DOCUMENT [illegible] IDENTIFICATION

GEOCRES No. 30 M 15 - 29

DIST 6 REGION CENTRAL

W. P. No. 44-71-07

CONT. No. 77-133

W. O No.

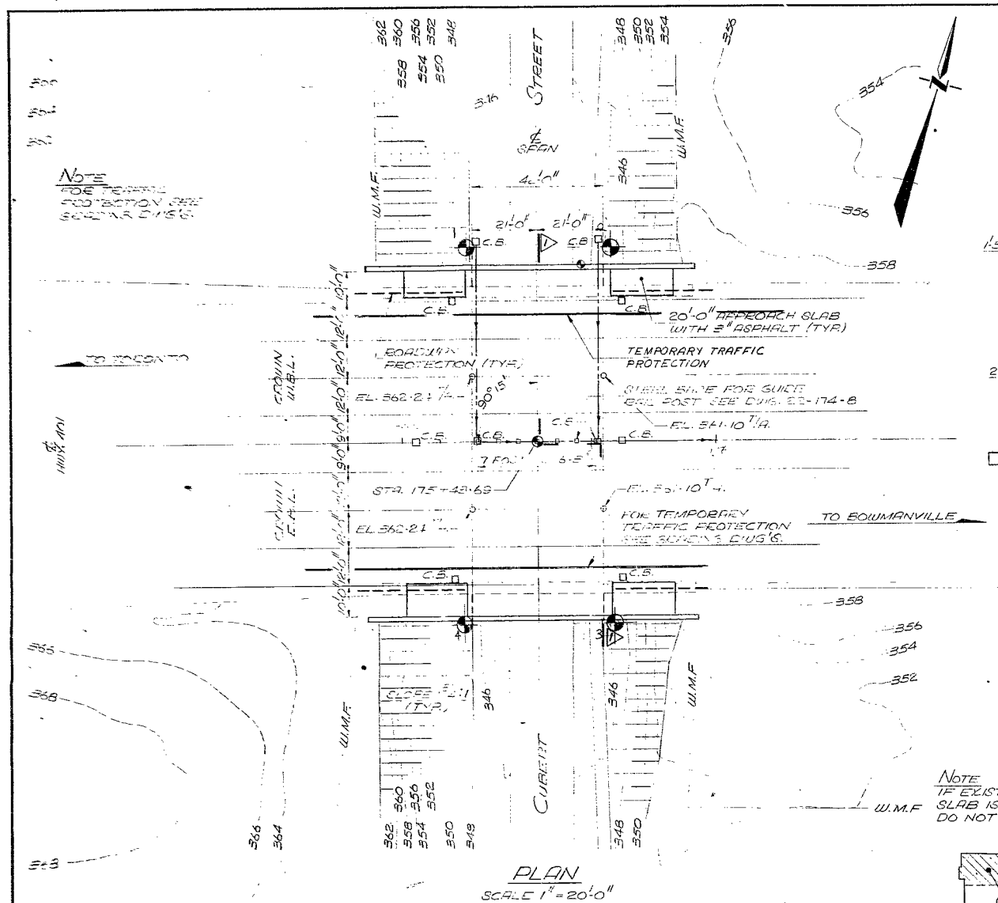
STR. SITE No. 22-174

HWY. No.

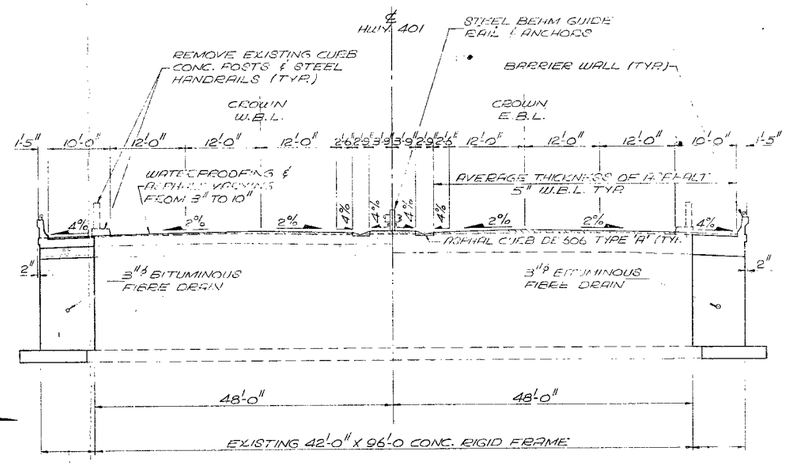
LOCATION WIDENING OF EXISTING OVERPASS STRUCTURE AT HWY 401 AND CUBERT ST.

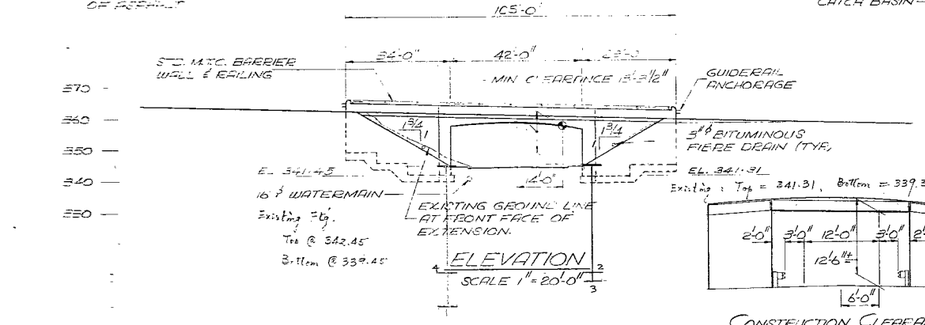
[illegible] 4

REMARKS:



PLAN
SCALE 1" = 20'-0"

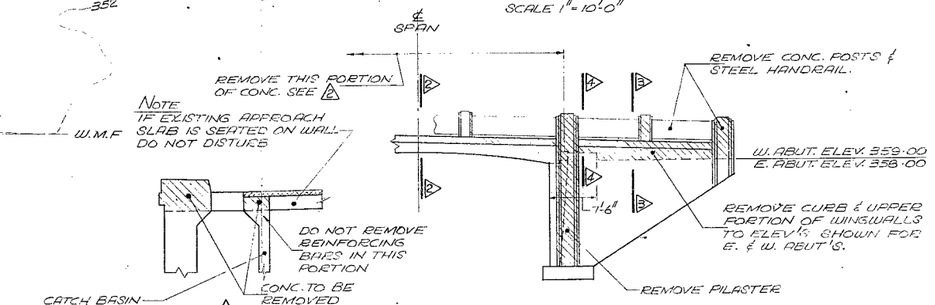




ELEVATION
SCALE 1" = 20'-0"

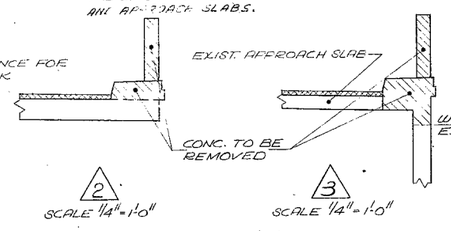
CONSTRUCTION CLEARANCE
SCALE 1" = 10'-0"

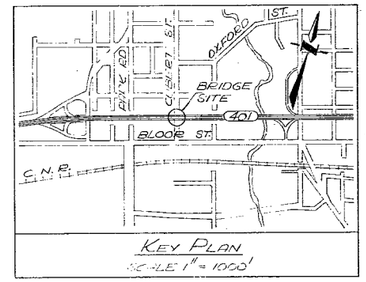
NOTE
T/A - DENOTES TOP OF PARAPET



HALF ELEVATION EXIST. STRUCTURE
SCALE 1" = 10'-0"

NOTE
ALL EXISTING ASPHALT TO BE REMOVED FROM STRUCTURE AND APPROACH SLABS.





GENERAL NOTES

CLASS OF CONCRETE

FOOTINGS	3,000	P.S.I.
REMAINDER	4,000	P.S.I.

CLEAR COVER ON REINFORCING STEEL

FOOTINGS, ABUTMENTS & RETAINING WALLS — 3"
DECK — TOP 2" — BOTTOM 1 1/2"
BARRIER WALLS — 1 1/2"
AND/OR AS NOTED ON DRAWINGS

CONSTRUCTION NOTES

- BACKFILL TO BE PLACED BEHIND ABUTMENTS BEFORE REMOVING FALSEWORK.
- FOR DETAILS OF EXIST. STRUCTURE SEE DWG. D-2748.
- DIMENSIONS OF EXIST. STRUCTURE MUST BE CHECKED IN FIELD BY THE CONTRACTOR.
- SPAN LENGTH, HEIGHT & CURVATURE OF DECK SOFFIT OF PROPOSED WIDENINGS SHALL MATCH THOSE OF EXIST. STRUCTURE.

LIST OF DRAWINGS

30M15-29

PRINT RECORD		
No.	FOR	DATE

REVISIONS		
DATE	BY	DESCRIPTION

C. F. FARRELL
REGISTERED PROFESSIONAL ENGINEER
PROVINCE OF ONTARIO

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

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS
ONTARIO

30M15-29

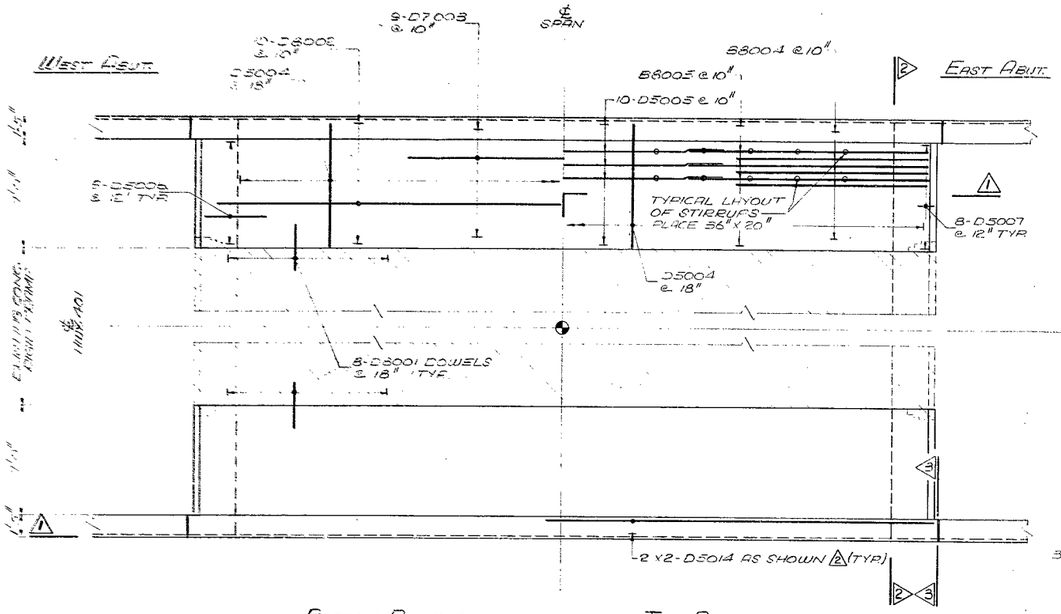
CUBERT STREET OVERPASS

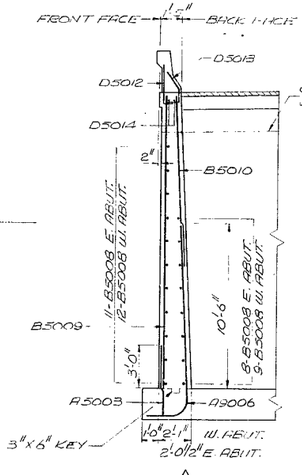
KING'S HIGHWAY No. 401 DIST. No. 6
CO. ONTARIO
TWP. CITY OF OSHAWA LOT ——— CON. ———

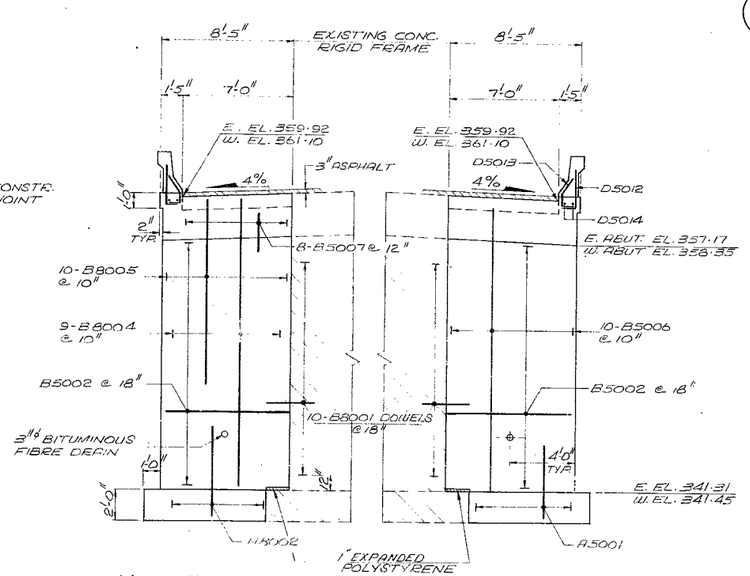
GENERAL PLAN

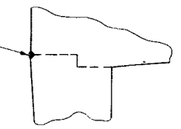
APPROVED ——— STRUCTURAL ENGINEER		CONTRACT No.	
DESIGN JDB	CHECK C.F.F.	W.P. No.	44-71-07
DRAWING E.O.N.	CHECK JDB		
DATE APRIL 74	LOADING HS-20-44	SITE No. 22-174	SHEET 1

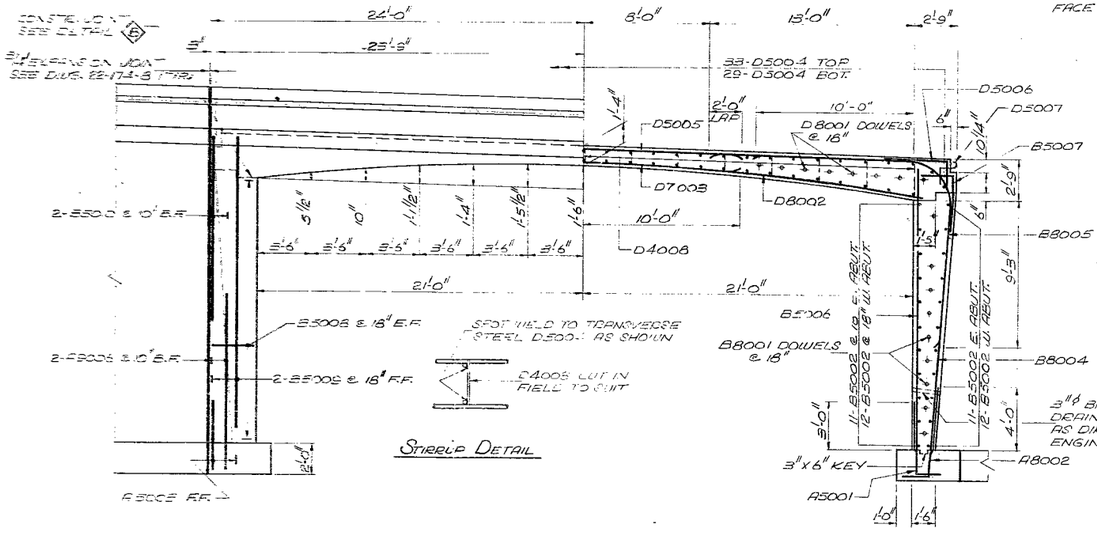
TRANSLEAR 2143-22

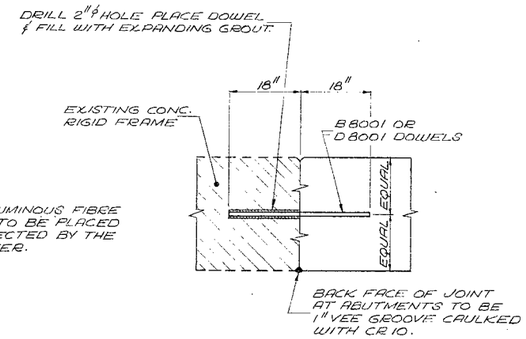












Note

Frame widenings to match existing structure.

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

PRINT RECORD

No.	FOR	DATE

REVISIONS

DATE	BY	DESCRIPTION

C. F. FARRELL
Registered Professional Engineer
Province of Ontario

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS
ONTARIO

30M15-29

CUBERT STREET OVERPASS

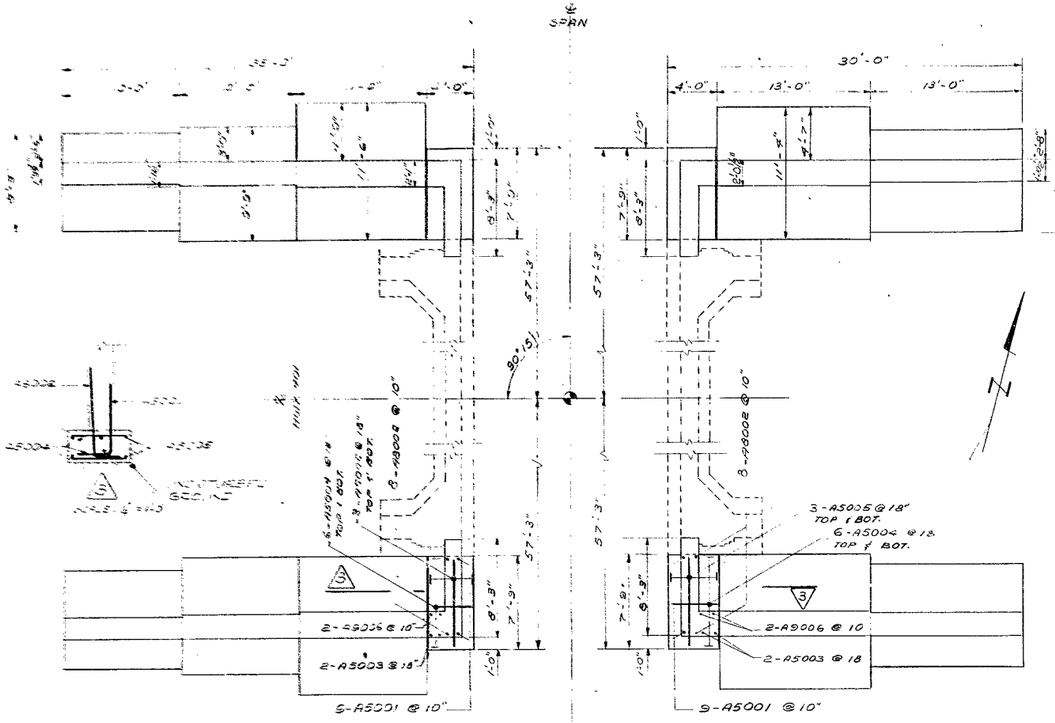
KING'S HIGHWAY No. 401 DIST. No. 6
CO. ONTARIO
TWP. CITY OF OSHAWA LOT CON.

FRAME

APPROVED STRUCTURAL ENGINEER

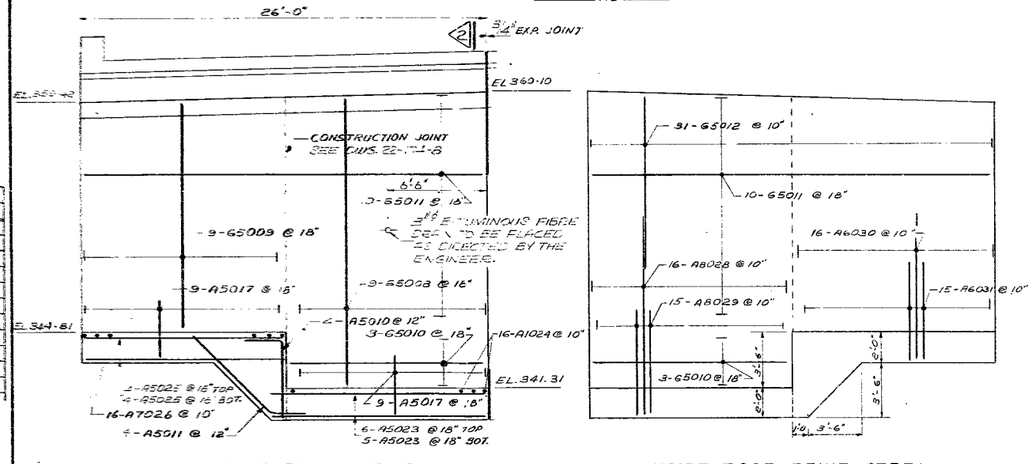
DESIGN	JDB	CHECK	C.F.F.
DRAWING	E.O'N	CHECK	JDB
DATE	APRIL 74	LOADING	HS 20-44

CONTRACT No.
W.P. No. 44-71-07
SITE No. 22-174 SHEET 4



FOOTING PLAN

SCALE : 3/16" = 1'-0"

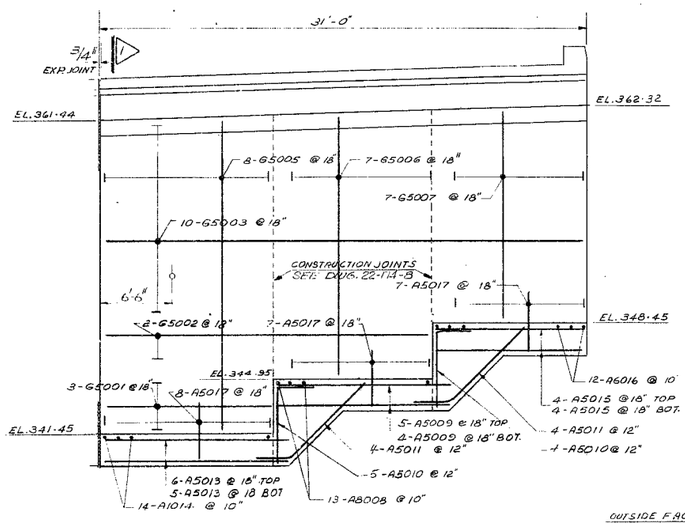


OUTSIDE FACE REINF. STEEL

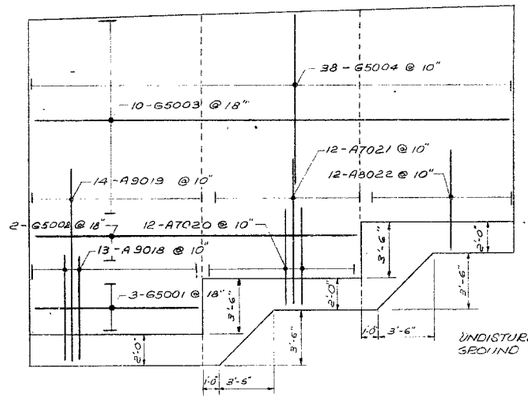
INSIDE FACE REINF. STEEL

EAST RET. WALLS (N.E. RET. WALL SHOWN)

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



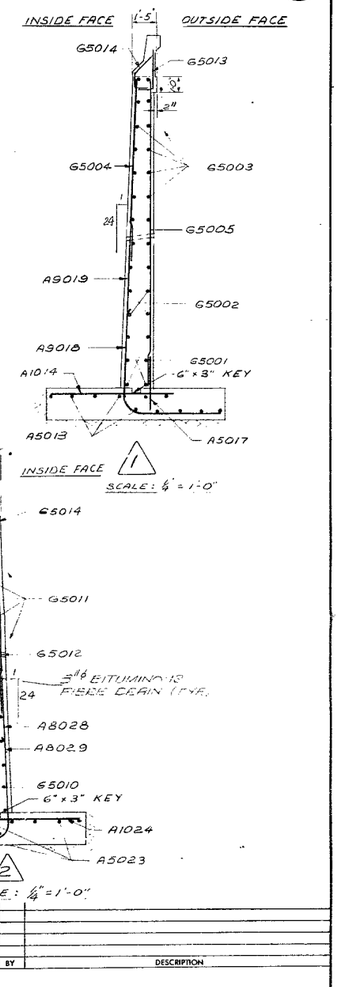
OUTSIDE FACE REINF. STEEL



INSIDE FACE REINF. STEEL

WEST RET. WALLS (S.W. RET. WALL SHOWN)

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



REVISIONS		
DATE	BY	DESCRIPTION

PRINT RECORD		
No.	FOR	DATE

FOR REDUCED PLAN

USE SCALE BELOW

10 11 12 13

3 INCHES ON ORIGINAL PLAN

REGISTERED PROFESSIONAL ENGINEER C. F. FARRELL PROVINCE OF ONTARIO

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS
ONTARIO

30M15-29

CUBERT STREET OVERPASS

KING'S HIGHWAY No. 401 DIST. No. 6

CO. ONTARIO

TWP. CITY OF OSHAWA LOT CON.

FOOTING LAYOUT & RET. WALLS

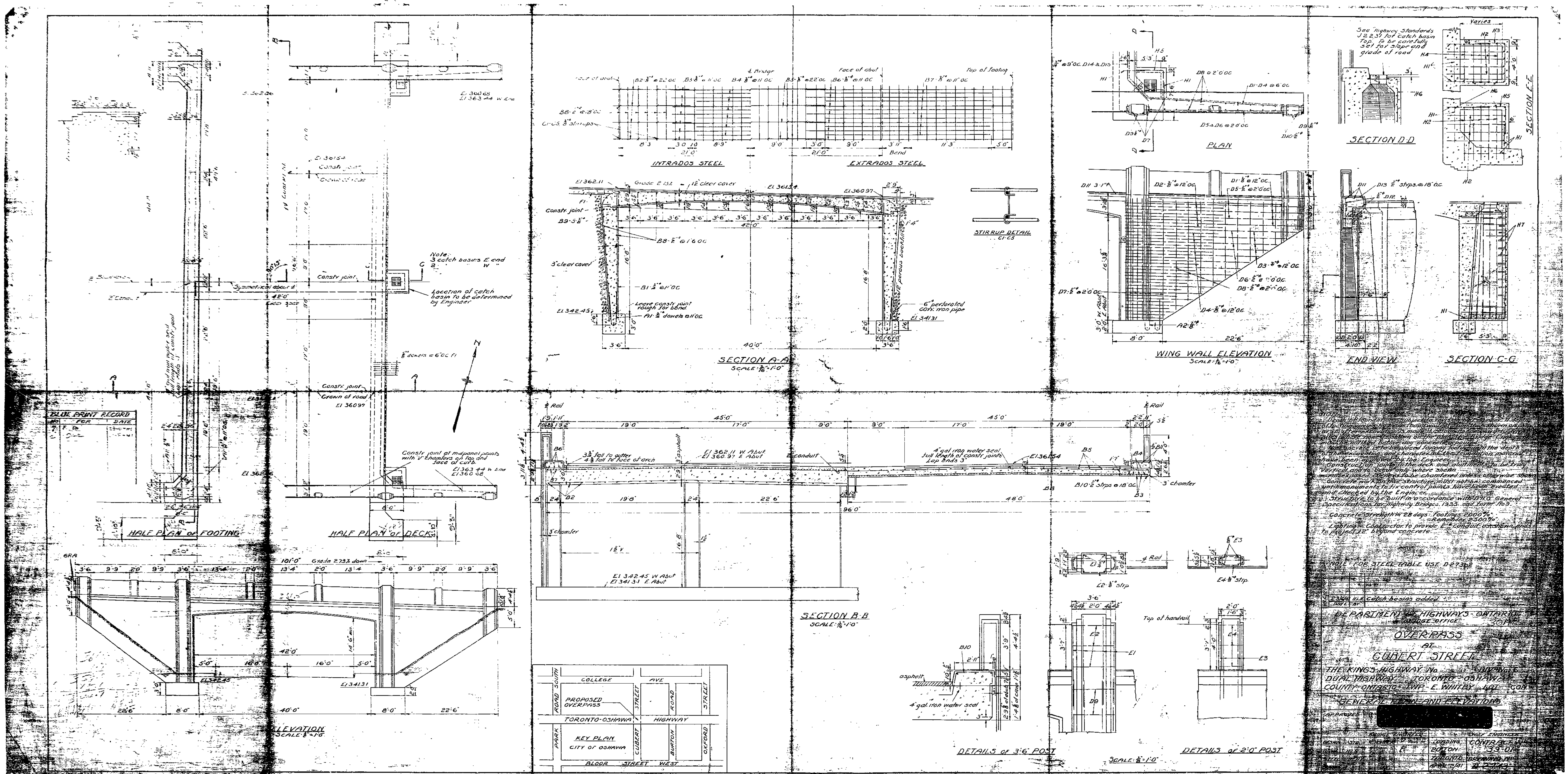
APPROVED _____ STRUCTURAL ENGINEER

DESIGN	J.D.B.	CHECK	C.F.F.
DRAWING	J.A.	CHECK	J.D.B.
DATE	APRIL 74	LOADING	HS-20-44

CONTRACT No. .

W.P. No. 44-71-07

SITE No. 22-174 SHEET 3


HALF PLAN of FOOTING
HALF PLAN of DECK
ELEVATION
SCALE 1/8"=1'-0"
INTRADOS STEEL
EXTRADOS STEEL
SECTION A-A
SCALE 1/4"=1'-0"
STIRRUP DETAIL
PLAN
WING WALL ELEVATION
SECTION D-D
SECTION E-E
END VIEW
SECTION C-C
SECTION B-B
SCALE 1/4"=1'-0"
DETAILS of 3'-6" POST
DETAILS of 2'-0" POST
BLUE PRINT RECORD
Location of catch basin to be determined by Engineer
KEY PLAN
CITY OF OSHAWA
COLLEGE AVE
TORONTO-OSHAWA HIGHWAY
PROPOSED OVERPASS
PARK ROAD SOUTH
CUBERT STREET
BURTON ROAD
OXFORD STREET
BLOOR STREET WEST
DEPARTMENT OF HIGHWAYS - ONTARIO
OVERPASS
AT
CUBERT STREET
THE KING'S HIGHWAY No.
DUAL HIGHWAY TORONTO-OSHAWA
GENERAL PLAN AND ELEVATIONS

DOCUMENT MICROFILMING IDENTIFICATION

GEOCRES No. 30M15-29

DIST. 6 REGION Central

W.P. No. 44-71-07

CONT. No. 77-133

W. O. No.

STR. SITE No. 22-174

HWY. No.

LOCATION Widening of Existing Overpass Structure at Hwy. 401 and Cubert Street

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT. 4

REMARKS ① documents to be unfolded before microfilming

② to be added to existing microfilm.

G1-30 SEPT 1976

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

30M15-29

MEMORANDUM

TO: Mr. G.C.E. Burkhardt, (3)
Regional Structural Planning Eng.,
Central Region,
3501 Dufferin St., Downsview.

FROM: Foundations Office,
Design Services Branch,
West Bldg., Downsview.

ATTENTION:

DATE: July 30, 1973.

OUR FILE REF.

IN REPLY TO AUG - 3 1973

SUBJECT:

FOUNDATION INVESTIGATION REPORT
For
The Proposed Widening of Existing
Overpass Structure at the Crossing of
Hwy. 401 and Cubert Street
City of Oshawa, County of Ontario
District #6 (Toronto), Site #22-174
W.O. 73-11010 - W.P. 44-71-07

cont. 77-133

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

We believe that the factual data and recommendations contained therein will prove adequate for your design requirements. Should additional information be required, please do not hesitate to contact our Office.

A. G. Stermac,
PRINCIPAL FOUNDATIONS ENGINEER.

AGS/ao
Attch.
c.c. E. J. Orr
B. R. Davis
A. Rutka
R. S. Pillar
H. Greenland
B. J. Giroux
C. Mirza
G. A. Wrong
B. A. Singh

Foundations Files
Documents

TABLE OF CONTENTS

FOUNDATION INVESTIGATION REPORT
For
The Proposed Widening of Existing
Overpass Structure at the Crossing of
Hwy. 401 and Cubert Street
City of Oshawa, County of Ontario.
District #6 (Toronto), Site #22-174
W.O. 73-11010 - W.P. 44-71-07

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1. *INTRODUCTION:*

The Foundations Office was requested to carry out a subsurface investigation at the crossing of Hwy. #401 and Cubert Street in the City of Oshawa, County of Ontario. This investigation is concerned with the widening of the Cubert Street Overpass to accommodate a six-lane traffic on Hwy. #401. The request was contained in a memo from Mr. G.C.E. Burkhardt, Regional Structural Planning Engineer, dated December 6, 1972. Subsequently, an investigation was carried out by this Office to determine the subsoil and groundwater conditions at this site.

This report contains the results of the investigation, together with recommendations pertaining to the foundations for the widening of the existing bridge structure, as well as the stability and settlement considerations associated with the approach embankments.

2. *DESCRIPTION OF THE SITE AND GEOLOGY:*

The site is situated at the crossing of Hwy. 401 and Cubert Street in the City of Oshawa, County of Ontario. It

....2

is about 1/4 mile west of Simcoe Street in Oshawa. The area is flat to undulating in relief between elevations 340 to 350 ft.

This region is physiographically referred to as the "Iroquois Plain." The old shoreline of glacial Lake Iroquois is well marked by gravel bars, off-shore deposits of sands and the rest of it is a "mosaic" of till plains, drumlins, and silty lacustrine deposits.

3. *FIELD AND LABORATORY WORK:*

Four sampled boreholes each accompanied by a dynamic cone penetration test, were put down at this site. The borings were advanced by means of a C.M.E. auger machine adopted for soil sampling purposes.

Samples of the subsoil were recovered at required depths in a 2" O.D. split-spoon sampler which was hammered into the soil in accordance with the specifications for the Standard Penetration Test. The same method was used to advance the dynamic cone penetration tests.

The locations and elevations of all the borings were surveyed in the field by personnel from this Office; they are shown on Drawing No. 73-11010A, together with estimated stratigraphical sections across the site.

All samples were visually examined and identified in the field and subsequently in the laboratory. Following this laboratory testing was carried out on selected representative samples to determine the various physical properties; namely,

Atterberg Limits
Natural Moisture Contents
Grain-Size Distributions

The results of the laboratory testing are plotted on the Record of Borelog sheets and summarized on Figures 1 and 2, all contained in the Appendix of this report.

4. *SUBSOIL CONDITIONS:*

4.1) *General:*

Underlying a 3.5 ft. to 6.5 ft. thick fill material

is the predominant stratum of hard heterogeneous mixture of clayey silt, sand and gravel (glacial till).

The boundaries of the various deposits are shown on the accompanying borelog sheets. The stratigraphical sections shown on Drawing No. 73-11010A have been inferred from this boring data.

From ground surface downward the various soil types encountered are as follows:

4.2) Fill Material (Clayey Silt with Some Sand and Gravel):

Fill material was encountered at all boring locations. Its thickness varies from 3.5 ft. (B.H. #4) to 6.5 ft. (B.H. #2). The fill material is a brown clayey silt with some sand and gravel and traces of organics. It is estimated that the fill material has been moderately compacted.

4.3) Heterogeneous Mixture of Clayey Silt, Sand and Gravel (Glacial Till):

The predominant stratum at the site is a heterogeneous mixture of clayey silt, sand and gravel of glacial origin. This deposit was not fully penetrated at any of the boring locations. The grain-size distribution curves for samples of the cohesive material are plotted on Fig. 1.

Atterberg limit testing was performed on samples of the cohesive material. The results, which are shown on the borelog sheets and on the Plasticity Chart (Fig. 2) are tabulated below:

	Range	*Average*
Liquid Limit %	17 - 30	23.5
Plastic Limit %	10 - 20	15
Natural Moisture Content %	6 - 14	10

Based on these results it is inferred that the cohesive glacial till is inorganic and of low plasticity.

Standard Penetration testing carried out within this stratum gave "N" values ranging from 43 blows per foot to 100 blows per 2". It is estimated that the consistency of the cohesive glacial till is hard.

....4

5. GROUNDWATER CONDITIONS:

The groundwater conditions across the site during the period of the investigation (April 1973) were observed by taking readings in the open boreholes. The results of these readings are shown on the borelog sheets, as well as on Drawing No. 73-11010A.

The observations indicate that the groundwater level in the open boreholes varies between elevations 338.5 to 341.2 ft. corresponding to depths below existing ground surface of from 3.5 ft. to 6.5 ft.

6. DISCUSSIONS AND RECOMMENDATIONS:

6.1) General:

It is proposed to widen the existing overpass structure at the crossing of Hwy. 401 and Cubert Street, in the City of Oshawa as part of the planned widening of Hwy. 401 in this area. This construction will require that the existing overpass structure be extended by some 9.5 feet on each side of the structure.

The existing bridge, which was constructed in 1941, is a 99-foot-wide single span (42 feet) rigid frame structure. According to available information, this structure is supported on spread footings founded on elevation 339.45 (west abutment) and 339.31 (east abutment). The profile grade of Hwy. 401, in the vicinity of the crossing, ranges from elevation 361 (east abutment) to elevation 362 (west abutment). The approaches are up to 17 feet above the existing grade of Cubert Street.

Visual observations indicate that the structure and the approaches are performing satisfactorily.

The subsoil at the site consists of up to 6.5 feet of fill material overlying an extensive deposit of glacial till.

The recommendations pertaining to the design of the footing extensions and the stability considerations associated with the approach embankments will be discussed in the subsections to follow.

....5

6.2) Foundations - Abutment Extensions:

The proposed abutment extensions may be founded on spread footings located within the hard parent glacial till deposit at the same founding elevation of the existing abutments. In designing these footings, an allowable bearing value of up to 3.5 t.s.f. may be used. In computing the lateral resistance of the footings, an adhesion value of 2,500 p.s.f. may be used between rough concrete and undisturbed glacial till.

The footing extensions will settle due to the imposed loading. The magnitude of the settlement should not exceed 1/2 inch provided the foundation subsoil is not loosened or softened during the construction period. In addition, this settlement will be elastic in nature; i.e., it will take place during or immediately following the application of the full structural load. In order to accommodate any possible differential settlement between the existing abutment footing and the extension, it is recommended that a construction joint be provided between these two elements.

The base of the footings will be located below the groundwater level recorded during the period of the field investigation (April 1973). In view of the impervious nature of the overburden, no major dewatering problems are anticipated. Any minor surface runoff and/or groundwater seepage into the excavations could be handled by conventional methods; e.g., by pumping from sumps.

The rigid walls of the extended portion of the abutments should be designed using a coefficient of earth pressure at rest (K_o) of 0.5 for the granular fill material placed behind the walls.

In order to relieve the buildup of excess hydrostatic pressure behind the abutment extensions suitable drainage measures should be provided. Backfill behind the wall should be carried out in accordance with current M.T.C. practices.

6.3) Widened Approach Embankments:

The existing approach embankments are to be widened

by about 9 ft. in both northerly and southerly directions. No stability problems are anticipated provided:

1) Standard 2:1 slopes are employed,
2) The topsoil, along the existing bank, be stripped and the new fill "keyed" into the existing slope in accordance with current M.T.C. practices.

7. *MISCELLANEOUS:*

The field work, performed during the period of April 17 to 24, 1973, was carried out under the supervision of Mr. V. Korlu, Project Foundations Engineer, who also prepared this report.

The equipment was owned and operated by Longyear Co. of Toronto.

This project was carried out under the general supervision of Mr. M. Devata, Supervising Foundations Engineer, who also reviewed this report.

V. Korlu, P. Eng.

REGISTERED PROFESSIONAL ENGINEER
CIVIL
V. KORLU
PROVINCE OF ONTARIO

M. Devata, P. Eng.

VK/ao
July 27, 1973.

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS–ONTARIO

DESIGN SERVICES BRANCH — FOUNDATIONS OFFICE

RECORD OF BOREHOLE Nº 1

JOB 73-11010 — LOCATION Co-ords. 15,944,784 N & 1,167,715 E — ORIGINATED BY V.K.

W.P. 44-71-07 — BORING DATE April 17, 1973. — COMPILED BY V.K.,

DATUM Geodetic — BOREHOLE TYPE Auger and Cone Test — CHECKED BY

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	TYPE	BLOWS/FOOT	ELEV. SCALE	REMARKS
344.7	Ground level.						GR.SA.SI.CL.
0.0	Clayey silt with some sand and gravel.						
339.7	(Fill material)Stiff.		1	SS	9	340	▼WL 339.7
5.0			2	SS	140/10"		
	Heterogeneous mixture of clayey silt to silty clay, sand and gravel.		3	SS	156/11"		9-37-35-19
			4	SS	179/11"	330	4-37-40-19
			5	SS	133/11"		
			6	SS	71		0-3-24-73
	(Glacial till)		7	SS	37		
			8	SS	43	320	
	Hard						
			9	SS	58	310	
300.2			10	SS	37	300	2-28-42-28
44.5	End of Borehole						

DYNAMIC PENETRATION RESISTANCE — BLOWS / FOOT — 20 40 60 80 100

SHEAR STRENGTH P.S.F. — ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE

LIQUID LIMIT w_L — PLASTIC LIMIT w_P — WATER CONTENT w — w_P w w_L

WATER CONTENT % — 15 30 45

BULK DENSITY γ P.C.F.

OFFICE REPORT — SOIL EXPLORATION

20
15 ◇ 5 % STRAIN AT FAILURE
10

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS – ONTARIO

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE Nº 2

JOB 73-11010 LOCATION Co-ords. 15,944,798N & 1,167,761E ORIGINATED BY V.K.

W.P. 44-71-07 BORING DATE April 18, 1973 COMPILED BY V.K.

DATUM Geodetic BOREHOLE TYPE Auger and Cone Test CHECKED BY

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT	ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE (BLOWS / FOOT 20 40 60 80 100; SHEAR STRENGTH P.S.F. o UNCONFINED + FIELD VANE • QUICK TRIAXIAL × LAB VANE)	LIQUID LIMIT W_L / PLASTIC LIMIT W_P / WATER CONTENT W (WATER CONTENT % 10 20 30)	BULK DENSITY γ P.C.F.	REMARKS GR.SA.SI.CL.
345.0	Ground level									
0.0	Clayey silt with some sand and gravel and traces of organics									
338.5	(Fill material) Firm		1	SS	7	340				WL 3385
6.5			2	SS	97					21-69-9
	Heterogeneous mixture of clayey silt, sand and gravel		3	SS	175/11"					
			4	SS	162/10"					3-39-41-17
			5	SS	121/9"	330				
	(Glacial till)		6	SS	100/3"					1-32-48-19
	Hard		7	SS	100/3"	320				
310.8			8	SS	100/2"	310				
34.2	End of Borehole									

OFFICE REPORT ON SOIL EXPLORATION

20
15 ◇ 5 % STRAIN AT FAILURE
10

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS – ONTARIO

DESIGN SERVICES BRANCH — FOUNDATIONS OFFICE

RECORD OF BOREHOLE Nº 3

JOB 73-11010 — LOCATION Co-ords. 15,944,684N & 1,167,798E — ORIGINATED BY V.K.

W.P. 44-71-07 — BORING DATE April 19, 1973 — COMPILED BY V.K.

DATUM Geodetic — BOREHOLE TYPE Auger and Core Test — CHECKED BY

SOIL PROFILE ELEV./DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	TYPE	BLOWS/FOOT	ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS/FOOT 20 40 60 80 100; SHEAR STRENGTH P.S.F. ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE	LIQUID LIMIT w_L PLASTIC LIMIT w_P WATER CONTENT w w_P w w_L WATER CONTENT % 10 20 30	BULK DENSITY γ P.C.F.	REMARKS GR.SA.SI.CL.
344.7	Ground level									
0.0	Clayey silt with some sand and gravel and traces of organics (Fill material) Stiff		1	SS	9	340				WL 339.7
339.7										
5.0	Heterogeneous mixture of clayey silt, sand and gravel		2	SS	160/9"			o		14-34-31-18
			3	SS	174/10"					
			4	SS	145/11"	330		o		
			5	SS	173					
			6	SS	137/10"			o		
	(Glacial till)		7	SS	100/4"					
			8	SS	81/8"	320		o		4-38-40-18
	Hard									
			9	SS	100/7"	310				
308.2										
36.5	End of Borehole					300				

20
15 ⊹ 5 % STRAIN AT FAILURE
10

OFFICE REPORT — SOIL EXPLORATION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS–ONTARIO

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE Nº 4

JOB 73-11010 LOCATION Co-ords. 15,944,669N & 1,167,752E ORIGINATED BY V.K.

W.P. 44-71-07 BORING DATE April 24, 1973 COMPILED BY V.K.

DATUM Geodetic BOREHOLE TYPE Auger and Cone Test CHECKED BY

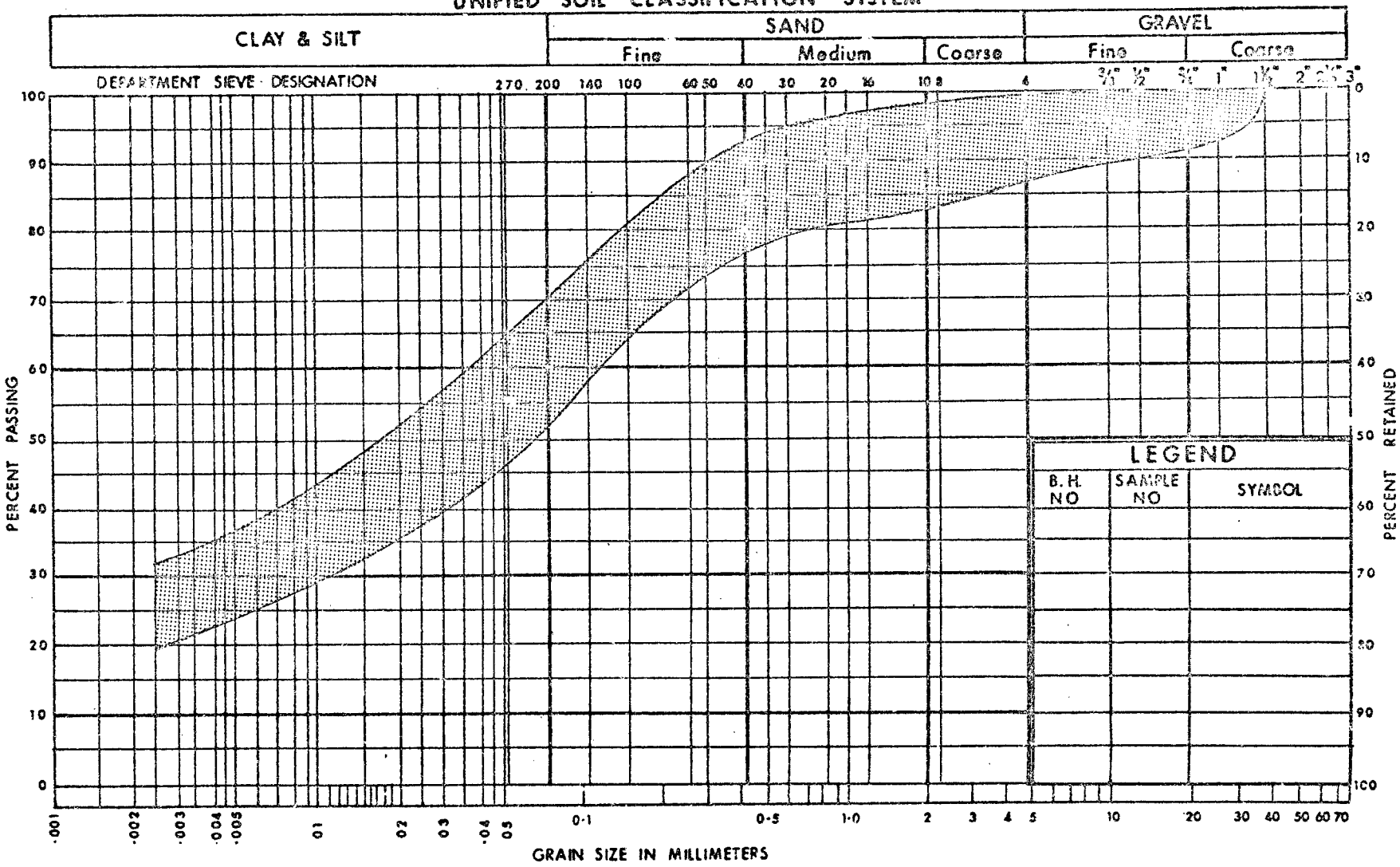
ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/FOOT	ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT (20 40 60 80 100) SHEAR STRENGTH P.S.F. ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE	LIQUID LIMIT w_L PLASTIC LIMIT w_P WATER CONTENT w WATER CONTENT % (10 20 30)	BULK DENSITY γ P.C.F.	REMARKS GR.SA.SI.CL.
344.7	Ground level									
0.0	Clayey silt with some sand and gravel (Fill material) Stiff		1	SS	58	340				WL 341.2
341.2										
3.5	Heterogeneous mixture of clayey silt, sand and gravel (Glacial till)		2	SS	16/7"			○		6-38-38-18
			3	SS	100/6"			○		
			4	SS	17/10"	330				
			5	SS	16/10"			○		12-33-35-20
			6	SS	100/6"					
	Hard		7	SS	16/11"	320		○		4-40-37-10
310.2			8	SS	100/6"	310				
34.5	End of Borehole									

20
15 ◇ 5 % STRAIN AT FAILURE
10

OFFICE REPORT ON SOIL EXPLORATION

FORM OD-MT
REV. AUG. 197

UNIFIED SOIL CLASSIFICATION SYSTEM



DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS
ONTARIO
DESIGN SERVICES BRANCH

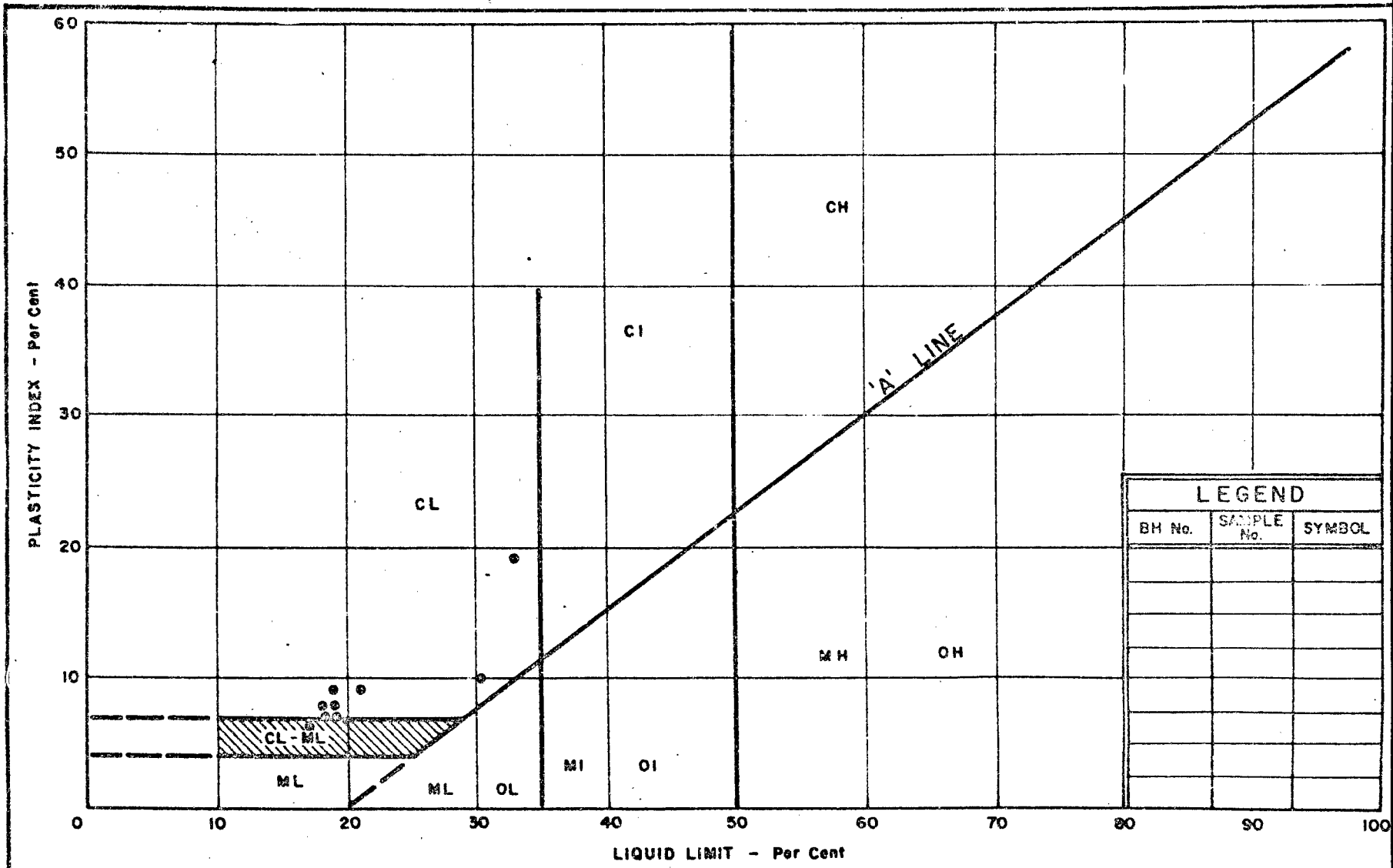
GRAIN SIZE DISTRIBUTION

GLACIAL TILL

HET. MIXTURE OF CLAYEY SILT, SAND & GRAVEL

W.P. No.	44 - 71 - 07
JOB No.	73 - 11010
	FIG. 1

FORM C -MT-252
REVISED JULY, 1966



DEPARTMENT OF HIGHWAYS
MATERIALS and TESTING DIVISION

PLASTICITY CHART
GLACIAL TILL
HET. MIXTURE OF CLAYEY SILT, SAND & GRAVEL

W.P. No. 44 - 71 - 07
JOB No. 73 - 11010
FIG. 2

FD-7 (Rev. Jan. 73)

ABBREVIATIONS & SYMBOLS USED IN THIS REPORT

PENETRATION RESISTANCE

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

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

DESCRIPTION OF SOIL

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

CONSISTENCY	c LB./SQ.FT.
VERY SOFT	0 - 250
SOFT	250 - 500
FIRM	500 - 1000
STIFF	1000 - 2000
VERY STIFF	2000 - 4000
HARD	> 4000

DENSENESS	'N' BLOWS / FT.
VERY LOOSE	0 - 4
LOOSE	4 - 10
COMPACT	10 - 30
DENSE	30 - 50
VERY DENSE	> 50

TERMS TO BE USED IN DESCRIBING SOILS:-

TRACE < 10% , SOME 10-25% , WITH 25-40% , > 40% SILTY, SANDY, GRAVELLY, CLAYEY ETC.

TYPE OF SAMPLE

S.S.	SPLIT SPOON	T.W.	THINWALL OPEN
W.S.	WASHED SAMPLE	T.P.	THINWALL PISTON
S.T.	SLOTTED TUBE SAMPLE	O.S.	OESTERBERG SAMPLE
A.S.	AUGER SAMPLE	F.S.	FOIL SAMPLE
C.S.	CHUNK SAMPLE	R.C.	ROCK CORE

P.H. SAMPLE ADVANCED HYDRAULICALLY

P.M. SAMPLE ADVANCED MANUALLY

SOIL TESTS

U	UNCONFINED COMPRESSION	L.V.	LABORATORY VANE
UU	UNCONSOLIDATED UNDRAINED TRIAXIAL	F.V.	FIELD VANE
CIU	CONSOLIDATED ISOTROPIC UNDRAINED TRIAXIAL	C	CONSOLIDATION
CID	" " DRAINED "	S	SENSITIVITY
CAU	" ANISOTROPIC UNDRAINED "		
CAD	" " DRAINED "		

FD-9b (Rev Jan 73)

ABBREVIATIONS & SYMBOLS USED IN THIS REPORT

SOIL PROPERTIES

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

EARTH PRESSURE

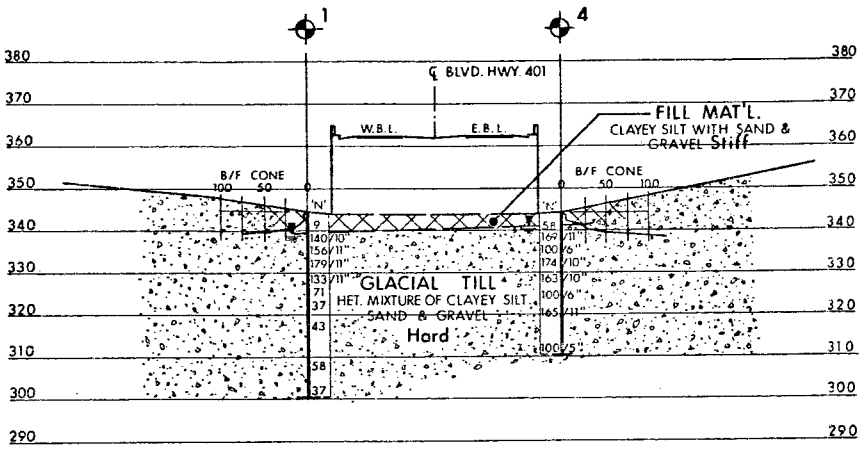
d	DISTANCE FROM TOP OF WALL TO POINT OF APPLICATION OF PRESSURE
δ	ANGLE OF WALL FRICTION
K	DIMENSIONLESS COEFFICIENT TO BE USED WITH VARIOUS SUFFIXES IN EXPRESSIONS REFERRING TO NORMAL STRESS ON WALLS
K_o	COEFFICIENT OF EARTH PRESSURE AT REST

FOUNDATIONS

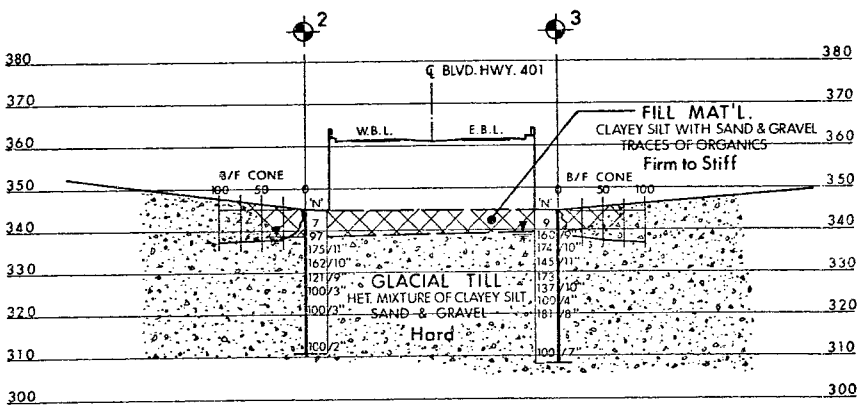
B	BREADTH OF FOUNDATION
L	LENGTH OF FOUNDATION
D	DEPTH OF FOUNDATION BENEATH GROUND
N	DIMENSIONLESS COEFFICIENT USED WITH A SUFFIX APPLYING TO SPECIFIC GRAVITY, DEPTH AND COHESION ETC. IN THE FORMULA FOR BEARING CAPACITY
k_s	MODULUS OF SUBGRADE REACTION

SLOPES

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



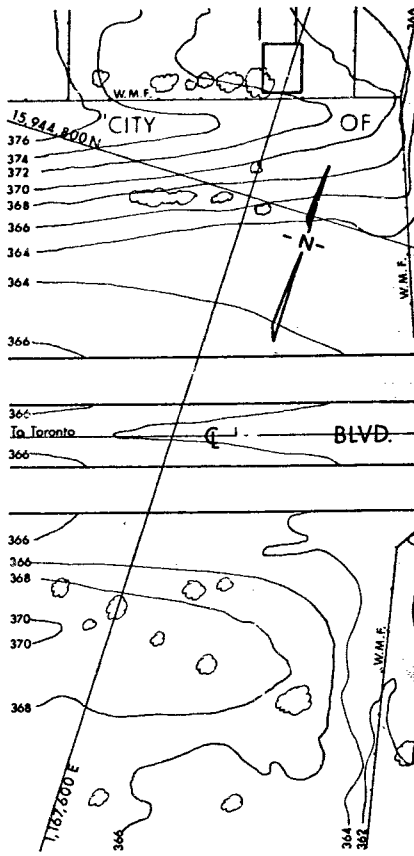
A-A

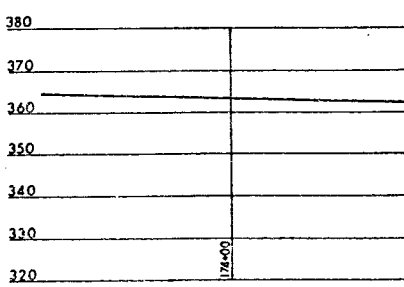


B-B

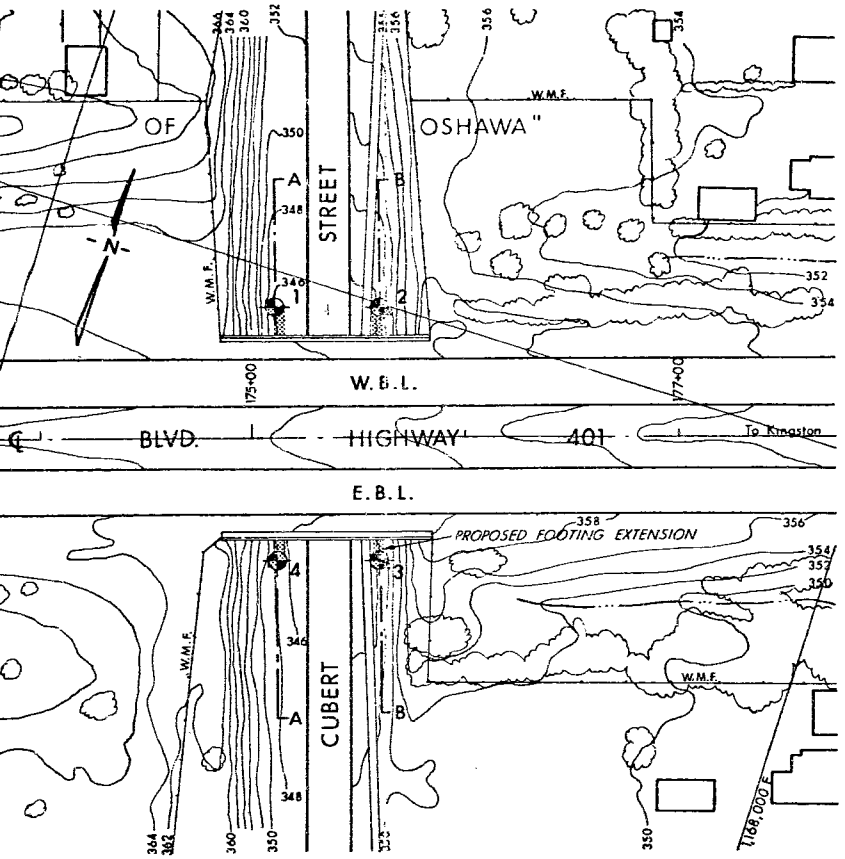
SECTIONS

VERT. 20 10 0 SCALE 20 ft.
HORIZ. 40 20 0 40 80





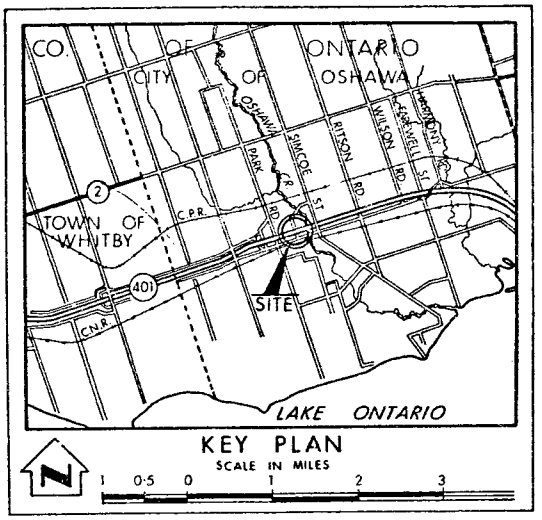
VERT. 20
HORIZ 40



PLAN

SCALE

40 20 0 40 80 FT.



KEY PLAN

SCALE IN MILES

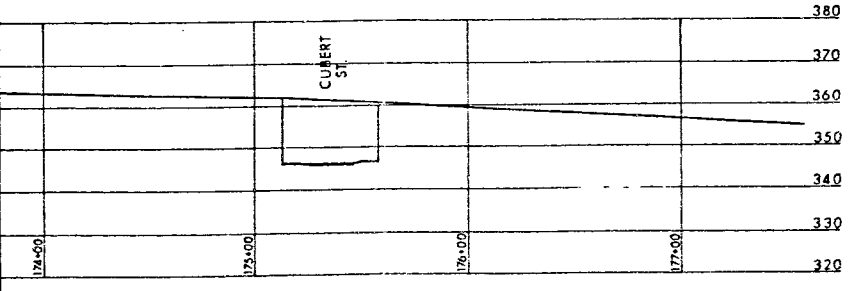
LEGEND

- Bore Hole
- Cone Penetration Test
- Bore Hole & Cone Test
- Water Levels established at time of field investigation. APRIL 1973

NO.	ELEVATION	CO-ORDINATES	
		NORTH	EAST
1	344·7	15,944,784	1,167,715
2	345·0	15,944,798	1,167,761
3	344·7	15,944,684	1,167,798
4	344·7	15,944,669	1,167,752

— NOTE —

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



℄ PROFILE

VERT. 20 10 0 SCALE 20 40 FT.

HORIZ 40 20 0 40 80

REGISTERED PROFESSIONAL ENGINEER V. KOTLIU PROVINCE OF ONTARIO

REF. NO. B4-18

REVISIONS			
	DATE	BY	DESCRIPTION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS—ONTARIO
DESIGN SERVICES BRANCH—FOUNDATIONS OFFICE

CUBERT STREET

HIGHWAY NO. 401 DIST. NO. 6

CO. ONTARIO CITY OF OSHAWA

TWP. LOT CON

BORE HOLE LOCATIONS & SOIL STRATA

SUBM'D V.K.	CHECKED	W.P. NO. 44-71-07	DRAWING NO. 73-11010A
DRAWN S.O.	CHECKED	W.O. NO. 73-11010	
DATE 19 JULY 1973		SITE NO.	BRIDGE DRAWING NO.
APPROVED PRINCIPAL FOUNDATION ENGINEER		CONT NO.	

SND-TRACE 300-8-75

Ministry of Transportation and Communications
Ontario

Memorandum

To: Mr. M. R. Ernesaks,
Regional Manager,
Central Region, Toronto.

From: Structural Office,
West Building, Downsview.

Attention:

Date: 77 09 19

Our File Ref.

In Reply to

Subject: Cubert Street Overpass Widening,
W.P. 44-71-07, Site 22-174,
Highway 401, District 6.

Since the Steel Noise Barrier is introduced, please delete the Steel Parapet Rail from the contract documents.

GP/WMcF/cf

G. Pajus,

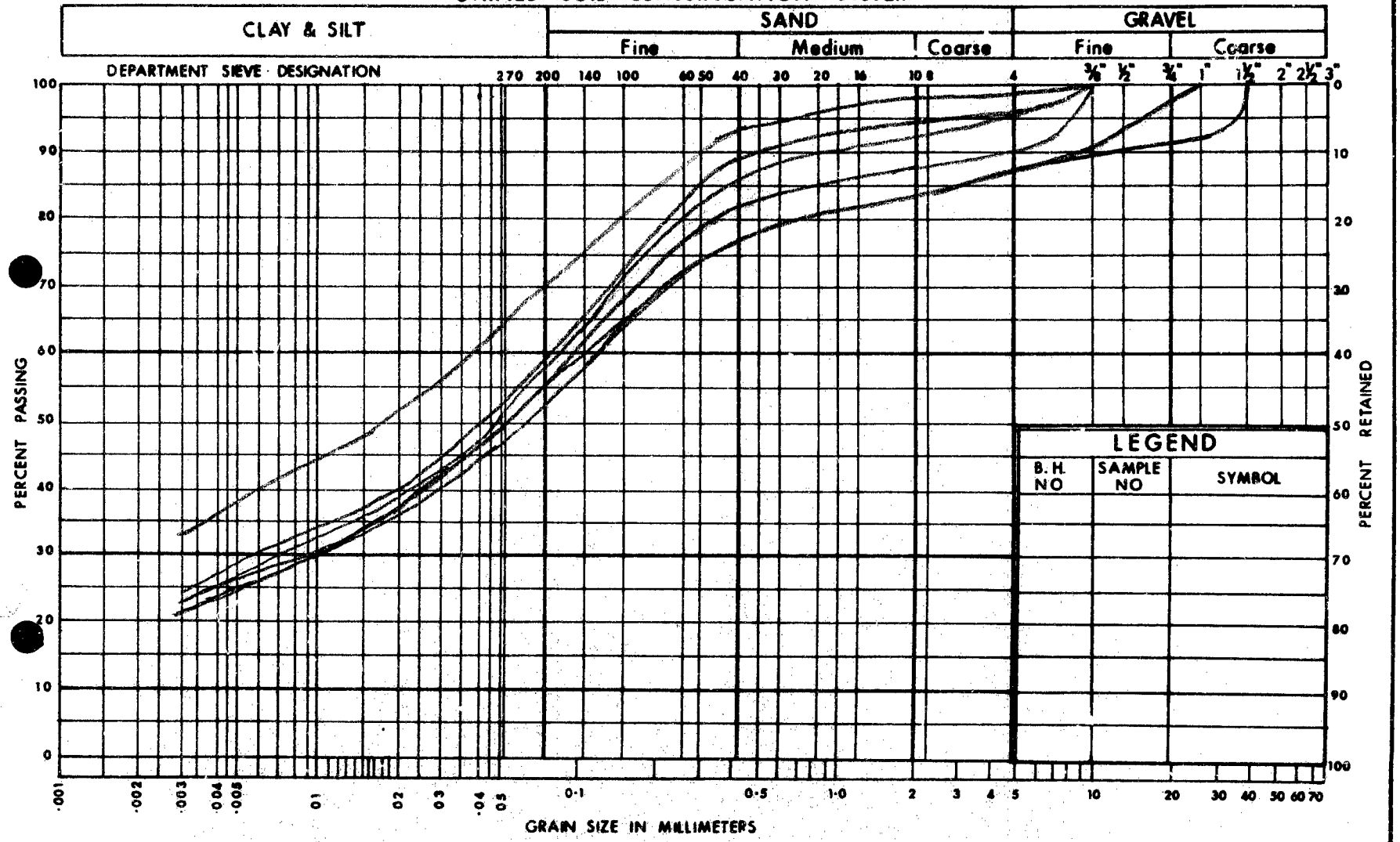
for: W. McFarlane
Regional Structural Design Engineer

c.c. N.Zoltay
J. Wear
B. Giroux
G. Burkhardt
A. McKim
H. Greenland
E. Van Beilen
A. Mirza

FORM OD-MT-17
REV. AUG. 1971

Fig. 1

UNIFIED SOIL CLASSIFICATION SYSTEM



DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS
ONTARIO
DESIGN SERVICES BRANCH

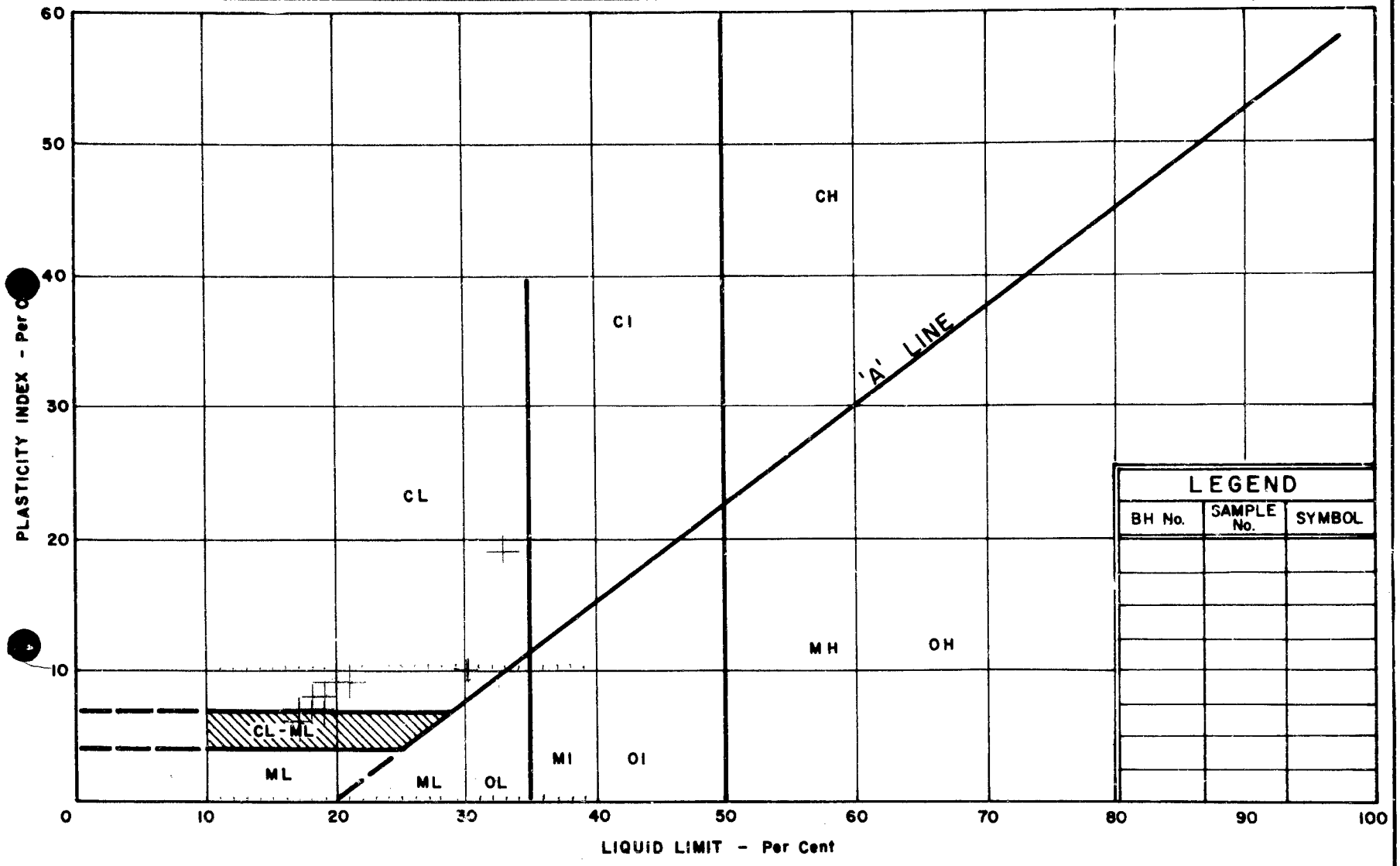
GRAIN SIZE DISTRIBUTION

Hot Mix 2 clayey silt, sand and gravel
- Glacial Till.

W.P. No. 44-71-07
JOB No. 73-11010

FORM OB-MT-252
REVISED JULY, 1966

Fig. 2



DEPARTMENT OF HIGHWAYS
MATERIALS and TESTING DIVISION

PLASTICITY CHART

W.P. No. 44-71-07
JOB No. 73-11010