

G.I.-30 SEPT. 1976

GEOCRES No. 31D-268DIST. 5 REGION W.P. No. 28-78-02CONT. No. 80-72W. O. No. STR. SITE No. 30-172HWY. No. 400LOCATION King's Hwy 26/27
Structure WideningNo of PAGES - =====
OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT. REMARKS:

FOUNDATION INVESTIGATION REPORT

CONTRACT NO 80 - 72



Ministry of
Transportation and
Communications

INDEX

<u>Page No.</u>	<u>Description</u>
1	/ Index
2	Abbreviations & Symbols
3	Soil Classification
4- 9	Foundation Investigation Report Hwy. #26/27 (Bayfield St.) U/Pass Widening, W.P. 28-78-02.

NOTE: For purposes of the contract this report supercedes all other foundation reports done by or for the Ministry in connection with the above mentioned project.

EXPLANATION OF TERMS USED IN REPORT

2

N VALUE: THE STANDARD PENETRATION TEST (SPT) N VALUE IS THE NUMBER OF BLOWS REQUIRED TO CAUSE A STANDARD 51mm O.D. SPLIT BARREL SAMPLER TO PENETRATE 0.3m INTO UNDISTURBED GROUND IN A BOREHOLE WHEN DRIVEN BY A HAMMER WITH A MASS OF 63.5kg, FALLING FREELY A DISTANCE OF 0.76m. FOR PENETRATIONS OF LESS THAN 0.3m N VALUES ARE INDICATED AS THE NUMBER OF BLOWS FOR THE PENETRATION ACHIEVED. AVERAGE N VALUE IS DENOTED THUS \bar{N} .

DYNAMIC CONE PENETRATION TEST: CONTINUOUS PENETRATION OF A CONICAL STEEL POINT (51mm O.D. 60° CONE ANGLE) DRIVEN BY 475 J IMPACT ENERGY ON 'A' SIZE DRILL RODS. THE RESISTANCE TO CONE PENETRATION IS MEASURED AS THE NUMBER OF BLOWS FOR EACH 0.3m ADVANCE OF THE CONICAL POINT INTO THE UNDISTURBED GROUND.

SOILS ARE DESCRIBED BY THEIR COMPOSITION AND CONSISTENCY OR DENSENESS.

CONSISTENCY: COHESIVE SOILS ARE DESCRIBED ON THE BASIS OF THEIR UNDRAINED SHEAR STRENGTH (c_u) AS FOLLOWS:

c_u (kPa)	0 - 12	12 - 25	25 - 50	50 - 100	100 - 200	> 200
	VERY SOFT	SOFT	FIRM	STIFF	VERY STIFF	HARD

DENSENESS: COHESIONLESS SOILS ARE DESCRIBED ON THE BASIS OF DENSENESS AS INDICATED BY SPT N VALUES AS FOLLOWS:

N (BLOWS/0.3m)	0 - 5	5 - 10	10 - 30	30 - 50	> 50
	VERY LOOSE	LOOSE	COMPACT	DENSE	VERY DENSE

ROCKS ARE DESCRIBED BY THEIR COMPOSITION AND STRUCTURAL FEATURES AND/OR STRENGTH.

RECOVERY: SUM OF ALL RECOVERED ROCK CORE PIECES FROM A CORING RUN EXPRESSED AS A PERCENT OF THE TOTAL LENGTH OF THE CORING RUN.

MODIFIED RECOVERY: SUM OF THOSE INTACT CORE PIECES, 100mm+ IN LENGTH EXPRESSED AS A PERCENT OF THE LENGTH OF THE CORING RUN. THE ROCK QUALITY DESIGNATION (RQD), FOR MODIFIED RECOVERY, IS:

RQD (%)	0 - 25	25 - 50	50 - 75	75 - 90	90 - 100
	VERY POOR	POOR	FAIR	GOOD	EXCELLENT

JOINTING AND BEDDING:

SPACING	50mm	50 - 300mm	0.3m - 1m	1m - 3m	> 3m
JOINTING	VERY CLOSE	CLOSE	MOD. CLOSE	WIDE	VERY WIDE
BEDDING	VERY THIN	THIN	MEDIUM	THICK	VERY THICK

ABBREVIATIONS AND SYMBOLS

FIELD SAMPLING

S S	SPLIT SPOON	T P	THINWALL PISTON
W S	WASH SAMPLE	O S	OSTERBERG SAMPLE
S T	SLOTTED TUBE SAMPLE	R C	ROCK CORE
B S	BLOCK SAMPLE	P H	T W ADVANCED HYDRAULICALLY
C S	CHUNK SAMPLE	P M	T W ADVANCED MANUALLY
T W	THINWALL OPEN	F S	FOIL SAMPLE

STRESS AND STRAIN

u_w	kPa	PORE WATER PRESSURE
r_u	1	PORE PRESSURE RATIO
σ	kPa	TOTAL NORMAL STRESS
σ'	kPa	EFFECTIVE NORMAL STRESS
τ	kPa	SHEAR STRESS
$\sigma_1, \sigma_2, \sigma_3$	kPa	PRINCIPAL STRESSES
ϵ	%	LINEAR STRAIN
$\epsilon_1, \epsilon_2, \epsilon_3$	%	PRINCIPAL STRAINS
E	kPa	MODULUS OF LINEAR DEFORMATION
G	kPa	MODULUS OF SHEAR DEFORMATION
μ	1	COEFFICIENT OF FRICTION

MECHANICAL PROPERTIES OF SOIL

m_v	kPa ⁻¹	COEFFICIENT OF VOLUME CHANGE
C_c	1	COMPRESSION INDEX
C_s	1	SWELLING INDEX
C_α	1	RATE OF SECONDARY CONSOLIDATION
c_v	m ² /s	COEFFICIENT OF CONSOLIDATION
H	m	DRAINAGE PATH
T_v	1	TIME FACTOR
U	%	DEGREE OF CONSOLIDATION
σ'_{vo}	kPa	EFFECTIVE OVERBURDEN PRESSURE
σ'_p	kPa	PRECONSOLIDATION PRESSURE
τ_f	kPa	SHEAR STRENGTH
c'	kPa	EFFECTIVE COHESION INTERCEPT
ϕ'	-°	EFFECTIVE ANGLE OF INTERNAL FRICTION
c_u	kPa	APPARENT COHESION INTERCEPT
ϕ_u	-°	APPARENT ANGLE OF INTERNAL FRICTION
τ_R	kPa	RESIDUAL SHEAR STRENGTH
τ_r	kPa	REMOULDED SHEAR STRENGTH
S_t	1	SENSITIVITY = $\frac{c_u}{\tau_r}$

PHYSICAL PROPERTIES OF SOIL

ρ_s	kg/m ³	DENSITY OF SOLID PARTICLES	e	1, %	VOID RATIO	e_{min}	1, %	VOID RATIO IN DENSEST STATE
γ_s	kn/m ³	UNIT WEIGHT OF SOLID PARTICLES	n	1, %	POROSITY	I_D	1	DENSITY INDEX = $\frac{e_{max} - e}{e_{max} - e_{min}}$
ρ_w	kg/m ³	DENSITY OF WATER	w	1, %	WATER CONTENT	D	mm	GRAIN DIAMETER
γ_w	kn/m ³	UNIT WEIGHT OF WATER	S_r	%	DEGREE OF SATURATION	D_n	mm	n PERCENT - DIAMETER
ρ	kg/m ³	DENSITY OF SOIL	w_L	%	LIQUID LIMIT	C_u	1	UNIFORMITY COEFFICIENT
γ	kn/m ³	UNIT WEIGHT OF SOIL	w_p	%	PLASTIC LIMIT	h	m	HYDRAULIC HEAD OR POTENTIAL
ρ_d	kg/m ³	DENSITY OF DRY SOIL	w_s	%	SHRINKAGE LIMIT	q	m ³ /s	RATE OF DISCHARGE
γ_d	kn/m ³	UNIT WEIGHT OF DRY SOIL	I_p	%	PLASTICITY INDEX = $w_L - w_p$	v	m/s	DISCHARGE VELOCITY
ρ_{sat}	kg/m ³	DENSITY OF SATURATED SOIL	I_L	1	LIQUIDITY INDEX = $\frac{w - w_p}{I_p}$	i	1	HYDRAULIC GRADIENT
γ_{sat}	kn/m ³	UNIT WEIGHT OF SATURATED SOIL	I_C	1	CONSISTENCY INDEX = $\frac{w_L - w}{I_p}$	k	m/s	HYDRAULIC CONDUCTIVITY
ρ'	kg/m ³	DENSITY OF SUBMERGED SOIL	e_{max}	1, %	VOID RATIO IN LOOSEST STATE	j	kn/m ³	SEEPAGE FORCE
γ'	kn/m ³	UNIT WEIGHT OF SUBMERGED SOIL						

EXTENDED CASAGRANDE SOIL CLASSIFICATION SYSTEM

FIELD IDENTIFICATION PROCEDURES (EXCLUDING PARTICLES LARGER THAN 75 μm (3 INCHES) AND BASING FRACTIONS ON ESTIMATED MASS)				GRP SYMP	TYPICAL NAMES	INFORMATION REQUIRED FOR DESCRIBING SOILS	LABORATORY CLASSIFICATION CRITERIA	
COARSE GRAINED SOILS MORE THAN HALF OF MATERIAL IS LARGER THAN 75 μm (NO. 200 SIEVE SIZE) (EXCLUDING PARTICLES LARGER THAN 75 μm (3 INCHES) AND BASING FRACTIONS ON ESTIMATED MASS)								
GRAVELS MORE THAN HALF OF COARSE FRACTION IS LARGER THAN 5 mm (NO. 4 SIEVE)	CLEAN GRAVELS (LITTLE OR NO FINES)	WIDE RANGE IN GRAIN SIZE & SUBSTANTIAL AMOUNTS OF ALL INTERMEDIATE PARTICLE SIZE		GW	WELL GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES.	GIVE TYPE, NAME, IF NECESSARY, INDICATE APPROX. % OF SAND & GRAVEL; MAX. SIZE, ANGULARITY, SURFACE CONDITION, & HARDNESS OF THE COARSE GRAINS; LOCAL OR GEOLOGIC NAME & OTHER PERTINENT DESCRIPTIVE INFORMATION, & SYMBOL IN PARENTHESIS. FOR UNDISTURBED SOILS ADD INFORMATION ON STRATIFICATION, DEGREE OF COMPACTNESS, CEMENTATION, MOISTURE CONDITIONS & DRAINAGE CHARACTERISTICS.	DETERMINE PERCENTAGES OF GRAVEL & SAND FROM GRAIN SIZE CURVE. DEPENDING ON PERCENTAGE OF FINES (FRACTION SMALLER THAN 75 μm (NO. 200 SIEVE)) COARSE GRAINED SOILS ARE CLASSIFIED AS FOLLOWS: LESS THAN 5% GM, GP, SM, SP MORE THAN 12% GM, GC, SM, SC 5% TO 12% BORDERLINE CASES REQ. USE OF DUAL SYMBOLS	
		PREDOMINANTLY ONE SIZE OR A RANGE OF SIZES WITH SOME INTERMEDIATE SIZES MISSING		GP	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES; LITTLE OR NO FINES			
		NON-PLASTIC FINES (FOR IDENTIFICATION PROCEDURES SEE ML BELOW)		GM	SILTY GRAVELS, POORLY GRADED GRAVEL-SAND-SILT MIXTURES			
	GRAVEL WITH APPRECIABLE AMOUNT OF FINES	WIDE RANGE IN GRAIN SIZES & SUBSTANTIAL AMOUNTS OF ALL INTERMEDIATE PARTICLE SIZES		SW	WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES			
		PREDOMINANTLY ONE SIZE OR A RANGE OF SIZES WITH SOME INTERMEDIATE SIZES MISSING		SP	POORLY GRADED SANDS, GRAVELLY SANDS; LITTLE OR NO FINES			
		NON-PLASTIC FINES (FOR IDENTIFICATION PROCEDURES SEE ML BELOW)		SM	SILTY SANDS, POORLY GRADED SAND-SILT MIXTURES			
SANDS MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN 5 mm (NO. 4 SIEVE)	CLEAN SANDS (LITTLE OR NO FINES)	WIDE RANGE IN GRAIN SIZES & SUBSTANTIAL AMOUNTS OF ALL INTERMEDIATE PARTICLE SIZES		SW	WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES	GIVE TYPE, NAME, IF NECESSARY, INDICATE DEGREE & CHARACTER OF PLASTICITY, AMOUNT & MAXIMUM SIZE OF COARSE GRAINS, COLOUR IN WET CONDITION, ODOUR, IF ANY, LOCAL OR GEOLOGIC NAME & OTHER PERTINENT DESCRIPTIVE INFORMATION & SYMBOL IN PARENTHESIS. FOR UNDISTURBED SOILS ADD INFORMATION ON STRUCTURE, STRATIFICATION, CONSISTENCY IN UNDISTURBED & REMOULDED STATES, MOISTURE & DRAINAGE CONDITIONS.	C _u = $\frac{D_{60}}{D_{10}}$ GREATER THAN 4 C _c = $\frac{(D_{30})^2}{D_{10} \cdot D_{60}}$ BETWEEN ONE AND 3 NOT MEETING ALL GRADATION REQUIREMENTS FOR GW ATTERBERG LIMITS BELOW A-LINE, OR I _p LESS THAN 4 ATTERBERG LIMITS ABOVE A-LINE WITH I _p GREATER THAN 7 ABOVE A-LINE WITH I _p BETWEEN 4 AND 7 ARE BORDERLINE CASES REQUIRING USE OF DUAL SYMBOLS	
		PREDOMINANTLY ONE SIZE OR A RANGE OF SIZES WITH SOME INTERMEDIATE SIZES MISSING		SP	POORLY GRADED SANDS, GRAVELLY SANDS; LITTLE OR NO FINES			
		NON-PLASTIC FINES (FOR IDENTIFICATION PROCEDURES SEE CL BELOW)		SC	CLAYEY SANDS, POORLY GRADED SAND-CLAY MIXTURES			
	SANDS WITH APPRECIABLE AMOUNT OF FINES	WIDE RANGE IN GRAIN SIZES & SUBSTANTIAL AMOUNTS OF ALL INTERMEDIATE PARTICLE SIZES		SW	WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES			
		PREDOMINANTLY ONE SIZE OR A RANGE OF SIZES WITH SOME INTERMEDIATE SIZES MISSING		SP	POORLY GRADED SANDS, GRAVELLY SANDS; LITTLE OR NO FINES			
		NON-PLASTIC FINES (FOR IDENTIFICATION PROCEDURES SEE CL BELOW)		SM	SILTY SANDS, POORLY GRADED SAND-SILT MIXTURES			
IDENTIFICATION PROCEDURES ON FRACTION SMALLER THAN 425 μm (NO. 40 SIEVE SIZE)								
SILTS AND CLAYS	LIQUID LIMIT LESS THAN 35%	DRY STRENGTH (CRUSHING CHARACTERISTICS)	DILATANCY (REACTION TO SHAKING)	TOUGHNESS (CONSISTENCY NEAR PLASTIC LIMIT)				
		NONE	QUICK	NONE	ML	INORGANIC SILTS & SANDY SILTS OF SLIGHT PLASTICITY, ROCK FLOUR	GIVE TYPE, NAME, IF NECESSARY, INDICATE DEGREE & CHARACTER OF PLASTICITY, AMOUNT & MAXIMUM SIZE OF COARSE GRAINS, COLOUR IN WET CONDITION, ODOUR, IF ANY, LOCAL OR GEOLOGIC NAME & OTHER PERTINENT DESCRIPTIVE INFORMATION & SYMBOL IN PARENTHESIS. FOR UNDISTURBED SOILS ADD INFORMATION ON STRUCTURE, STRATIFICATION, CONSISTENCY IN UNDISTURBED & REMOULDED STATES, MOISTURE & DRAINAGE CONDITIONS.	C _u = $\frac{D_{60}}{D_{10}}$ GREATER THAN 4 C _c = $\frac{(D_{30})^2}{D_{10} \cdot D_{60}}$ BETWEEN ONE AND 3 NOT MEETING ALL GRADATION REQUIREMENTS FOR GW ATTERBERG LIMITS BELOW A-LINE, OR I _p LESS THAN 4 ATTERBERG LIMITS ABOVE A-LINE WITH I _p GREATER THAN 7 ABOVE A-LINE WITH I _p BETWEEN 4 AND 7 ARE BORDERLINE CASES REQUIRING USE OF DUAL SYMBOLS
		MEDIUM TO HIGH	NONE TO VERY SLOW	MEDIUM	CL	CLAYEY SILTS (INORGANIC), GRAVELLY CLAYS, SANDY CLAYS, LEAN CLAYS		
		SLIGHT TO MEDIUM	SLOW	SLIGHT	OL	ORGANIC SILT OF LOW PLASTICITY, ORGANIC SANDY SILTS		
		NONE TO SLIGHT	SLOW TO QUICK	SLIGHT	MI	INORGANIC COMPRESSIBLE SILTS OR SILTY FINE SANDS WITH SOME CLAY OF MEDIUM PLASTICITY (BELOW A-LINE)		
		HIGH	NONE	MEDIUM TO HIGH	CI	SILTY CLAYS (INORGANIC) OF MEDIUM PLASTICITY		
	LIQUID LIMIT BETWEEN 35% AND 50%	SLIGHT TO MEDIUM	VERY SLOW	SLIGHT	OI	ORGANIC SILTY CLAYS OF MEDIUM PLASTICITY		
		SLIGHT TO MEDIUM	SLOW TO NONE	MEDIUM	MH	INORGANIC SILTS, HIGHLY COMPRESSIBLE MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS		
		HIGH TO VERY HIGH	NONE	HIGH	CH	CLAYS (INORGANIC) OF HIGH PLASTICITY, FAT CLAYS		
	LIQUID LIMIT GREATER THAN 50%	MEDIUM TO HIGH	NONE TO VERY SLOW	SLIGHT TO MEDIUM	OH	ORGANIC CLAYS OF HIGH PLASTICITY		
		SLIGHT TO MEDIUM	SLOW TO NONE	MEDIUM	MH	INORGANIC SILTS, HIGHLY COMPRESSIBLE MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS		
		HIGH TO VERY HIGH	NONE	HIGH	CH	CLAYS (INORGANIC) OF HIGH PLASTICITY, FAT CLAYS		
HIGHLY ORGANIC SOILS				PI	PEAT & OTHER HIGHLY ORGANIC SOILS			

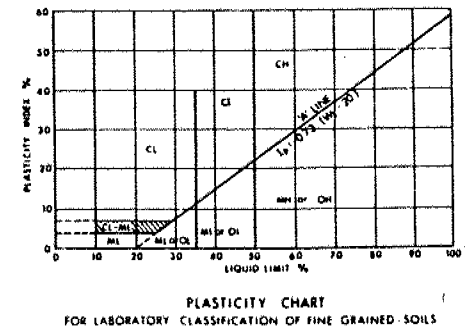
USE GRAIN SIZE CURVE IN IDENTIFYING THE FRACTIONS AS GIVEN UNDER FIELD IDENTIFICATION

DETERMINE PERCENTAGES OF GRAVEL & SAND FROM GRAIN SIZE CURVE. DEPENDING ON PERCENTAGE OF FINES (FRACTION SMALLER THAN 75 μm (NO. 200 SIEVE)) COARSE GRAINED SOILS ARE CLASSIFIED AS FOLLOWS:

LESS THAN 5% GM, GP, SM, SP
MORE THAN 12% GM, GC, SM, SC
5% TO 12% BORDERLINE CASES REQ. USE OF DUAL SYMBOLS

PLASTICITY CHART
FOR LABORATORY CLASSIFICATION OF FINE GRAINED SOILS

BOUNDARY CLASSIFICATIONS: SOILS POSSESSING CHARACTERISTICS OF TWO GROUPS ARE DESIGNATED BY COMBINATIONS OF GROUP SYMBOLS. FOR EXAMPLE GW-GC, WELL GRADED GRAVEL-SAND MIXTURE WITH CLAY BINDER



FOUNDATION INVESTIGATION REPORT

For

Hwy. #26/27 (Bayfield Street)
Underpass Widening
Hwy. 400, District #5, Owen Sound
W.P. 28-78-02, Site: 30-172

INTRODUCTION

A Foundation Investigation was carried out at the above mentioned site. This report contains the results of the investigation and the interpreted soil data. The fieldwork was carried out on June 6 and 7, 1979, utilizing a trailer mounted continuous flight auger machine equipped with 82.6 mm I.D. hollow stem and 101.6 mm dia. solid augers.

SITE DESCRIPTION

The site is located at the crossing of Hwy. #26/27 (Bayfield Street) in the City of Barrie. The terrain adjacent to the site (with the exception of the interchange complex) is a relatively flat residential area.

Physiographically, the site lies on the till plain in the region of the Simcoe Uplands.

SUBSURFACE CONDITIONSGeneral

Generally, uniform subsoil conditions were encountered at the boring locations. The subsoil consists of clayey silt to silt with sand, traces of gravel containing occasional boulders.

The results of the field and laboratory tests are plotted on the Record of Borehole Sheets. The estimated stratigraphical profile is shown on Drawing 30-172-2 of the Contract Drawings. The soil encountered in the boreholes can be described as follows.

Clayey Silt to Silt With
Sand and Traces of Gravel

Immediately below an approximate 0.3 m thick asphalt pavement, a glacial till deposit was encountered at each boring location to about 8 m, the full depth of exploration. The material in the stratum consists of clayey silt to silt, with sand and traces of gravel. In addition, below a depth of around 3 m, cobbles were also observed within the deposit. The results of Grain Size Distribution Tests are presented in envelope form on Figure 1 of the Appendix. The Natural Moisture Content ranges from 7.5% to 8.5%. The Standard Penetration Test 'N' values in the deposit range from 13 to over 100 blows per 0.3 m, the lower values being confined to the upper 4 m. The consistency of the overall stratum varies from stiff to hard.

Groundwater Conditions

No groundwater was found in any of the boreholes to the depth of exploration (8 m) during the time of field investigation. It is believed that the groundwater lies below this level, i.e. below elev. 258 m.

P. Payer
P. Payer, P. Eng.
Foundations Engineer



K. G. Selby
K.G. Selby, P. Eng.
Senior Foundations Engineer

APPENDIX



RECORD OF BOREHOLE No 1

METRIC

7

W P 28-78-02 LOCATION Sta. 10+446.3 o/s 13.4 m Lt. of Hwy. 26 & 27 ORIGINATED BY PRK
 DIST 5 HWY 400 BOREHOLE TYPE Hollow Stem Auger 82 mm I.D. COMPILED BY PRK
 DATUM Geodetic DATE 1979.06.06 CHECKED BY AS

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT Y	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100		
266.1	Ground Level													
0.0	Asphalt Pavement					*	266							GR SA SI CL
0.3	Very Stiff		1	SS	17									6 63 21 10
	Clayey Silt to Silt With Sand Trace of Gravel Occasional Cobbles Hard (Glacial Till)		2	SS	42		264							9 58 23 10
			3	SS	84									
			4	SS	98									
			5	SS	88		262							4 59 25 12
			6	SS	90									
			7	SS	58									
			8	SS	70		260							5 59 25 11
258.6			9	SS	67									
7.5	End of Borehole * Water Level Not Observed at Completion of Augering													

+3, x5: Numbers refer to
Sensitivity

20
15 5 (%) STRAIN AT FAILURE
10



RECORD OF BOREHOLE No 2

METRIC

8

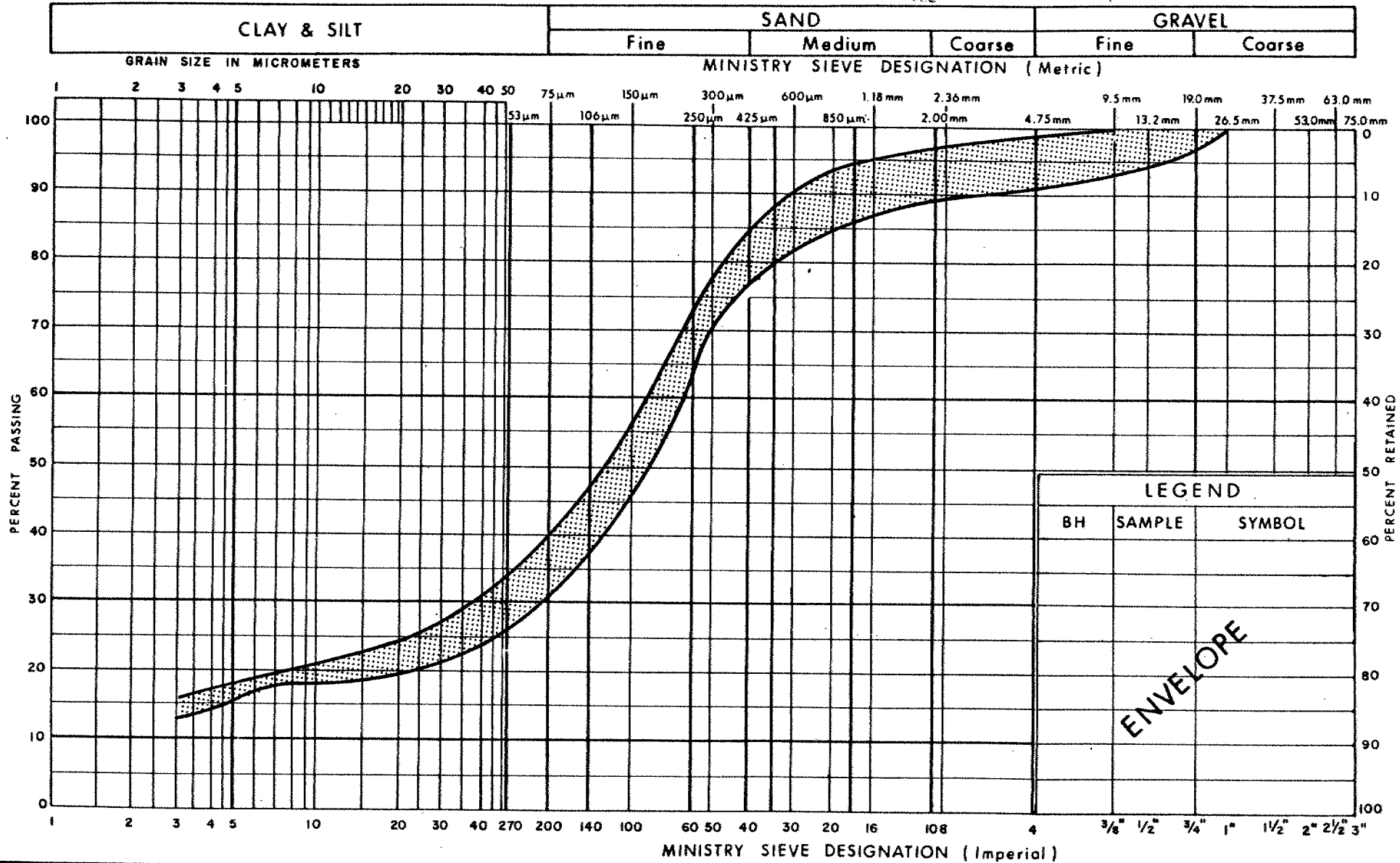
W P 28-78-02 LOCATION Sta. 10+477.1 o/s 12.5 m Lt. of Hwy. 26 & 27 ORIGINATED BY PRK
DIST 5 HWY 400 BOREHOLE TYPE Solid Stem Auger, Cone Test COMPILED BY PRK
DATUM Geodetic DATE 1979 06 07 CHECKED BY RS

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	PLASTIC LIMIT Wp	NATURAL MOISTURE CONTENT W	LIQUID LIMIT Wl	UNIT WEIGHT Y	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES								
266.4	Ground Level												
0.0	Asphalt Pavement												
0.3	Stiff Clayey Silt to Silt With Sand Traces of Gravel Occasional Cobbles Hard (Glacial Till)		1	SS	13		266	0.3 m augered through pavement					
			2	SS	77		264						8 55 26 11
			3	SS	106								
			4	SS	63								2 59 27 12
			5	SS	110		262	100/0.08 m					
			6	SS	111/	0.20 m							3 62 23 12
			7	SS	128								
			8	SS	74		260						
258.3			9	SS	147/	0.25 m							
8.1	End of Borehole Water Level Not * Observed at Completion of Augering												

+3, x5: Numbers refer to Sensitivity

20
15 ϕ 5 (%) STRAIN AT FAILURE
10

UNIFIED SOIL CLASSIFICATION SYSTEM



Ontario

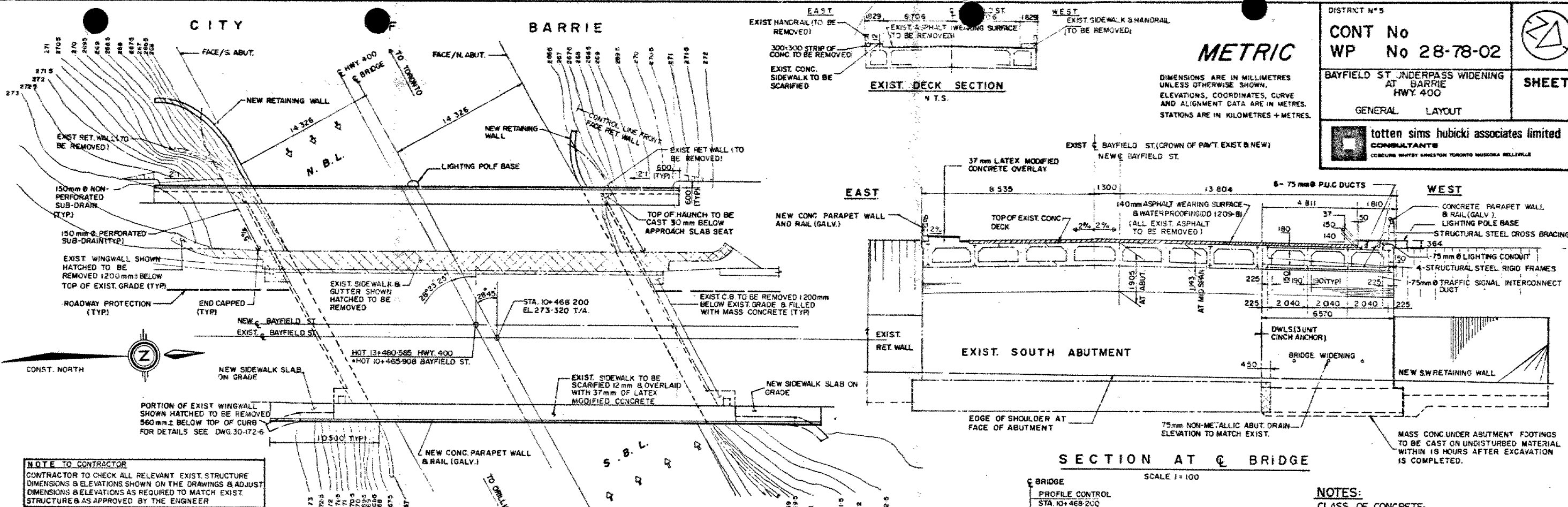
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GRAIN SIZE DISTRIBUTION CLAYEY SILT TO SILT

WITH SAND, TRACES OF GRAVEL, OCC COBBLES (GLACIAL TILL)

FIG No 1

W P 28 - 78 - 02



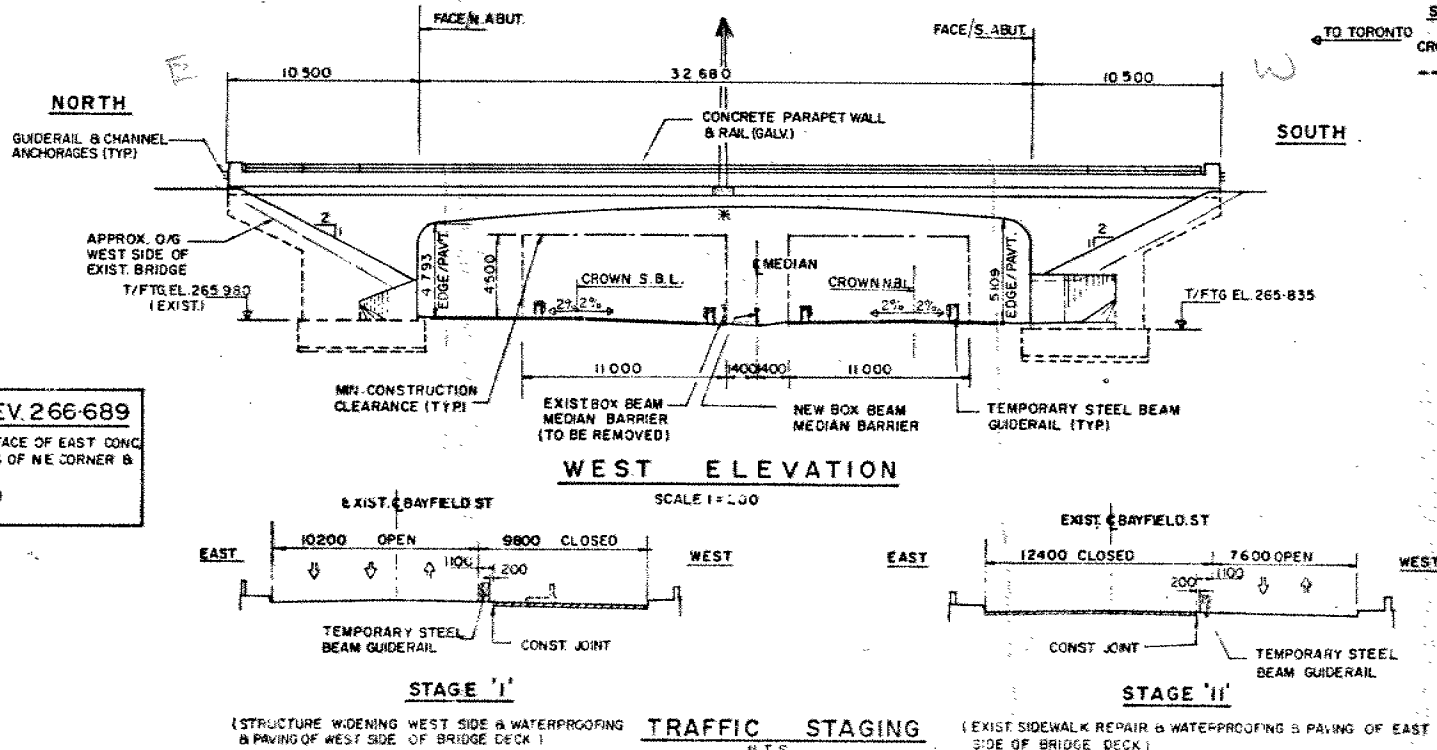
NOTE TO CONTRACTOR
CONTRACTOR TO CHECK ALL RELEVANT EXIST. STRUCTURE DIMENSIONS & ELEVATIONS SHOWN ON THE DRAWINGS & ADJUST DIMENSIONS & ELEVATIONS AS REQUIRED TO MATCH EXIST. STRUCTURE AS APPROVED BY THE ENGINEER

FUNCTION OF 28° 45' 00"
SIN. 0.48099
COS. 0.87673
TAN. 0.54862
SEC. 1.4061

NOTE
• CONTRACTOR TO REMOVE EXIST. SIGN SUPPORT STRUCTURE ATTACHED TO WEST SIDE OF BRIDGE.
• * FOR TEMPORARY SUPPORT DURING CONSTRUCTION SEE DWG. 30-172-7

NOTES
• DETAILS OF EXIST. STRUCTURE HAVE BEEN DERIVED FROM DWGS. D.2962-1 TO 6 FOR BRIDGE N° 6.
• EAST ABUTMENT IS NOW SOUTH ABUTMENT.
• T/A DENOTES ELEVATION GIVEN TO TOP OF ASPHALT.
• W.P. DENOTES WORKING POINT

M.T.C. BM 100-68 ELEV. 266.689
TABLET IS SET HORIZONTALLY IN W. FACE OF EAST CONC. ABUTMENT OF CONC. BRIDGE 6.52ms OF NE CORNER & 0.30m ABOVE GROUND
12.9m R 13+478-1 (HWY 400 REV.)
ROUTE 32 BARRIE



PROFILE OF HWY 400
N.T.S.

CONCRETE QUANTITIES
CONCRETE QUANTITIES ARE LISTED BELOW FOR THE APPROPRIATE CONCRETE LUMP SUM TENDER ITEM:
CONC. IN BRIDGE 217 m³ 30 MPa
CONC. IN PARAPET WALLS 192 m³ 20 MPa
CONC. IN RETAINING WALLS 33 m³ 20 MPa

STRUCTURAL STEEL QUANTITIES
STRUCTURAL STEEL 37 TONNE

NOTES:
CLASS OF CONCRETE:
• DECK AND SIDEWALK 30 MPa
• PARAPET WALLS 30 MPa
• ABUTMENTS, WINGWALLS & RETAINING WALLS 20 MPa
• FOOTINGS 20 MPa
• MASS CONCRETE 20 MPa
CLEAR COVER TO REINFE STEEL:
• FOOTINGS 75 mm
• ABUTMENTS, WINGWALLS & RETAINING WALLS 75 mm
• DECK 50 mm TOP 40 mm BOT.
• PARAPET WALLS 40 mm
• OR AS SHOWN ON THE DRAWINGS

REINFORCING STEEL:
• REINFORCING STEEL SHALL BE IN ACCORDANCE WITH C.S.A. G30-12-M877, GRADE 400 EXCEPT AS NOTED REINFORCING BARS WITH THE DESIGNATION 'C' AT THE END OF THE BAR MARKS SHALL BE COATED BARS.
CONSTRUCTION NOTES:
• BACKFILL SHALL BE PLACED SIMULTANEOUSLY BEHIND BOTH ABUTMENTS KEEPING THE HEIGHT OF THE BACKFILL APPROXIMATELY THE SAME. AT NO TIME SHALL THE DIFFERENCE IN ELEVATIONS BE GREATER THAN 600 mm.
• TO ACHIEVE THE MINIMUM CLEAR COVER OF 50mm SPECIFIED, THE TOP LAYER OF REINFORCING STEEL IN THE DECK SLAB SHALL BE PLACED PRIOR TO CONCRETING WITH A CLEAR COVER OF 65mm ± 15mm TOLERANCE.

LIST OF DRAWINGS:
30-172-1 GENERAL LAYOUT
2 BOREHOLE LOCATIONS & SOIL STRATA
3 FOOTINGS
4 DECK AND LEG DETAILS
5 DECK AND LEG REINFORCEMENT
6 WINGWALLS AND SIDEWALKS
7 STRUCTURAL STEEL FRAME
8 RETAINING WALLS
9 PARAPET WALL DETAILS (700mm HIGH)
10 STEEL PARAPET RAILING-DOUBLE TUBE
11 BRIDGE ELECTRICAL DETAILS-TYPE I
12 STANDARDS I
13 STANDARDS II
14 STANDARDS III
15 STANDARDS IV
16 BRIDGE DATE & SITE NUMBER DATA
17 AS CONSTRUCTED ELEV. & DIM.



DRAWING NOT TO BE SCALED
100 mm ON ORIGINAL DRAWING

REVISIONS				SCALE AS NOTED	
NO.	DATE	BY	DESCRIPTION	DESIGN	CHECK
1	1998-01-15	W. J. M.	LOADING HO. 20-44	DATE JAN 15	1998
2	1998-01-15	W. J. M.	CHECK G. L. A.	SITE NO. 32-172	1998

CONT No
WP No 28-78-02



BAYFIELD ST. UNDERPASS WIDENING
AT BARRIE
HIGHWAY 400
FOOTINGS

SHEET

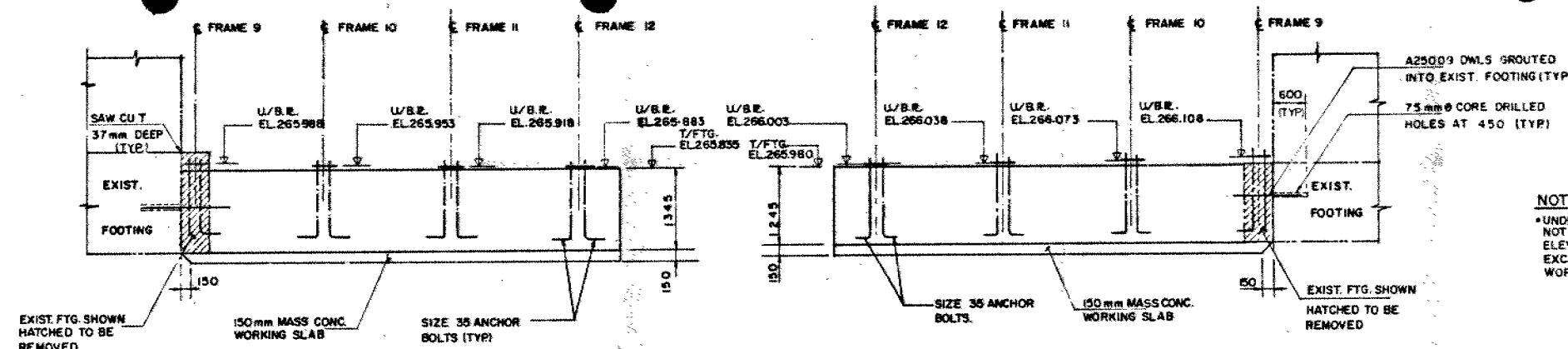
METRIC

DIMENSIONS ARE IN MILLIMETRES
UNLESS OTHERWISE SHOWN.
ELEVATIONS, COORDINATES, CURVE
AND ALIGNMENT DATA ARE IN METRES.
STATIONS ARE IN KILOMETRES + METRES.

totten sims hubicki associates limited
CONSULTANTS
CORPORATE OFFICE: KINGSTON TORONTO MISSISSAUGA BELLEVILLE

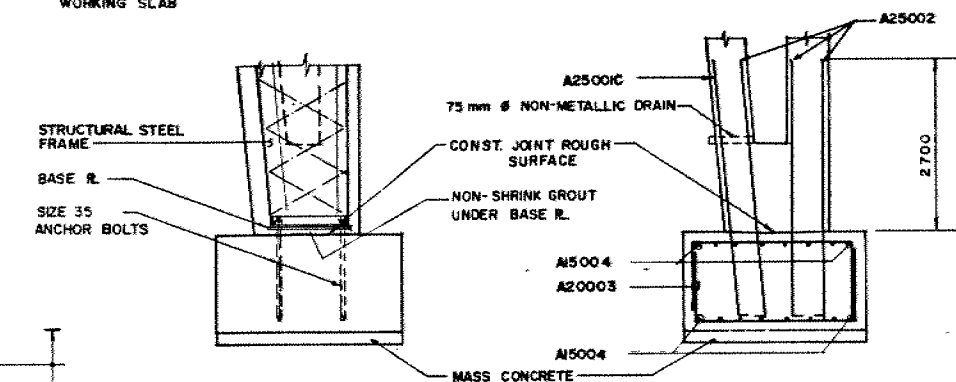
NOTE

*UNDERSIDE OF ABUTMENT FOOTINGS
NOT TO EXTEND BELOW THE UNDERSIDE
ELEVATION OF THE EXISTING FOOTINGS
EXCEPT FOR 150mm MASS CONCRETE
WORKING SLAB



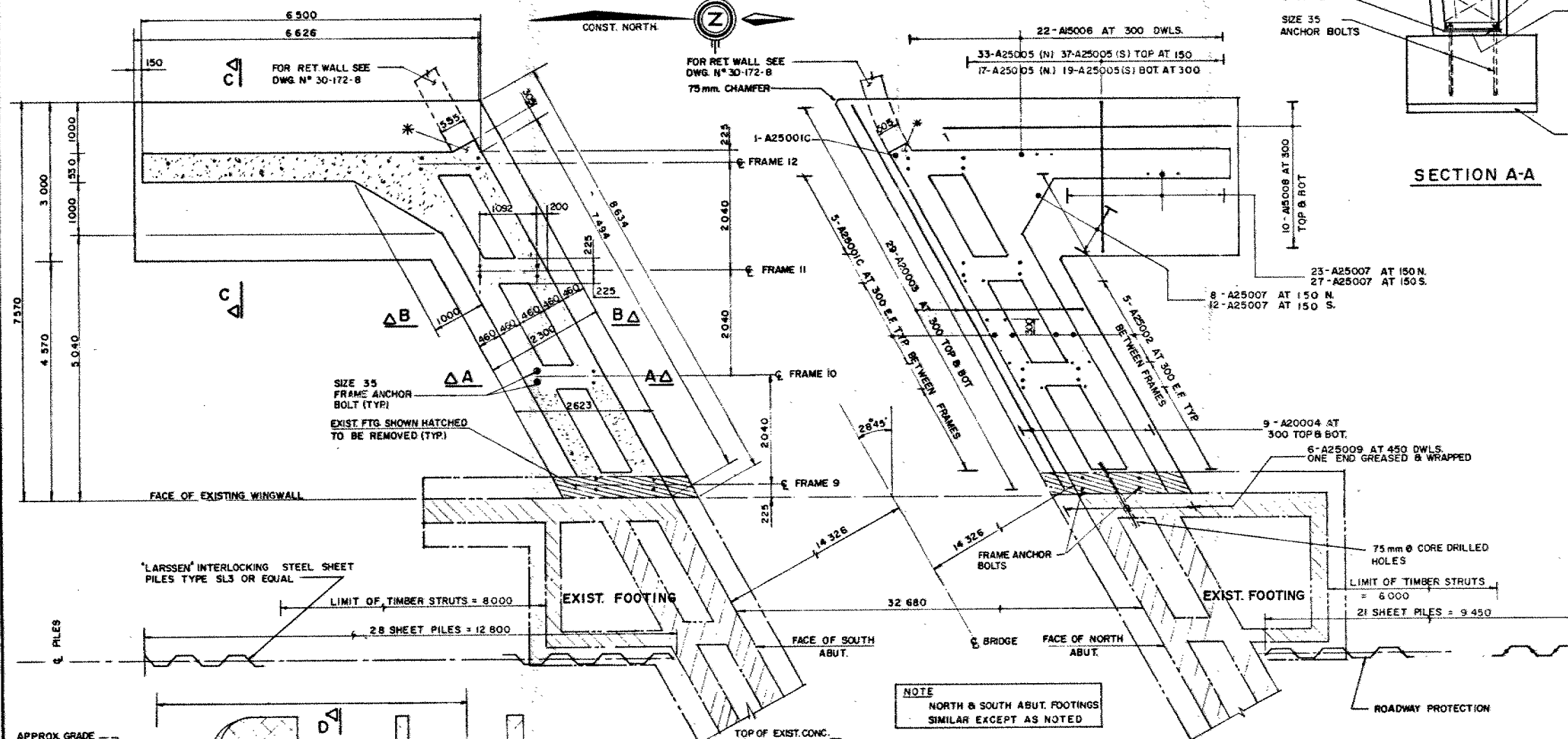
ELEVATION SOUTH FOOTING

ELEVATION NORTH FOOTING



SECTION A-A

SECTION B-B



NOTE
NORTH & SOUTH ABUT. FOOTINGS
SIMILAR EXCEPT AS NOTED

FOOTING PLAN

NOTES

- * TOP OF ABUT. PROJECTION TO MATCH TOP OF ADJACENT RETAINING WALL ELEVATION
- STEEL FOR ROADWAY PROTECTION SHALL BE IN ACCORDANCE WITH CSA G40-21M GRADE 300 OR EQUAL
- ALTERNATIVE SCHEMES FOR ROADWAY PROTECTION WILL BE CONSIDERED SUBJECT TO APPROVAL OF THE ENGINEER
- ALL TIMBER SHALL BE IN ACCORDANCE WITH N.L.G.A. 1970 STANDARD GRADING RULES SPECIES GROUP D GRADE N°1



DRAWING NOT TO BE SCALED
100 mm ON ORIGINAL DRAWING

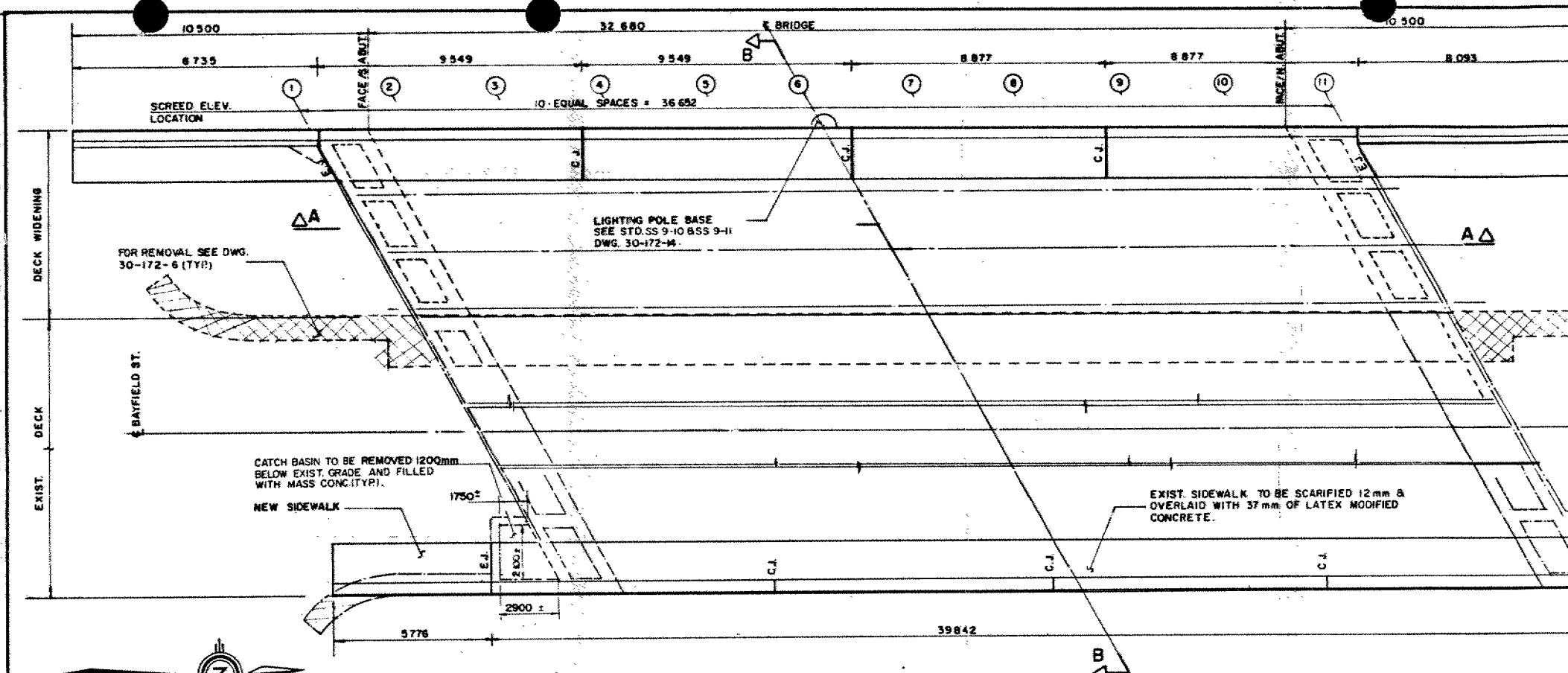
SECTION C-C

NOTES

- * BOTTOM AND SIDES OF FOOTINGS TO BE CAST AGAINST UNDISTURBED GROUND
- * ANY OVEREXCAVATION FOR SIDES OF BRIDGE FOOTINGS TO BE FILLED WITH COMPACTED GRANULAR A

SCALE 1:50 UNLESS NOTED

REVISIONS	DATE	BY	DESCRIPTION
DESIGN M.G.S.	CHECK T.V.M.	LOADING MS 20-44	DATE JAN 80
DRAWING HAS	CHECK G.L.A.	SITE No	SL-172 DWG 3



METRIC

DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE SHOWN. ELEVATIONS, COORDINATES, CURVE AND ALIGNMENT DATA ARE IN METRES. STATIONS ARE IN KILOMETRES + METRES.

CONT No
WP No 28-78-02

BAYFIELD ST. UNDERPASS WIDENING
AT BARRIE
HWY. 400

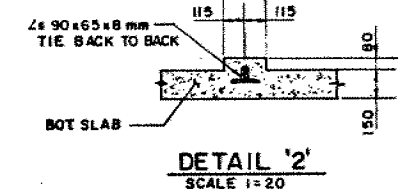
DECK & LEG DETAILS

totten sims hubicki associates limited
CONSULTANTS
CORPORATE: 1000 SHEPPARD AVENUE EAST, SUITE 100, SCARBOROUGH, ONTARIO M1S 1T5
TEL: (416) 291-1111 FAX: (416) 291-1112

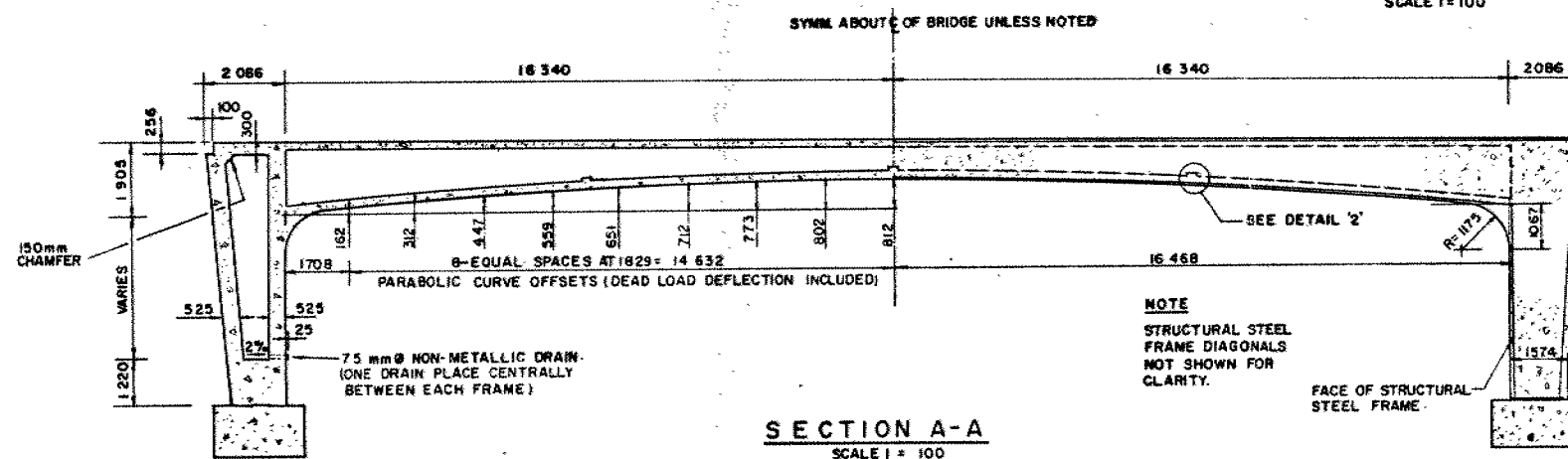
	SCREED					ELEVATIONS					
	1	2	3	4	5	6	7	8	9	10	11
A	273.137	273.126	273.124	273.116	273.104	273.086	273.064	273.035	273.003	272.965	272.934
B	273.054	273.045	273.043	273.035	273.023	273.008	272.985	272.955	272.923	272.884	272.853
C	273.024	273.015	273.013	273.005	272.993	272.975	272.953	272.924	272.892	272.854	272.823

NOTES

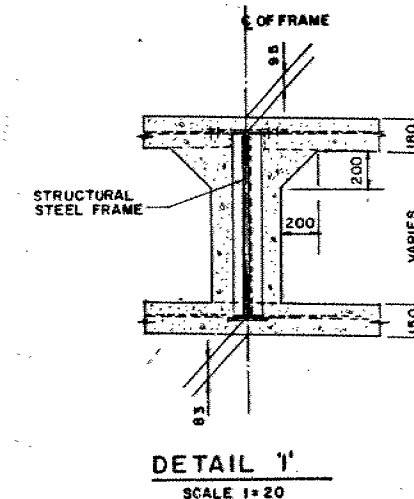
- SCREED ELEVATIONS INCLUDE ALLOWANCES FOR GRADE AND DEAD LOAD DEFLECTION.
- SCREED ELEVATIONS ARE GIVEN TO TOP OF CONCRETE DECK.
- THIS DWG. TO READ IN CONJUNCTION WITH DWG. 30-172-5.



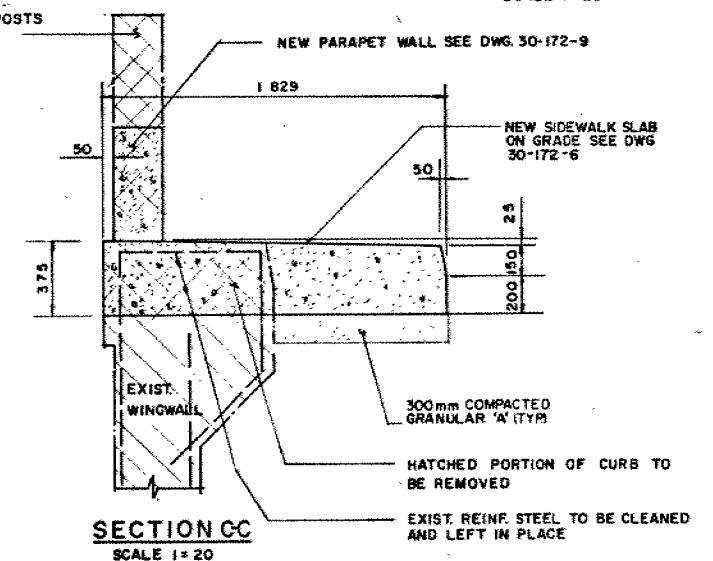
PLAN
SCALE 1:100



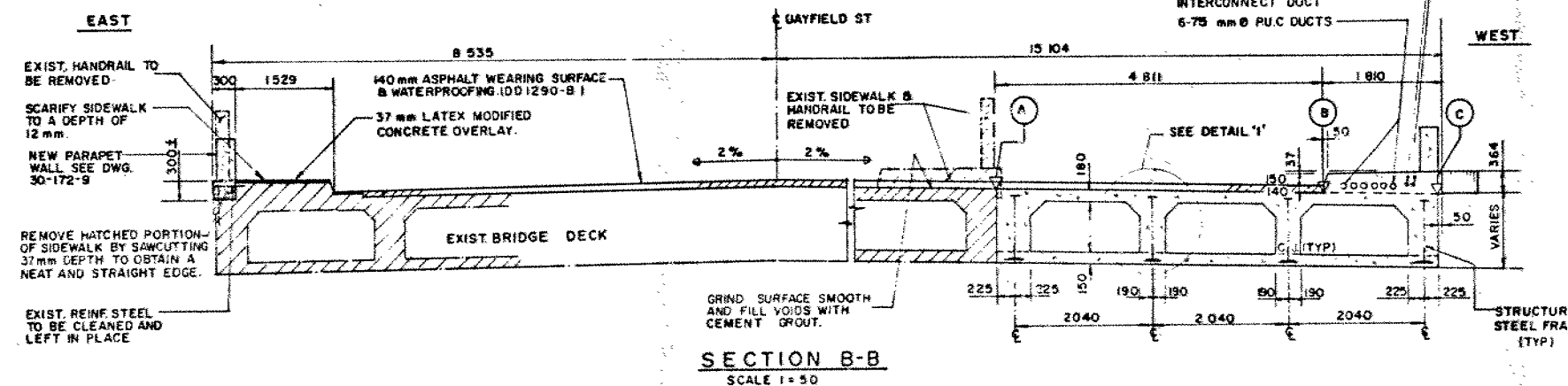
SECTION A-A
SCALE 1:100



DETAIL '1'
SCALE 1:20



SECTION CC
SCALE 1:20



SECTION B-B
SCALE 1:50

NOTES

- DIAPHRAGMS TO BE CAST INTEGRAL WITH TOP DECK. SLAB AND CONCRETE IN DIAPHRAGMS TO BE VIBRATED THOROUGHLY.
- CONCRETE PARAPET WALLS SHALL NOT BE PLACED UNTIL ALL CONCRETE IN DECK HAS REACHED A STRENGTH OF 20 MPa.
- TO ACHIEVE THE MINIMUM CLEAR COVER OF 50 mm SPECIFIED, THE TOP LAYER OF REINFORCING STEEL IN THE DECK SLAB SHALL BE PLACED PRIOR TO CONCRETING WITH A CLEAR COVER OF 65 mm ± 5 mm TOLERANCE.
- CONTRACTOR SHALL MAKE ALLOWANCE FOR CREEP AND DEFLECTION OF FALSEWORK AND ENSURE THAT THE FACE OF THE ABUTMENTS AND SOFFIT OF DECK WIDENING MATCH THE EXIST. STRUCTURE.

SCALE AS NOTED

REVISIONS	DATE	BY	DESCRIPTION
DESIGN M.G.S.	CHECK T.J.M.	LOADING HS 20-44	DATE JAN 90
DRAWING R.A.S.	CHECK G.L.A.	SITE No 30-172	DWG 4

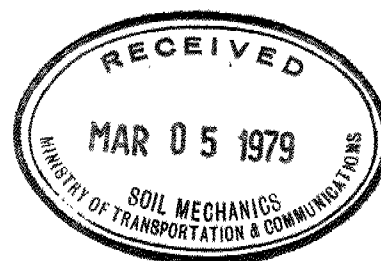
DRAWING NOT TO BE SCALED
100 mm ON ORIGINAL DRAWING

Hwy. 26-27 Underpass I.C. Hwy. 400

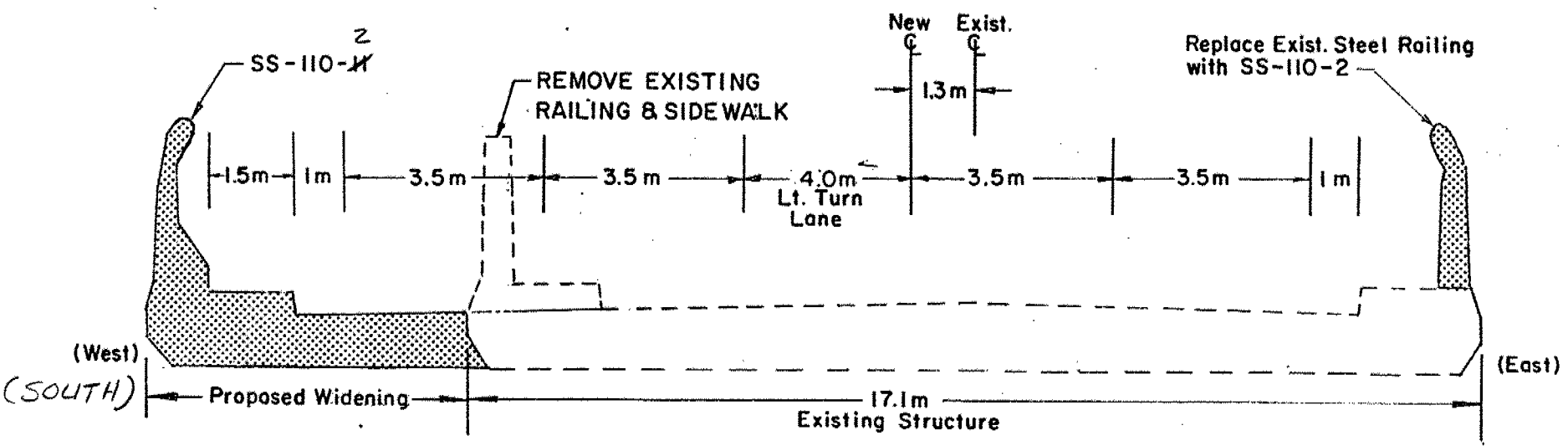
Site 30-172



south elevation



Oct 8/75



HWY. 26/27
(BAYFIELD ST.)
TYPICAL STRUCTURE X-SECTION

