

list 258-2

Mr. A. M. Toye,
Bridge Engineer.
Materials & Research Division,
(Foundation Section)
Attention: Mr. S. McCombie.

April 19, 1962.

D.H.O. FOUNDATION INVESTIGATION
REPORT.
W.J. 62-F-27 -- W.P. 242-61.

Re: Plains Road E. (Old Q.E.W.) & C.N.R.,
Line 'A' - In Town of Burlington,
District No. 4.

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

We believe the factual data and recommendations
contained therein, should prove adequate for your future
design work. If further assistance is required in connection
with this project, please do not hesitate to contact our Office.

AGS/MdeF
Attach.

cc: Messrs. A. M. Toye (2)
H. A. Tregaskes
H. D. McMillan
I. C. Campbell
J. C. Thatcher
T. J. Kovich
J. Roy
J. E. Gruspier
E. R. Saint
F. Norman
A. Watt
Foundations Office
Gen. Files.

A. G. Sternmac
A. G. Sternmac,
PRINCIPAL FOUNDATION ENGINEER

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FOUNDATION INVESTIGATION

F

Plains Road B. (O.V.C.E.W.) & C.N.R.
Line 'A' - in Town of Burlington.
District 1004
W.J. 62-F-27 - W.P. 242-61.

1. INTRODUCTION:

A memo dated March 2, 1962 requesting a soil investigation at the site of the proposed new overhead to carry Plains Road over the C.N.R. tracks in the Town of Burlington, was received from the Bridge Location Section, on March 5, 1962.

The requested investigation was carried out by the Bridge Location Section and presented in this report, are all the field and laboratory results, their interpretation and discussion, as well as the necessary recommendations for the foundation of the proposed new structure.

2. DESCRIPTION OF SITE:

The proposed overhead is located in a flat plain drained by four ditches, each about 3' deep. There is a drainage ditch on either side of the tracks. On the east side, this ditch flows into the roadside ditch and is carried under the highway by a small concrete culvert. On the west side, another similar culvert at the junction of the other ditches, drains southerly under the highway.

At the time of this investigation, there was about 6 in. of water at the culverts.

3. FIELD INVESTIGATION:

Eight boreholes were drilled at the site, utilizing a conventional diamond drill rig. Disturbed samples were recovered using a 2-inch O.D. split-spoon sampler driven into the soil with an energy of 350 ft.-lbs. per blow. Because of the very dense and gravelly nature of the soil, no undisturbed samples were taken.

A dynamic cone penetration test was carried out in B.H. #1 only; the penetration values appear on the attached borehole logs.

Bedrock was established in all boreholes. At the abutment locations, rock samples were recovered using an AX core barrel; in all the other boreholes, bedrock was assumed at absolute refusal of the BX casing - in some cases, chunk samples were recovered in AX casing, especially cut for use as a washing bit.

The locations and elevations of all boreholes are shown on the attached Plan No. 62-F-27A. All elevations are referred to a D.H.O. B.M. located in the vicinity and transferred by means of a hand-level. The B.M. elevation is 331.17, and is of geodetic origin.

Each sample of the subsoil was visually classified in the field.

4. LABORATORY INVESTIGATION:

Each sample, taken in the field, was once more classified visually in the laboratory. Liquid limit, plastic limit, moisture content and grain size distribution analyses were also carried out

4. LABORATORY INVESTIGATION: (cont'd.) ...

on certain representative samples.

The results of these tests are plotted on the attached borehole logs.

5. SUBSOIL CONDITIONS:

5.1) General:

Conditions at the site were found to be generally uniform, with only small local variations.

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

5.2) Clayey-Silt with Sand and Gravel:

This is a very dense, brown deposit extending from ground level (elev. 329 \pm) downwards to a very dense sandy-silt stratum. The maximum depth was 110' in B.H. No. 8, but, in general, this deposit terminates at elevation 321 \pm at which elevation the sandy-silt begins. 'N' values were generally in excess of 50.

5.3) Brown Sandy-Silt:

Very dense sandy-silt was encountered in all boreholes and extends from elevation 321 \pm down to bedrock. In general, the thickness of this stratum varies from 4' - 7', and 'N' values not lower than 80 were obtained.

5.4) Bedrock:

Sound shale bedrock was established in all of the eight boreholes. At the abutment locations, samples were recovered using an AX core barrel; at all other locations, bedrock was assumed to be at the refusal depth of the casing.

cont'd. /4 ...

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

5.4) Bedrock: (cont'd.) ...

The surface of the sound bedrock dips southerly (towards Lake Ontario); the difference in elevation, however, is only 2'.7 at the maximum.

In the first four boreholes, a weathered zone of 1 - 2'.5 was observed.

Sound, brown shale bedrock, with grey-green seams exists between elevations 316.0 and 313.3 over the entire area investigated.

6. GROUND WATER CONDITIONS:

Considerable difficulty was encountered in measuring the water level in all boreholes.

Since the investigation was carried out at a time when spring run-off was very rapid, and due to the relatively flat terrain, the elevation of the water in the boreholes varied considerably. During the day, water filled or almost filled most holes.

Borehole #2 was pumped dry and 5'-0 of BX casing left in the ground - in this borehole, a water table elevation of 327.6 was established. This elevation was also confirmed in borehole #5 after several days' observation and it corresponds to the water level in the ditches on both sides of the C.N.R. tracks.

cont'd. /5 ...

7. DISCUSSION AND RECOMMENDATIONS:

A four-span overhead is proposed, to carry Plains Road (Old Q.E.W.) over the C.N.R. tracks, in the Town of Burlington.

The subsoil at the site consists of brown, very dense clayey-silt with sand and gravel, followed by brown, very dense sandy-silt extending to bedrock. The shale bedrock dips in a southerly direction and extends over the entire area investigated.

Adequate bearing capacity can be found in the clayey-silt stratum from 4'-0 below the ground level downwards. A spread footing foundation may be used at all locations and a safe bearing pressure of 3 T.S.F. is recommended for design purposes.

It is recommended that spread footings be placed at elevation 323.0 or below, however, to provide approximately 6' of cover for frost protection.

The approach fills are assumed to be in the order of 20' in height, and with slopes of 2:1, no stability problems are anticipated.

Dewatering, also, should not present any serious difficulties even though the recommended footing grade is below the observed water table. This water table may be only a seasonal high - in any case, the clayey-silt is relatively impermeable and any water seeping into the excavation can be readily removed by ordinary pumping methods.

8. SUMMARY:

Subsoil at the site consists of very dense clayey-silt, followed by very dense sandy-silt down to shale bedrock.

cont'd. /6 ...

8. SUMMARY: (cont'd.) ...

Spread footings with a safe bearing pressure of 3 T.S.F. may be used at all locations. The footings should be placed in the clayey-silt stratum at elevation 323.0 or below to provide adequate cover for frost protection.

No stability problems are anticipated with the approach fills.

No dewatering problems are anticipated during construction.

9. MISCELLANEOUS:

The field investigation was carried out during the period March 19 - 28, 1962, under the supervision of Mr. G. Mierzynski of the Foundation Section, D.H.C.

Equipment was owned and operated by the Johnston Drilling Co. of Ottawa.

April 1962

REPORT PREPARED BY:

G. Mierzynski
.....
G. Mierzynski,
PROJECT FOUNDATION ENGINEER.

REPORT APPROVED BY:

M. Devata
.....
M. Devata,
SE. PROJECT FOUNDATION ENGINEER.

1. *Chlorophyll a* and *Chlorophyll b* contents were determined by the method of Arar and Cook (1987).

ABBREVIATIONS USED IN THIS REPORT

PENETRATION RESISTANCE

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

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

DESCRIPTION OF SOIL

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

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

TYPE OF SAMPLE

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

SOIL TESTS

Q _u	UNCONFINED COMPRESSION	L.V.	LABORATORY VANE
Q	UNDRAINED TRIAXIAL	F.V.	FIELD VANE
Q _{cu}	CONSOLIDATED UNDRAINED TRIAXIAL	C	CONSOLIDATION
Q _d	DRAINED TRIAXIAL	S	SENSITIVITY

ABBREVIATIONS USED IN THIS REPORT

SOIL PROPERTIES

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

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 1

FOUNDATION SECTION

JOB 62-F-27 LOCATION 20' Lt. of Sta. 248/17 - Line "A" ORIGINATED BY G.M.
W.P. 242-61 BORING DATE Mar. 19 & 20, 1962. COMPILED BY G.M.
DATUM Geodetic BOREHOLE TYPE Washboring & Cone Penetration - BX Casing. CHECKED BY G.M.

SOIL PROFILE		SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT 20 40 60 80 100 SHEAR STRENGTH P.S.F.	LIQUID LIMIT — WL PLASTIC LIMIT — WP WATER CONTENT — W WATER CONTENT % 10 20 30	BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE					
329.0 0.0	Groundlevel				330				
	Clayey-silt with sand and gravel.		1	S.S.	54				
	Very dense-brown.		2	S.S.	70				
320.5 8.5	Sandy-silt.		3	S.S.	155				
	Very dense-brown.								
317.0 12.0	Shale bedrock.		4	S.S.	18				
	Brown with grey-green seams.		5	S.S.	100				
	Upper 2.5' weathered								
309.5 19.5	End of borehole.				310				
					300				

wl from observation in borehole

RECORD OF BOREHOLE NO. 2

FOUNDATION SECTION

JOB 62-F-27 LOCATION 10' Rt. of Sta. 247/30 - Line "A" ORIGINATED BY G.M.
W. P. 242-61 BORING DATE Mar. 20 & 21, 1962. COMPILED BY G.M.
DATUM Geodetic BOREHOLE TYPE Washboring - BX Casing. CHECKED BY G.M.

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT	LIQUID LIMIT ——— WL PLASTIC LIMIT ——— WP WATER CONTENT ——— W	BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		SHEAR STRENGTH P.S.F.	<div> <div>WP</div> <div>W</div> <div>WL</div> </div> WATER CONTENT % 10 20 30		
330.5 0.0	Groundlevel					330				WL from observa- tion in borehole. ∇ w.l. $\overline{\quad}$ 327.6'
	Clayey-silt with sand and gravel. Very dense-brown.		1	S.S.	70					
321.5 9.0	Sandy-silt. Very dense-brown.		2	S.S.	91	320				
317.0 13.5	Shale bedrock. Brown with gray-green seams. Upper 1.0' weathered		3	S.S.	>138					
311.5 19.0	End of borehole.		4	R.C.	-	310				

RECORD OF BOREHOLE NO. 3

FOUNDATION SECTION

JOB 62-P-27 LOCATION 25' Rt. of Sta. 248/-17 - Line "A" ORIGINATED BY G.M.
W.P. 242-61 BORING DATE Mar. 21 & 22, 1962. COMPILED BY G.M.
DATUM Geodetic BOREHOLE TYPE Washboring - BX Casing. CHECKED BY G.M.

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT			LIQUID LIMIT ——— WL PLASTIC LIMIT ——— WP WATER CONTENT ——— W wp ——— w ——— WL WATER CONTENT % 10 20 30			BULK DENSITY Y P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		SHEAR STRENGTH P.S.F.							
331.0 0.0	Groundlevel					330								
	Clayey-silt with sand and gravel.													
	Very dense-brown.		1	S.S.	64									
322.0 9.0	Sandy-silt.		2	S.S.	123	320								
	Very dense-brown.	3	S.S.	124										
317.0 14.0	Weathered shale.	USE REM	4	C.S.	-									
316.0 15.0	End of borehole.					310								

JOB <u>62-F-27</u>	LOCATION <u>12' Lt. of Sta. 249/10 - Line "A"</u>	ORIGINATED BY <u>G.M.</u>
W.P. <u>242-61</u>	BORING DATE <u>Mar. 22, 1962.</u>	COMPILED BY <u>G.M.</u>
DATUM <u>Geodetic</u>	BOREHOLE TYPE <u>Washboring - BX Casing.</u>	CHECKED BY <u>G.M.</u>

SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE			LIQUID LIMIT ——— w_L			BULK DENSITY P.C.F.	REMARKS		
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE	BLOWS / FOOT			PLASTIC LIMIT ——— w_p				WATER CONTENT ——— w	
							SHEAR STRENGTH P.S.F.			WATER CONTENT % 10 20 30					
328.2 0.0	Groundlevel					330									
	Clayey silt with sand and gravel.														
	Very dense-brown.														
321.2 7.0			1	S.S.	83										
	Sandy-silt.					320									
	Very dense-brown.		2	S.S.	91										
316.0 12.2			3	S.S.	83										
315.1 13.1	Weathered shale.		4	S.S.	125										
	End of borehole.					310									

CHECKED BY _____ G.M.

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT	LIQUID LIMIT ——— w _L PLASTIC LIMIT ——— w _p WATER CONTENT ——— w w _p ——— w ——— w _L WATER CONTENT % 10 20 30	BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT					
329.3 0.0	Groundlevel					330				WL from observation in borehole ∇ w _L = 327.5'
	Clayey-silt with sand and gravel. Very dense-brown.		1	S.S.	48					
320.3 9.0			2	S.S.	>70	320				
			3	S.S.	158					
	Sandy-silt. Very dense-brown.		4	S.S.	132					
313.3 16.0	End of borehole.		5	S.S.	>60	310				

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 7

FOUNDATION SECTION

JOB 62-F-27 LOCATION 21' Rt. of Sta. 250+50 - Line "A" ORIGINATED BY G.M.
W.P. 242-61 BORING DATE Mar. 26 & 27, 1962. COMPILED BY G.M.
DATUM Geodetic BOREHOLE TYPE Washboring - BX Casing. CHECKED BY G.M.


SOIL PROFILE		SAMPLES		ELEV SCALE	DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT — WL		BULK DENSITY	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLT	NUMBER TYPE		BLOWS / FOOT	SHEAR STRENGTH P.S.F.	PLASTIC LIMIT — WP	WATER CONTENT — W		
328.6 0.0	Groundlevel			330						
	Clayey-silt with sand and gravel.									
	Very dense-brown.									
			1 S.S. 73							
320.6 8.0	Sandy-silt with occasional gravel.			320						
	Very dense-brown.									
			2 S.S. 116							
			3 S.S. 132							
314.4 14.2	Shale Bedrock.									
	Brown with grey-green seams.									
			4 R.C. -	310						
308.6 20.0	End of borehole.			300						

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

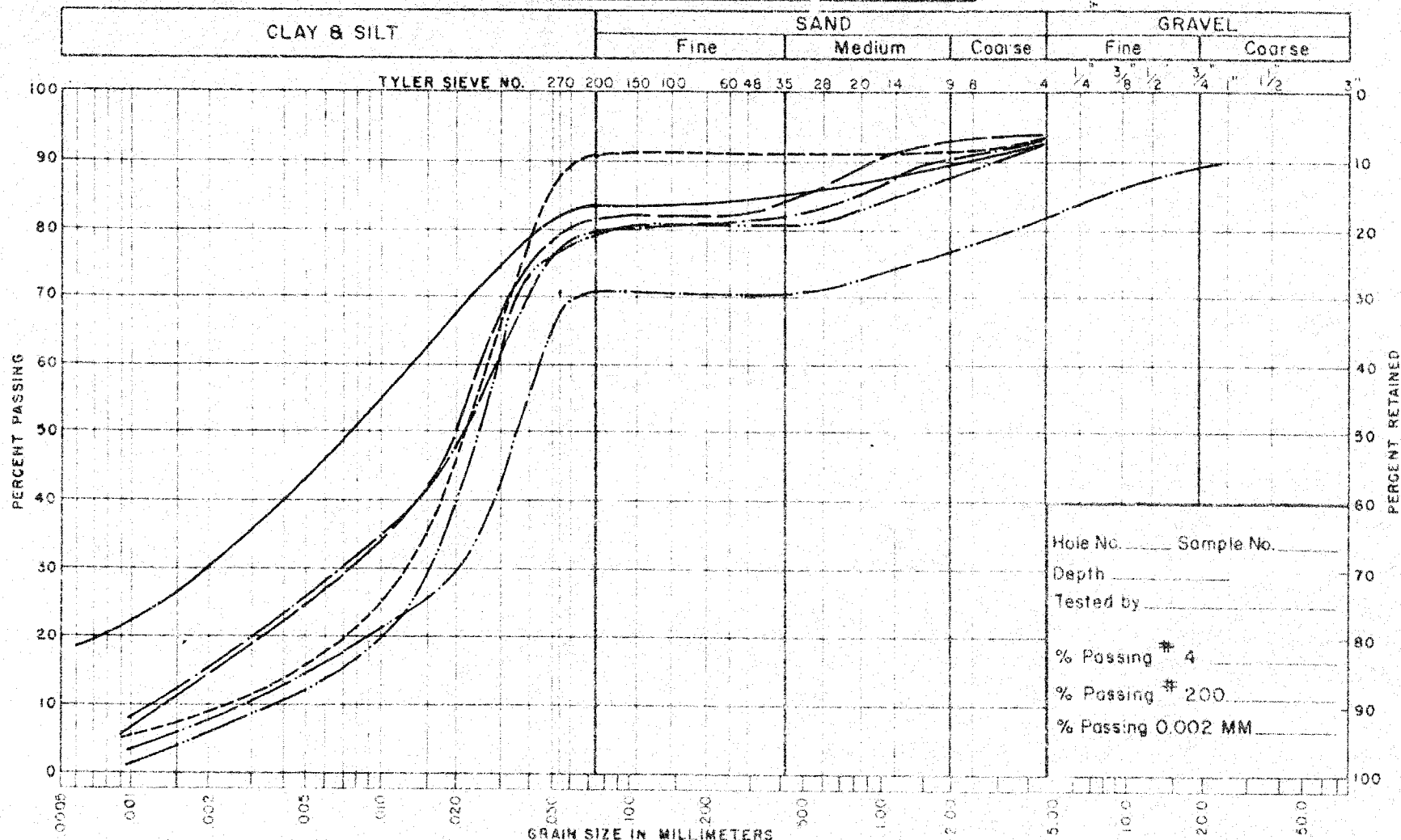
RECORD OF BOREHOLE NO. 8

FOUNDATION SECTION

JOB 62-F-27 LOCATION 15' Lt. of Sta. 251/17 - Line "A" ORIGINATED BY G.M.
 W.P. 242-61 BORING DATE Mar. 27 & 28, 1962. COMPILED BY G.M.
 DATUM Geodetic BOREHOLE TYPE Washboring - BX Casing. CHECKED BY G.M.

SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT — WL PLASTIC LIMIT — WP WATER CONTENT — W		BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER TYPE	BLOWS / FOOT	ELEV. SCALE	SHEAR STRENGTH P.S.F.			
328.8 0.0	Groundlevel				330				WL from observation in borehole 
	Clayey silt with sand and gravel.		1 S.S. 54						
	Very dense-brown. (Grey seam from 9'-11.0'),		2 S.S. 78		320				
317.8 11.0	Sandy-silt with occasional gravel. Very dense-brown.		3 S.S. 82						
			4 S.S. 174						
313.3 15.5	Shale Bedrock.		5 S.S. 92						
	Brown with grey-green seams.		6 R.C. -		310				
305.0 23.8	End of borehole.				300				

UNIFIED SOIL CLASSIFICATION SYSTEM



NOTES

B.H. NO. 1, DEPTH 6'-7.5' ————	B.H. NO. 7, DEPTH 12'-13.5' ————
B.H. NO. 1, DEPTH 9'-10.5' ————	B.H. NO. 8, DEPTH 12'-13.5' ————
B.H. NO. 4, DEPTH 8.5'-10.0' ————	
B.H. NO. 6, DEPTH 9'-10.5' ————	

DEPARTMENT OF HIGHWAYS - ONTARIO
 MATERIALS & RESEARCH SECTION
 GRAIN SIZE DISTRIBUTION

Job No. 62-F-27 W.P. No. 242-61
 Location QEW & C.N.R. — BURLINGTON



ONTARIO

DEPARTMENT OF HIGHWAYS

Bridge Division

Memo to	Mr. A. Stermac, Principal Foundation Engr., Lab. Building.	Date	August 13, 1962.
From	F. DeVisser	Subject	^{62-F-27} W.P. 242-61, Site #11-177 C.N.R. O'head at Plains Road Old Q.E.W., District #4.

Attached is one print of our preliminary plan
D 5085-P1 for the subject structure.

If you have any comments, please let us know.

FDeV/rt

F. DeVisser,
Bridge Location Engineer.

O.k.

Aug 15/62

[Signature]

Mr. Bruce Davis,
Bridge Design Engineer,
Bridge Design Unit.

August 20, 1962.

Re: C.N.R. Overhead and

Materials & Research Division.

Plains Road - W.P. 242-61.

Attention: Mr. Frank Gormek:

We have reviewed the preliminary plan D-5085-P1 for the above structure and herewith submit our suggestions concerning the type of footing for your consideration:

The subsoil at the proposed bridge site is undoubtedly of very good properties.

The upper two layers, the clayey silt with sand and gravel and the sandy silt are very dense and have therefore a high bearing capacity. The underlying shale of course is also a very competent material.

In our report we have recommended spread footings at approx. 5 ft. below groundlevel (elev. 323.0) and a safe load of 3.0 tons sq. ft. This load is definitely on the very conservative side and could be increased up to 5 tons if required.

From the drawing we understand that a maximum load of up to 600 tons per three columns is to be expected. Equally divided a load of 200 tons will have to be supported by each column. If a 6x8 spread footing is designed a bearing load of 4.2 t.s.f. would act on the subsoil. Since the columns are asymmetrical the loads that they carry will be different, and the footings should be designed accordingly, namely, to allow the same bearing load to act on the subsoil.

As an alternative to this solution drilled-in and cast-in-place piles are suggested. Those piles can be continued above groundlevel and used as columns. They would be bearing piles drilled some 5 feet into shale bedrock to avoid the upper possibly softened and weathered zone. If 3 ft. diameter piles are used the bearing pressure on the shale

would be slightly less than 30 t.s.f. Experience with bearing on shales in Hamilton would indicate that such a pressure is not excessive and is therefore allowable.

If there are any other additional questions you would like to discuss please feel free to contact our Office.

AGS/tt
cc: Foundations Office/
General Files

A. G. Stermac
A. G. Stermac
Principal Foundation Engineer.

10/7/64

*Discussion with Mr. G. G. Gornish and R. H. Rittner
bearing pressure for Granite Canyon increased
from 20 to 30 T.S.F. due to conditions
of rock encountered.*

SWP 242-61

FRANKI

OF CANADA LIMITED



214 MERTON STREET,

TORONTO.

CABLEGRAMS
"FRANKIPILE"

TELEPHONE:
HUDSON 1-6426-7

August 12, 1963.

Materials & Research

Department of Highways of Ontario,
~~Bridge Office,~~
Keele Street and Highway 401,
Downsview, Ontario.

Re: Plains Rd - C.N.R. Overpass,
Burlington, Ontario.

Attention: Mr. M. Devata

Dear Sir:

As you requested we have made a study of the above project considering two possible alternatives, namely Franki caisson-piles and excavated caissons.

ALTERNATE "A"

According to the approximate loadings given us, the abutments would each require 3 vertical and 4 battered 24" diameter Franki caisson-piles. The piers are each supported on three columns, and we propose to found each column on a pair of 24" diameter Franki caisson-piles. Each caisson-pile would have a working capacity of up to 175 tons.

Our estimated budget price for installing 8 battered and 30 vertical, 24" diameter Franki caisson-piles is TEN THOUSAND DOLLARS (\$10,000.00)

ALTERNATE "B"

For the alternative employing excavated caissons we propose using 4 - 38" diameter caissons under each abutment. Each pier column would be supported on one caisson, and according to our approximate assessment of the column loads the caisson

.....continued

diameters would be from 44" to 58". The caissons would be excavated approximately 2 feet into shale bedrock, but because of the ground water problem these would all have straight-sided shafts with no bell at the bottom.

Our budget price for installing 20 excavated caissons without bells is EIGHT THOUSAND, SIX HUNDRED DOLLARS (\$8,600.00).

However, it should be pointed out that it would not be possible to install battered caissons to resist the lateral thrust at the abutments. Furthermore, there is no assurance that the ground water problem can be overcome without undue delay.

We would therefore suggest that prior to a design employing excavated caissons, test holes should be drilled using a large diameter earth auger to clarify this point. We estimate that such tests would cost about FOUR HUNDRED AND FIFTY DOLLARS (\$450.00).

The two alternatives studied are flexible enough so as to be interchangeable.

For the purposes of estimating the above foundation costs, we have made the following assumptions:

- (1) The caissons for the piers would be driven or installed from present grade, but at the abutments the fill would be placed first and would have a 13 foot wide minimum berm at caisson cutoff elevation to permit installation.
- (2) The caissons or piles would be cut-off about 4 feet below grade.
- (3) The right-of-way would be cleared of all surface or sub-surface obstructions such as utilities and old foundations, and would be graded level.
- (4) The purchaser would provide adequate protection such as flagmen and barriers, at no cost to ourselves.

We appreciate the opportunity of studying this project with you, and hope the foregoing estimated prices will be of assistance to you. Please do not hesitate to contact us for further information.

Yours very truly,
FRANKI OF CANADA LIMITED

Mervyn Mindess

Mervyn Mindess, P. Eng.

MM:hb

WP 242-61

WESTERN CAISSONS LIMITED

7 CONNIE STREET

TORONTO 15, ONTARIO

PHONES: 249-2481

766-7921

August 12th, 1963

Department of Highways,
Materials and Research Division,
Downsview, Ontario.

Attention: Mr. M. De Vata
c/o Mr. A. G. Stermac
Principal Foundation Engineer

Dear Sir:

Re: Caisson Installation
Proposed C.N.R. O'Head &
Plains Road
Burlington, Ontario

We would like to submit the following quotation
for the installation of concrete caissons on the above
project. Our quotation is:-

NINE THOUSAND NINE HUNDRED AND FIFTY DOLLARS (\$9,950.00).

The above price includes:-

- 1) Pier Caissons: 12 only 42 inch diameter caissons belled out to 62 inch diameter on shale bedrock, but does not include any reinforcing steel dowels. Each caisson is designed to carry 300 tons.
- 2) Abutment Caissons:
 - a) Vertical Caissons: 10 only 30 inch diameter caissons to be founded on shale bedrock.
 - b) Battered Caissons: 10 only 30 inch diameter caissons to be founded on shale bedrock.

The above abutment caissons are reinforced for 30'-0" with 6 only #6 bars x 30' long and #3 ties at 2'-0" center to center. Each caisson is designed to carry 60 tons.

The above price to include provision of all labor, equipment and materials to install the above caissons on shale bedrock capable of safely sustaining 15 T.S.F. Our tender includes supply and placing of 3000 p.s.i. concrete.

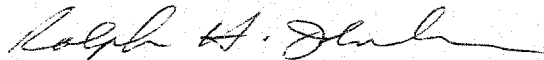
August 12th, 1963

Our price does not allow for concrete testing, caisson inspection, removal of cuttings from the site, nor the running of a caisson load test should it be required.

It is understood that adequate access for our truck mounted drilling equipment, accurate caisson location, and cut-off elevation will be provided by the General Contractor for each caisson.

We trust you will find our proposal worthy of consideration and should additional information be required, please feel free to contact us.

Yours very truly,
WESTERN CAISSONS LIMITED



Ralph H. Jenkins

REJ/rj

SPECIFICATIONS FOR SPECIAL FOUNDATIONS: CAISSONS

1. GENERAL CONDITIONS:

The General Conditions of the Canadian Standard Form of Construction Contract for Stipulated Sum (R.A.I.C. Document #12) latest revised edition, and the Supplementary General Conditions, shall govern this work.

2. WORK INCLUDED

The work of this Division includes the supplying of all labor, materials, tools, plant and incidentals necessary to excavate for an complete the work of providing caisson foundation in a manner hereinafter specified and as shown on the Structural Drawings. This Sub-contractor shall provide for the work of all excavation, cribbing, shoring, etc. below existing grades and/or as detailed on the Drawings.

3. PROTECTIONS

This Sub-contractor shall provide all items of protection as required by Municipal Authorities having jurisdiction. This protection shall include all additional cribbing and shoring necessary to be installed and maintained in the excavation for caissons from existing grades.

4. APPARATUS

- a) This Sub-contractor shall furnish all items of machinery, power, tools, and other apparatus and all equipment for hoisting, digging, ventilating, pumping and drilling together with power for operating same.
- b) Provide all emergency equipment, extra pump etc.

5. VENTILATION

This Sub-contractor shall furnish and operate an approved system of ventilation during the work of excavation of caissons.

6. PUMPING AND DRAINAGE

Accumulation of water in caissons will not be permitted and this Sub-contractor must provide, operate and maintain proper and adequate means for its immediate removal of pumping, including at least one extra pump to provide for breakdown. No water shall be in the caissons at the time concrete is poured.

7. CAISSON EXCAVATION

- a) Excavate caissons from predetermined grades to bearing material as required by the Department.

SPECIFICATIONS FOR SPECIAL FOUNDATIONS: CAISSONS (cont'd)

7. CAISSON EXCAVATION (cont'd)

- b) When the bearing material is reached, it shall be levelled off reasonably smooth prior to pouring all concrete. The material in all caissons shall be approved by the Department.
- c) Where shown on the Structural Drawings the bottom of the caissons shall be belled out to a greater diameter or width than the caisson proper.
- d) The caissons shall be drilled no more than 2% out of plumb nor 3% off their true location.
- e) At the top of the caisson a water tight curb approximately 1'-6" high shall be erected for full circumference to protect the holes from surface water. Curbs may be removed after concrete has been poured.

8. MATERIALS AND WORKMANSHIP

- a) This Sub-contractor is hereby advised that cement, aggregates, water, concrete proportions, ready-mix concrete, mixing of concrete, etc. shall be as specified in the C.S.A. Standard Specification A-23-1960.
- b) Three concrete cylinders, properly identified, shall be taken from the concrete mix as it is delivered to the job site in the presence of the testing engineer and shall be tested for each fifty yards of concrete placed, and in any event no less than one test each day concrete is used.

9. PLACING CONCRETE

- a) This Sub-contractor shall supply and deposit concrete into the caissons in such a manner as to minimize segregation and after concrete on any one caisson has started, work shall be carried on continuously to completion, working as many shifts as necessary.
- b) No caissons shall be left standing for more than 24 hours after excavation has been completed. This Sub-contractor shall be responsible for the caissons during the time they are left open and for damage to any other work.
- c) The tops of all caissons shall be reinforced in a manner shown with steel placed as detailed for dowelling of structural work to be poured later by another Sub-contractor. The top of caissons shall be levelled off at levels shown.

10. UNIT PRICES

- a) Any variation in the cut-off elevations, higher or lower

10. UNIT PRICES (cont'd)

than shown on the Drawings or any variation in a number or size of the caissons, greater or less than shown on the Drawings shall be paid by or credited to the Department, and the unit price for same shall be agreed upon before the commencement of the work.

b) This Sub-contractor shall submit in his tender unit prices per cubic yard, addition or deletion, of the following:

1. Concrete
2. Excavation of silt, clay, sand or other materials which may be removed with ordinary excavation tools.
3. Excavation of rock greater than $\frac{1}{2}$ cubic yard in size.

11. CLEAN UP

Upon a satisfactory completion of his work, this Sub-contractor shall remove from the site all his equipment, excess or waste materials and debris resulting from his operations, and shall leave all in a clean, complete and acceptable condition within contract time.

STANDARD SPECIFICATIONS FOR EXCAVATED OR DRILLED CAISSONS

1. Work Included

The work of this section includes the supplying of all labour, materials, tools, plant and incidentals necessary to excavate for and complete the work of providing caisson foundations in a manner as herein after specified and as shown on the structural drawings.

2. Protection

Work under this section shall be carried out in accordance with the safety regulations of the City of Toronto and the Province of Ontario.

3. Pumping and Draining

Accumulation of water in caisson excavations will not be permitted and this subcontractor must provide, operate and maintain proper and adequate means for its immediate removal, including at least one extra pump to provide for breakdown. No water shall be in the caisson excavations at the time concrete is poured.

4. Materials

a. All concrete for excavated caissons shall have a minimum compressive strength at 28 days of pounds per square inch. Concrete shall comply with the requirements of section of these specifications.

b. Reinforcing steel shall be as specified in section of these specifications.

5. Caisson Excavation

Caissons shall be excavated down to a stratum capable of providing at least tons per square foot safe bearing capacity. Caissons will be founded at or below elevation . Work under this section will include excavation from the level of the general excavation down to the bearing stratum, and the removal of the excavated material from the site.

When the bearing stratum is reached, the bottom of the caisson shall be cleaned off by hand and the

capacity of the stratum verified by the Inspector. A test hole at least 5 feet deep shall be star-drilled into the bearing stratum under the direction of the Inspector to prove its consistency.

Care shall be taken to excavate true to the dimensions shown, and keep the excavation plumb within two percent of vertical. The centre of the caissons shall be within 3" of the location shown on plan.

At the top of each caisson a water tight curb approximately 1'-6" high shall be erected for the full circumference, to protect the holes from surface water. Curbs may be removed after concrete has been poured.

In the event that any caissons encounter a boulder or other obstruction, this contractor shall make every reasonable effort to remove or displace the obstruction. Where this proves to be unsuccessful, the architect shall be consulted to obtain his approval of further expedient action. Any boulder encountered up to and including $\frac{1}{2}$ cubic yard in size shall be removed under the conditions of the contract.

6. Placing of Concrete

Concrete shall be deposited into the caissons through a short vertical tremie, at least 10 feet long, held firmly in the centre of the caisson. Concrete deposition shall be controlled so that the concrete falls without hitting the sides of the excavation or reinforcing steel.

The first 6 inches of the caisson shall be poured using a mortar mixture proportioned with one part cement and three parts sand.

Concrete shall be vibrated throughout the top 10 feet of the caisson shaft.

After concrete work in any one caisson has been started, work shall be carried out continuously to completion working as many shifts as necessary.

If special circumstances indicate the need for construction joints, such joints must be approved by the architect prior to installation. All construction joints shall be dowelled.

The top of each caisson shall be struck off level at the elevation shown. Dowels shall be inserted where required.

.....3

7. Inspection

At least three concrete cylinders shall be cast for every 50 cubic yards of concrete poured. At least three cylinders will be cast from concrete poured in any one day. Of each group of three cylinders, one shall be broken at 7 days, and the other two at 28 days after casting.

8. Payment

Payment for this contract shall be a lump sum. Additional payment shall be made only for boulders more than $\frac{1}{2}$ cubic yard in size. The contractor shall submit with his tender a unit price per cubic yard for dealing with such boulders.

The contractor shall submit in his tender a unit price for extra caissons, or a credit per caisson should caisson be omitted.

9. Cleanup

Upon satisfactory completion of this work, the contractor shall remove from the site all tools, plant, surplus materials, and debris resulting from his operations, and shall leave the site in a clean and acceptable condition.

special equipment for belting

1) ~~belting equipr~~

2) necessary equipment for penetrating into bedrock.

3) What about drilling some x ft into bedrock —

No additional cost for drilling into bedrock.

Mr. A. Stermac,
Principal Foundations Engineer,
Room 107, Lab. Bldg..
Downsview, Ontario. Att.: M. Devata

Mr. M. Stoyanoff,
Bridge Contract Engineer,
Bridge Division.

J. L. Keen

September 17, 1963.

C.N.R. O'Head & Plains Rd. (Old Q.E.W.),
W.P. 242-61

Dist. #4.

RE: Caissons

Along with this memorandum is a draught for a specification covering the "bored-in" caissons for the above project. It is intended to serve as a "working draught" and basis for writing your own specification for this item. I have prepared my specification working from sample copies of specifications for this type of caisson as supplied to the Foundation Section by Western Caissons and the Franki Co. Copies of these two specifications also accompany this memorandum.

I will send a copy of my work to the Foundation Section for their review and comments.

The Foundation Section have obtained cost estimates for the caissons from Western Caissons and the Franki Co. and if these estimates do not appear in our file please contact the Foundation Section for this information.
(M. Devata).

JLK:go
c.c. A. Stermac

J. L. Keen,
Sr. Bridge Project Engineer.

Specification for Caissons

1. Work Included - The work of this item includes the supply of all labour, materials not supplied by the Department, tools, plant, power and equipment necessary to excavate and complete the work of providing caisson foundations in a manner as herein after specified and as shown on the drawings. This will also include any labour and material required for shoring and retaining the stability of the excavation and satisfying the requirements under the items outlined within these specifications.
2. Protection - The Contractor shall provide all items of protection and carry out his work in such a manner as to conform with the regulations required by municipal authorities having jurisdiction, and the Province of Ontario.
3. Ventilation - The Contractor shall furnish and operate an approved system of ventilation during the work of excavating the caissons.
4. Pumping and Drainage - accumulation of water in caissons will not be permitted and the Contractor must provide, operate and maintain proper and adequate means for its immediate removal, including at least one extra pump to provide for breakdown. No water shall be in the caissons at the time concrete is placed.

Caisson Excavation -

(a) The caissons shall be excavated down to a stratum capable of providing at least ----- tons per square foot safe bearing capacity. In any case the caissons will be founded at or below the elevations shown on the drawings, and if conditions are such that difficulty is experienced reaching the elevations shown on the drawings, the Contractor shall bring this to the attention of the Engineer. In this case the Engineer shall decide at what elevation the caisson may be terminated.

(b) When the bearing stratum is reached it shall be levelled off smooth and if necessary cleaned off by hand to the satisfaction of the Engineer.

(c) The bottom of the caissons shall be inspected and approved by the Engineer prior to the placing of the reinforcing steel and the pouring of concrete.

(d) If deemed necessary by the Engineer a test hole at least five feet deep shall be drilled into the bearing stratum to prove its consistency

5. Caisson Excavation - Cont'd.

(e) The bottom of the caissons shall be belled out to the diameter shown on the drawings.

(f) The caissons shall be no more than 2% from the vertical. The centre of the caissons shall be within 3" of the location shown on the drawings.

(g) At the top of each caisson a water tight curb approximately 1'-6" high shall be erected for the full circumference to protect the excavation from surface water. If the excavation is to remain open for a length of time that the ^{open} excavation may be subjected to rain, snow and debris, the Contractor shall suitably cover the opening to prevent their entry, at his own expense. The Contractor shall remove all curbs and protective material after the caissons have been completed to, or above ground line, or when directed by the Engineer.

(h) In the event that a boulder or other obstruction is encountered during excavation of the caisson, the Contractor shall make every reasonable effort to remove or displace the obstruction. Where this proves to be unsuccessful, the Engineer shall be consulted to obtain his approval and instructions for further action. Any boulder encountered up to and including one half cubic yard shall be removed at no additional cost to the Department.

(i) If in the opinion of the Engineer it is deemed necessary to protect and reinforce the surfaces of the excavations to retain their stability, the Contractor shall advance a steel liner as the excavation is progressed. The liner shall remain in place until the time of pouring concrete at which time it will be extracted as the concreting progresses, and in such a manner that the placed concrete will be in contact with the undisturbed surfaces of the excavation.

6. Placing Concrete

(a) The Contractor shall supply and deposit concrete into the caisson in such a manner as to minimize segregation. Concrete deposition shall be controlled so that the concrete falls without hitting the sides of the excavation or reinforcing steel. The procedure to be used for the deposition of the concrete shall be approved in advance by the Engineer.

(b) After concreting in any one caisson has been started, work shall be carried out continuously to completion, working as many shifts as necessary.

(c) If special circumstances indicate the need for construction joints, such joints must be approved by the Engineer prior to installation.

(d) The concrete shall be vibrated throughout the top ten feet of the caisson shaft.

6. Placing Concrete - Cont'd.

(e) No caisson shall be left standing for more than 24 hours after the excavation has been completed. The Contractor shall be responsible for the caissons during the time they are left open and for damage to any other work and/or adjacent railway property and traffic.

(f) The caissons shall be reinforced as shown on the drawings. The cost of placing the reinforcing will be included in the Contractor's bid price.

(g) The top of all caissons shall be levelled off at the termination of pours, to the elevations shown on the drawings. Where indicated on the drawings, the surfaces shall be left roughened for shear resistance (in avoidance of shear keys) however the overall section shall be approximately a level plane.

7. Materials

(a) All concrete for caissons shall have a minimum compressive strength at 28 days of 3000 p.s.i.

(b) The concrete shall be supplied by the Contractor, however, the Department will supply the cement.

(c) Reinforcing steel shown on the drawings will be supplied by the Department.

8. Inspection At least three concrete cylinders properly identified shall be cast for every 50 cubic yards of concrete poured, or as may be directed by the Engineer, or elsewhere within the specifications.

9. Railway Approval

The Contractor shall notify the Canadian National Railway of his intended schedule of operations and working times at least ----- days in advance and obtain approval before commencing work. The Contractor will be expected to demonstrate good cooperation in complying with the regulations of the C.N.R. and in maintenance of railway traffic with a minimum of interference.

10. Cleanup Upon satisfactory completion of his work, the Contractor shall remove from the site all tools, plant, surplus materials, and debris resulting from his operations, and shall leave the site in a clean and acceptable condition.

Mr. B. R. Davis,
Bridge Design Engineer,
Bridge Division.

Attention: Mr. J. Keen

Mr. A. G. Stermac,
Principal Foundation Engr.,
Foundation Section,
Materials & Research Division.
September 18, 1963.

- Installation of Caissons -
Plains Rd. E. (Old Q.E.W.) & C.N.R.,
Town of Burlington, Dist. #4
W.P. 262-61 -- W.J. 62-F-27

242-61

We understand that at the above-mentioned location it has been decided to use concrete caissons to support the pier columns of the proposed structure.

This type of work requires special techniques and equipment. It must be realized that the success of the scheme depends upon an efficient installation. To ensure that this is achieved, it is our recommendation that the installation of concrete caissons should be carried out by an organization specializing in this type of work.

A Special Provision in the general contract should be prepared to cover this situation.

MD/MdeF

cc: Foundations Office ✓
Gen. Files

M. Devata
M. Devata,
SENIOR FOUNDATION ENGR.
For:
A. G. Stermac,
PRINCIPAL FOUNDATION ENGR.

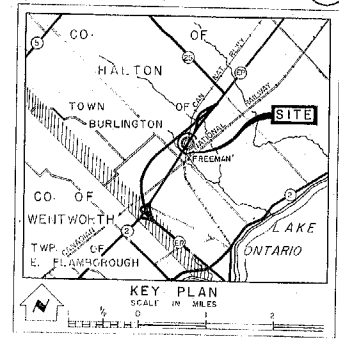
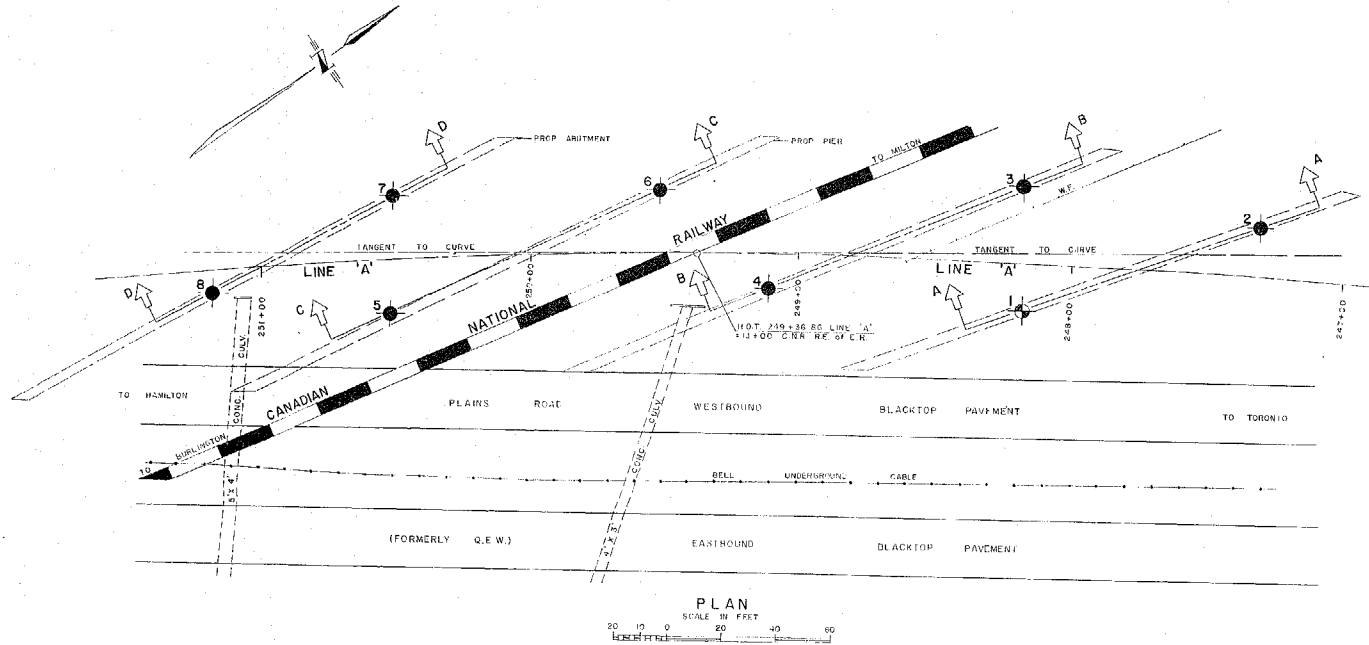
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W.P. # 242-61

PLAINS RD. E.

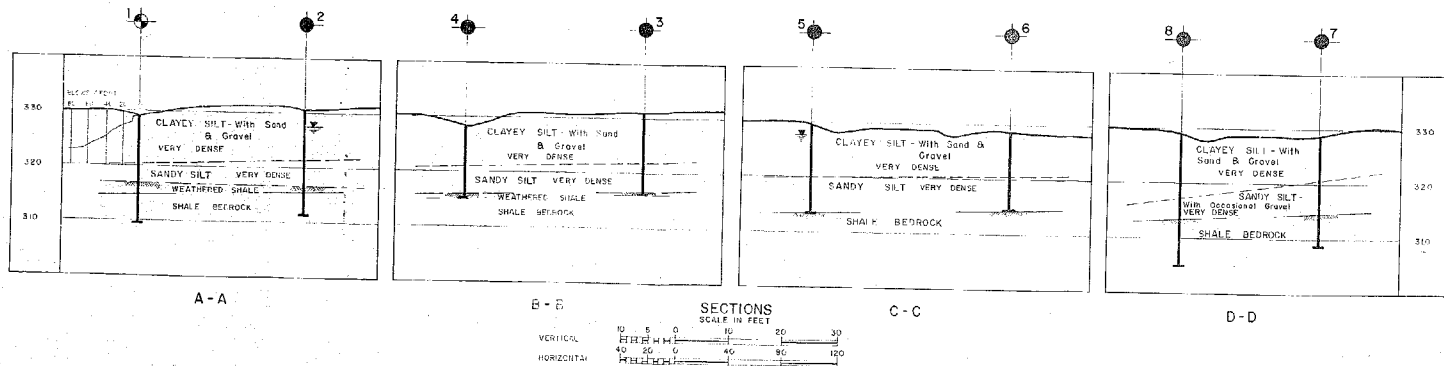
(OLD B.E.W.) &

C.N.R.



NO.	ELEVATION	STATION	TANGENT OFFSET
1	325.0	248+17	20' LT
2	330.5	247+30	10' RT
3	331.0	248+17	25' RT
4	329.2	249+10	12' LT
5	329.8	250+50	20' LT
6	328.6	249+50	25' RT
7	326.5	250+50	21' RT
8	328.8	251+17	10' LT

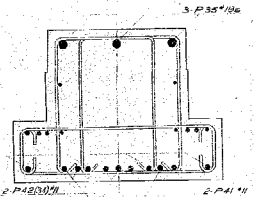
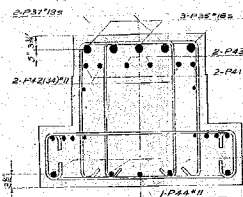
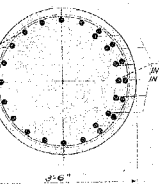
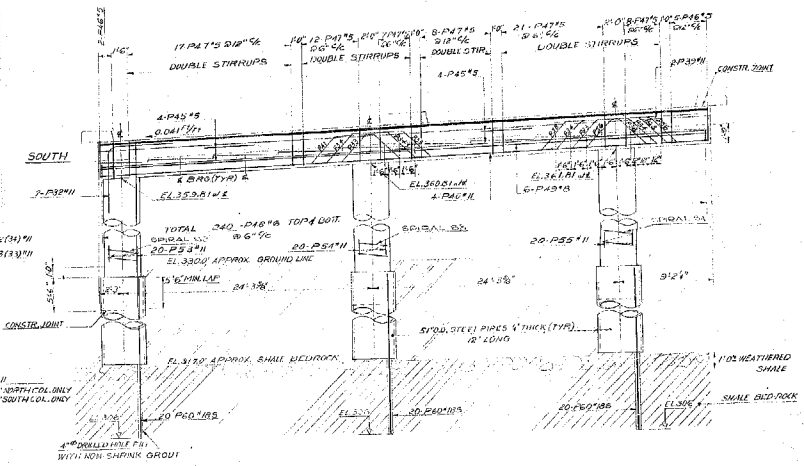
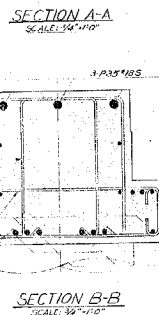
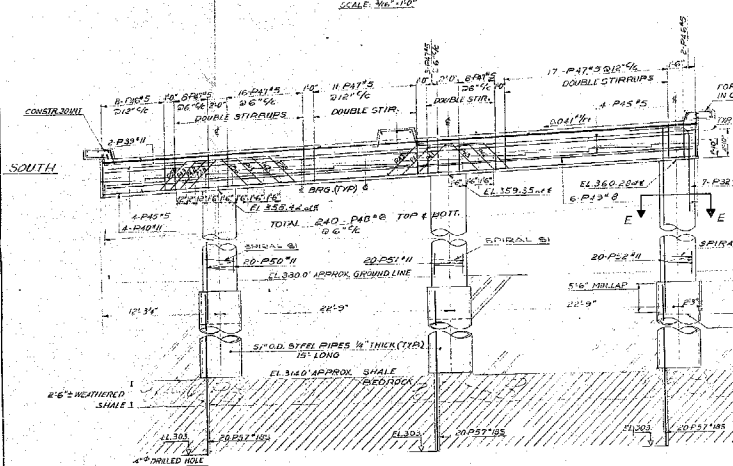
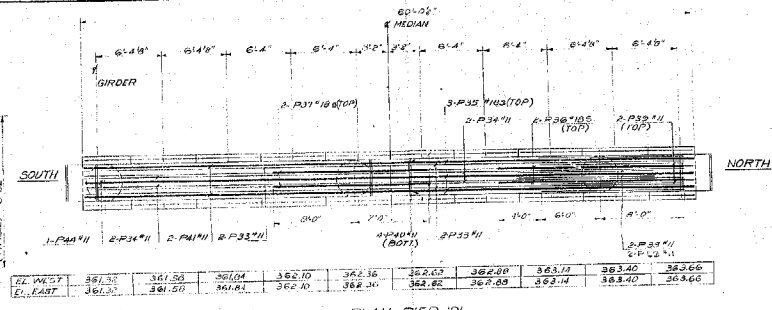
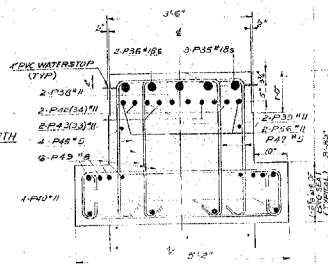
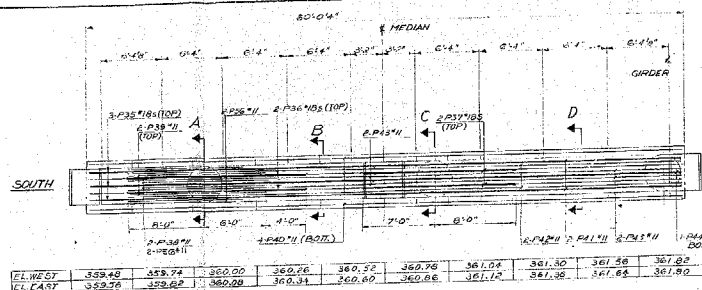
NOTE
The boundaries between soil strata have been established only at Bore Hole locations. Between Bore Holes the boundaries are assumed from geological evidence and may be subject to considerable error.



DEPARTMENT OF HIGHWAYS - ONTARIO
NOTES: ALL BORE HOLES WITH TYPICAL - FOUNDATION SECTION

**CANADIAN NATIONAL RAILWAY
AND
PLAINS ROAD - LINE 'A'
AT FREEMAN**

DESIGNED BY: G. MICRZYNSKI	DISTRICT NO. 4	DATE: APRIL 25, 1962
DRAWN BY: F. CLARK	W.P. NO. 242-61	JOB NO. 62-F-27
CHECKED BY: [Signature]	CONTRACT NO.	DRAWING NO.
APPROVED BY: [Signature]		62-F-27A



NOTE:

- FOR CURB, MEDIAN & STOP BLOCK DETAILS SEE D-5005-6
- FOR STOP BLOCK LOCATION & BEARING DETAILS SEE D-5005-8
- FOR LOCATION OF TANGENT LINE SEE DRG. D-5005-3a/d

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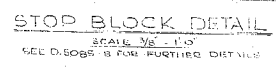
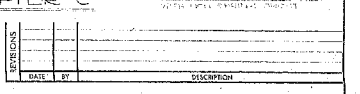
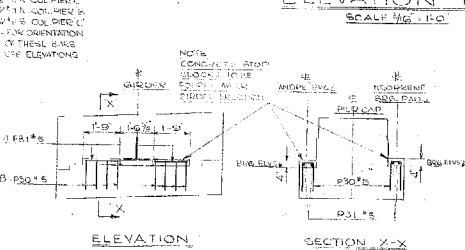
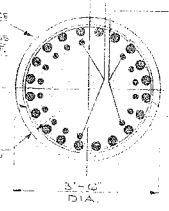
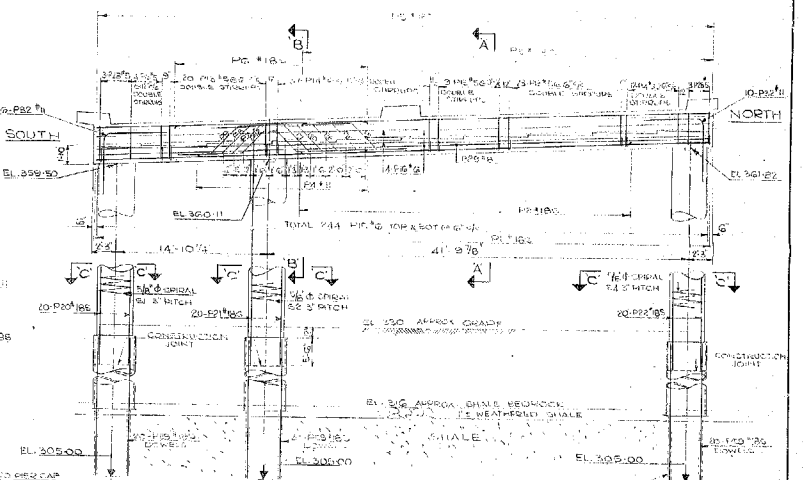
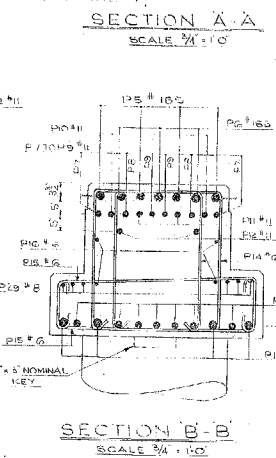
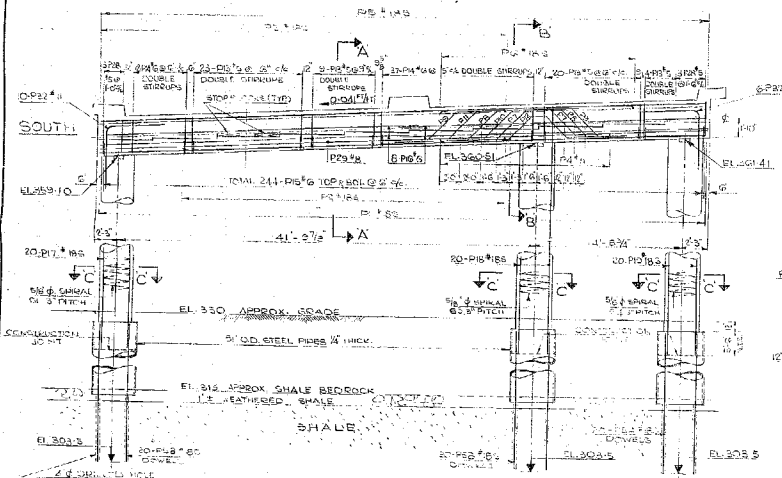
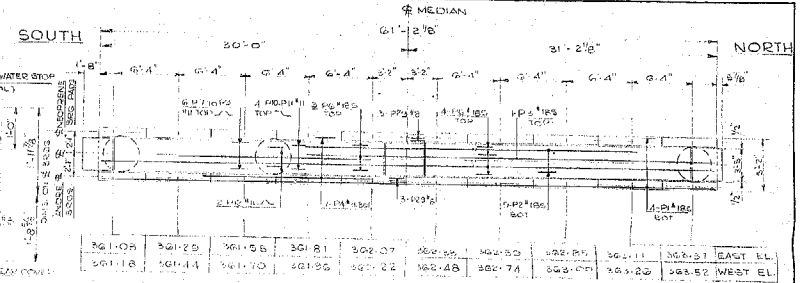
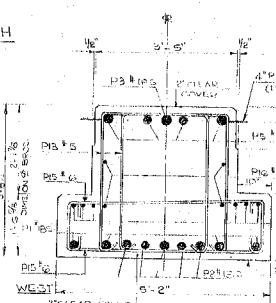
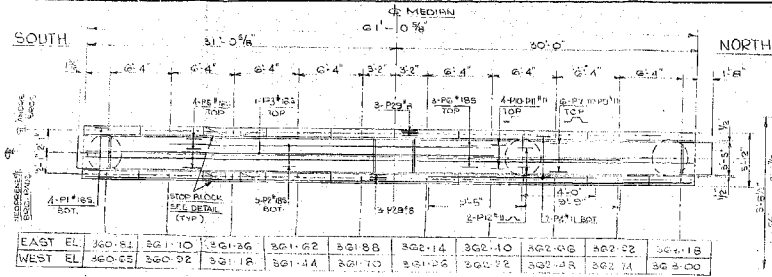
DEPARTMENT OF HIGHWAYS ONTARIO
BRIDGE DIVISION

CNR OVERHEAD & PLAINS ROAD

KING'S HIGHWAY No. PLAINFIELD (40-D GRW) DIST. No. 4
CO. 14710N WEST OF FRESHWATER CREEK
1/2 MI. S. OF WILKINSON LOT 17 COMMUNITY'S GRACE

PIERS 4' X 4'

APPROVED		DATE		W.P. No.	
DESIGN	<u>74</u>	OFFICE	<u>2-22</u>	CONTRACT	<u>#24-81</u>
QUANTITY	<u>2-14</u>	CHECK	<u>1-24</u>		
DATE	<u>1-24-63</u>	LOADING	<u>1-24</u>	REMARKS	<u>D-5083-5</u>



DEPARTMENT OF HIGHWAYS ONTARIO			
BRIDGE DIVISION			
CNR. O'HEAD & PLAINS ROAD			
KING'S HIGHWAY No. PLAINS RD. (OLD G.W.)		DIST. No. 4	
CO. HALTON	WEIR OF FLEMING CUT-OFF		
TWE. TOWN OF HURLINGTON		LOT 17	CON. BRG-TNTS BRIDGE
PIERS B & C			
APPROVED _____		BRIDGE SUPERVISOR	DATE _____
DRAWN BY _____		ENGINEER	CONTRACT NO. _____
DATE	JAN 1938	LOADING	H. 7.50
			G. 11.6
		DRAWING NO.	D.5085-G