	32	3.68	117.76
Equipment:					
*Dump Truck	8	8	16	2.45	39.20
*Pickup Truck	2	2	4	1.70	6.80
Engineers Supervision	16 hrs @ \$25/hr				400.00
Lost Profits	5 days @ \$150.00/day				750.00

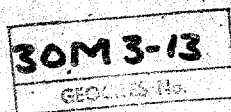
SUMMARY

A)	Labour Cost:	830.12	
	830.12 @ 135%	<u>1,120.66</u>	
	Total Labour Charges		\$1,120.66
B)	Equipment:		
	**Rented Equipment Cost	237.00	
	20%	<u>47.40</u>	
	Total	<u>284.40</u>	
	*Equipment on 527 Rates	<u>335.80</u>	
	Total Equipment Charges		620.20
C)	Materials:		
	Cost of Materials	275.00	
	20%	<u>55.00</u>	
	Total Material Charges		330.00
D)	Engineering Charges		400.00
E)	Lost Profits Charges		<u>750.00</u>
	Total value of claim:		<u>\$3,220.86</u>

5275
1175
1725
1175
575

ROAD DESIGN DIVISION

PROPOSED SPECIAL PROVISION



1. W.P. 211-63-01 Hwy. Q.E.W. Type G., D. Dist. 4 - Hamilton
Location North and South Service Roads from 13th Street 1.1 Miles East of
Jordan Station Interchange Easterly to 7th Street

2. Initiated by (Give Names, Divisions, District & Jurisdictions, etc.)

A.G. Kelly Road Design

3. (a) REFERENCE

This S.P. replaces No. in the Special Provisions Manual

This S.P. modifies the following Specification requirement

D.H.O. Form Section Page Paragraph

This S.P. is new - Remarks

Special Material Recommended by Soils

(b)

Purpose and Intent with Explanations, etc.

To specify type of material and to provide requirements for sand, gravels,
or sandy glacial till.

4. Special Provision

Selected Backfill Material

All material placed under this item shall consist of rock, sands, gravels
or sandy glacial till. The requirements of D.H.O. Form 200 shall apply for
the rock. D.H.O. Form 314 shall apply for the sands, gravels, or sandy glacial
fill with the exception that they shall meet the following requirements:

Passing #100 Sieve	3% to 40%
Passing #200 Sieve	3% to 15%
Plasticity Index	Maximum of 5%
Clay Index	Maximum of 10%
Material Moisture	Maximum of 5% over optimum

5. Regional Pre-Contract Review: Date

Approved by _____ Revised by _____

Referred to H.O. - Reason

6. Head Office Pre-Contract Review Date

Revised as noted

Approved:

DEPARTMENT OF HIGHWAYS ONTARIO

MEMORANDUM

TO: Mr. A. Rutka,
Materials & Testing Engineer,
Materials & Testing Office,
Room 102, Lab. Bldg.

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

ATTENTION:

DATE: January 15, 1970

OUR FILE REF.

IN REPLY TO

SUBJECT: Re: Contract 69-151 - Hamilton District
Notification of Intent to Claim -
Antici Construction Company Limited

With respect to the above mentioned 'Notification' dated December 22, 1969, we herewith submit the following comments:

The Contractor makes the following statement regarding the conditions at Piers A and B of the Fifteen Mile and Sixteen Mile Creek structures on the South Service Road:

"The information provided on the drawings and in the specifications regarding the soil conditions at the above mentioned locations was not an accurate representation of the actual conditions."

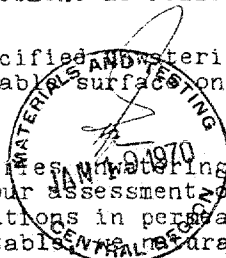
we disagree with the above statement for the following reasons:

Under the previous Contract 68-103, the organic material within the area of the structure was excavated, removed and replaced. On the Contract Drawing D-6126-1 of Contract 69-151, this area is shown and it is stated that the organic material is replaced with "Selected backfill material". From the previous Grading Contract (68-103), it can be seen that the "Selected backfill material" was Sand Cushion (Special Provisions, p. 15) - and this is exactly what was there, and what the Contractor (Antici Construction Co.) found.

The Contractor proceeds with his statement as follows:

"The result of this was that the specified ^{and watering} alone was not effective in providing an acceptable surface on which to place the pier footings."

The Department generally never specifies ^{watering} methods. We provide factual information and our assessment of problems that can be encountered. When excavations in permeable soils have to be carried out below the water table, naturally



PHW

..... 2

0.01

January 15, 1970

Re: Contract 69-151 - Hamilton District - Notification of Intent
to Claim - Antici Construction Company Limited

point out this fact and indicate the need for an appropriate dewatering scheme. Often we give details of a scheme which we know would be satisfactory, but we never specify it. For the Sixteen Mile Creek structure, for example, we made, in our Report W.J. 66-F-62 dated November 14, 1966, the following statement - (page 8):

"Since the pile caps for the piers (and the struts between the pile caps if this method is adopted) will be constructed below the groundwater level, a dewatering scheme will be necessary. A suitable scheme would be to drive temporary sheeting around the excavation to a depth of at least 5 feet greater than the base of the excavation."

A similar statement is to be found in our Report W.J. 66-F-63, for the Fifteen Mile Creek structure.

As can be seen, the above statement is positive regarding the need for dewatering, but is only suggestive regarding the method to be used. Consequently, to state that the ... "Specified unwatering alone was not effective ..." - is wrong.

The Contractor's statement reads further, as follows:

"At locations 1) and 2) the drawings indicated that the areas involved were excavated and backfilled with "Select Backfill Material" under a previous contract. In actual fact, the present soil condition is best described as silty sand to sandy silt in a "quick" condition."

Nowhere in Contract 69-151 is the "Select Backfill Material" defined, and it is therefore impossible for the Contractor to argue that the material presently in place is not the one that should be there. There were three ways by which the Contractor could have found out, ahead of time, what is understood as "Select Backfill Material" if he had been in doubt:

- (1) He could have asked the D.H.O., or
- (2) he could have looked through the Contract Documents of the previous Contract (69-103) under which this operation was completed, or
- (3) he could have gone to the site and taken a few samples of the material in question.

January 15, 1970

Re: Contract 69-151 - Hamilton District - Notification of Intent
to Claim - Antici Construction Company Limited

In addition to the foregoing, the following should be kept in mind: Since the excavation of the organic material and its replacement was to be carried out predominantly under water, it is desirable to use a granular type of material as backfill. The best material would probably be G.B.C. 'A'; the next, G.B.C. 'B', and next, Sand Cushion. In these two particular cases it was decided to use Sand Cushion.

All the three above mentioned materials would become "quick" or "boil" if subjected to a high-enough hydraulic gradient. Boiling of such materials is not a property, but a condition. If an excavation in such materials is to be carried out below the water table, an appropriate dewatering procedure has to be used. Failure to do this, will result in a "quick" or "boiling" condition.

Since the Contractor states that a "quick" condition was observed, we submit that he was using the wrong dewatering procedure and has nobody to blame but himself.

Regarding the rip-rap at Location 3), we have no knowledge of this; it has nothing to do with our work and, therefore, we have no comments.

AGS/MieF

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

cc: Mr. A. G. Stermac
Gen. Files

Mr. T. J. Kovich

ACTION SLIP

DATE

Jan 5/69

TO

Mr. T. Kovich

FROM

A. RUTKA

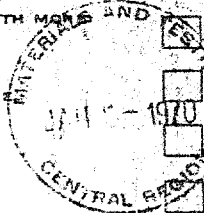
☐NOTE AND
FILE☐PREPARE REPLY FOR
MY SIGNATURE☐NOTE AND
RETURN TO ME☐TAKE APPROPRIATE
ACTION☐RETURN WITH MARKS AND
DETAILS☐PER YOUR
REQUEST☐NOTE
AND SEE ME☐FOR YOUR
SIGNATURE☐PLEASE
ANSWER☐FOR YOUR
INFORMATION☐FOR YOUR
APPROVAL☐INVESTIGATE AND
REPORT☐RETURN WITH YOUR
COMMENTS☐

COMMENTS

Could you please

report on this please.

AR



Mr. R. R. Eadie,
Director,
Operations Branch.

J. W. MacDougall

December 31, 1969

Claim on Contract 69-151
Antici Construction Company Limited
Hamilton District

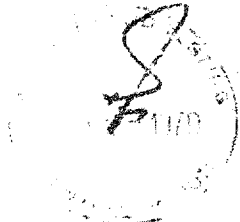
Attached please find for your information copy of Notification
of Intent to Claim dated December 22, 1969 from Antici
Construction Company Limited regarding the above contract.

Encl.
JWM/wm

J. W. MacDougall,
Claims Engineer.

c.c. - Mr. D. M. Hopper
Mr. H. Greenland
Mr. A. Rutka ✓
Mr. E. R. Davis

62



SPECIAL PROVISION

Swamp Backfill

Materials placed under this item shall consist of sands, gravels, or sandy glacial till or rock. In general, the requirements of D.H.O. Form 200 shall apply. For the materials other than rock, the following requirements will apply:

Maximum passing #100 sieve - 3% to 85%

Maximum passing #270 sieve - 3% to 60%

Plasticity Index -- Maximum of 5%

Clay fractions - Maximum of 15%

Natural Moisture - Maximum of 6% over Optimum

Materials meeting these gradation requirements are located on and adjacent to the job, in the form of outwash of variable thickness over clay. ^{55,000}Approx. 25,000 cu yds are located between the ~~and~~ ^{and} ~~road of the highway~~ ^{road of the highway}.

Rock may be obtained from the Niagara Escarpment.

Note. This was discussed with Mr. Trejaster on July 14th 1968 in his office (GHS was present). He approved of it. My contention was that the 2nd last para. could be misleading to the Contractor since this same L could not get material from this area. However, HAT & GHS said that it was up to the Contractor to find out on his own.

July 168

T. J. P. 1968

Mr. G. K. Hunter,
Reg. Road Design Engr.,
Central Region.

Materials & Testing Division,
Central Region,
Room 134, Lab. Bldg.

May 6, 1968.

Special Provision for Selected Backfill Material
W.P. 211-63-01, Q.E.W. Service Roads
Jordan Interchange East to 13th Street
Hamilton District

The suggested special you left in our office today has been reviewed. We are recommending that it be changed to read as follows:

All material placed under this item shall consist of rock, sands, gravels or sandy glacial till. In general, the requirements of D.H.O. Form 200 shall apply. However, for the materials other than rock the following restrictions will apply:

Maximum Passing #100 Sieve...3% to 40%
Maximum Passing #270 Sieve...3% to 15%
Plasticity Index.....Maximum of 5%
Percent Clay.....Maximum of 10%
Natural Moisture.....Maximum of 5% over optimum

changed by H.O.

P. F. Weber

PFW/js.

P. F. Weber,
SR. PROJECT SOILS SUPERVISOR.

cc: G. A. Wrong

In accordance with the first paragraph of this Tender the Contractor hereby offers to complete the work specified in the Contract for the following prices for

CONTRACT NO. 68-108

ITEM NO.	SPEC. NO.	ITEM	UNIT	QUANTITY	UNIT PRICE	TOTAL
BROUGHT FORWARD						
1	200,SP	Clearing (1)	Acre	16		
2	200	Grubbing (2)	Acre	16		
3	200,SP	Earth Excavation (Grading) (3)	C.Y.	277,000		
4	200,SP	Earth Borrow (Outside Right-of-way) (4)	C.Y.	119,000		
5	200,SP	Rental of Crawler Mounted Dragline (1 C.Y. Minimum Operated) (5)	Hour	2,650	23.75	62,937.50
6	200,SP	Compaction Equipment Rental (Sheepsfoot Roller and Tractor) (6)	Hour	1,000	16.50	16,500.00
7	200,SP	Compaction Equipment Rental (Pneumatic-Tired Wobble-Wheel Roller and Tractor) (7)	Hour	1,300	9.45	12,285.00
8	200,314 SP	Application of Water (8)	Thousand Gals.	1,300		
9	SP	Grader Rental (100 H.P. Tandem Drive) (9)	Hour	50	11.70	585.00
10	316,318 432,SP	Sand Cushion (10)	Ton	28,500		

EARTH EXCAVATION (GRADING) - Item No. 3.

Benching of Earth Slopes -

Where benching of earth slopes is required in accordance with Standard DD-414, no measurement or payment shall be made in respect of quantities excavated during this operation.

EARTH EXCAVATION (GRADING) - Item No. 3.

Disposal of Excess Material

Of approximately 28,700 cubic yards of excess earth material, 21,700 cubic yards shall be disposed of at the Charles Daly Park fill area as shown on the Contract Drawings.

The remainder shall be disposed of within the right-of-way by flattening side slopes as directed by the Engineer.

All costs arising from the disposal of excess material shall be deemed to be included in the unit price bid for earth excavation (grading).

EARTH EXCAVATION (GRADING) - Item No. 3.

EARTH BORROW (OUTSIDE RIGHT-OF-WAY) - Item No. 4.

Swamp Backfill

Under the above items, Materials placed as swamp backfill within the limits as shown on the Contract Drawings shall consist of sands, gravels or sandy glacial till. In general, the requirements of D.H.O. Form 200 shall apply with the exception that they shall meet the following requirements:

Maximum passing #100 sieve	-	3% to 85%
Maximum passing #270 sieve	-	3% to 60%
Plasticity index	-	Maximum of 5%
Clay fractions	-	Maximum of 15%
Natural moisture	-	Maximum of 6% over optimum

Materials meeting these gradation requirements are located on and adjacent to the job, in the form of outwash of variable thickness over clay.

EARTH BORROW (OUTSIDE RIGHT-OF-WAY) - Item No. 4.

Material Available from Department-Owned Property

Approximately 119,000 c.y. of earth borrow is available free of charge on this Contract from Department-Owned property in the following location:

Township of Louth, Lot 12 Conc. 1, from the North Service Roads's North R.O.W. limit to the edge of the Lake Ontario embankment between Sta. 154 and Sta. 167.

167 ±

Should the Contractor elect to obtain borrow from the above, the Contractor shall comply with the following terms and conditions:

1. All topsoil shall be removed, piled and stored by the Contractor before any borrow material is taken.
2. The area from which the borrow material is to be taken shall be designated and staked out as directed by the Engineer.
3. The Contractor shall comply with the grades set by the Engineer.
4. The Contractor's vehicles and other equipment shall be operated only along and upon such service road right-of-way and areas as designated by the Engineer.
5. The quality and quantity of the borrow material are not guaranteed by the Department.
6. Upon completion of operations in the above-described property the Contractor shall reshape the area so that there is satisfactory drainage and shall replace and uniformly spread topsoil over the area of excavation where directed and to the satisfaction of the Engineer.

RENTAL OF CRAWLER MOUNTED DRAGLINE (1 CU.YD. MINIMUM OPERATED - Item No. 5.

Under this item the Contractor shall furnish and operate a Crawler Mounted Dragline (1 cu. yd. minimum) in order to excavate to the

Basis of Payment -

Paragraph (a) of Section 214-11 of Form 200 shall be deleted and replaced by the following paragraph:

- (a) For the hours during which the equipment is actually employed, payment will be made at the applicable unit price per hour as specified on the Tender, or, for approved special equipment, either at the rate listed for that equipment in D.H.O. Form 527, or, for equipment not therein listed, at the rate established by the Department on the basis used in computing the 527 rates PLUS in either case 135% of the applicable Labour Rate for the Labour Zone and Classification of the operator shown in the Fair Wage Schedule for the Contract.

Such payment shall constitute full compensation for furnishing all necessary labour, equipment and materials and for properly operating the unit in accordance with the requirements of the Contract.

APPLICATION OF WATER - Item No. 8.

Water shall be applied by means of approved equipment capable of distributing it uniformly and with proper control.

Water shall be measured for payment either by means of a tank of predetermined volume or by means of an accurate meter, and all costs so arising shall be deemed to be included in the Contract unit price for this item.

GRADER RENTAL (100 H.P. MINIMUM TANDEM DRIVE, OPERATED) - Item No. 9.

Under the above items, the Contractor shall furnish and operate the specified unit of equipment. Payment shall be made at the unit price per hour specified in the tender only for the time in which the equipment is in effective operation, and for work designated by the Engineer to be carried out on an equipment rental basis and for which a tender price basis of payment is not otherwise provided.

SAND CUSHION - Item No. 10.

Use of Spreader Boxes -

Except where placed as the lower 6 inches of granular base course on top of a rock grade, or where for any other reason,

the Engineer considers it impractical to do so, all material under this item shall be placed by use of spreader boxes of approved design, which shall be adjustable to place the material in layers of the specified widths and depths.

All costs relating directly or indirectly to this requirement shall be included in the unit price bid and no separate payment will be made therefor.

SAND CUSHION - Item No. 10.

Compaction -

Each layer of material shall be compacted to a minimum dry density of 100% of the maximum dry density as determined by the current Department procedure.

SELECTED GRANULAR BASE COURSE CLASS "A" - Item Nos. 11 & 12.

Stockpiling of Material -

Should it be required under the Contract, by the Contractor's scheduling of his work or for any other reason, to stockpile Selected Granular Base Course Class "A", the stockpiling site shall be:

- (a) provided by the Contractor unless otherwise noted in the Special Provisions,
- (b) cleared of all foreign materials and shall be well drained, reasonably level and firm, and
- (c) when directed by the Engineer, covered with a sand pad of a minimum depth of one foot.

Stockpiles shall be built in layers not to exceed three feet in depth and each layer shall be completed over the entire area of the stockpile before beginning the next layer. Coning of the stockpiles or spilling of material over the edges of the stockpiles will not be permitted. The material shall be handled at all times in a manner that will avoid undue segregation.

All costs incurred in providing and preparing the stockpiling sites, in providing and placing the sand pad when required and in building the stockpiles shall be considered incidental to and included in the unit price bid for Selected Granular Base Course Class "A" and no additional payment will be made for such work.

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

TO: Mr. C. Mirza,
Head, Soil Mechanics Section,
Geotechnical Office,
West Building.

FROM: L. D. Fisher,
Assistant to the Claims Engineer.

ATTENTION:

DATE: March 27, 1975

OUR FILE REF.

IN REPLY TO

SUBJECT: Re: Contract 69-151
Antici Construction Co. Ltd.
Claim by Moir Construction - Subcontractor
August 27, 1971

RECEIVED
GEOTECHNICAL OFFICE
APR - 1975
MINISTRY OF TRANSPORTATION & COMMUNICATIONS
SOIL MECHANICS

The above noted claim originated due to soil conditions found at Fifteen and Sixteen Mile Creeks, Piers A and B and resultant costs to crib excavations at the four pier footings and excavation costs.

Under a previous contract, 68-108, organic clay material was excavated to design dimensions in the area of the piers and backfilled with porous material. This material became saturated and when the 69-151 contractor attempted to excavate for the footings, the material was in what has been described as a "quick condition".

In your soils design report of February 3, 1967 WP 211-63, Page 12, you give a recommended gradation for backfill material.

Were any tests taken of material used for backfill and if so would you please forward copies of test results? This may be a major consideration in assessing this claim since the contractor has described the material on site as "silty sand to sandy silt in quick condition" and since the complete soils reports were available to the contractor at time of bidding, he may have expected a different condition based on your recommended backfill requirements.

Should you have any questions please call the undersigned.



L. D. Fisher,
Assistant to the Claims Engineer.
(for) J. W. MacDougall,
Claims Engineer.

LDF:dk

B-M.L.-4
64-1377

DEPARTMENT OF HIGHWAYS - ONTARIO

AGGREGATE SAMPLE

Contract or W.P. 69-151 Dist. A Hwy 62W (SR)
Work and location S. BERRY RD - JORDAN STATION
ELY TO 7TH STREET
County GLYCOLIN Twp. 154TH Lot _____ Con. _____
Militia sheet _____ Co-Ord _____
Pit name or owner FOUNTWILL
Pit location _____
FIFTEEN MI. CREEK - PIER 'A'
Haul route (condition, distance etc.) _____

SAMPLED FROM: Channelled face ☐, Truck ☐, Bin ☐,
Test pit ☐, Gradall ☐, Auger ☐, Stockpile ☐,
End of bell ☐, R.R. Car ☐, Road ☐.

DEPTH: From _____ to _____ Total depth _____

AT: Station, hole, face _____ Quantity (cu.yds.) _____

Formation _____

STRIPPING REQUIRED: G.B.C. & $\frac{5}{8}$ " _____ H.L. & Conc. _____

History of use _____

% Oversize: 8" _____ 4" _____ $2\frac{1}{2}$ " _____ 1" _____ #4 _____

Intended use _____

Additional information SAND CUSHION USED FOR
SWAMP B/EILL AT PIER 'A' (WEST
15 MI. CREEK

CONTRACT SAMPLE

Preliminary ☐
Production ☐

NON-CONTRACT SAMPLE

Proposed ☐
Research ☒

FIELD OPINION: Acceptable ☐, Borderline ☐, Unsatisfactory ☐
Quality _____

DATA FORWARDED: Sketch ☐, Field notes ☐, Correspondence ☐

TESTS REQUIRED

P.N. ☐, P.I. ☐, L.A. ☐, MgSO₄ ☐, Abs. ☐, S.G. ☐,
Moisture ☐, Proctor ☐, Pass # 200 ☐, % Crushed ☐,
Organic ☐, % Flats ☐, Gradation ☒,
Special tests _____

MIX DESIGN: Hot mix _____ Concrete _____ PSI

Sampled by P. PEINEV Date MARCH 24/75

Field sample no. 70XEL1007 Lab. sample no. 70X-5015

Date required ASAP Date received _____

Results to T. KUCH



OD-ML-4
64-1377

DEPARTMENT OF HIGHWAYS - ONTARIO

AGGREGATE SAMPLE

Contract or W.P. 69-151 Dist. 4 Hwy Q.E.W.
Work and location S. TERRY RD - JORDAN STATION
ELY TO 7TH STREET
County LINCOLN Twp. LEITCH Lot Con
Militia sheet Co-Ord
Pit name or owner 15 FIFTEEN MILE CR.
Pit location PIER 'B'

Haul route (condition, distance etc.)

SAMPLED FROM: Channelled face ☐, Truck ☐, Bin ☐,
Test pit ☐, Gradall ☐, Auger ☐, Stockpile ☐,
End of belt ☐, R.R. Car ☐, Road ☐.

DEPTH: From to Total depth

AT: Station, hole, face Quantity (cu.yds.)

Formation

STRIPPING REQUIRED: G.B.C. & $\frac{5}{8}$ " H.L. & Conc.

History of use

% Oversize: 8" 4" $2\frac{1}{2}$ " 1" #4

Intended use

Additional information SAND CUSHION BACKFILL
MATERIAL USED FOR SWAMPED/FILL
AT PIER 'B' (EAST)

CONTRACT SAMPLE

Preliminary ☐
Production ☐

NON-CONTRACT SAMPLE

Proposed ☐
Research ☒

FIELD OPINION: Acceptable ☐, Borderline ☒, Unsatisfactory ☐

Quality

DATA FORWARDED: Sketch ☐, Field notes ☐, Correspondence ☐

TESTS REQUIRED

P.N. ☐, P.I. ☐, L.A. ☐, MgSO₄ ☐, Abs. ☐, S.G. ☐,
Moisture ☐, Proctor ☐, Pass # 200 ☐, % Crushed ☐,
Organic ☐, % Flats ☐, Gradation ☒.

Special tests

MIX DESIGN: Hot mix Concrete

Sampled by P. PENEY Date FEB 16/76
Field sample no. 70 XE1003 Lab. sample no. 70 0-5-001
Date required FEB 24/76 Date received
Results to P. WEBER

DD-MI-4
64-1377

DEPARTMENT OF HIGHWAYS - ONTARIO

AGGREGATE SAMPLE

Contract or W.P. 69-151 Dist. 4 Hwy Q.E.W.

Work and location S. GERRARD & TORRAN STATION
ELY TO 7TH STREET

County LINCOLN Twp. 16TH Lot. _____ Con. _____

Militia sheet _____ Co-Ord. _____

Pit name or owner SIXTEEN MILE CREEK BR

Pit location PIER 'A'

Haul route (condition, distance etc.) _____

SAMPLED FROM: Channelled face ☐, Truck ☐, Bin ☐,
Test pit ☐, Gradall ☐, Auger ☐, Stockpile ☐,
End of belt ☐, R.R. Car ☐, Road ☐.

DEPTH: From _____ to _____ Total depth _____

AT: Station, hole, face _____ Quantity (cu yds) _____

Formation _____

STRIPPING REQUIRED: G.B.C. & $\frac{5}{8}$ " _____ H.L. & Conc. _____

History of use _____

% Oversize: 8" _____ 4" _____ 2 $\frac{1}{2}$ " _____ 1" _____ #4 _____

Intended use _____

Additional information SAND CUSHION BACKFILL

MATERIAL USED FOR SHAPE B/FILL

AT PIER 'A' (WEST) - SIXTEEN MILE

CREEK BRIDGE

CONTRACT SAMPLE

Preliminary ☐
Production ☐

NON-CONTRACT SAMPLE

Proposed ☐
Research ☒

FIELD OPINION: Acceptable ☐, Borderline ☐, Unsatisfactory ☐.

Quality _____

DATA FORWARDED: Sketch ☐, Field notes ☐, Correspondence ☐

TESTS REQUIRED

P.N. ☐, P.I. ☐, L.A. ☐, MgSO₄ ☐, Abs. ☐, S.G. ☐.

Moisture ☐, Proctor ☐, Pass # 200 ☐, % Crushed ☐.

Organic ☐, % Flats ☐, Gradation ☒.

Special tests _____

MIX DESIGN: Hot mix _____ Concrete _____ PSI

Sampled by P. PENEV Date FEB 16/70

Field sample no. 70XFI004 Lab. sample no. 70-15-504

Date required FEB 26/70 Date received _____

Results to P. WEBER

DD-MI-4
64-1377

DEPARTMENT OF HIGHWAYS - ONTARIO

AGGREGATE SAMPLE

Contract or W.P. 64-151 Dist. 4 Hwy Q.F.W.
Work and location 3. SERV. RD - JORDAN STATION
ELY TO 7TH STREET
County LINCOLN Twp. LOUTH Lot Con
Militia sheet Co-Ord
Pit name or owner SIXTEEN MILE CREEK BR
Pit location (PIER 'B')

Haul route (condition, distance etc.)

SAMPLED FROM: Channelled face ☐, Truck ☐, Bin ☐,
Test pit ☐, Gradall ☐, Auger ☐, Stockpile ☐,
End of belt ☐, R.R. Car ☐, Road ☐.

DEPTH: From to Total depth

AT: Station, hole, face Quantity (cu.yds.)

Formation

STRIPPING REQUIRED: G.B.C. & $\frac{5}{8}$ " H.L. & Conc.

History of use

% Oversize: 8" 4" 2 $\frac{1}{2}$ " 1" #4

Intended use

Additional information SAND CUSHION BACKFILL
MATERIAL USED FOR SWAMP B/FILL
AT PIER 'B' (ELST) - SIXTEEN
MILE CREEK BRIDGE

CONTRACT SAMPLE

Preliminary ☐
Production ☐

NON-CONTRACT SAMPLE

Proposed ☐
Research ☒

FIELD OPINION: Acceptable ☐, Borderline ☐, Unsatisfactory ☐
Quality

DATA FORWARDED: Sketch ☐, Field notes ☐, Correspondence ☐

TESTS REQUIRED

P.N. ☐, P.I. ☐, L.A. ☐, $MgSO_4$ ☐, Abs. ☐, S.G. ☐,
Moisture ☐, Proctor ☐, Pass # 200 ☐, % Crushed ☐,
Organic ☐, % Flats ☐, Gradation ☒.

Special tests

MIX DESIGN: Hot mix Concrete PSI

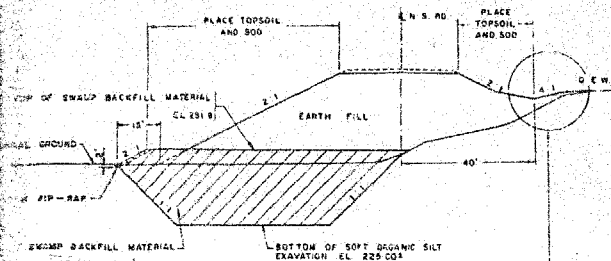
Sampled by P. PENEV Date FEB 12/70

Field sample no. 20 XE 1004 Lab. sample no. 70-16-5008

Date required FEB 26/70 Date received

Results to P. WEBER

SOFT ORGANIC SILT EXCAVATION AND BACKFILL

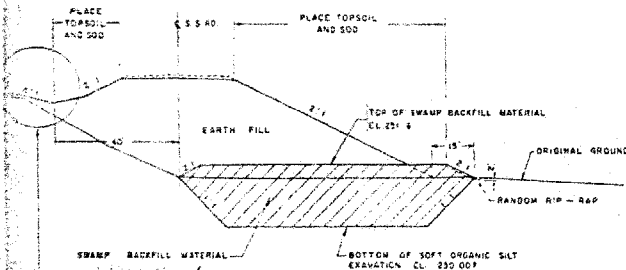


TYPICAL SECTION NORTH SERVICE ROAD AT 18-MILE CREEK

STA 150+50 TO STA 154+00

FOR GRADING ADJACENT TO Q.E.W.
STA 149+50 TO STA 154+50

SOFT ORGANIC SILT EXCAVATION AND BACKFILL

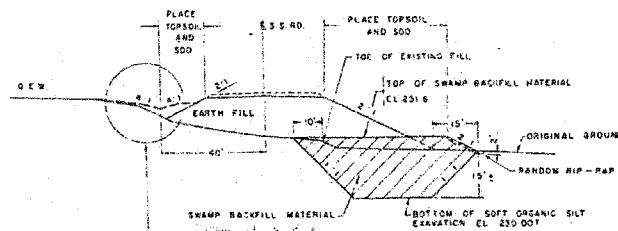


TYPICAL SECTION SOUTH SERVICE ROAD AT 18-MILE CREEK

STA 152+56 TO STA 159+25

FOR GRADING ADJACENT TO Q.E.W.
STA 151+20 TO STA 159+25

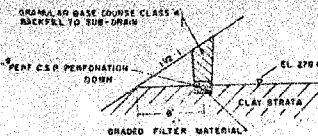
SOFT ORGANIC SILT EXCAVATION AND BACKFILL



TYPICAL SECTION SOUTH SERVICE ROAD AT 16-MILE CREEK

STA 181+60 TO STA 187+45

FOR GRADING ADJACENT TO Q.E.W.
STA 181+60 TO STA 185+30
STA 186+75 TO STA 187+45



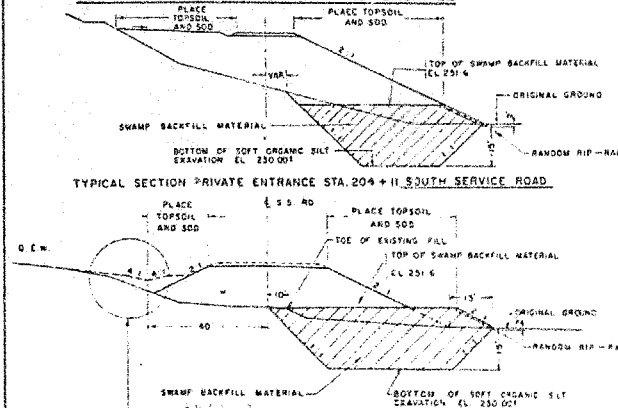
DETAIL 'A'

NOTE: INVERT ELEVATION OF PERFORATED SUB-DRAIN TO BE
6" BELOW THE CLAY STRATA.
THIS TYPICAL SECTION TO BE USED IN CONJUNCTION
WITH DD 202-A-LT. B DD-237-B RF.

TYPICAL SECTION SOUTH SERVICE ROAD WITH SUB-DRAIN
INSTALLATION

STA 187+45 TO STA 194+46
STA 196+00 TO STA 197+60

SOFT ORGANIC SILT EXCAVATION AND BACKFILL



TYPICAL SECTION PRIVATE ENTRANCE STA. 204+11, SOUTH SERVICE ROAD

TYPICAL SECTION SOUTH SERVICE ROAD AT 15-MILE CREEK

STA 199+00 TO STA 203+30

FOR GRADING ADJACENT TO Q.E.W.
STA 187+60 TO STA 199+50
STA 203+00 TO STA 203+80

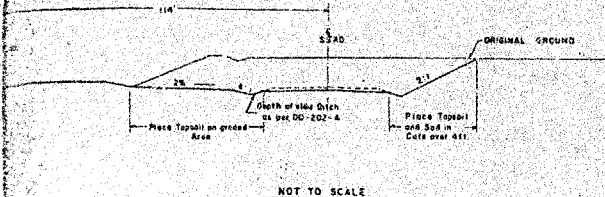
TYPICAL SECTIONS
NOT TO SCALE

APPROVED: [Signature]

DATE: [Date]

30M 3-13

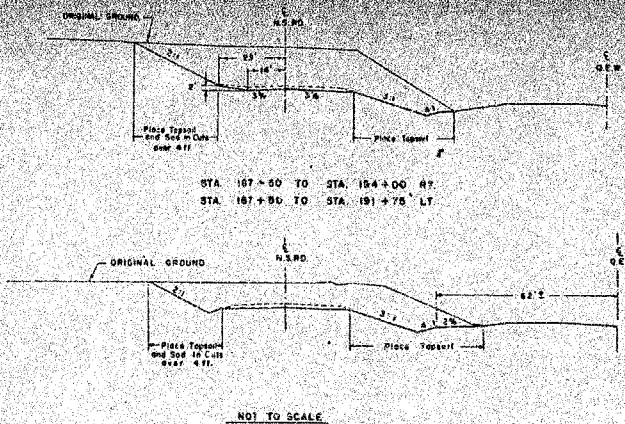
APPROVED BY: *[Signature]*
Date: *10/14/68*
Scale: *1" = 40'*
Sheet: *10/14/68*



TYPICAL EARTH GRADING SECTION SOUTH SERVICE ROAD

STA 149+55 TO STA 151+20
STA 159+25 TO STA 161+60

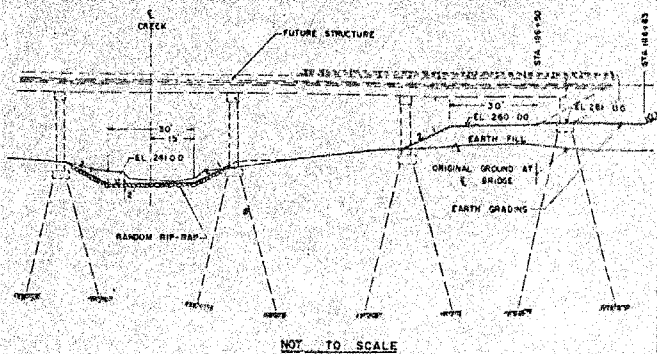
USE TYPICAL SECTION IN CONJUNCTION
WITH STANDARD DD-202-A



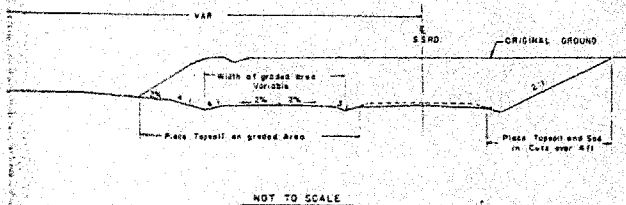
TYPICAL EARTH GRADING SECTIONS NORTH SERVICE ROAD

STA 154+50 TO STA 167+40

USE TYPICAL SECTIONS IN CONJUNCTION
WITH STANDARD DD-202-A & DD-237-B



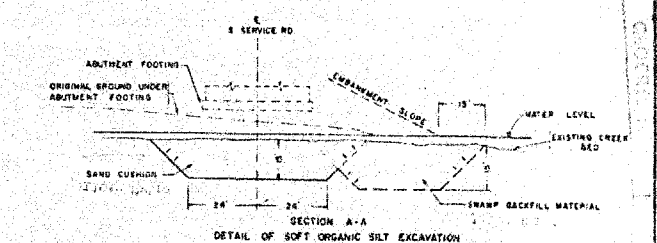
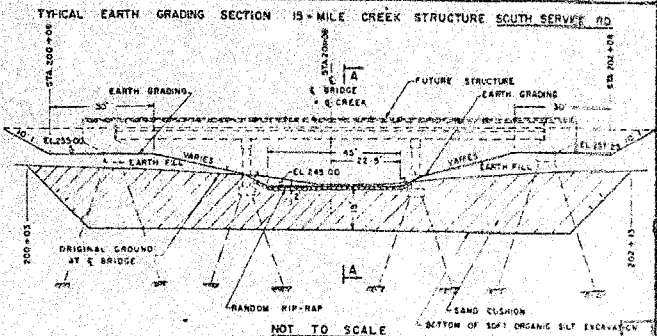
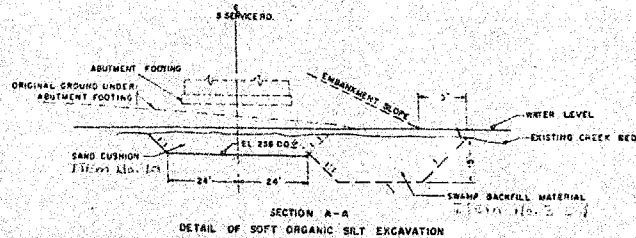
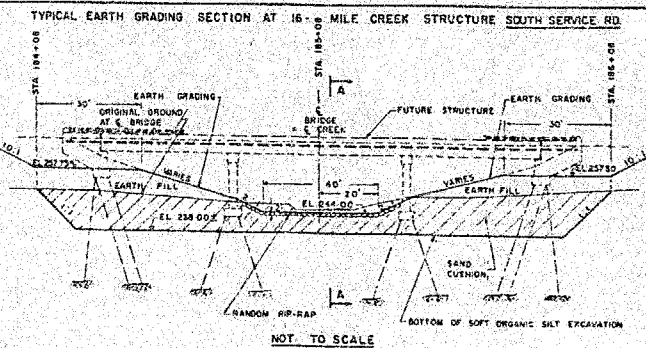
TYPICAL EARTH GRADING SECTION 18-MILE CREEK STRUCTURE NORTH SERVICE RD.



TYPICAL EARTH GRADING SECTION SOUTH SERVICE ROAD

STA 203+90 TO STA 213+00

USE TYPICAL SECTION IN CONJUNCTION
WITH STANDARD DD-202-A



c.c. J. G. Allen
J. B. Wilkes
C. R. Wilmot
J. M. Crannie

H. Kivi
C. R. Robertson

N.B. - Copies of claim
to follow.

Copies of Claim sent out Apr. 29/75

1201 Wilson Avenue,
Downsview, Ontario.
April 1, 1975.

Moir Construction Co. Ltd.,
Box 476,
St. Catharines, Ontario.

Attention: Mr. R. J. Roscoe, P. Eng.,
President.

Dear Sir: Re: Contract 69-151
 Claim - Moir Construction
 Antici Construction Company
 Limited - Prime Contractor
 \$19,591.80

This letter acknowledges receipt of your claim under covering letter of March 3, 1975 from Antici Construction Limited in the amount of \$19,591.80.

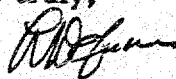
Antici Construction Co. Ltd., the prime contractor, have given their permission to deal directly with your company in an attempt to resolve this matter.

Your claim has now been registered and is presently under review.

I feel it would be advantageous to have a preliminary meeting at this office in order to discuss the various principles involved. To this end, please contact the undersigned at your convenience so that a meeting may be arranged.

I can be reached at Area Code 416 - 248-3611 and am located in Room 124 of the Central Building of the Ministry's offices located at Highway 401 and Keele St. in Downsview. In addition, would you please forward 5 additional copies of your claim to this office.

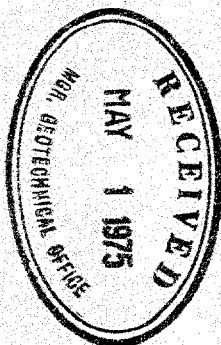
Yours truly,



L. D. Fisher,
Assistant to the Claims Engineer.
(for) J. W. MacDougall,
Claims Engineer.

LDF:dk

c.c. - Antici Construction Co. Ltd.



MEMORANDUM

TO: Mr. J. W. MacDougall,
Claims Engineer,
Room 124, Central Building.

FROM: Materials and Testing Office,
Central Region.

ATTENTION: Mr. L. Fisher

DATE: April 8, 1975

OUR FILE REF.

IN REPLY TO

SUBJECT:

Conditions of the Backfill Material
Used at Fifteen and Sixteen Mile Creek Structures
(Piers "A" and "B")
Contract #69-151, Hamilton District

Under the grading Contract #68-108, the organic material
- at the locations mentioned above was excavated and replaced
with the "selected backfill material".

1. The original gradation requirement for this material prepared by this office was changed by Head Office. Apparently, Mr. G. Hunter suggested the change and this office concurred with, which is evident from memo dated May 6, 1968.
2. The revised gradation was further discussed with Messrs. H. Tregaskes, G. Wrong and T. Kovich on July 11, 1968, and consequently it was approved by the Construction Engineer (H. Tregaskes). No written confirmation could be found in the file re this approval, except the note jotted down by Mr. T. Kovich on the bottom of the "Special Provision" of the revised gradation requirement for the swamp backfill (July, 1968).
3. The lab results of the samples that were taken during the grading operation indicated that the material used for backfill met the revised gradation requirement.
4. For your information the copies of the following memoranda are attached:
 - (a) Proposed Special Provision - April 24, 1968.
 - (b) Special Provision for S.B.M. - May 6, 1968.
 - (c) Special Provision (revised gradation) with note of approval (July, 1968).

PP/PFW/nr
Attach.


P. Penev,
Project Soils Engineer.

For: P. F. Weber,
Senior Soils Supervisor.



Memorandum

MP

To: Mr. J. W. MacDougall,
Claims Engineer,
Rm. 124, Central Building.

From: Materials and Testing Office,
Central Region.

Attention: Mr. L. Fisher

Date: June 9, 1975

Our File Ref.

In Reply to

Subject:

Swamp Backfill Materials
Contract 68-108

File under Cont 69-151

Further to our memorandum dated April 8, 1975, attached herewith are copies of the Contract Drawings on which has been indicated the locations of the Swamp Backfill areas and type of Backfill materials used.

This additional information was obtained from the Project Supervisor for this Contract, Mr. E. Smith.

From the drawings, it is evident that the swampy areas were backfilled with the materials paid under items 4 and 10 of tender. Gradation of the material used and paid for under item 4 was in accordance with Special Provision requirements, but on the other hand the sand cushion hauled from Fonthill did not comply with the gradation requirements. (Refer to the attached copies of the lab results of the sand cushion samples that were taken during the backfilling operation.

P. Penev

P

P. Penev,
Project Soils Engineer.

P. F. Weber,
Senior Soils Supervisor.

PP/PFW/jcc

cc: M. Devato





Memorandum

To: Mr. J.W. MacDougall
Claims Engineer
Engineering Claims Office

From: Mr. A. Rutka

Attention: Mr. L.D. Fisher
Our File Ref.

Date: 10th June 1975
In Reply to

Subject:

CONTRACT 69-151 - W.P. 211-63

Fifteen Mile Creek Bridge, Site No. 18-202
Sixteen Mile Creek Bridge, Site No. 18-203
Q.E.W. South Service Rd., Dist. #4 (Hamilton)
Claim - Moir Construction, Antici Construction
Company Limited - Prime Contractor

This office reviewed the claim by the Contractor for the above mentioned contract which relates to foundation work for piers A & B of Fifteen Mile Creek Bridge (Claim #1) and, also, for piers A & B of Sixteen Mile Creek Bridge (Claim #2). Our comments pertaining to Claim #1 and #2 are as follows:

1. Subsoil conditions at these two structure sites are, in general, very similar. The subsoil at these sites consists of a deep deposit of organic material underlain by a stratum of clayey silt and then shale bedrock. In order to ensure stability of these approach embankments, both in the longitudinal and transverse directions, removal of organic material with replacement by suitable granular type material was recommended in the respective foundation reports.
2. The grading work for these structure sites was carried out under a separate contract (68-108) which includes the removal of organic material and replacement with "Selected Backfill Material". The original gradation requirements for this material as per Soils Design Report submitted by the Regional Materials Section, dated February 3, 1967, are as follows:

- | | | |
|----------------------|---|------------------------------|
| - Passing #100 sieve | - | 3% to 40% |
| - Passing #270 sieve | - | 3% to 15% |
| - Clay Fraction | - | Maximum of 10% |
| - Plasticity Index | - | Maximum of 5% |
| - Natural Moisture | - | Max. of 5% over the optimum. |

Materials of the aforementioned gradation generally can only be obtained from commercial sources; consequently, this increases the cost of construction. In view of this, the gradation requirements for "Selected Granular Backfill Material" were modified after the Head Office Review Meeting, to permit the use of local granular type material, which was present in the form of a shallow sand layer over the clay or till in the vicinity of the project:

- | | | |
|------------------------------|---|----------------------|
| - Maximum Passing #100 sieve | - | 3% to 85% |
| - Maximum Passing #270 sieve | - | 3% to 60% |
| - Plasticity Index | - | Max. 5% |
| - Percent Clay | - | Max. 15% |
| - Natural Moisture | - | Max. 6% over optimum |

3. The source of the actual backfill material is not known by this Office, but it is known that, from samples taken during the course of construction that the backfill material met the revised gradation requirements - which was, of course, much finer and siltier than the original gradation.
4. The structure construction was carried out under a separate contract (Cont.69-151) and, on the contract drawings of this project, the following note was shown on Drawing No. D-6103-1 and D-6126-1

"Under previous contract (Cont.68-108) all organic material to be excavated and replaced with "Selected Backfill Material."

In the Tender documents, however, no mention was made as to the type or the gradation requirements of the "Selected Backfill Material".

5. The construction of pier caps for both structures are located below the creek water in the backfill material shown as "Selected Backfill Material". The piers are supported on steel 'H' end bearing piles driven to bedrock. Construction of pile caps below the prevailing creek water level in non-cohesive material requires a dewatering scheme. This was discussed in the respective foundation reports, which stated that temporary sheeting driven to a depth of 5ft. below the anticipated base of the excavation would provide a suitable scheme of dewatering. However, the Contractor made an attempt to carry out the construction of pier caps in the following manner:

An impervious earth dyke was constructed between the pier cap excavation and the creek to prevent water entering the excavation. Excavation was then carried out in the "Selected Backfill Material" to the base elevation of the pile caps and, in addition, a clay seal of sufficient thickness was placed on all sides of the excavation except at the base of the excavation. According to available information, the Contractor lost the clay seal and encountered 'quick' conditions at the base of pile cap excavations.

When excavations are carried out in non-cohesive material below the prevailing water level, 'quick' conditions can be created. As a result, the base can be loosened and unable to support any loads.

It is understood that the Contractor finally used sheeting as suggested in the foundation report and, further more, that a concrete working slab was poured to act as a mat on the loose subsoil which was previously subjected to 'quick' conditions. This method successfully completed the construction of pier caps on both structure sites.

SUMMARY AND CONCLUSIONS

1. The contract documents (Cont.69-151) indicated that the base of the pier caps would be in the "Selected Backfill Material" below water level and, hence it should have been recognised that a dewatering scheme would be required. A scheme suggested in the foundation report was eventually used. The Contractor initially tried a scheme using clay to act as an impervious layer, which was not effective.
2. The revised backfill material although meeting the gradation requirements for this contract is much finer and siltier than the original proposed gradation. Such a fine grain granular type soil is susceptible to 'quick' conditions due to unbalanced hydrostatic condition. The original proposed gradation would also have been susceptible to 'quick' conditions. but probably to a lesser extent and it might have been possible to have used an oversized excavation with sumps.

3. The Contractor was aware that a dewatering scheme was required, but he did not know the type and gradation of the material he would encounter with his footing excavations. In this respect the contract documents should have shown the gradation of the "Selected Backfill Material" contained in Structure Contract 69-151, in order to assess the dewatering scheme required during the bedding stages at both structure sites.

A. Rutka

A. RUTKA

Manager, Geotechnical Office

MD/nn

C.C. W.G. Wigle

C. Mirza

Files

Record Services.

D. Gunter

GRAIN SIZE DISTRIBUTION

UNIFIED SOIL CLASSIFICATION SYSTEM

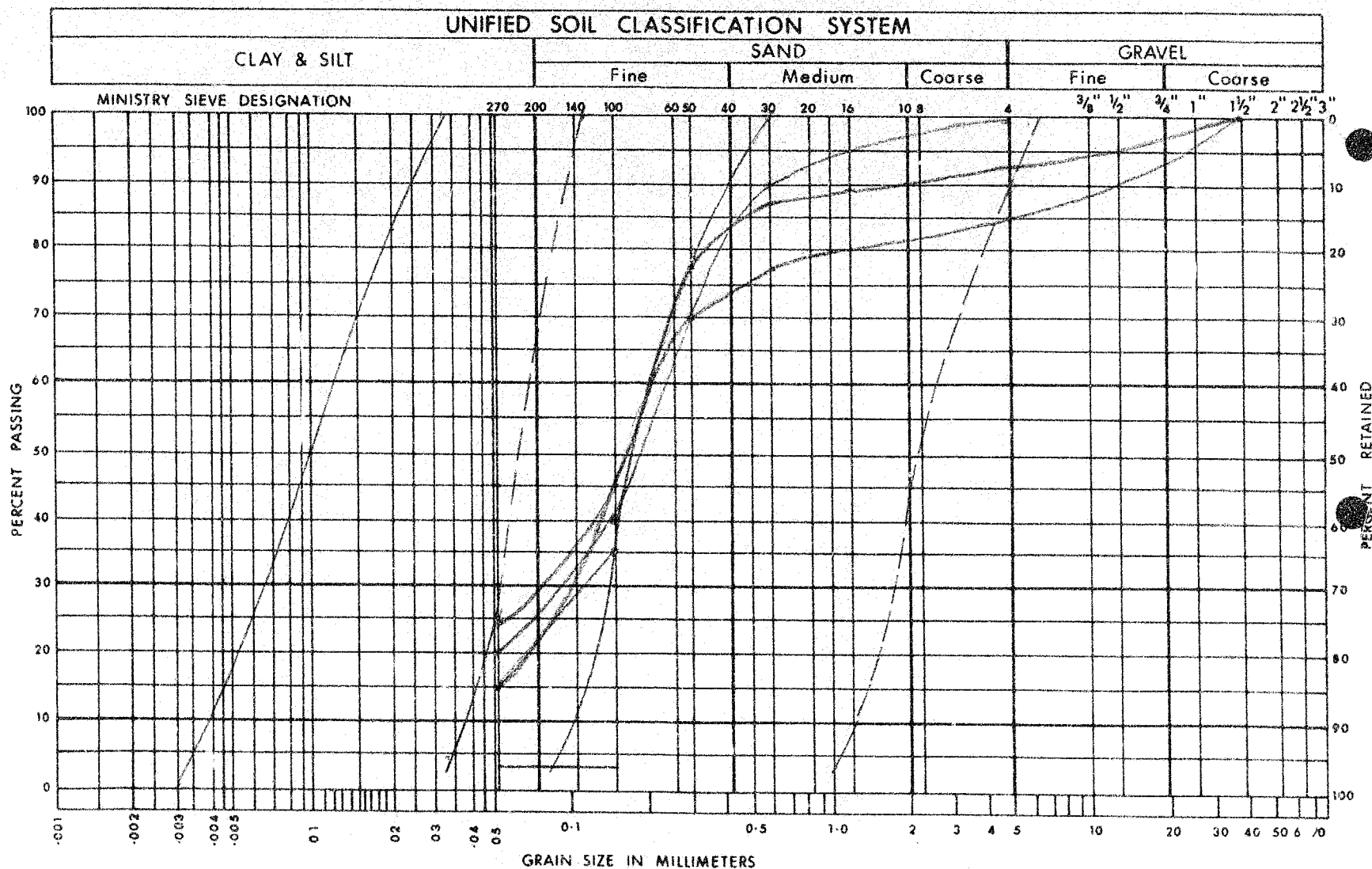


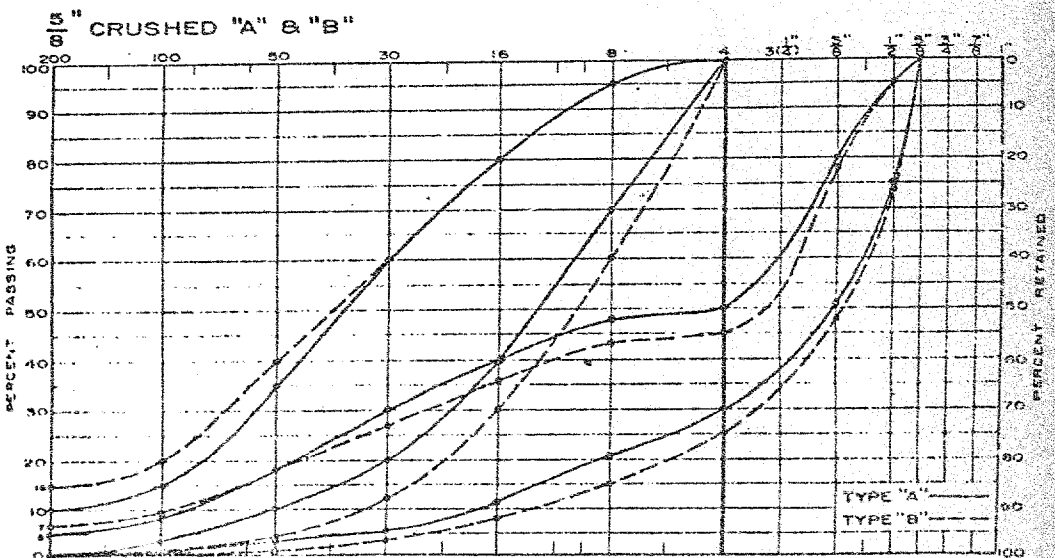
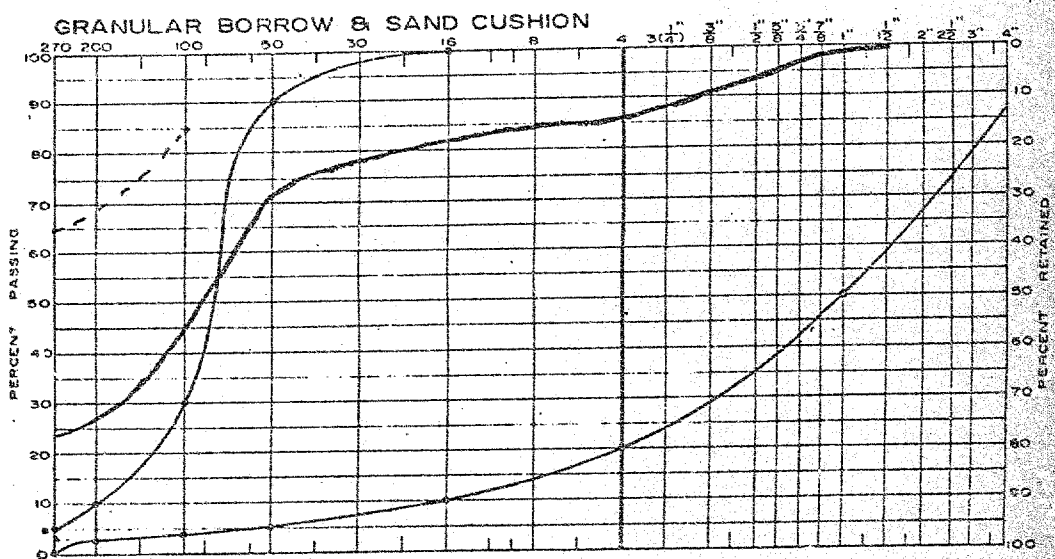
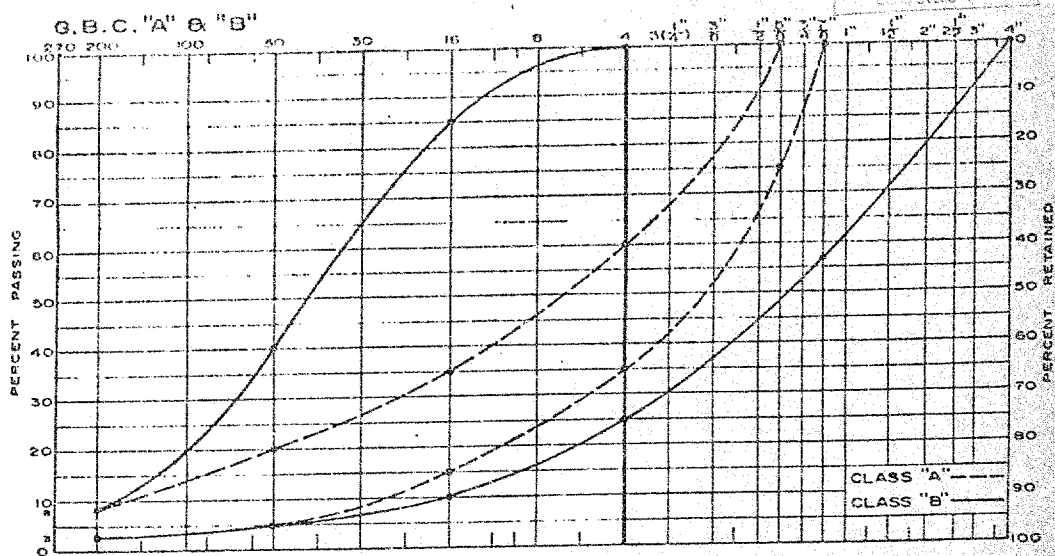
FIG.

W.O.

DEPARTMENT OF HIGHWAYS - ONTARIO
SEMI-LOG GRADING CHARTS
DEPARTMENT SIEVE DESIGNATION

30M3-13

CLASS "A" & "B"



NOTE: SPECIFICATION POINTS INDICATED BY DOTS.

IT-117
APRIL 1935

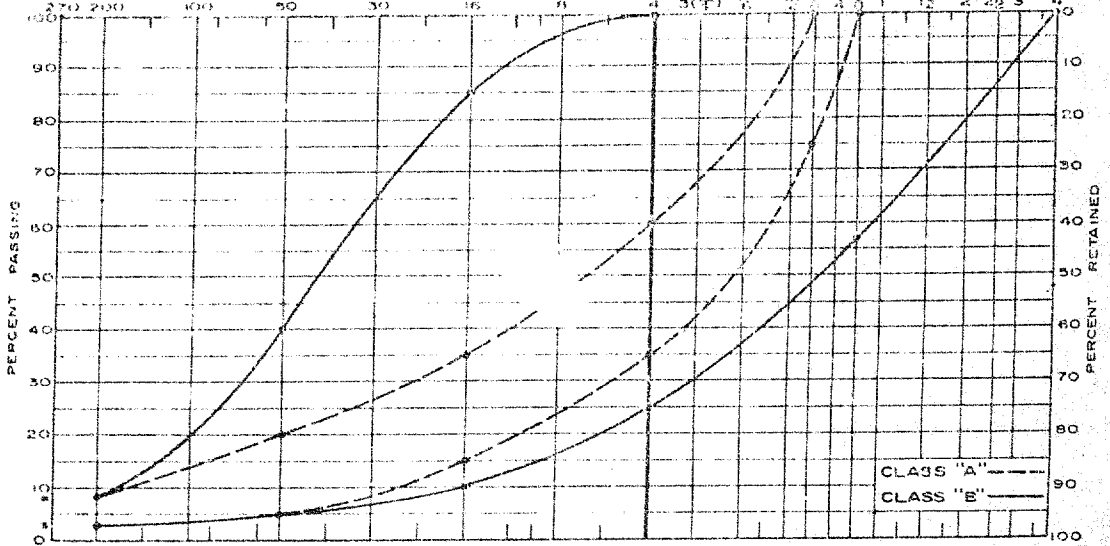
DEPARTMENT OF HIGHWAYS - ONTARIO

SEMI-LOG GRADING CHARTS
DEPARTMENT SIEVE DESIGNATION

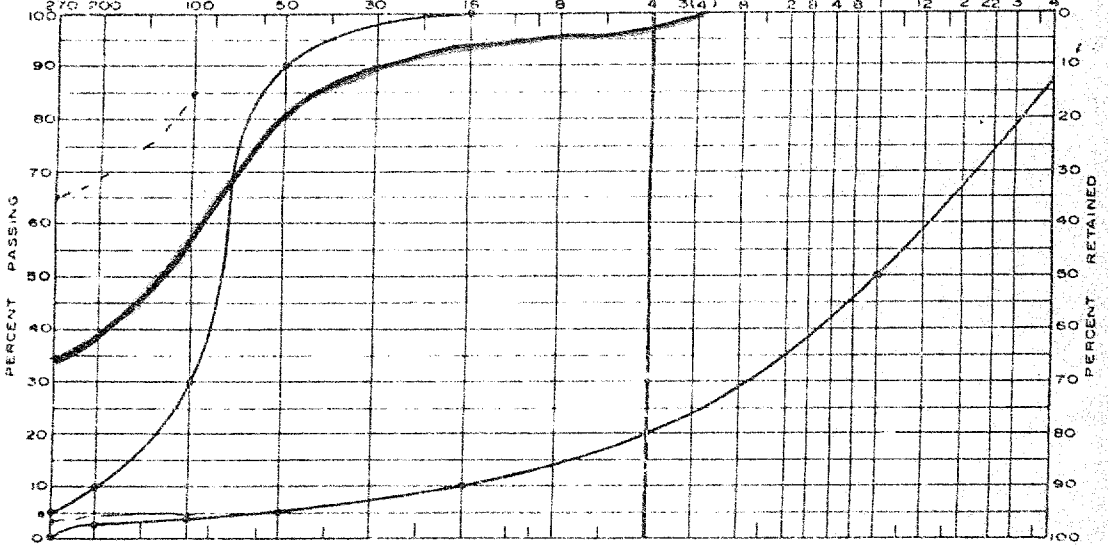
36M3-13

GEOCRES No.

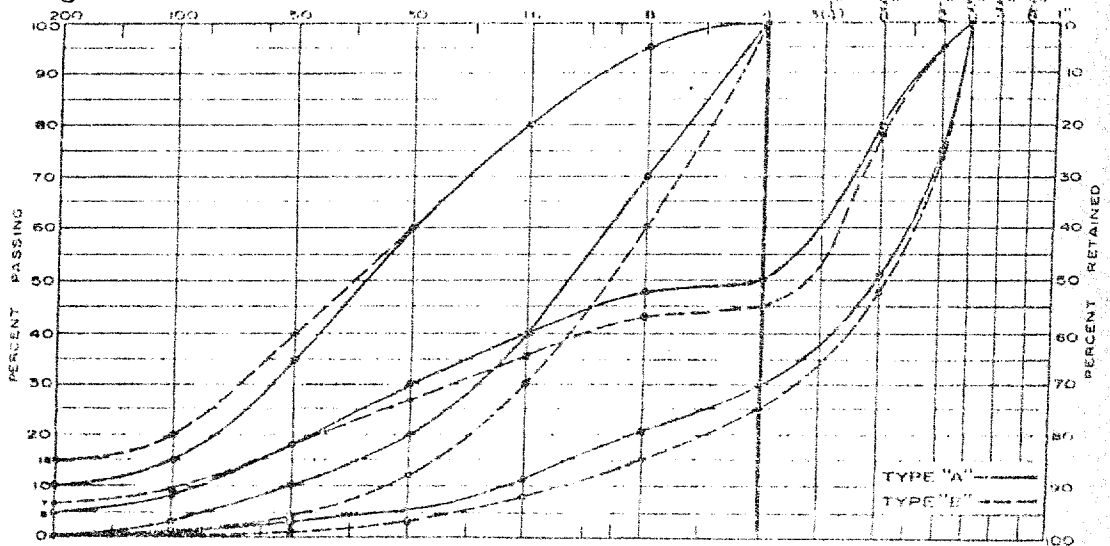
G.B.C. "A" & "B"



GRANULAR BORROW & SAND CUSHION



3/8" CRUSHED "A" & "B"



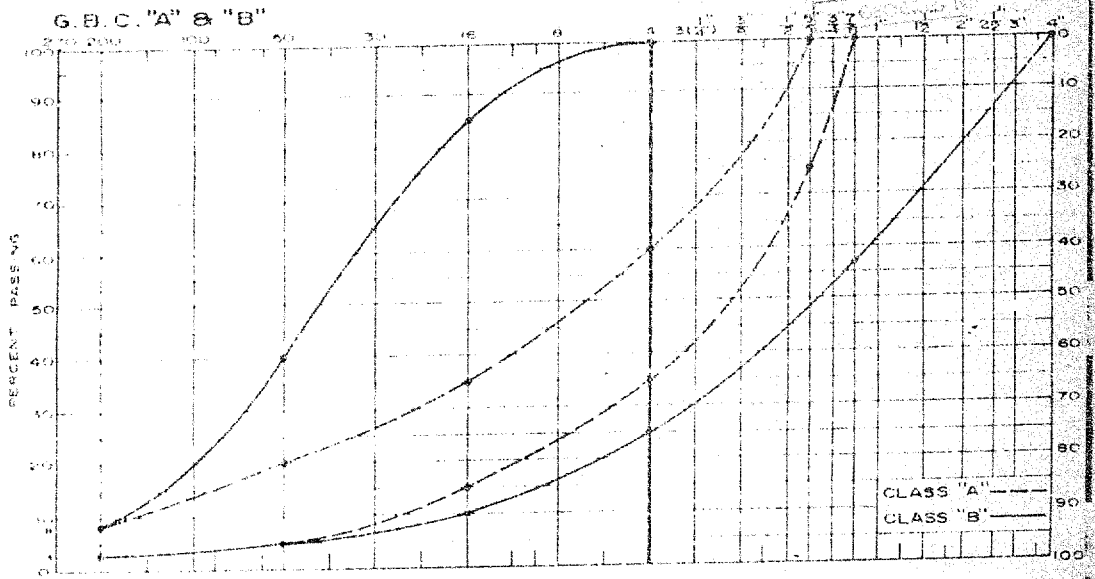
NOTE: SPECIFICATION POINTS INDICATED BY DOTS.

DEPARTMENT OF HIGHWAYS - ONTARIO

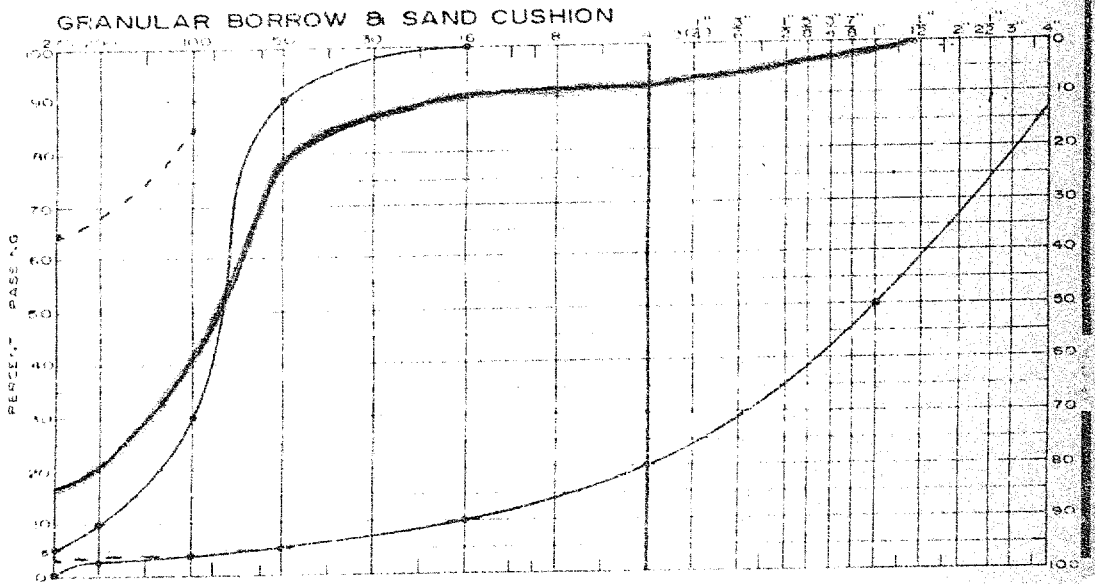
SEMI-LOG GRADING CHARTS DEPARTMENT SIEVE DESIGNATION

30m3-13

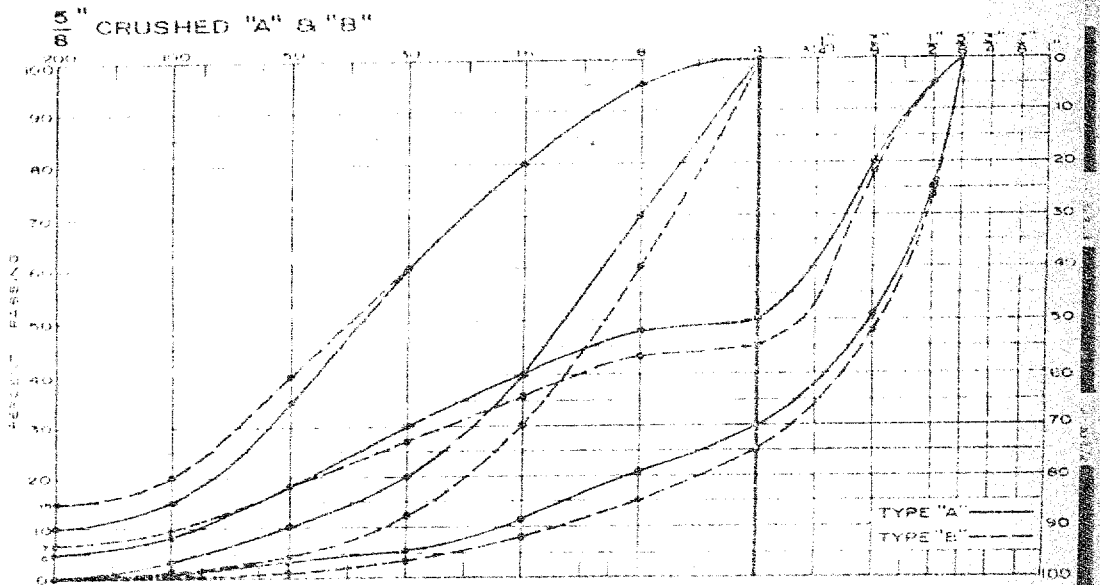
G.B.C. "A" & "B"



GRANULAR BORROW & SAND CUSHION



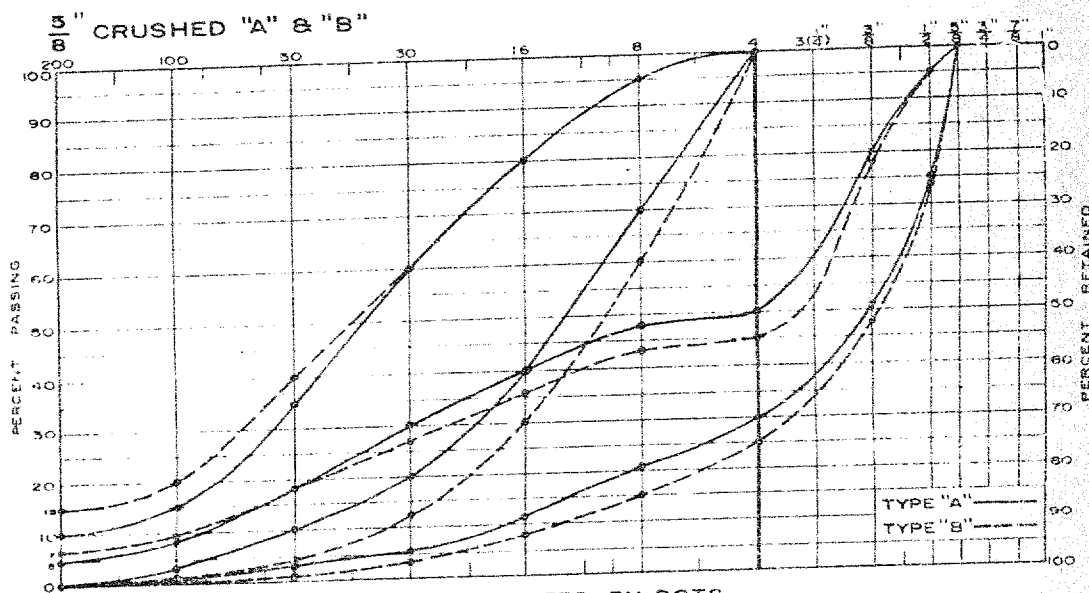
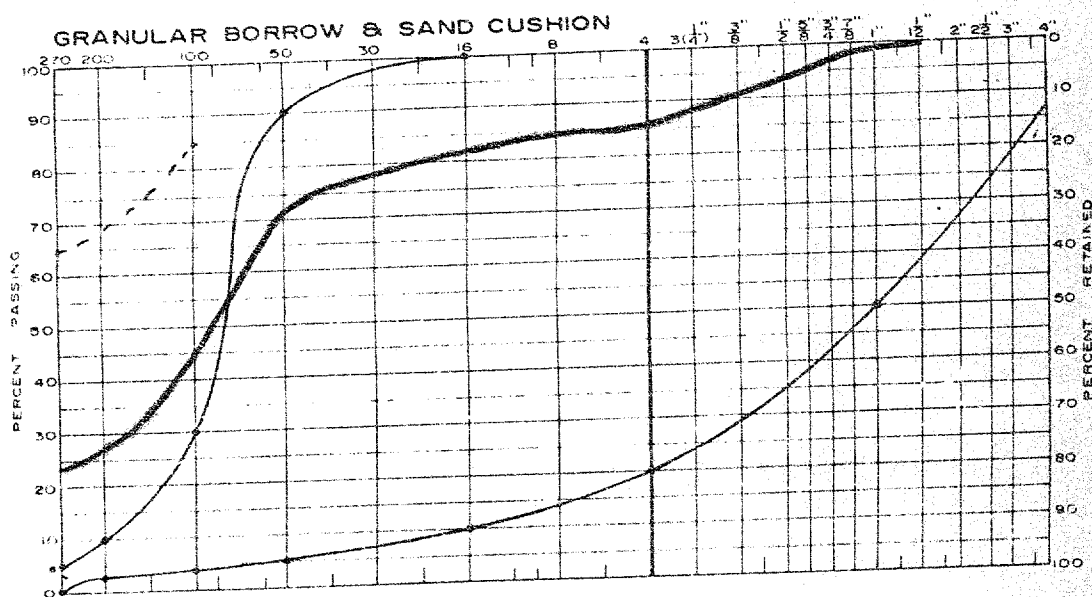
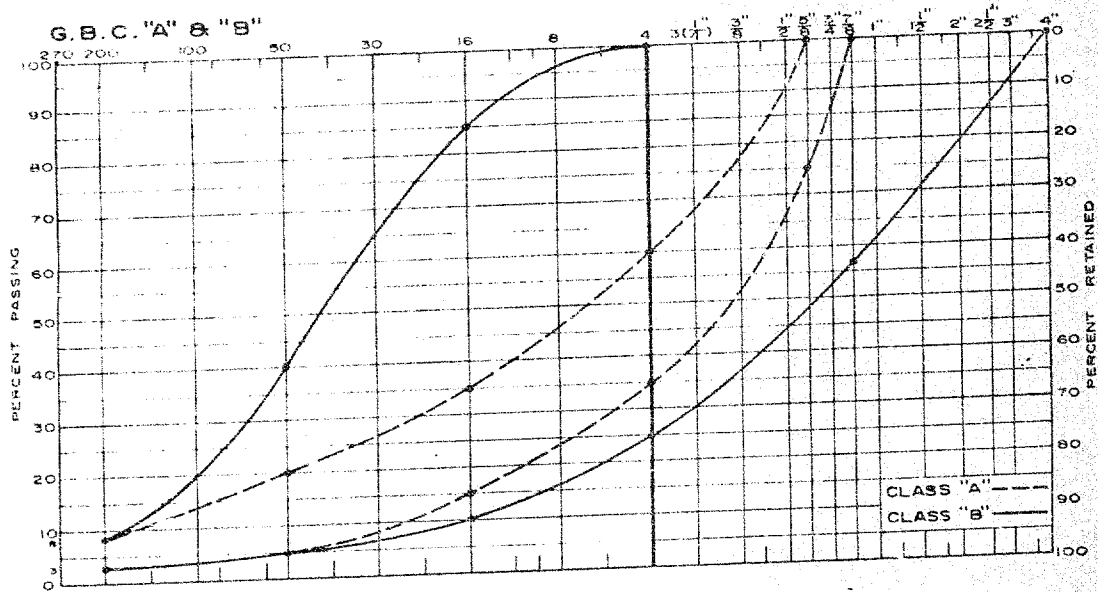
5/8" CRUSHED "A" & "B"



NOTE: SPECIFICATION POINTS INDICATED BY DOTS.

DEPARTMENT OF HIGHWAYS--ONTARIO
SEMI-LOG GRADING CHARTS
DEPARTMENT SIEVE DESIGNATION

30m3-13
GEOCRE'S No.



NOTE: SPECIFICATION POINTS INDICATED BY DOTS.

OVER

BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 4 CONTRACT NO. 69-151 STRUCTURE 7th St. LOUTHCONTRACTOR MOIR CONST. CO. (BERMINGHAM) DESIGN LOAD OF PILE 80 TONSHAMMER DETAILS: TYPE D-22 WEIGHT 2.4 TON HEIGHT OF FALL OR ENERGY 39800

TYPE OF ANVIL OR CAP _____ WEIGHT OF ANVIL OR CAP _____

PILE DETAILS 14" BP 73PILE NO. 6 LOCATION PIER 'C' EAST FOOTING DATE DRIVEN 5/19/70

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.
60	1	1	60	26	12	60	51	116		76	
	2	1		27	13		52	103		77	
	3	1		28	14		53	103		78	
	4	2		29	16		54	92		79	
	5	2		30	17		55	76		80	
	6	2		31	20		56	105		81	
	7	3		32	21		57	82		82	
	8	3		33	23		58	91		83	
	9	2		34	24		59	88		84	
	10	2		35	30		60	76		85	
	11	2		36	31		61	98		86	
	12	4		37	34		62	112		87	
	13	4		38	40		63	126		88	
	14	4		39	44		64	104		89	
	15	4		40	45		65	134		90	
	16	4		41	45		66	140		91	
	17	5		42	43		67	144		92	
	18	5		43	43		68			93	
	19	4		44	45		69			94	
	20	5		45	41		70			95	
	21	5		46	42		71			96	
	22	7		47	81		72			97	
	23	7		48	85		73			98	
	24	10		49	97		74			99	
	25	10		50	150		75			100	

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH	17	18	18	19	19	20
MEASURED REBOUND IN INCHES	5/8	1/2	1/2	3/4	7/8	3/4
FINAL LENGTH OF PILE	FINAL CUT OFF ELEVATION <u>70'2"</u>					

REPORT TO BE SENT TO: - PRINCIPAL FOUNDATION ENGINEER
MATERIALS & TESTING DIVISION
DEPARTMENT OF HIGHWAYS
DOWNSVIEW, ONTARIOSIGNED Richard D. ShafferNAME (PRINT) RICHARD SHAFFERDATE MAY 19/70

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.

BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 4 CONTRACT NO. 69-151 STRUCTURE 744 St. Louis

CONTRACTOR BERMINGHAM DESIGN LOAD OF PILE 80 Tons

HAMMER DETAILS: TYPE D-22 WEIGHT _____ HEIGHT OF FALL OR ENERGY _____

TYPE OF ANVIL OR CAP _____ WEIGHT OF ANVIL OR CAP _____

PILE DETAILS 14" RP 73

PILE NO. 2 LOCATION PIER 4 EAST FOOTING DATE DRIVEN 5/15/70

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.
60	1	1	60	26	12	60	51	83		76	
	2	1		27	14		52	121		77	
	3	1		28	15		53	146		78	
	4	2		29	18		54	146		79	
	5	2		30	21		55	138		80	
	6	2		31	20		56	134		81	
	7	2		32	24		57	127		82	
	8	2		33	26		58	137		83	
	9	1		34	29		59	161		84	
	10	2		35	30		60			85	
	11	1		36	31		61			86	
	12	2		37	33		62			87	
	13	3		38	33		63			88	
	14	3		39	36		64			89	
	15	3		40	37		65			90	
	16	3		41	38		66			91	
	17	4		42	30		67			92	
	18	4		43	33		68			93	
	19	5		44	33		69			94	
	20	5		45	31		70			95	
	21	6		46	43		71			96	
	22	7		47	66		72			97	
	23	8		48	98		73			98	
	24	9		49	120		74			99	
	25	10		50	107		75			100	

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH	18	18	19	19	20	20
MEASURED REBOUND IN INCHES	1/2	1/2	1/2	1/2	3/4	1/2
FINAL LENGTH OF PILE	FINAL CUT OFF ELEVATION <u>62' 4"</u>					

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

SIGNED Richard Shaker

NAME (PRINT) RICHARD SHAKER

DATE MAY 15/70

ATTACH SKETCH OF PILE NUMBERING SYSTEM

BRIDGE CONSTRUCTION — PILE DRIVING RECORD

DISTRICT NO. 4 CONTRACT NO. 69-151 STRUCTURE SEVENTH STREET UNDERPASS

CONTRACTOR BERMINGHAM DESIGN LOAD OF PILE 80 TONS

HAMMER DETAILS: TYPE D-22 WEIGHT 2.4 TONS HEIGHT OF FALL OR ENERGY 39.800

TYPE OF ANVIL OR CAP _____ WEIGHT OF ANVIL OR CAP _____

PILE DETAILS 14" BP 73

PILE NO. 3 LOCATION PIER B' EAST FOOTING DATE DRIVEN MAY 14 1970

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

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH	14	14	16	16	16	20
MEASURED REBOUND IN INCHES	$\frac{3}{4}$	$\frac{1}{2}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{3}{4}$
FINAL LENGTH OF PILE	FINAL CUT OFF ELEVATION <u>50' 5"</u>					

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

SIGNED George S. Cottage

NAME (PRINT) G.S. COTTAGE

DATE MAY 14 1970

ATTACH SKETCH OF PILE NUMBERING SYSTEM

BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 4 CONTRACT NO. 69-151 STRUCTURE SEVENTH STREET UNDERPASS

CONTRACTOR BERMINGHAM DESIGN LOAD OF PILE 80 TONS

HAMMER DETAILS: TYPE D-22 WEIGHT 2.4 TONS HEIGHT OF FALL OR ENERGY 39 800

TYPE OF ANVIL OR CAP _____ WEIGHT OF ANVIL OR CAP .25 TON

PILE DETAILS 14" BP 73

PILE NO. 14 LOCATION PIER 'B' EAST FOOTING DATE DRIVEN MAY 13 1970

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

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH	18	22	21	24	27	28
MEASURED REBOUND IN INCHES	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{5}{8}$	1	1	1
FINAL LENGTH OF PILE	FINAL CUT OFF ELEVATION					48' 11"

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

SIGNED George S. Cottage
NAME (PRINT) G. S. COTTAGE
DATE MAY 13 1970

ATTACH SKETCH OF PILE NUMBERING SYSTEM

BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 4 CONTRACT NO. 69-151 STRUCTURE SEVENTH STREET UNDERPASS

CONTRACTOR BERMINGHAM

DESIGN LOAD OF PILE 80 TONS

HAMMER DETAILS: TYPE D-22

WEIGHT 2.4 TONS HEIGHT OF FALL OR ENERGY 39800

TYPE OF ANVIL OR CAP

WEIGHT OF ANVIL OR CAP .25 Tons

PILE DETAILS 14" BP 73

PILE NO. 9 LOCATION PIER 'C' WEST FOOTING

DATE DRIVEN MAY 4 1970

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.
45	1			26	12		51	119		76	
	2	1		27	15		52			77	
	3	2		28	15		53			78	
	4	2		29	17		54			79	
	5	3		30	20		55			80	
	6	2		31	22		56			81	
	7	2		32	23		57			82	
	8	2		33	24		58			83	
	9	2		34	24		59			84	
	10	3		35	27		60			85	
	11	3		36	30		61			86	
	12	3		37	31		62			87	
	13	4		38	32		63			88	
	14	5		39	35		64			89	
	15	5		40	35		65			90	
	16	5		41	36		66			91	
	17	5		42	40		67			92	
	18	6		43	40		68			93	
	19	7		44	40		69			94	
	20	8		45	33		70			95	
	21	8		46	47		71			96	
	22	9		47	80		72			97	
	23	10		48	56		73			98	
	24	11		49	60		74			99	
	25	12		50	62		75			100	

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH			19	19	18	19
MEASURED REBOUND IN INCHES			$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{3}{4}$
FINAL LENGTH OF PILE <u>52'</u>	FINAL CUT OFF ELEVATION					

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

SIGNED George S. Cottage

NAME (PRINT) GEORGE S. COTTAGE

DATE MAY 4 1970

ATTACH SKETCH OF PILE NUMBERING SYSTEM

BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 4 CONTRACT NO. 69-151 STRUCTURE SEVENTH ST. LOUTH UNDERPASS

CONTRACTOR BERMINGHAM CONST DESIGN LOAD OF PILE 80 TONS

HAMMER DETAILS: TYPE D-22 WEIGHT 2.4 TONS HEIGHT OF FALL OR ENERGY 39,800

TYPE OF ANVIL OR CAP _____ WEIGHT OF ANVIL OR CAP .25 TON

PILE DETAILS 14" BP 73

PILE NO. 20 ~~19~~ LOCATION SEVENTH ST. NORTH ABUT DATE DRIVEN FEB 19/70

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.
45	1	2	45	26	12	90	51	42		76	
	2	2		27	13		52	43		77	
	3	2		28	13		53	43		78	
	4	2		29	15		54	45		79	
	5	3		30	16		55	53		80	
	6	3		31	17		56	61		81	
	7	3		32	19		57	66		82	
	8	3		33	21		58	91		83	
	9	2		34	22		59	123		84	
	10	3		35	24		60			85	
	11	3		36	23		61			86	
	12	3		37	26		62			87	
	13	3		38	29		63			88	
	14	2		39	28		64			89	
	15	2		40	32		65			90	
	16	4	90	41	34		66			91	
	17	3		42	32		67			92	
	18	7		43	35		68			93	
	19	7		44	32		69			94	
	20	8		45	27		70			95	
	21	8		46	40		71			96	
	22	8		47	38		72			97	
	23	8		48	40		73			98	
	24	9		49	38		74			99	
	25	10		50	41		75			100	

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH	17	18	18	18	18	18
MEASURED REBOUND IN INCHES	$\frac{7}{16}$	$\frac{7}{16}$	$\frac{1}{2}$	$\frac{7}{16}$	$\frac{1}{2}$	$\frac{1}{2}$
FINAL LENGTH OF PILE <u>60' 7"</u>	FINAL CUT OFF ELEVATION					

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

SIGNED George S. Cottage
NAME (PRINT) George S. Cottage

DATE FEB. 19 1970

ATTACH SKETCH OF PILE NUMBERING SYSTEM

CONTRACT 69-151
SEVENTH ST. LOUTH - NORTH ABUTMENT



BATTER THIS SIDE 1:10

11 20

11 19

11 18

11 17

11 16

11 15

11 4

11 3

11 2

11 1

11 0

11 9

11 8

11 7

11 6

11 5

11 4

11 3

11 2

11 1

BATTER THIS SIDE 1:4

BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 4 CONTRACT NO. 69-151 STRUCTURE SEVENTH STREET LOUTH
 CONTRACTOR BERMINGHAM CONST. DESIGN LOAD OF PILE 80 TON
 HAMMER DETAILS: TYPE B-225 WEIGHT 4,800 lb HEIGHT OF FALL OR ENERGY 25,000 lb-ft
 TYPE OF ANVIL OR CAP _____ WEIGHT OF ANVIL OR CAP 1,100 lb.
 PILE DETAILS 14' 'H' PILES 73 3/8 POUNDS PER FOOT
 PILE NO. 14 LOCATION SOUTH ABUTMENT DATE DRIVEN JAN 26/70

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.
45	1	16	45	26	24	90	51	81	90	76	82
	2	9		27	25		52	95		77	89
	3	5		28	28		53	107		78	128
	4	5		29	30		54	132		79	
	5	10		30	34		55	52		80	
	6	11		31	38		56	37		81	
	7	11		32	39		57	39		82	
	8	18		33	43		58	39		83	
	9	22		34	48		59	42		84	
	10	23		35	57		60	44		85	
	11	24		36	57		61	44		86	
	12	22		37	74		62	45		87	
	13	22		38	73		63	47		88	
	14	18		39	78		64	46		89	
	15	19		40	80		65	53		90	
	16	18	90	41	87		66	55		91	
	17	18		42	87		67	58		92	
	18	16		43	92		68	61		93	
	19	16		44	94		69	61		94	
	20	16		45	90		70	64		95	
	21	17		46	82		71	63		96	
	22	16		47	83		72	68		97	
	23	19		48	78		73	70		98	
	24	20		49	80		74	71		99	
	25	23		50	80		75	78		100	

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH	8	8	9	9	9	10
MEASURED REBOUND IN INCHES	5/8"	5/8"	5/8"	5/8"	3/4"	5/8"
FINAL LENGTH OF PILE	90'					
FINAL CUT OFF ELEVATION						80' 2"

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

SIGNED George S. Cottage
 NAME (PRINT) G. S. COTTAGE
 DATE JAN 26 1970

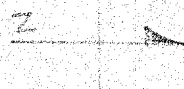
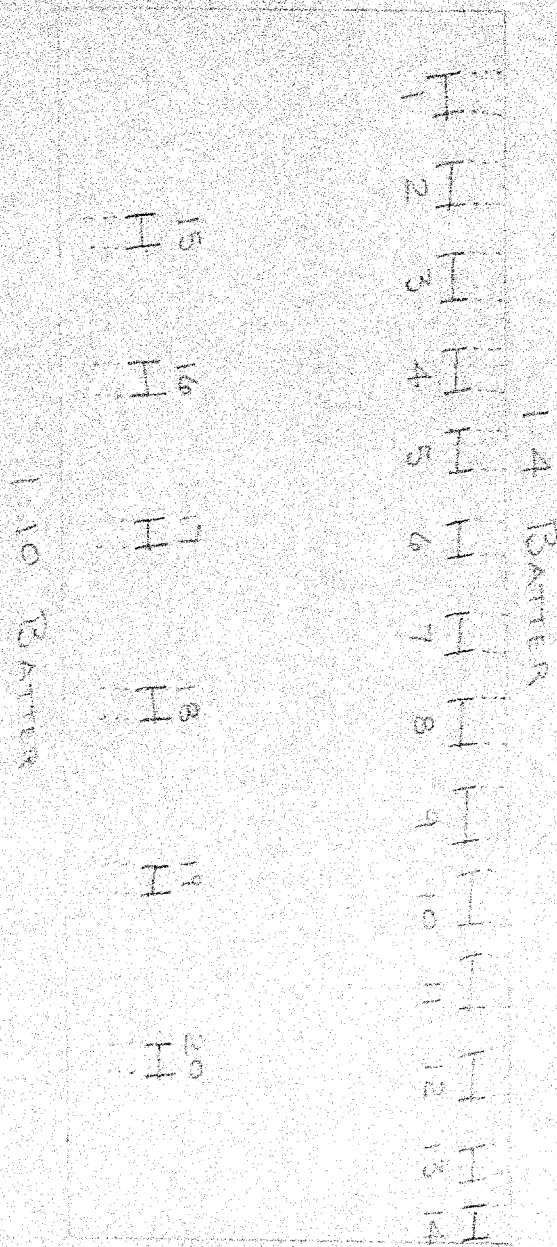
ATTACH SKETCH OF PILE NUMBERING SYSTEM

CONTRACT 67-151

JORDAN STA TO FIFTH ST LOUTH

SEVENTH ST LOUTH - SOUTH ABUTMENT

14" BP-73 PILES



BRIDGE CONSTRUCTION — PILE DRIVING RECORD

DISTRICT NO. 4 CONTRACT NO. 69-151 STRUCTURE SIXTEEN MILE CREEK
 CONTRACTOR BERMINGHAM CONST. DESIGN LOAD OF PILE 70 TONS
 HAMMER DETAILS: TYPE B-225 WEIGHT _____ HEIGHT OF FALL OR ENERGY 25000 LB/FT
 TYPE OF ANVIL OR CAP _____ WEIGHT OF ANVIL OR CAP 1,100 POUNDS
 PILE DETAILS 12 INCH 'H' PILES 53 POUNDS PER FOOT
 PILE NO. 4 LOCATION WEST ABUTMENT - NORTH SIDE DATE DRIVEN JAN 21/70

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.
48	1	7	48	26	23	80	51	30		76	
	2	4		27	27		52	30		77	
	3	1		28	27		53	31		78	
	4	1		29	27		54	30		79	
	5	1		30	27		55	37		80	
	6	2		31	29		56	38		81	
	7	2		32	31		57	41		82	
	8	3		33	31		58	45		83	
	9	4		34	31		59	48		84	
	10	4		35	32		60	46		85	
	11	6		36	32		61	50		86	
	12	5		37	30		62	53		87	
	13	5		38	30		63	81		88	
	14	6		39	29		64	126		89	
	15	7		40	27		65			90	
	16	7		41	28		66			91	
	17	11		42	27		67			92	
	18	13		43	26		68			93	
	19	14	80	44	29		69			94	
	20	15		45	29		70			95	
	21	17		46	27		71			96	
	22	20		47	28		72			97	
	23	20		48	27		73			98	
	24	22		49	25		74			99	
	25	23		50	27		75			100	

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH	9	9	10	9	9	10
MEASURED REBOUND IN INCHES	$\frac{1}{2}$ "	$\frac{9}{16}$ "	$\frac{7}{16}$ "	$\frac{9}{16}$ "	$\frac{1}{2}$ "	$\frac{7}{16}$ "
FINAL LENGTH OF PILE	66' 2" 80'			FINAL CUT OFF ELEVATION 66' 2"		

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

SIGNED George S. Cottage
NAME (PRINT) G.S. COTTAGE
DATE JAN. 21 1970

ATTACH SKETCH OF PILE NUMBERING SYSTEM

CONTRACT 69-151 JORDAN STA TO FIFTH ST LOUIS

SIXTEEN MILE CREEK - WEST ABOUT - NORTH SIDE

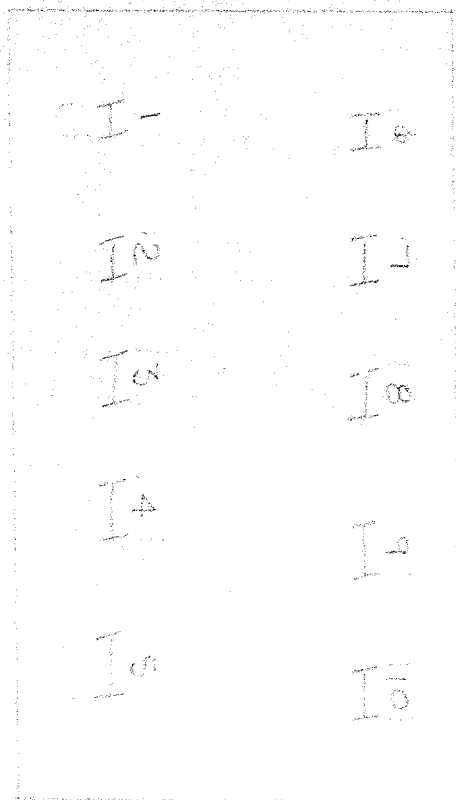
12" BP-53 PILES

PILES 2, 3, 4, 6, 7,
8, 9, 10

AT 1/4 BATTER

PILES 1 & 5 AT

1/10 BATTER



BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 4 CONTRACT NO. 69-151 STRUCTURE SIXTEEN MILE NORTH
 CONTRACTOR BERMINGHAM DESIGN LOAD OF PILE 70 TONS
 HAMMER DETAILS: TYPE B-225 WEIGHT 800 lbs. HEIGHT OF FALL OR ENERGY _____
 TYPE OF ANVIL OR CAP _____ WEIGHT OF ANVIL OR CAP 1,100 lbs.
 PILE DETAILS Using 50' "H" 14" Piles
 PILE NO. 2 LOCATION PIER #1 DATE DRIVEN JAN. 9/70

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			26	7		51			76	
	2			27	7		52			77	
	3			28	8		53			78	
	4			29	16		54			79	
	5			30	17		55			80	
	6			31	19		56			81	
	7	3		32	19		57			82	
	8	3		33	24		58			83	
	9	5		34	30		59			84	
	10	5		35	34		60			85	
	11	8		36	34		61			86	
	12	8		37	44		62			87	
	13	8		38	53		63			88	
	14	8		39	52		64			89	
	15	17		40	60		65			90	
	16	7		41	74		66			91	
	17	8		42	82		67			92	
	18	7		43	85		68			93	
	19	8		44	119		69			94	
	20	8		45			70			95	
	21	8		46			71			96	
	22	7		47			72			97	
	23	7		48			73			98	
	24	7		49			74			99	
	25	8		50			75			100	

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH						
MEASURED REBOUND IN INCHES						
FINAL LENGTH OF PILE	45' 9"			FINAL CUT OFF ELEVATION		

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

SIGNED [Signature]
 NAME (PRINT) J. ANDERSON

DATE JANUARY 9, 1970

ATTACH SKETCH OF PILE NUMBERING SYSTEM

SIXTEEN MILE CREEK NORTH.
PILE - DRIVING RECORD
PIER #1

1	5
2	6
3	7
4	8

BATTER 4:1
14" PILES



BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 4 CONTRACT NO. 69-151 STRUCTURE SIXTEEN MILE NORTH
 CONTRACTOR BERMINGHAM DESIGN LOAD OF PILE 70 TONS
 HAMMER DETAILS: TYPE B-225 WEIGHT 6800 lbs. WEIGHT OF FALL OR ENERGY
 TYPE OF ANVIL OR CAP WEIGHT OF ANVIL OR CAP 1100 lbs.
 PILE DETAILS USING 50' H" 14" PILES
 PILE NO. 7 LOCATION PIER #3 DATE DRIVEN JAN. 8/70

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		26	6			51			76	
	2	1	27	6			52			77	
	3		28	7			53			78	
	4		29	8			54			79	
	5	1	30	8			55			80	
	6		31	9			56			81	
	7		32	10			57			82	
	8	2	33	13			58			83	
	9	2	34	12			59			84	
	10	2	35	15			60			85	
	11	3	36	18			61			86	
	12	4	37	22			62			87	
	13	4	38	30			63			88	
	14	4	39	37			64			89	
	15	4	40	46			65			90	
	16	4	41	80			66			91	
	17	4	42	96			67			92	
	18	4	43	122			68			93	
	19	5	44				69			94	
	20	5	45				70			95	
	21	5	46				71			96	
	22	5	47				72			97	
	23	6	48				73			98	
	24	5	49				74			99	
	25	6	50				75			100	

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>44' 2"</u>	FINAL CUT OFF ELEVATION					

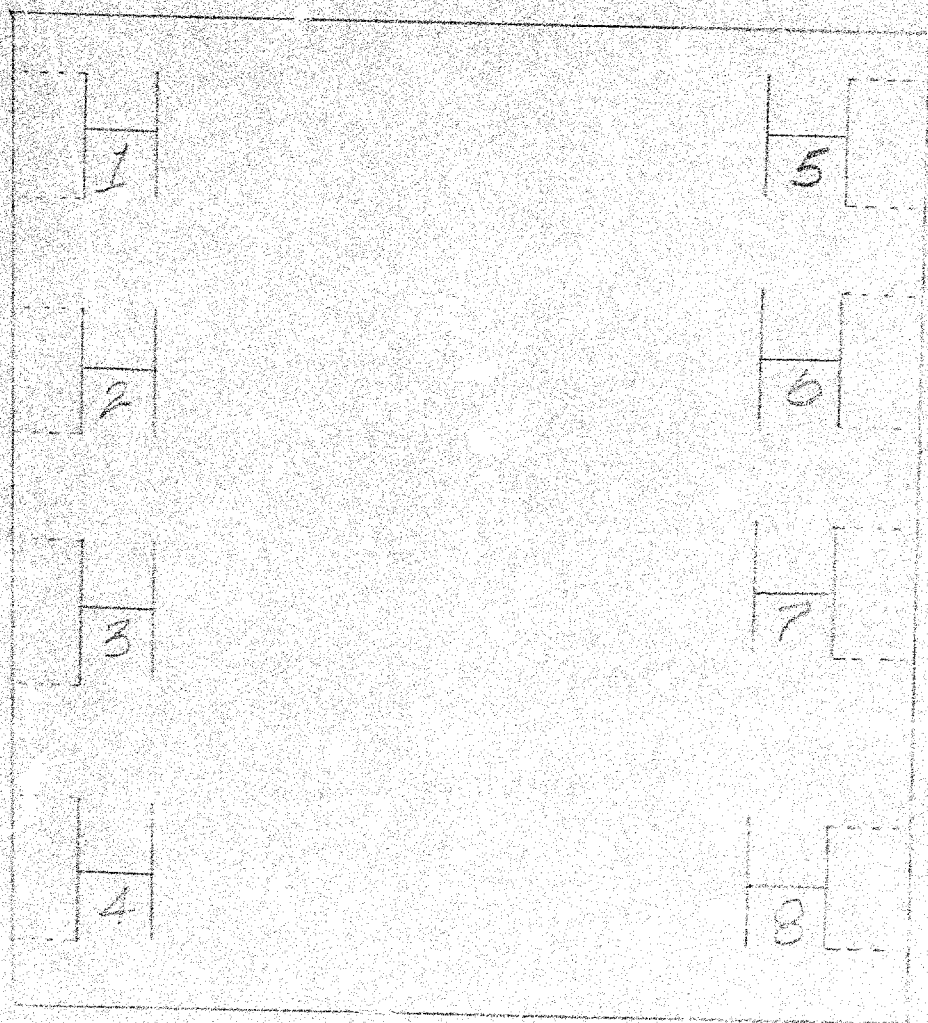
REPORT TO BE SENT TO: - PRINCIPAL FOUNDATION ENGINEER
 MATERIALS & TESTING DIVISION
 DEPARTMENT OF HIGHWAYS
 DOWNSVIEW, ONTARIO

SIGNED J. Anderson
 NAME (PRINT) J. ANDERSON

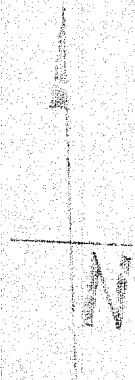
DATE January 8, 1970

ATTACH SKETCH OF PILE NUMBERING SYSTEM

SIXTEEN MILE CREEK NORTH.
PIER #3 - PILE DRIVING.



50' (14") 4" PILES.



BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 4 CONTRACT NO. 69-151 STRUCTURE SIXTEEN MILE CREEK N.
CONTRACTOR BERMINGHAM DESIGN LOAD OF PILE 70 TONS.
HAMMER DETAILS: TYPE B-225 WEIGHT 6800 lbs HEIGHT OF FALL OR ENERGY _____
TYPE OF ANVIL OR CAP _____ WEIGHT OF ANVIL OR CAP 1100 lbs.
PILE DETAILS Using 50' "H" 14" PILES.
PILE NO. 1 LOCATION PIER #2 DATE DRIVEN JAN. 8/90

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			26	5		51			76	
	2	1		27	5		52			77	
				28	6		53			78	
	4			29	5		54			79	
	5	1		30	5		55			80	
	6			31	5		56			81	
	7			32	7		57			82	
	8	1		33	8		58			83	
	9	1		34	12		59			84	
	10	1		35	13		60			85	
	11	1		36	17		61			86	
	12	2		37	23		62			87	
	13	2		38	29		63			88	
	14	2		39	30		64			89	
	15	3		40	42		65			90	
	16	3		41	60		66			91	
	17	4		42	82		67			92	
	18	5		43	132		68			93	
	19	6		44			69			94	
	20	6		45			70			95	
	21	6		46			71			96	
	22	6		47			72			97	
	23	6		48			73			98	
	24	6		49			74			99	
	25	5		50			75			100	

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH						
MEASURED REBOUND IN INCHES						
FINAL LENGTH OF PILE	44' 8"					
FINAL CUT OFF ELEVATION						

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

SIGNED J. Anderson
NAME (PRINT) J. ANDERSON
DATE January 8/1990
ATTACH SKETCH OF PILE NUMBERING SYSTEM

SIXTEEN MILE CREEK NORTH
PILE-DRIVING RECORD.
PIER 1

1	5
2	6
3	7
4	8

(14" PILES)

BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 4 CONTRACT NO. 69-151 STRUCTURE SIXTEEN MILE NORTH
CONTRACTOR BERMINGHAM DESIGN LOAD OF PILE 70 TONS.
HAMMER DETAILS: TYPE B-225 WEIGHT 6800 lbs. WEIGHT OF FALL OR ENERGY _____
TYPE OF ANVIL OR CAP _____ WEIGHT OF ANVIL OR CAP 1100 lbs.
PILE DETAILS Using 50' "H" 14" PILES.
PILE NO. 6 LOCATION PIER #4 DATE DRIVEN JAN. 7/70

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			26	5		51			76	
	2			27	5		52			77	
	3	1		28	6		53			78	
	4			29	6		54			79	
	5			30	6		55			80	
	6			31	6		56			81	
	7	2		32	6		57			82	
	8	2		33	6		58			83	
	9	2		34	6		59			84	
	10	2		35	7		60			85	
	11	2		36	7		61			86	
	12	2		37	7		62			87	
	13	3		38	8		63			88	
	14	3		39	8		64			89	
	15	3		40	8		65			90	
	16	3		41	8		66			91	
	17	3		42	9		67			92	
	18	4		43	9		68			93	
	19	4		44	11		69			94	
	20	4		45	12		70			95	
	21	4		46	52		71			96	
	22	4		47	126		72			97	
	23	5		48			73			98	
	24	5		49			74			99	
	25	5		50			75			100	

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>48' 7"</u>	FINAL CUT OFF ELEVATION					

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

SIGNED J. Anderson
NAME (PRINT) J. ANDERSON
DATE JANUARY 7, 1970
ATTACH SKETCH OF PILE NUMBERING SYSTEM

PILE - DRIVING RECORD
PIER #4 - PILE #6
SIXTEEN MILE NORTH

1	5
2	6
3	7
4	8

BATTER OF 4:1

BRIDGE CONSTRUCTION — PILE DRIVING RECORD

DISTRICT NO. 4 CONTRACT NO. 69-151 STRUCTURE SIXTEEN MILE NORTH
 CONTRACTOR BERMINGHAM DESIGN LOAD OF PILE 70 TONS
 HAMMER DETAILS: TYPE B-225 WEIGHT 6800 lbs HEIGHT OF FALL OR ENERGY _____
 TYPE OF ANVIL OR CAP _____ WEIGHT OF ANVIL OR CAP 1,100 lbs.
 PILE DETAILS Using 50' H" 14" PILES
 PILE NO. 1 LOCATION PIER #5 DATE DRIVEN JAN. 7/70

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			26	3		51			76	
	2			27	3		52			77	
	3	1		28	3		53			78	
	4			29	4		54			79	
	5			30	4		55			80	
	6			31	5		56			81	
	7			32	5		57			82	
	8	1		33	7		58			83	
	9	1		34	7		59			84	
	10	2		35	8		60			85	
	11	2		36	8		61			86	
	12	2		37	8		62			87	
	13	2		38	8		63			88	
	14	2		39	8		64			89	
	15	2		40	9		65			90	
	16	2		41	9		66			91	
	17	2		42	10		67			92	
	18	2		43	10		68			93	
	19	3		44	11		69			94	
	20	3		45	13		70			95	
	21	3		46	32		71			96	
	22	3		47	64		72			97	
	23	3		48	120		73			98	
	24	3		49	134		74			99	
	25	3		50			75			100	

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH						
MEASURED REBOUND IN INCHES						
FINAL LENGTH OF PILE	50'					
FINAL CUT OFF ELEVATION	JAN. 7/70					

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

SIGNED J. Anderson
 NAME (PRINT) J. ANDERSON
 DATE JAN. 7/70

ATTACH SKETCH OF PILE NUMBERING SYSTEM

PILE DRIVING RECORD

PIER #5 - PILE #2.

16 MILE CREEK NORTH.

1	5
2	6
3	7
4	8

BATTER OF 4:1

BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 4 CONTRACT NO. 69-151 STRUCTURE SIXTEEN MILE NORTH
 CONTRACTOR BERMINGHAM DESIGN LOAD OF PILE 70 TONS
 HAMMER DETAILS: TYPE B-225 WEIGHT 800 lb. HEIGHT OF FALL OR ENERGY 25,000
 TYPE OF ANVIL OR CAP _____ WEIGHT OF ANVIL OR CAP 1100 lbs.
 PILE DETAILS Using 46" H" PILES "14" BEFORE SPLICING.
 PILE NO. 4 LOCATION PIER #6 - DATE DRIVEN JAN 5/70

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		26	9		51				76	
	2	1	27	10		52				77	
	3		28	10		53				78	
	4		29	11		54				79	
	5		30	10		55				80	
	6	2	31	11		56				81	
	7	2	32	12		57				82	
	8	2	33	13		58				83	
	9	2	34	13		59				84	
	10	2	35	13		60				85	
	11	2	36	15		61				86	
	12	3	37	16		62				87	
	13	3	38	16		63				88	
	14	3	39	17		64				89	
	15	4	40	17		65				90	
	16	5	41	21		66				91	
	17	5	42	26		67				92	
	18	6	43	28		68				93	
	19	6	44	35		69				94	
	20	8	45	48		70				95	
	21	8	46	84		71				96	
	22	8	47	105		72				97	
	23	8	48			73				98	
	24	8	49			74				99	
	25	8	50			75				100	

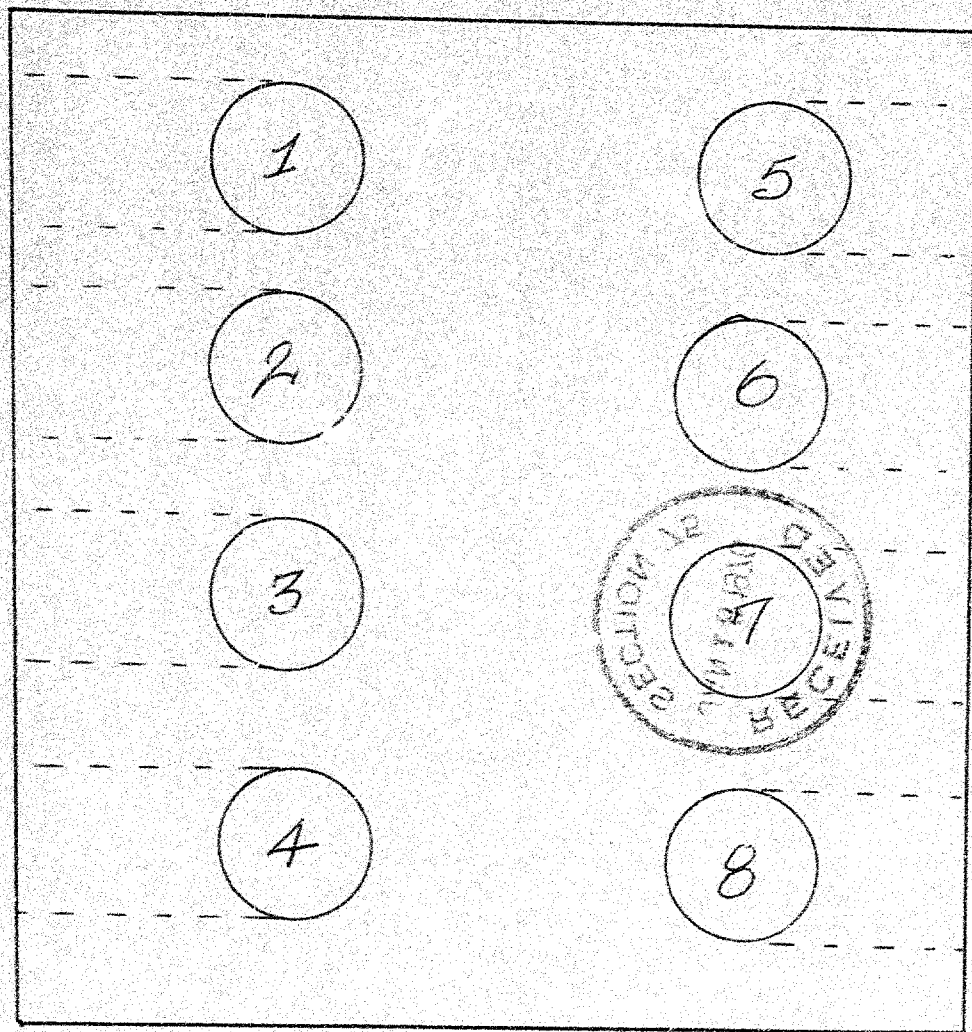
DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH						
MEASURED REBOUND IN INCHES				13 4/10"	15 4/10"	20 5/10"
FINAL LENGTH OF PILE	47' 9"					
FINAL CUT OFF ELEVATION						

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

SIGNED J. R. Anderson
 NAME (PRINT) J. R. ANDERSON
 DATE JAN 5, 1970
 ATTACH SKETCH OF PILE NUMBERING SYSTEM

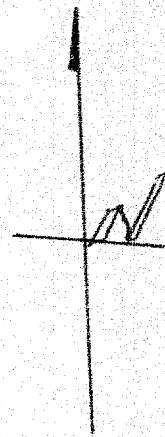
SIXTEEN MILE CREEK - NORTH.

PIER # 6



14" "H" PILES

ALL AT 4:1 BATTER



BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 4 CONTRACT NO. 69-151 STRUCTURE Sixteen Mile - N.S.R.
 CONTRACTOR BERMINGHAM DESIGN LOAD OF PILE 70 TONS.
 HAMMER DETAILS: TYPE B-225 WEIGHT 6800 HEIGHT OF FALL OR ENERGY 25,000
 TYPE OF ANVIL OR CAP _____ WEIGHT OF ANVIL OR CAP 1,100 lbs.
 PILE DETAILS Using 50' - 14" - 11" Pile - No splice.
 PILE NO. 2 LOCATION Pile #7 DATE DRIVEN Dec. 19/69

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			26	5		51			76	
	2			27	5		52			77	
	3			28	5		53			78	
	4			29	5		54			79	
	5			30	6		55			80	
	6			31	6		56			81	
	7			32	5		57			82	
	8			33	6		58			83	
	9			34	6		59			84	
	10			35	6		60			85	
	11			36	7		61			86	
	12			37	8		62			87	
	13	2		38	8		63			88	
	14	2		39	8		64			89	
	15	2		40	9		65			90	
	16	2		41	10		66			91	
	17	2		42	16		67			92	
	18	2		43	16		68			93	
	19	2		44	18		69			94	
	20	2		45	19		70			95	
	21	2		46	27		71			96	
	22	3		47	84		72			97	
	23	3		48	105		73			98	
	24	4		49	121		74			99	
	25	4		50			75			100	

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH	Not possible to get - due to					
MEASURED REBOUND IN INCHES	water condensing					
FINAL LENGTH OF PILE	50' - cut to top of footing					

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

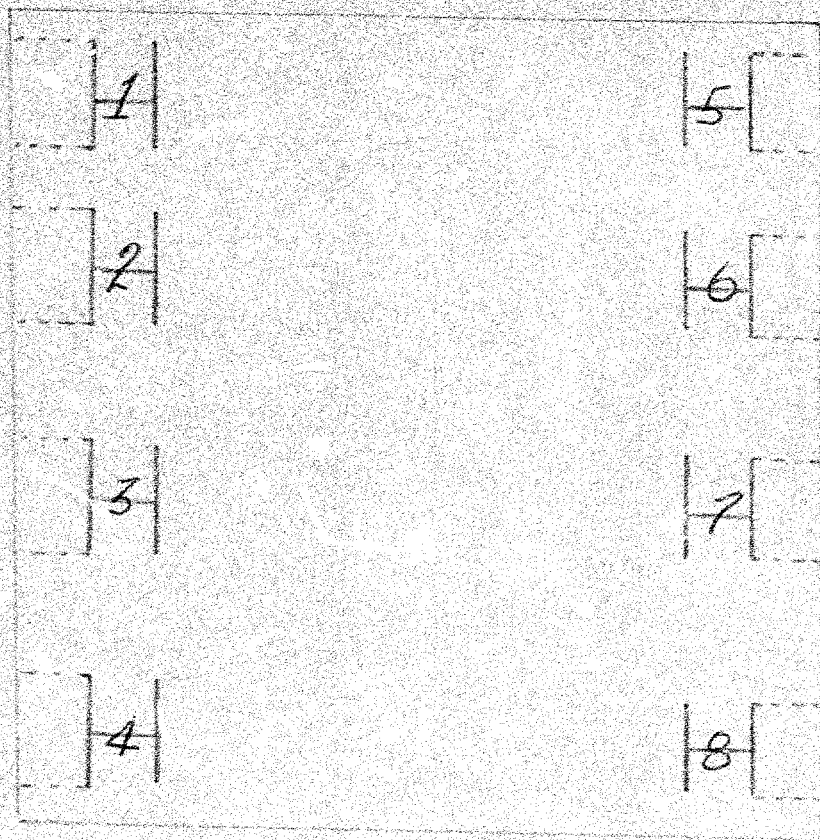
SIGNED James Anderson
 NAME (PRINT) R. ANDERSON

DATE December 19, 1969

ATTACH SKETCH OF PILE NUMBERING SYSTEM

SIXTEEN MILE CREEK - NORTH.

PIER #7 - #2 PILE.



USING 28" "H" PILES
PRIOR TO SPLICING.
ALL PILES at 4:1

BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 4 CONTRACT NO. 69-151 STRUCTURE SIXTEEN MILE CREEK BRIDGE
CONTRACTOR BERMINGHAM DESIGN LOAD OF PILE 70 TONS
HAMMER DETAILS: TYPE B-225 WEIGHT 600 lbs HEIGHT OF FALL OR ENERGY 25,000
TYPE OF ANVIL OR CAP _____ WEIGHT OF ANVIL OR CAP 1,100 lbs.
PILE DETAILS Using 41" H" PILES BEFORE SPLICING
PILE NO. 3 LOCATION EAST ABUTMENT - CENTRE PILE DATE DRIVEN December 17, 1969

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	1		26	9		51	30		76	
	2	1		27	9		52	33		77	
	3	4		28	9		53	40		78	
	4	5		29	8		54	46		79	
	5	7		30	8		55	48		80	
	6	7		31	8		56	55		81	
	7	6		32	7		57	56		82	
	8	7		33	8		58	58		83	
	9	7		34	9		59	63		84	
	10	6		35	8		60	66		85	
	11	6		36	8		61	74		86	
	12	5		37	9		62	90		87	
	13	6		38	10		63	124		88	
	14	6		39	12		64	135		89	
	15	6		40	12		65			90	
	16	6		41	12		66			91	
	17	6		42	15		67			92	
	18	6		43	15		68			93	
	19	6		44	17		69			94	
	20	7		45	17		70			95	
	21	9		46	19		71			96	
	22	9		47	19		72			97	
	23	9		48	20		73			98	
	24	9		49	26		74			99	
	25	9		50	26		75			100	

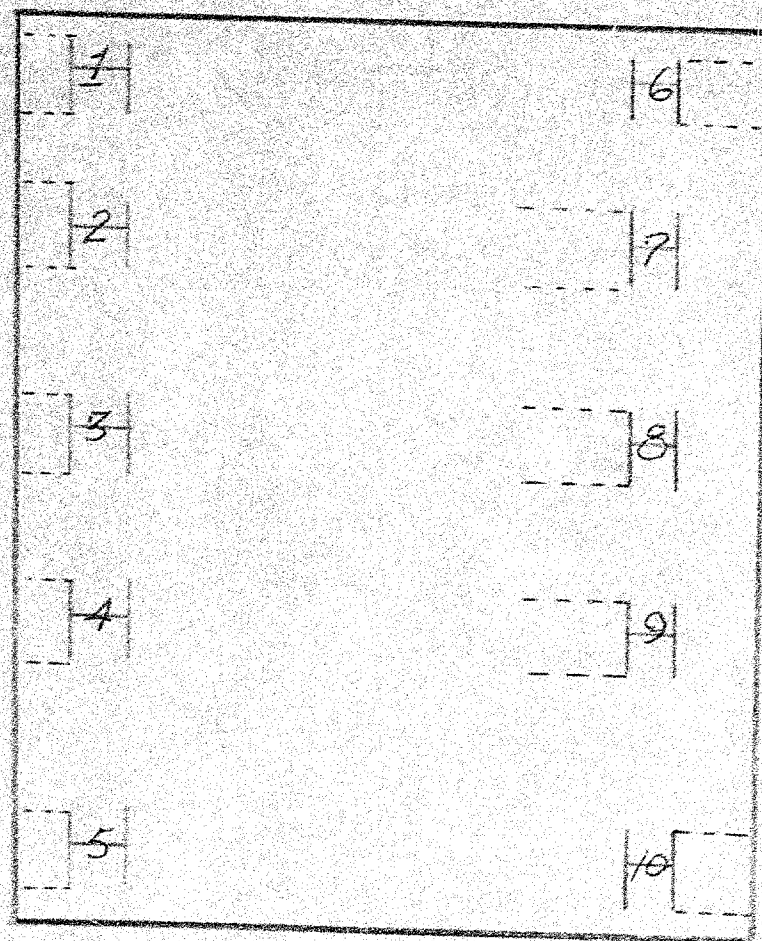
DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH	8'	8	8	9	11'	11
MEASURED REBOUND IN INCHES	5 1/16"	3 5/8"	3 5/8"	2 1/16"	1 1/2"	1 1/2"
FINAL LENGTH OF PILE	64' 1"			FINAL CUT OFF ELEVATION		

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

SIGNED J. Anderson
NAME (PRINT) J. ANDERSON
DATE DECEMBER 17, 1969

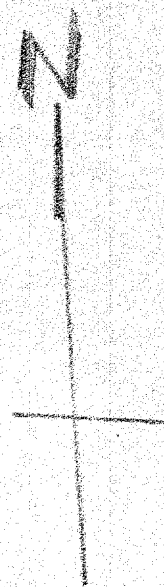
ATTACH SKETCH OF PILE NUMBERING SYSTEM

SIXTEEN MILE CREEK - NORTH.
EAST ABUTMENT - # 3 PILE.



Using 41" "H" PILES
PRIOR TO SPLICING.

PILES 6 & 10 at 10:1 BATTER.
PILES 1 to 5, 7, 8, 9 at 4:1 BATTER.



BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 4 CONTRACT NO. 69-151 STRUCTURE SIXTEEN Mile Creek
 CONTRACTOR BERMINGHAM (Hamilton) DESIGN LOAD OF PILE 70 TONS.
 HAMMER DETAILS: TYPE B-225 WEIGHT 6800 lbs. HEIGHT OF FALL OR ENERGY 25.000
 TYPE OF ANVIL OR CAP _____ WEIGHT OF ANVIL OR CAP 1100 lbs.
 PILE DETAILS Using 45" H" Piles From S. P. Co.
 PILE NO. 1 LOCATION EAST Pier - S. of QEW DATE DRIVEN Dec. 10, 1969

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

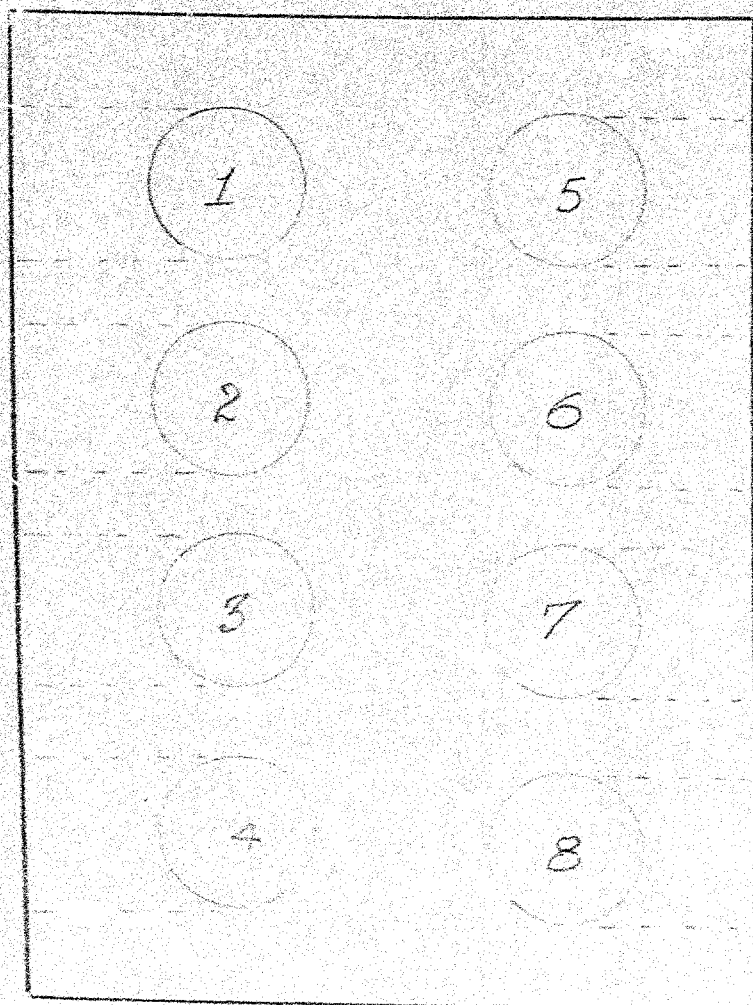
DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH	7	8	8	7	10	10
MEASURED REBOUND IN INCHES	1/4	3/8	3/8	3/8	1/2	1/2
FINAL LENGTH OF PILE <u>51' 10"</u>	FINAL CUT OFF ELEVATION					

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

SIGNED J. R. [Signature]
 NAME (PRINT) J. R. [Name]
 DATE Dec 14, 1969

ATTACH SKETCH OF PILE NUMBERING SYSTEM

SIXTEEN Mile Creek
EAST PIER - SOUTH OF QFW



Using 45" H. Pins
Before Shoveling

4:1 BATTER



BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 4 CONTRACT NO. 69-151 STRUCTURE SIXTEEN Mile Creek
CONTRACTOR BIRMINGHAM (Hamilton) DESIGN LOAD OF PILE 70 TONS
HAMMER DETAILS: TYPE B-225 WEIGHT 2800 lbs HEIGHT OF FALL OR ENERGY 25,000
TYPE OF ANVIL OR CAP _____ WEIGHT OF ANVIL OR CAP 1,100 lbs
PILE DETAILS Using 45" H Piles Before Splicing
PILE NO. 5 LOCATION EAST ABUTMENT - S. of R.W. DATE DRIVEN Dec. 9/69

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	1		26	1		51	26		76	
	2	2		27	2		52	29		77	
	3	3		28	3		53	33		78	
	4	4		29	4		54	37		79	
	5	5		30	5		55	39		80	
	6	6		31	6		56			81	
	7	7		32	7		57			82	
	8	8		33	7		58			83	
	9	4		34	7		59			84	
	10	4		35	7		60			85	
	11	4		36	6		61			86	
	12	4		37	7		62			87	
	13	5		38	7		63			88	
	14	4		39	7		64			89	
	15	4		40	9		65			90	
	16	3		41	9		66			91	
	17	4		42	10		67			92	
	18	4		43	4		68			93	
	19	6		44	0		69			94	
	20	4		45	6		70			95	
	21	4		46	5		71			96	
	22	5		47	4		72			97	
	23	4		48	0		73			98	
	24	4		49	12		74			99	
	25	5		50	16		75			100	

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH	6	8	6	7	11	11
MEASURED REBOUND IN INCHES	4	4	3	3	3	2
FINAL LENGTH OF PILE <u>55' 3"</u>	FINAL CUT OFF ELEVATION					

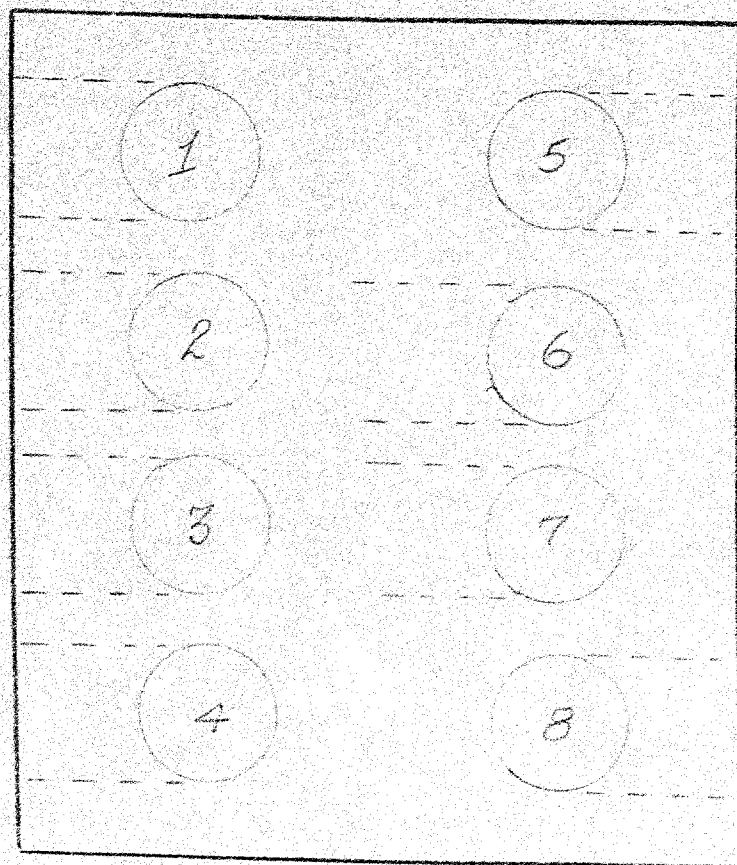
REPORT TO BE SENT TO: - PRINCIPAL FOUNDATION ENGINEER
MATERIALS & TESTING DIVISION
DEPARTMENT OF HIGHWAYS
DOWNSVIEW, ONTARIO

SIGNED James P. Henderson
NAME (PRINT) J. R. Anderson
DATE December 9, 1969

ATTACH SKETCH OF PILE NUMBERING SYSTEM

SIXTEEN MILE CREEK.

EAST ABUTMENT - S. of DEWL

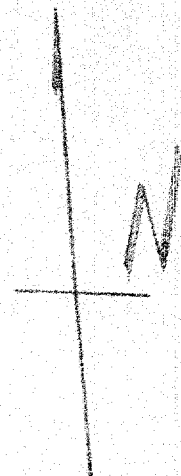


USING 45" H PILES

BEFORE SPILING.

PILES 5 & 8, 110 BATTER.

PILES 1, 2, 3, 4, 6, 7, 114 BATTER.



BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 4 CONTRACT NO. 69-151 STRUCTURE FIFTEEN MILE CREEK
 CONTRACTOR BERMINGHAM (HAMILTON) DESIGN LOAD OF PILE 70 TONS
 HAMMER DETAILS: TYPE BERMINGHAM 3005 WEIGHT 6800 lbs HEIGHT OF FALL OR ENERGY 25,000
 TYPE OF ANVIL OR CAP _____ WEIGHT OF ANVIL OR CAP 1,100 lbs.
 PILE DETAILS Using 33' H¹ PILES BEFORE SPLICING
 PILE NO. 6 LOCATION PIER "A" - NORTH END. DATE DRIVEN Dec. 4/69

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

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH						
MEASURED REBOUND IN INCHES						
FINAL LENGTH OF PILE	40' 9"					
FINAL CUT OFF ELEVATION						

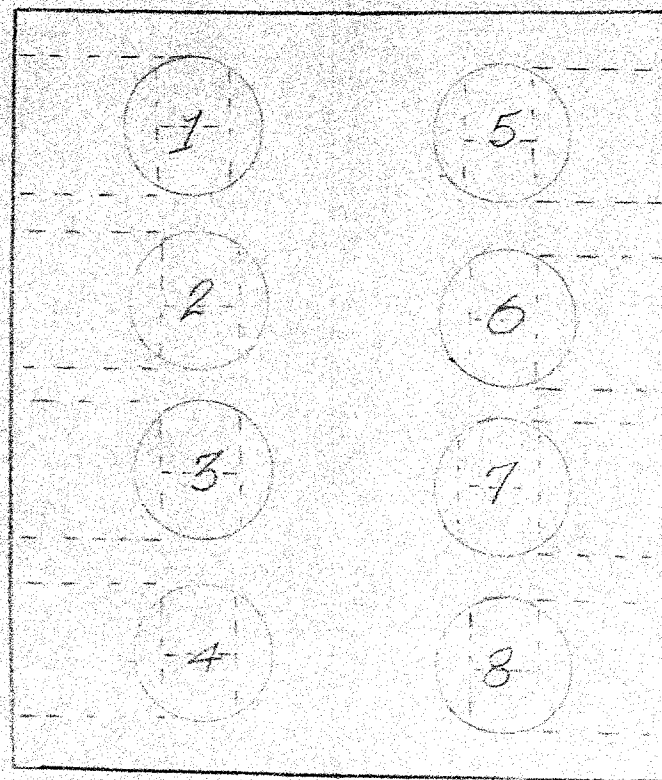
REPORT TO BE SENT TO: - PRINCIPAL FOUNDATION ENGINEER
 MATERIALS & TESTING DIVISION
 DEPARTMENT OF HIGHWAYS
 DOWNSVIEW, ONTARIO

SIGNED J. R. Anderson
 NAME (PRINT) J. R. ANDERSON
 DATE Dec 4/69

ATTACH SKETCH OF PILE NUMBERING SYSTEM

FIFTEEN MILE CREEK

11" PIER - SOUTH OF D.E. W



USING 33' PILES BEFORE
SPLICING

BATTER ALL 1:4

BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 4 CONTRACT NO. 69-151 STRUCTURE FIFTEEN MILE CREEK
 CONTRACTOR BERMINGHAM DESIGN LOAD OF PILE 70 TONS
 HAMMER DETAILS: TYPE BERMINGHAM B-20 WEIGHT 6,800 LBS. HEIGHT OF FALL OR ENERGY 25,000
 TYPE OF ANVIL OR CAP _____ WEIGHT OF ANVIL OR CAP 1,100 LBS.
 PILE DETAILS USING H PILES 45' BEFORE SPLICE.
 PILE NO. 1 LOCATION WEST ABUTMENT, NORTH END DATE DRIVEN DEC. 3/69

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

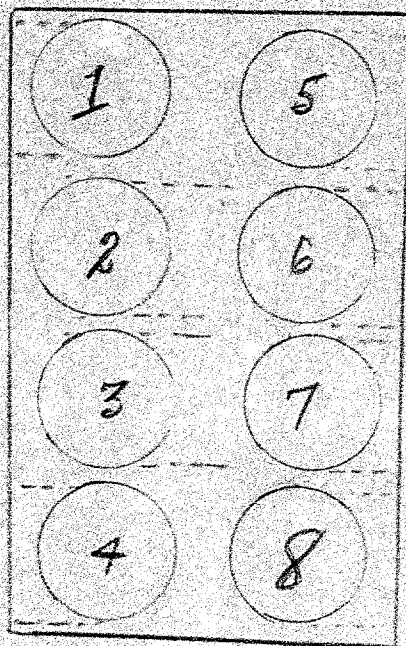
DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH	10	11	11	12	14	14
MEASURED REBOUND IN INCHES	5/16"	5/16"	3/8"	3/8"	1/2"	1/2"
FINAL LENGTH OF PILE	46'5"					FINAL CUT OFF ELEVATION

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

SIGNED J. R. Anderson
 NAME (PRINT) J. R. Anderson
 DATE December 3, 1969

ATTACH SKETCH OF PILE NUMBERING SYSTEM

December 3, 1969
J. R. Anderson



WEST ABUTMENT - FIFTEEN MILE CREEK
DRIVING 45' "H" PILES.
ALL REQUIRED SPlicing
PILE DRIVING RECORD COMPILED
ON PILE #1
PILE BATTER FOR NO. 1 AT 1:10

BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 4 CONTRACT NO. 48-151 STRUCTURE FIFTEEN MILE CREEK
CONTRACTOR BERMINGHAM DESIGN LOAD OF PILE 70 TONS
HAMMER DETAILS: TYPE BERMINGHAM B-225 WEIGHT 6,800 lbs HEIGHT OF FALL OR ENERGY 25,000
TYPE OF ANVIL OR CAP SQUARE WEIGHT OF ANVIL OR CAP 1,100 lbs
PILE DETAILS Using 4 PILES 47' Long PILES BEFORE SWICE
PILE NO. 4 LOCATION EAST ABUT. FOOTING SOUTH END DATE DRIVEN Nov. 27/69

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

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH	8	8	9	10	10	12
MEASURED REBOUND IN INCHES	1/4"	1/4"	5/16"	3/8"	3/8"	1/2"
FINAL LENGTH OF PILE	49' 5"					FINAL CUT OFF ELEVATION 255+50

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

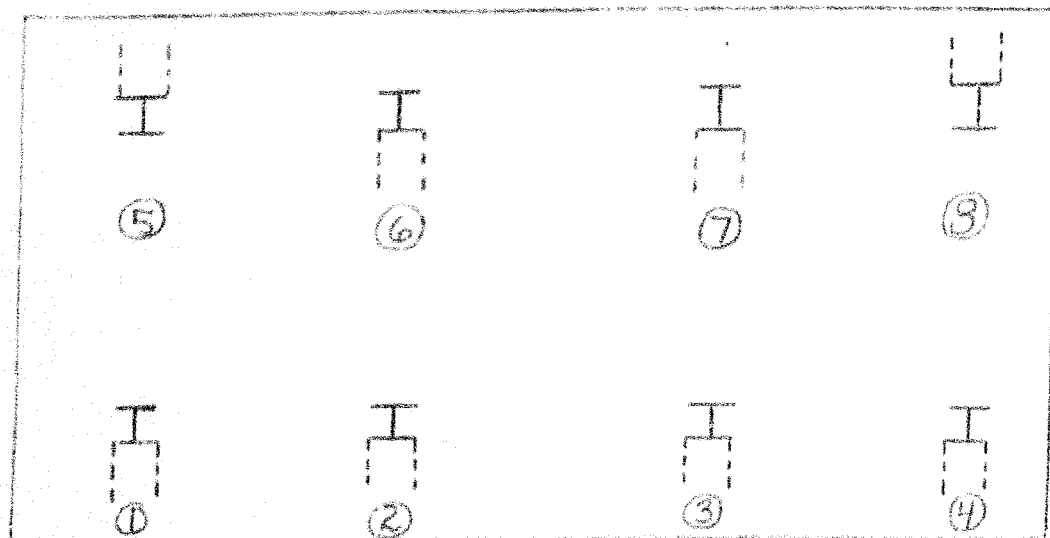
SIGNED J.W. Johnson
NAME (PRINT) J.W. Johnson
DATE Nov. 27/69

ATTACH SKETCH OF PILE NUMBERING SYSTEM

FIFTEEN MILE CASSIC STRUCTURE

EAST FOOTING PILE LAYOUT

(N)



FIFTEEN MILE CREEK STRUCTURE

EAST FOOTING TILE LAYOUT

