

## MEMORANDUM

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

FROM: G. C. E. Burkhardt

DATE: January 8, 1964.

OUR FILE REF.

IN REPLY TO

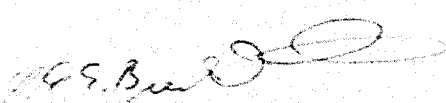
SUBJECT: Twp. of North Dorchester - The Player Bridge  
Lot 17, Con. IV/V - County of Middlesex  
Structure Site No. 20-308 - Our File No. BA 1734

Attached please find one copy of the Foundation Report, by Dominion Soil Investigation Limited, and one copy of the Preliminary Plans for your comments.

We intend to approve the plans within two weeks and we would appreciate your comments on/or before January 17th./64.

GCEE/bm

c.c. J. Walter

  
G. C. E. Burkhardt,  
for K. L. Kleinsteinber,  
Mun. Bridge Liaison Engineer.

*27 1/2 T.S.F.*  
*Recommended d.p. slightly too high, as m/c at H.S.*  
*Actual design load = 57 T.S.F.*

*ref.*

MESSRS. A. M. SPRIET & ASSOCIATES  
CONSULTING ENGINEERS  
264 WELLINGTON ROAD  
LONDON ONTARIO

63-7-282 M

STRUCTURE SITE No. 26 308

Report on  
SOIL INVESTIGATION  
for  
ROAD BRIDGE  
LOT 17, CONCESSION 4 & 5  
TOWNSHIP OF NORTH DORCHESTER

by  
DOMINION SOIL INVESTIGATION LIMITED  
363 Queens Avenue  
LONDON ONTARIO  
Reference No. 3-10-L4  
October, 1963

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SUMMARY

Below shallow surface deposits of organic matter and sand, the soil is a very dense, cohesive till deposit.

It is recommended that the structure should be supported on spread footings at el. 86.0 feet, using a gross soil pressure not exceeding 15,000 p.s.f. Settlements due to compression of the soil will be small.

No unusual construction problems are anticipated.

## I INTRODUCTION

In accordance with verbal authorization from Mr. A. M. Spriet, a soil investigation has been carried out at a site in the township of North Dorchester where it is proposed to replace an existing road bridge with a new structure. The bridge carries the gravel road dividing Concessions 4 and 5 across a tributary stream of the River Thames.

It is understood that the new structure will have a span of 30 to 35 feet and will be located symmetrically about the existing bridge.

The purpose of this investigation has been to reveal the subsurface conditions and to determine the necessary soil properties for the design and construction of the new foundations.

## II PHYSIOGRAPHY

The site lies approximately 3 miles east of Dorchester in a shallow V-shaped valley which drains southward towards the River Thames. Both of these valleys have been spillways carrying the waters of melting glaciers, and they are now occupied by much smaller streams.

The till formation found near the surface at this site is a dense ground moraine deposited by the advancing glaciers. The area can be considered as an extension of the Oxford Till Plain lying to the north.

## III FIELD WORK

Field work was carried out on the 16th and 17th of October, 1963 and consisted of 2 boreholes at the locations shown on enclosure 2. The holes were advanced by washboring and lined with Bx (3-inch) casing. Standard penetration tests were made at intervals of 2'-6" throughout the depth of the boreholes. This test gives a measure of the relative density or consistency of the soil, and enables disturbed samples to be recovered. One dynamic cone penetration test was made adjacent to borehole 1. Because of the very dense soil conditions the cone reached a depth of only 9 feet, and no further tests were attempted.

The results of the field tests are recorded on/an engineering data sheet comprising enclosure 3. Elevations have been referred to the centre of the deck of the existing bridge which is taken as E1,100.0 feet.

#### IV SUBSURFACE CONDITIONS

Details of the stratification at each borehole are shown on the data sheet and a general picture of the subsurface conditions is given by the profile shown on enclosure 2.

Sandy topsoil and organic deposits extend to depths of 1'-0" and 2'-6" at boreholes 1 and 2 respectively. Below the topsoil at borehole 1, a very stiff brown, clay till extends to 4'-6" and at borehole 2 a fine, grey, dense sand extends to a depth of 5'-3".

Throughout the remaining depth explored, the soil is classified as a hard grey clayey sandy silt till. This is a very dense material of low permeability. While basically a silt, it contains about 15% of sand and fine angular gravel particles, and sufficient clay to be cohesive. Dried out samples show a high unconfined strength. In borehole 1, seams of predominantly sandy material were encountered within the till at depths of 6'-6" to 7'-6" and 19'-6" to 20'-0".

Groundwater was encountered in the boreholes at a level corresponding to the water in the creek, i.e. El. 94.0 feet.

#### V FOUNDATIONS

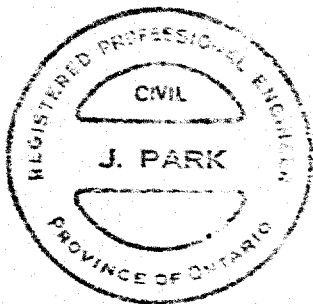
The very dense soil conditions are suitable for the design of spread footing foundations. The bed of the creek extends to El. 91 feet, so that allowing a depth of 3 feet for scour, the footings should be located at or near El. 86 feet. Below this level the standard penetration tests show values in excess of 100 blows per foot which, since no large particles are present to distort the results, may be taken as a true measure of the consistency of the soil. The theoretical safe soil pressure in such conditions is far in excess of commonly used values. In the present case where there is no appreciable economic advantage in using a very high value, a maximum gross soil pressure of 15,000 p.s.f. is proposed for the design of footings. Settlement due to compression of the soil under this loading will be small. Differential settlement between abutments should be of negligible magnitude so that a rigid-frame structure will perform satisfactorily.

No unusual construction problems are anticipated. The excavation will not require bracing and seepage through the till layer will be small. If the sand layer encountered at borehole 2 is extensive, it may be necessary to intercept

the flow of groundwater through this stratum with a trench or cut-off. If, however it is only an isolated deposit, it will probably dry out when the creek is diverted away from the area of the excavation.

## VI REFERENCES

1. The Physiography of Southern Ontario by L. J. Chapman and D. F. Putnam of the Ontario Research Foundation - University of Toronto Press 1951.
2. Procedures for Testing Soils, ASTM, April 1958. pp. 186 to 198. (Unified Soil Classification System - by A. A. Wagner).
3. Proceedings of the 4th International Conference on Soil Mechanics and Foundations Engineering (Research on Determining the Density of Sands by Spoon Penetration Testing - by H. J. Gibbs and W. G. Holtz of the United States Bureau of Reclamation). London, 1957.
4. Terzaghi and Peck: Soil Mechanics in Engineering Practice. John Wiley and Sons, New York 1948.
5. Strength and Deformation Characteristics of Various Glacial Till in New England, by Kenneth A. Linell and H. F. Shea, Research Conference on Shear Strength of Cohesive Soils, Boulder, Colorado, June 1960.



DOMINION SOIL INVESTIGATION LIMITED

*James Park*

James Park, M.Sc., P.Eng.

# LIST OF SYMBOLS, ABBREVIATIONS AND NOMENCLATURE.

## SOIL COMPONENTS AND GROUND WATER CONDITIONS.

BOULDER	COBBLE	GRAVEL		SAND			SILT	CLAY	ORGANICS	BEDROCK	GROUND WATER LEVEL	DEPTH OF CAVE-IN
Ø	> 8"	3"	3/4"	4.76mm	2.0	0.42	0.074	0.002	>	NO SIZE LIMIT		
U.S. Standard Sieve Size:		No. 4		No. 10		No. 40		No. 200				

## SAMPLE TYPES.

AS Auger sample  
CS Sample from casing  
ChS Chunk sample

RC Rock core  
% Recovery  
SS Split spoon sample

TP Piston, thin walled tube sample  
TW Open, thin walled tube sample  
WS Wash sample

SAMPLER ADVANCED BY static weight : w  
" pressure : p  
" tapping : t

OBSERVATIONS MADE WHILE CORING  
Steady pressure  
No pressure  
Intermittent pressure

Washwater returns  
Washwater lost

## PENETRATION RESISTANCES.

**DYNAMIC PENETRATION RESISTANCE** : to drive a 2" dia, 60° cone attached to the end of the drilling rods into the ground, expressed in blows per foot

**STANDARD PENETRATION RESISTANCE, -N-** : to drive a 2" outside dia, split spoon sampler 1 foot into the ground, expressed in blows per foot

### EXTRAPOLATED -N- VALUE

The energy for the penetration resistances is supplied by a 140 lb. hammer falling 30 inches

SYMBOL :



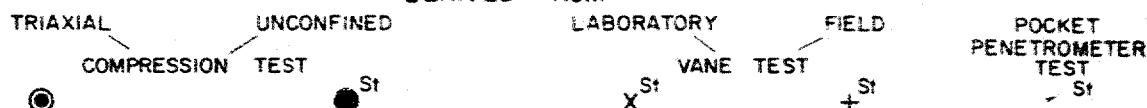
322

## SOIL PROPERTIES.

W %	Water content	$\gamma$	Natural bulk density (unit weight)	k	Coeff. of permeability
LL %	Liquid limit	e	Void ratio	C	Shear strength in terms of
PL %	Plastic limit	RD	Relative density	$\phi$	Angle of int. friction - total stress
PI %	Plasticity index	C <sub>v</sub>	Coeff. of consolidation	C'	Cohesion in terms of
LI	Liquidity index	m <sub>v</sub>	Coeff. of volume compressibility	$\phi'$	Angle of int. friction - effective stress

## UNDRAINED SHEAR STRENGTH.

— DERIVED FROM —



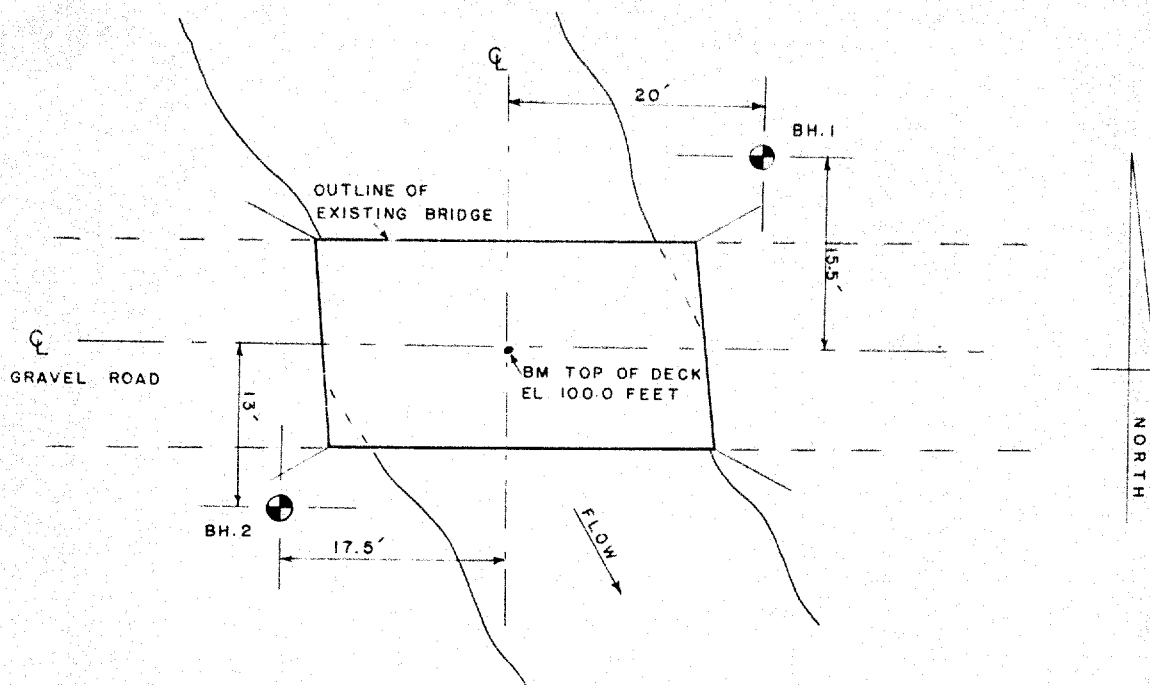
Strain at failure is represented by direction of stem

20%  
15% + 5%  
10%

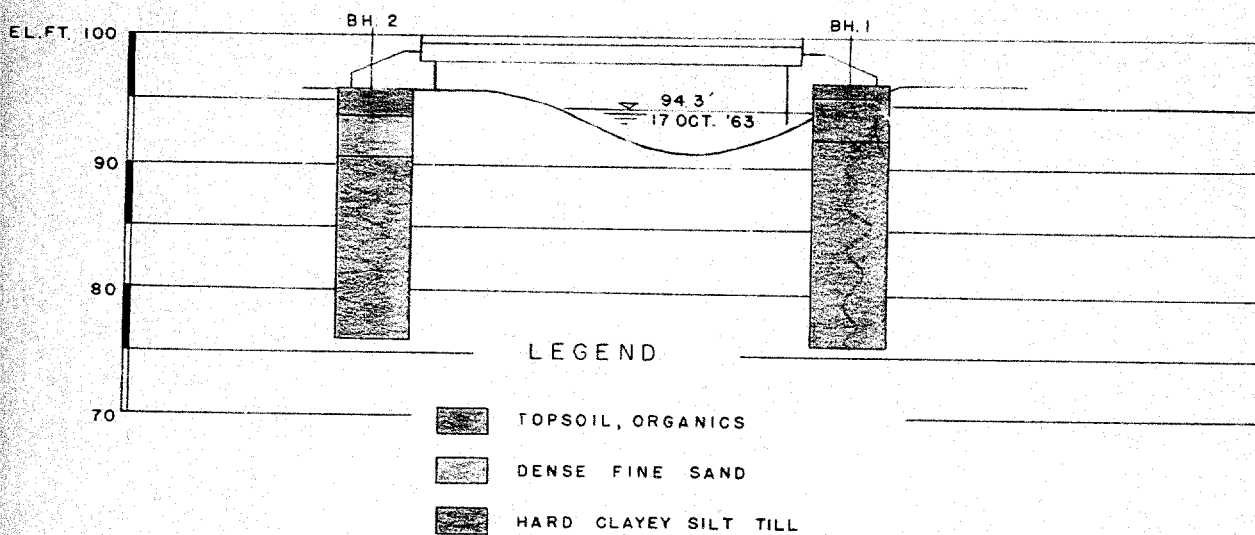
St : sensitivity =  $\frac{\text{shear strength in undisturbed state}}{\text{shear strength in remoulded state}}$

## SOIL DESCRIPTION.

COHESIONLESS SOILS :	RD :	COHESIVE SOILS :	C lbs/sqft
Very loose	0 - 15 %	Very soft	less than 250
Loose	15 - 35 %	Soft	250 - 500
Compact	35 - 65 %	Firm	500 - 1000
Dense	65 - 85 %	Stiff	1000 - 2000
Very dense	85 - 100 %	Very stiff	2000 - 4000
		Hard	over 4000



LOCATION OF BOREHOLES  
SCALE: 1 INCH TO 10 FEET



SUBSURFACE PROFILE  
SCALE: 1 INCH TO 10 FEET

# GEOTECHNICAL DATA SHEET FOR BOREHOLE . 1. and . 2

OUR REFERENCE NO. 3-10-14

CLIENT: Messrs. A.M. Spriet & Assocs.  
 PROJECT: Road Bridge  
 LOCATION: Township of North Dorchester  
 DATUM ELEVATION: 100.0' (existing bridge deck)

METHOD OF BORING: Washboring  
 DIAMETER OF BOREHOLE: 5x (3-inch)  
 DATE: October 16-17, 1963.

ENCLOSURE NO. 3

ELEVATION ft	DEPTH ft	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE					CONSISTENCY WATER CONTENT	REMARKS
				NUMBER	TYPE	DEPTH ft	20	40	60	80	100		
96.0	0	Ground Surface											
		Topsoil											
95.0		Brown clayey silt till, very stiff		1	SS	24							
	5			2	SS	29							
90.0		sandy		3	SS	46							
	10			4	SS	116/10"							
85.0		Grey clayey sandy silt till, hard		5	SS	117/10"							
	15			6	SS	100/10"							
80.0				7	SS	117 3/4"							
	20	sandy		8	SS	150							
75.0		End of borehole											
96.0	0	Ground Surface											
		Sandy topsoil and organics											
	5	Dense grey fine sand		1	SS	29							
90.0				2	SS	70							
	10			3	SS	109							
85.0		Grey clayey sandy silt till, hard		4	S	100/10"							
	15			5	S	116/10"							
80.0				6	S	116/10"							
	20			7	S	100/10"							
				8	S	110/10"							
75.0		End of borehole											

BOREHOLE 1

BOREHOLE 2

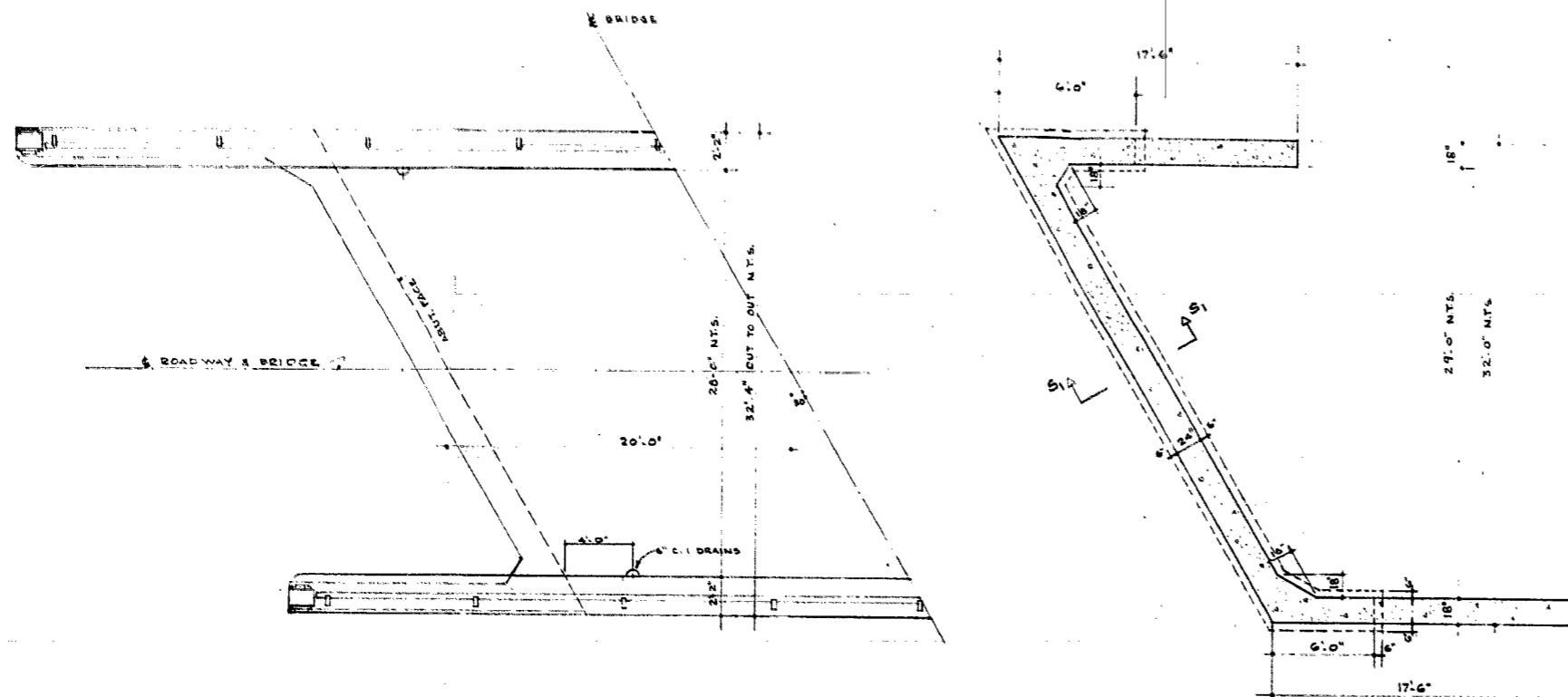
WL.  
 E1.94.3'

# 63-F-252 M

PLAYER BRIDGE

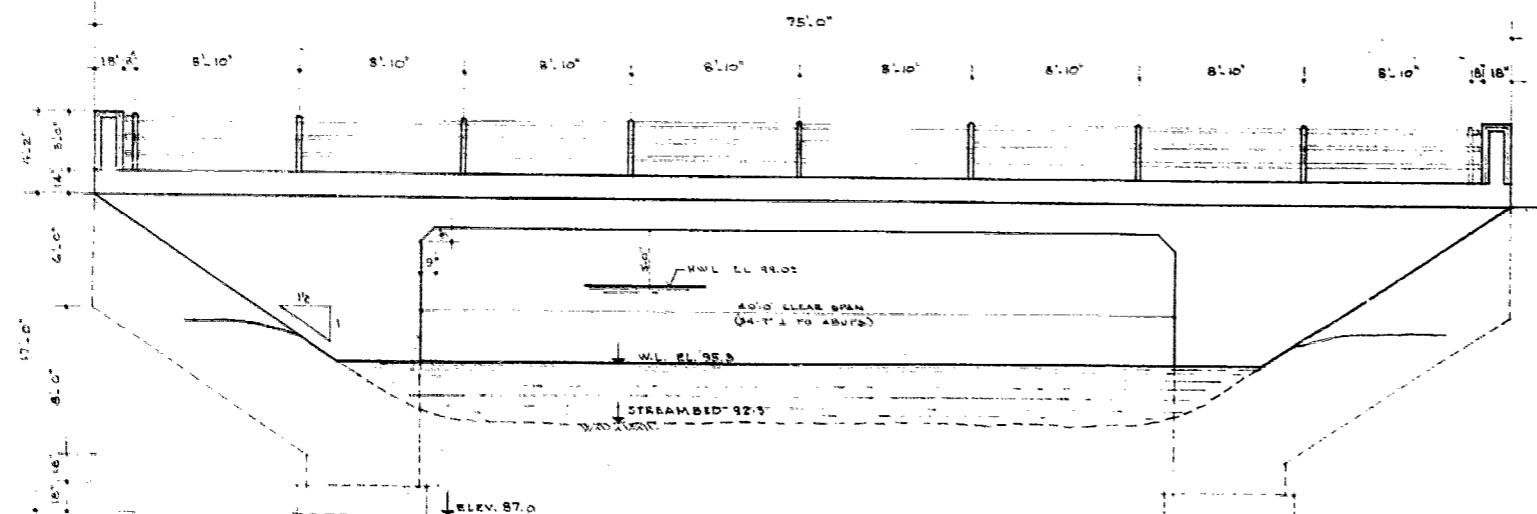
LOT 17, CON. IV/V

NORTH DORCHESTER TWP.

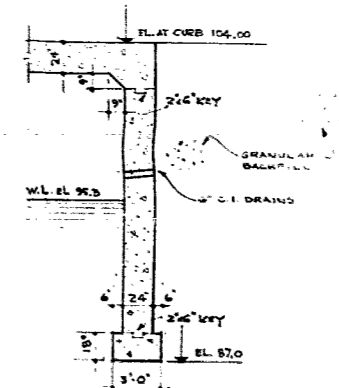


**HALF PLAN**  
SCALE 1/4" = 1'-0"

**HALF SECTION**  
SCALE 1/4" = 1'-0"



**ELEVATION**  
SCALE 1/4" = 1'-0"



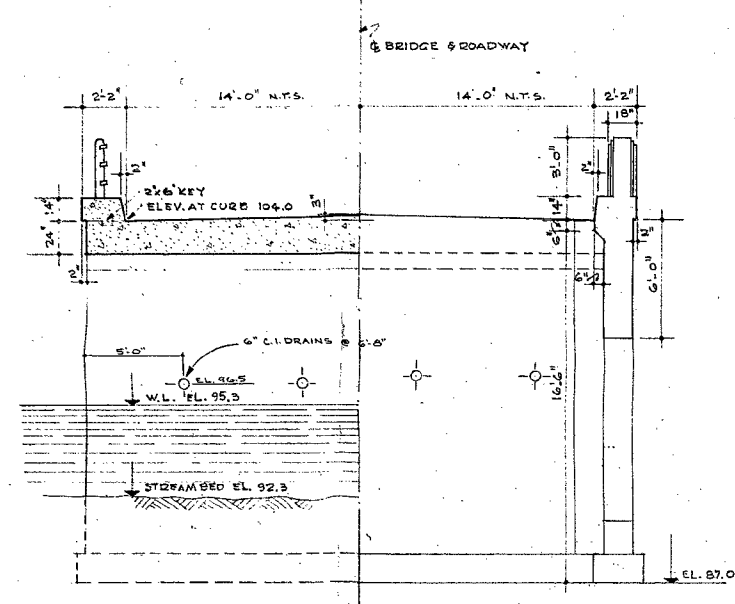
**SECTION S-S**  
SCALE 1/4" = 1'-0"

**GENERAL NOTES**

- Structure designed for H20-S16 loading.
- Work on the structure must not be commenced until monuments to fix control points have been erected and checked by the Engineer.
- Structure to be built in accordance with U.S.C. Form 9 Revised and the Engineers specifications for the Player Bridge--Concessions 5 15, Lot 17.
- The complete soil investigation report by Dominion Soil Investigation Limited may be examined at the Consulting Engineer's office. The Consulting Engineer does not guarantee the accuracy of this report.
- Footings subject to revision by Engineer. Footing designed for maximum soil pressure of 18,000 lbs. per sq. ft.
- Footings to be finished to the neat dimensions and the concrete shall be poured against undisturbed material where applicable.
- No concrete shall be placed in the footings before the character of the soil and excavation for footings has been ascertained by the Engineer.
- Concrete--
  - Minimum strength at 28 days 3000 psi (except the precast prestressed beams) NOT APPLICABLE
  - All concrete except in footings shall include an approved air entraining agent.
  - Maximum size of aggregate shall be 3/4 in. in deck slab, curb and guardrail; 1 1/2 in. in footings and 1 in. elsewhere or as specified.
  - Concrete 1500 psi.
- All exposed edges to be reinforced 1" unless otherwise noted. All acute angles shall be filleted as indicated.
- No concrete to be poured before materials, men, formwork, falsework and reinforcement have been checked by the Engineer.
- Low falsework shall not be struck until all backfill has been placed and compacted behind the abutments, to the satisfaction of the Engineer. In case of girders and beams, no backfill to be placed before girders are erected and secured.
- Backfill behind abutments to be brought up simultaneously at both ends.
- Construction joints not shown on plans must be approved by the Engineer.
- Reinforcing steel to be 11-Tons. Clear cover unless otherwise noted: 3" in footings or all surfaces in contact with earth or water; 1 1/2" in bottom of deck; 1" elsewhere.
- Precast Prestressed Concrete Beams
  - Concrete Strength 3000 psi.
  - On stressing 1000 psi.
  - At 28 days 1000 psi.
- Work to be performed by others
  - Grading of approaches shall be by the Township, outside of limits shown.
- Estimated Quantities
  - Reinforcing steel 11-Tons.
  - Concrete 2550 cu yd.
- Notify U.S.C. prior to structure being started. Submit prestressed Shop Drawings, NOT APPLICABLE

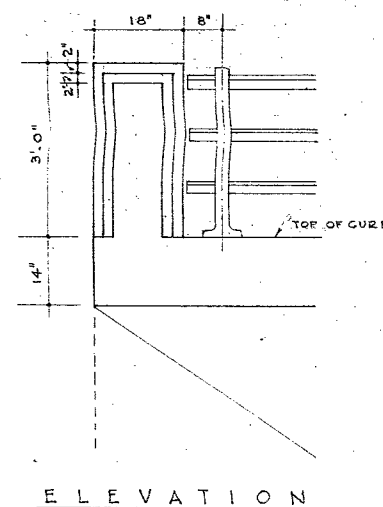


THE PLAYER BRIDGE			
NORTH DORCHESTER TWP.			
SCALE 1/4" = 1'-0"	APPROVED BY:	JOB NO.	DRAWN BY
DATE 10-1-63		6353	REVISOR
GEN. PLAN & SECTIONS			
J. D. VALLUT & ASSOCIATES			DRAWING NUMBER
CONSULTING ENGINEERS			2

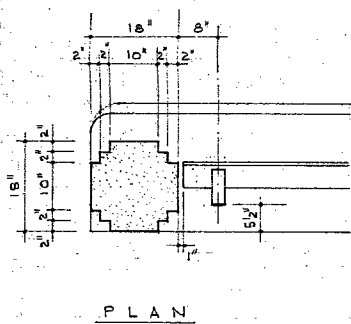


**HALF CROSS SECTION**  
SCALE : 1/4" = 1'-0"

**HALF END VIEW**  
SCALE : 1/4" = 1'-0"

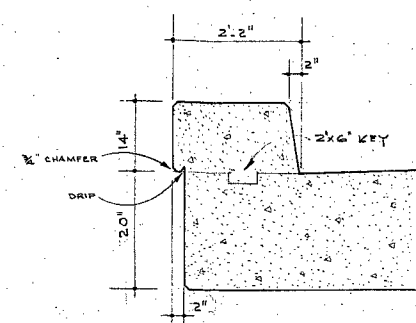


**ELEVATION**

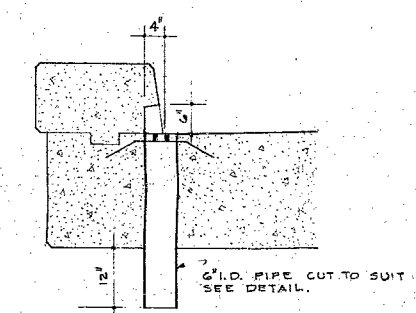


**PLAN**

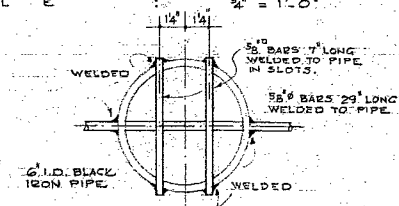
**END POST DETAIL**  
SCALE : 3/4" = 1'-0"



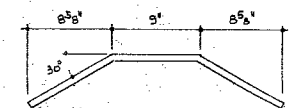
**CURB DETAIL**  
SCALE : 3/4" = 1'-0"



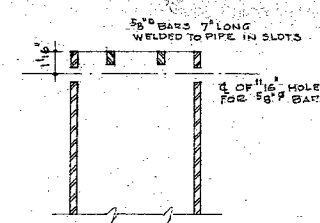
**DRAIN DETAIL**  
SCALE : 3/4" = 1'-0"



**PLAN**  
SCALE : 3/4" = 1'-0"

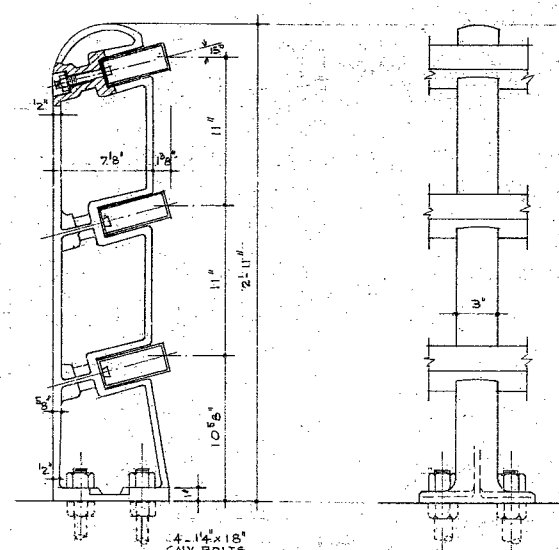


**DETAIL 5/8" BAR**  
SCALE : 1/2" = 1'-0"  
ONE REQ'D FOR EACH DRAIN  
BAR TO BE BENT AFTER  
INSERTED IN PIPE.

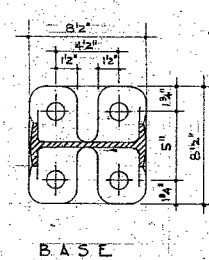


**SECTION**  
SCALE : 3/4" = 1'-0"

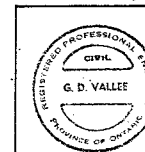
**DETAIL FOR 6" DECK DRAIN**  
SCALE : 3/4" = 1'-0"



**RAILING DETAIL**  
N. T. S.



**BASE**



<b>THE PLAYER BRIDGE</b> NORTH DORCHESTER TWP.			
SCALE: AS SHOWN	APPROVED BY:	JOB NO.	DRAWN BY
DATE: 10-12-65		6555	
<b>DETAILS &amp; SECTIONS</b>			DRAWING NUMBER
A. M. SPIET & ASSOCIATES CONSULTING ENGINEERS LONDON & SIMCOE			3