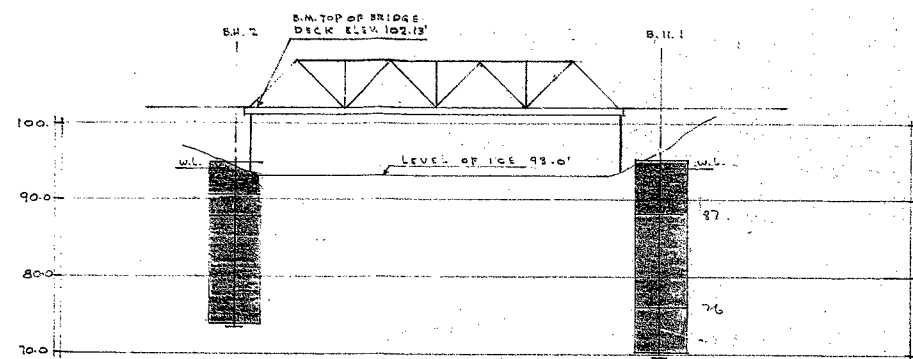
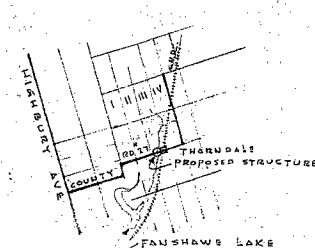


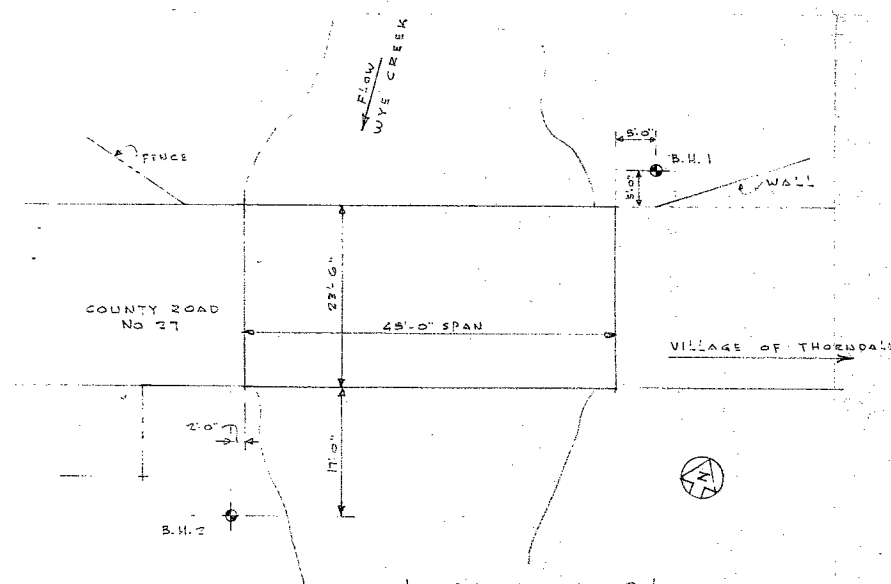
62-F-294 M  
THORNDALE  
BRIDGE  
LOTS 15/16, CON. III  
W. MISSOURI  
Twp.



SUBSURFACE PROFILE Looking NORTH  
SCALE 1" TO 10' 0"



KEY PLAN  
1" TO 4 MILES

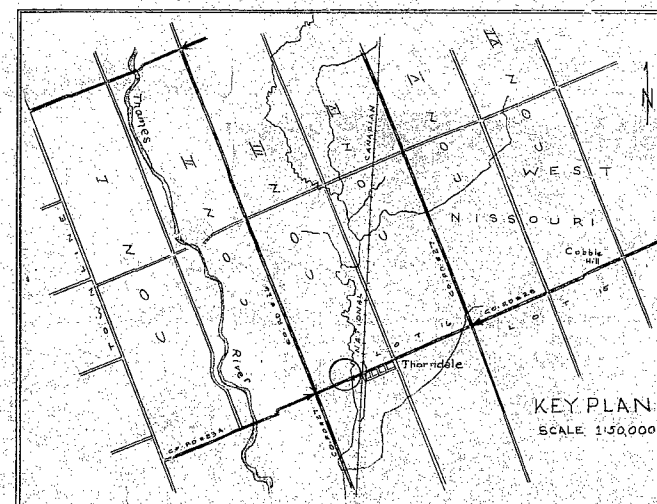
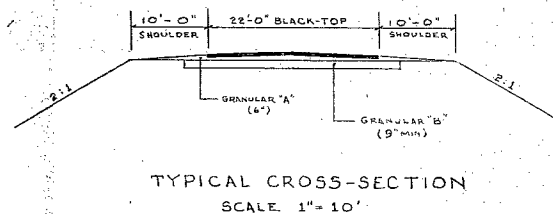
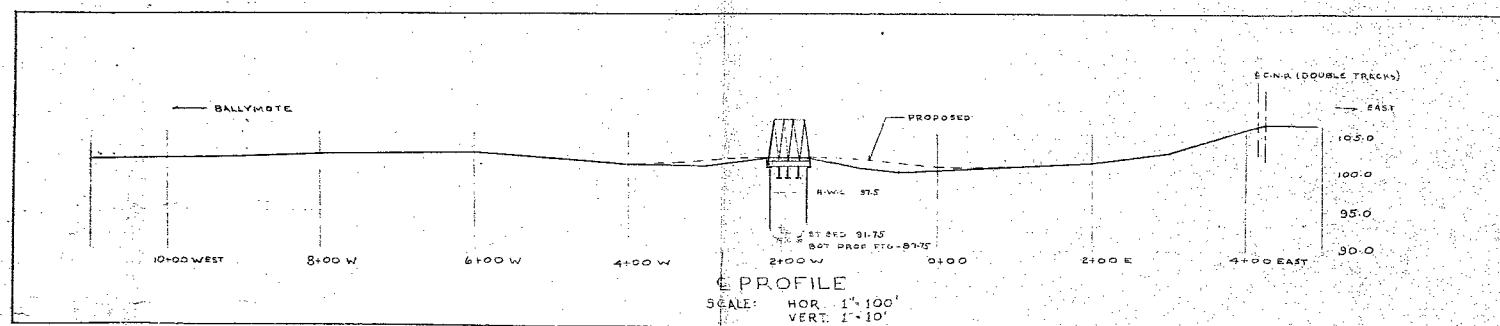
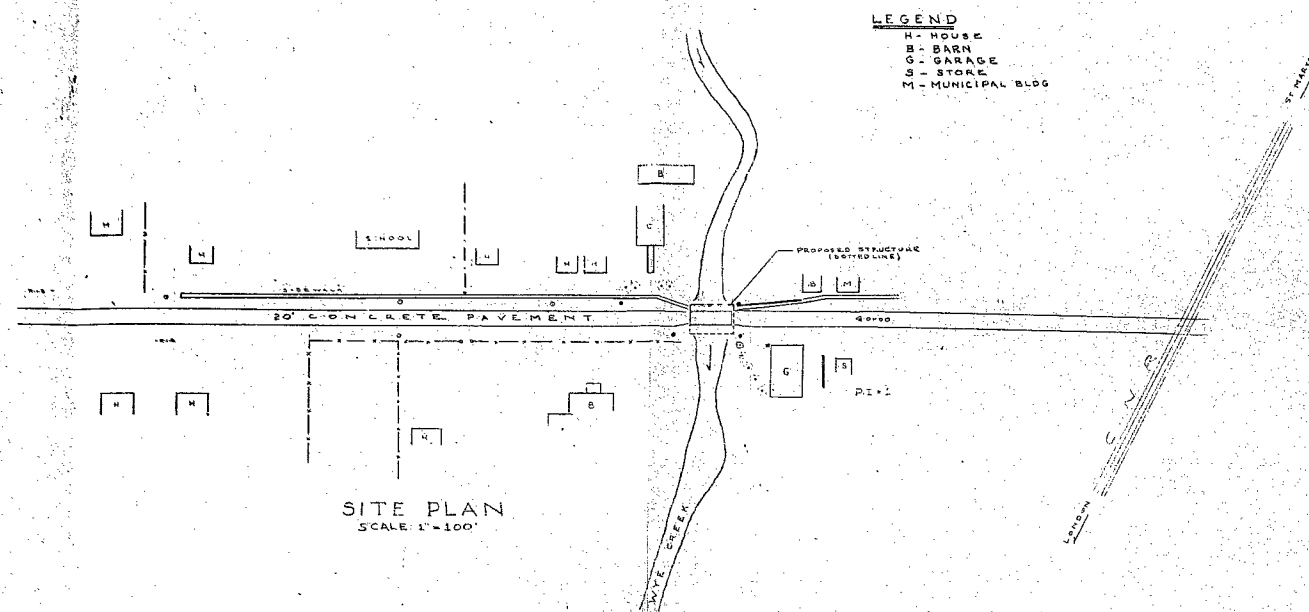


LOCATION PLAN  
SCALE 1" TO 10' 0"

# LEGEND

- SANDY CLAY, TRACES OF GRAVEL & ORGANICS
- FINE TO MEDIUM GREY SAND
- GREY SILTY CLAY TILL
- FINE GREY SILTY SAND WITH SEAMS OF SAND CLAY AND CLAY TILL

ORDER NO.	COUNTY OF MIDDLESEX	
2-T-15	LONDON COUNTY BUILDING	
ENCLOSURE	ONTARIO	
1	SOIL INVESTIGATION	
JAN. 1962	FOR	
PREP. BY	THORNDALE BRIDGE LOTS 15/16 CONCESSION III	
J.T.	TOWNSHIP OF WEST NISSOURI	
CHECKED BY	DOMINION SOIL INVESTIGATION LIMITED	
J.P.	363 QUEENS AVE	
	LONDON ONTARIO	



#### DATA

- Special features: Flats on either side of the bridge, floods almost every spring and occasionally there is a fair amount of ice. However, according to local residents it is never high enough to cause any serious flooding or ice jams.
- UPSTREAM STRUCTURE: 1 mile; 42' rigid frame - constructed in 1950, 3' above N.H.W.L.; Net area below high water level approximately 300 sq.ft.  
DOWNSTREAM STRUCTURE: 1 mile; 50' rigid frame - constructed in 1954; 2' above N.H.W.L.; Net area below high water level approximately 350 sq. ft.
- Reasons why these bridges are fair indications of size of proposed bridge: No visible erosion at any of the three bridges and life-time residents at each site say that they appear adequate during flood period.
- Is the stream gradient liable to be lowered? No.
- Navigation clearance required, if any? None.
- Railway clearance required, if any? None.
- Is temporary detour required? Yes, a one-lane detour probably between the existing structure and the church.  
Who will build it? Contractor.  
Who will maintain it? Contractor.
- Information on H.W.L.: According to local residents H.W.L. is approximately 97.5.  
L.W.L. is approximately 92.0.
- Road design information:  
Existing traffic count - 1000  
Design speed - 65  
Stopping site distance - 540'

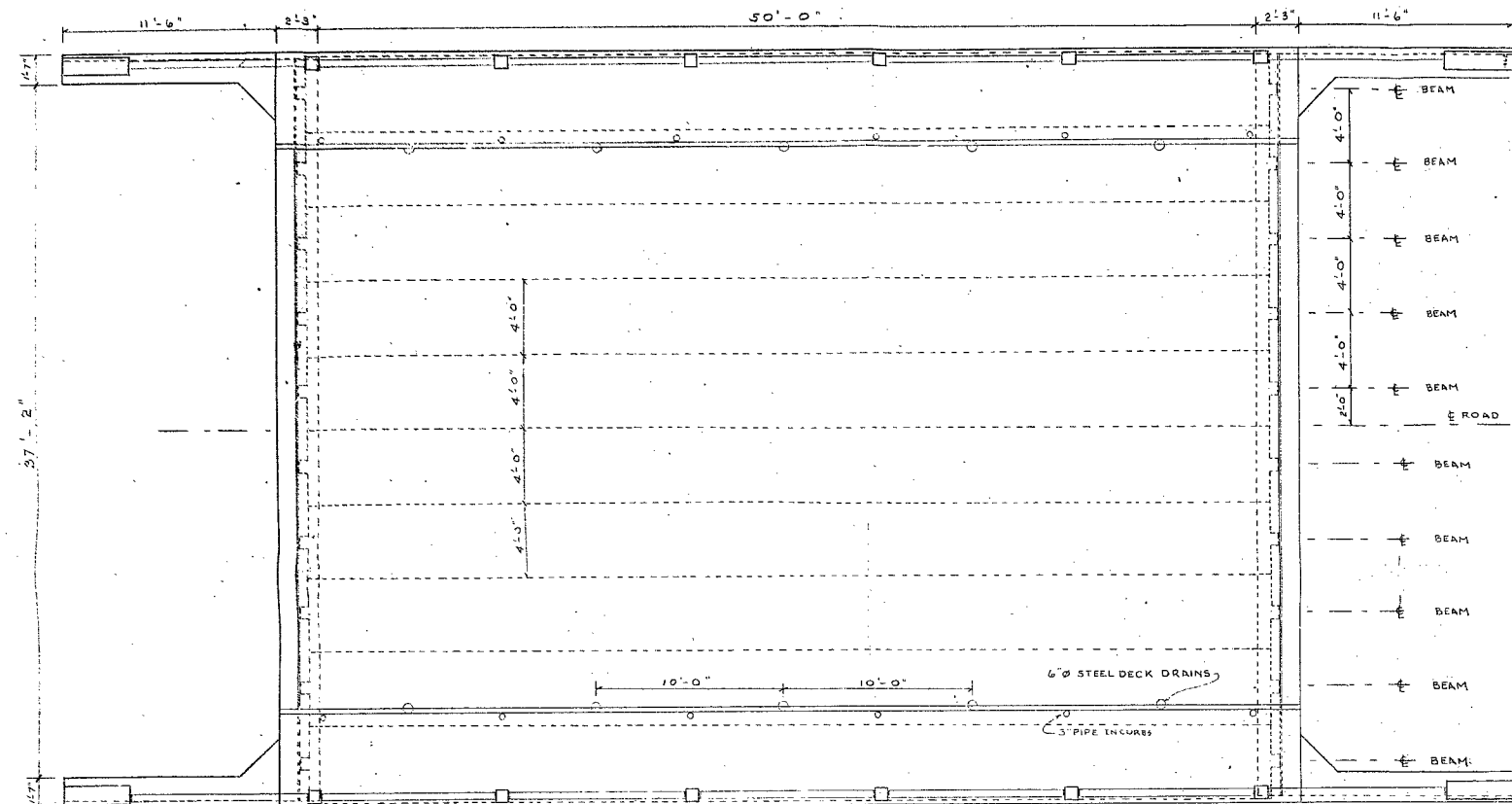
#### STRUCTURAL DATA

- Net span and type of bridge: 50' - simply supported prestressed lin-T deck.
- Roadway width on bridge: 30'
- Number and width of sidewalks: 2 - 5' each.
- Skew angle: No.
- Approximate Vol. Concrete 229 C.Y.
- Approximate wt. reinforcing steel 15T
- Drainage area: Approximately 7,400 acres.

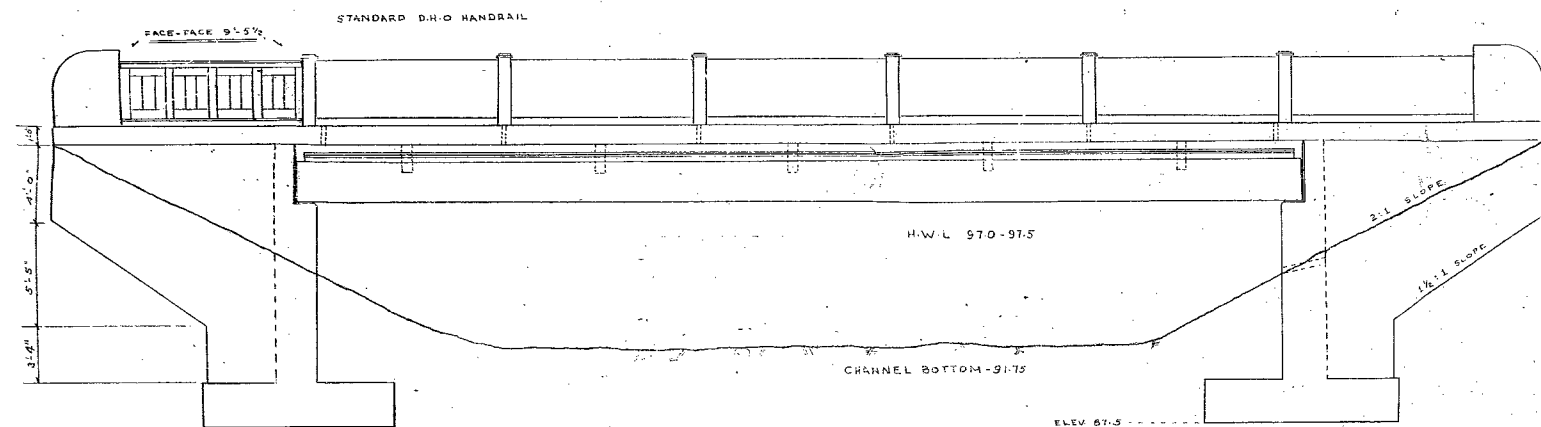
Field Investigation made January 2, 1962.

By: Tom Collings  
Survey Engineer.

COUNTY OF MIDDLESEX  
PROPOSED THORNDALE  
BRIDGE  
LOTS 15 & 16 CON III CO RD 27  
TOWNSHIP WEST MISSOURI  
AL. COLLINGS, F.P. RANDOLPH  
BY E.D.S. JUNIOR  
DATE 12/13/62



PLAN



ELEVATION

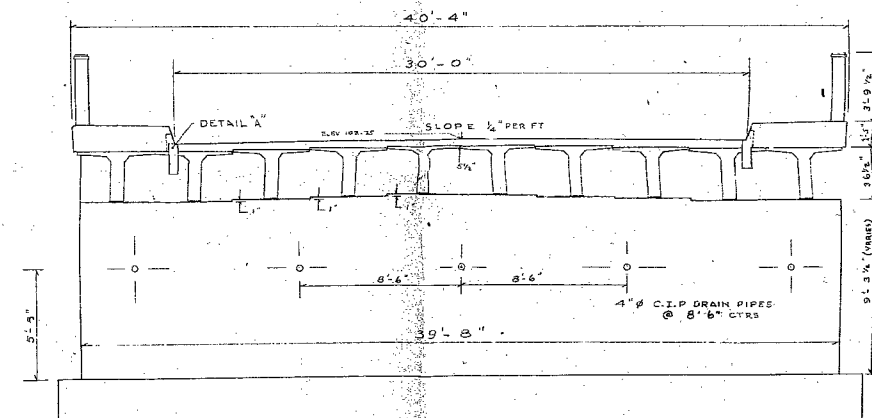
### GENERAL NOTES

1. STRUCTURE TO BE BUILT IN ACCORDANCE WITH D.H.O. SPECS FORMS REVISED 1960 AND COUNTY OF MIDDLESEX SUPPLEMENTAL SPECS.
2. EXCAV. FOR FOOTINGS TO BE FINISHED BY HAND TO THE NEAT DIMENSIONS AND THE CONCRETE SHALL BE PLACED ON UNDISTURBED GROUND ON FRONT, BACK AND BOTTOM FACES.
3. FOOTING DEPTH SUBJECT TO REVISION BY ENGINEER.
4. FOOTINGS ARE DESIGNED FOR AN ALLOWABLE SOIL PRESS. OF 4.3-6.0/sgft.
5. REINFORCED CONCRETE SHALL HAVE A MIN. COMPRESSIVE STRENGTH OF 3000 PSI. MAXIMUM SLUMP OF 3". COUNTY TO DESIGN MIX ON RECEIVING SAMPLES OF SAND AND AGGREGATE FROM SUCCESSFUL BIDDER.
6. NOTE THE ADDENDUM IN COUNTY SPECS RE: THE ADDITION OF AN ADMIXTURE CONTAINING AN AIR ENTRAINING AGENT. FOR ESTIMATING PURPOSES ASSUME THAT 1/2 BAG 4 HIGHWAY POZZOLITH SHALL BE USED PER BAG OF CEMENT.
7. MAXIMUM SIZE AGGREGATES:  
3/4" IN DECK SLAB, CURB AND HANDRAIL  
1 1/2" IN FOOTING  
2" ELSEWHERE
8. CONCRETE COVER:  
3" IN CONTACT WITH EARTH OR WATER.  
1" IN DECK.  
2" ELSEWHERE.
9. ALL EXPOSED EDGES TO HAVE 3/4" CHAMFER UNLESS OTHERWISE NOTED.
10. BACKFILL TO BE MECHANICALLY COMPACTED TO SATISFACTION OF THE ENGINEER.
11. DRAIN PIPES AND JOINT MATERIALS SHALL BE SUPPLIED BY THE CONTRACTOR.
12. CONSTRUCTION YEAR TO APPEAR ON N.E. & S.W. END OF GUARD RAIL. TEMPLATES SUPPLIED BY THE COUNTY.
13. DECK TO BE BROOMED FINISHED.

### APPROXIMATE QUANTITIES

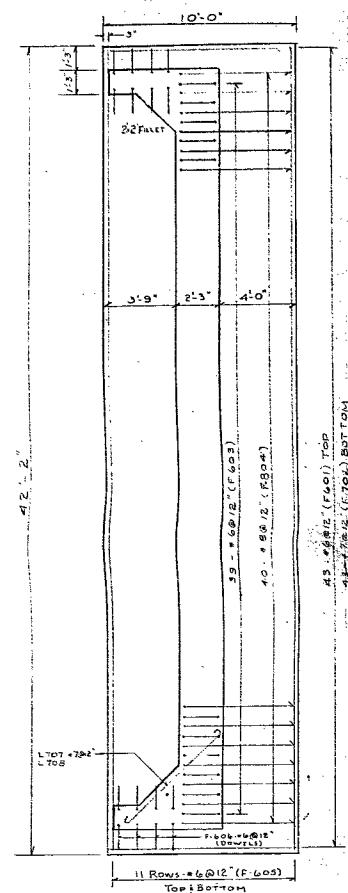
CONCRETE	229 CY
REINFORCING STEEL	15T
DECK DRAINS (L-18')	10 REQ'D
WEERING DRAINS (L-2'-5")	10 REQ'D
D.H.O. STANDARD HANDRAIL	14 PANELS-9'-5 1/2" FACE-TO-FACE
3" PIPE FOR SPLASH RAIL (L-10')	12 REQ'D

### CROSS-SECTION

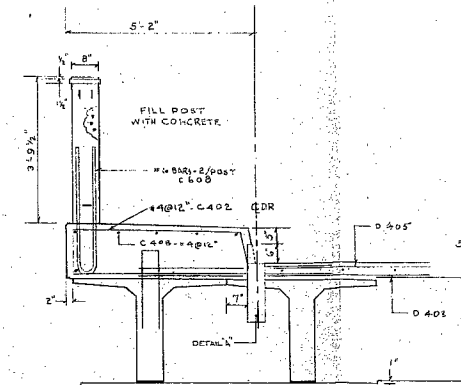
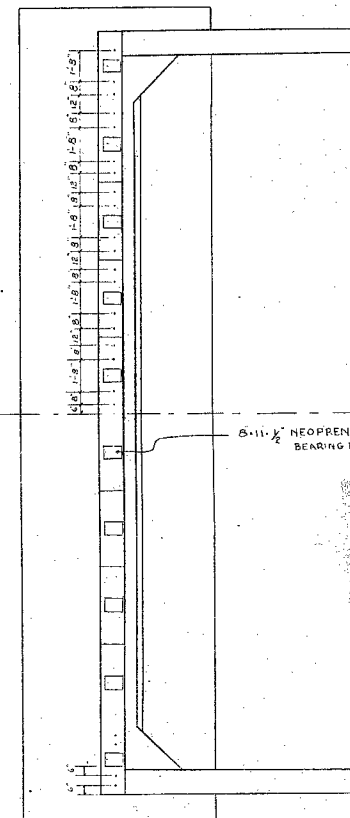


COUNTY OF MIDDLESEX  
PROPOSED THORNDALE  
BRIDGE  
LOTS 15 & 16, CON III, COR D=27  
TOWNSHIP OF WEST NISSOURI  
SCALE 1/4"=1'-0"  
DRAWN BY J.B.C.  
CHECKED BY J.B.C.  
DATE FEB 7/64

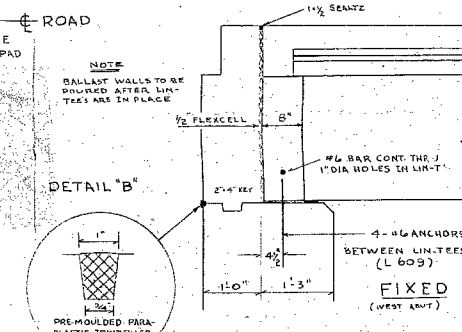
# FOOTING REINFORCING



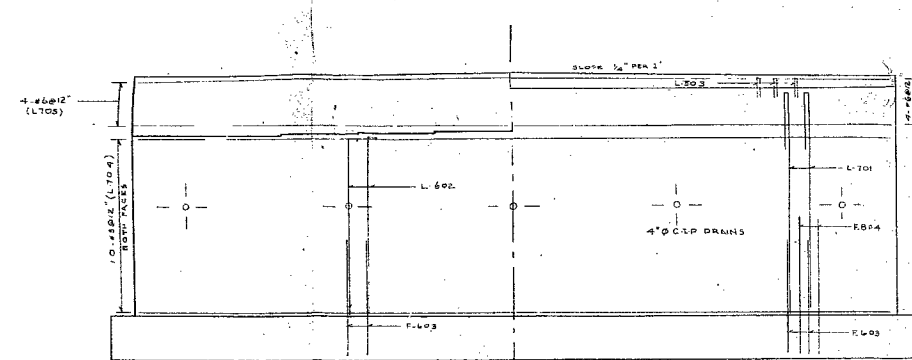
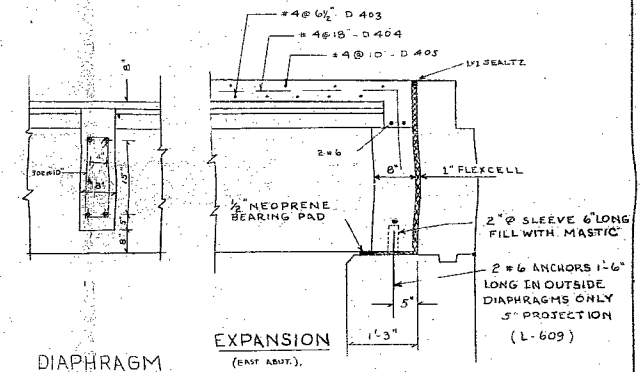
# TYPICAL BEARING SEAT SHOWING DOWELS



# TYPICAL CROSS-SECTION SCALE 1/2" = 1'

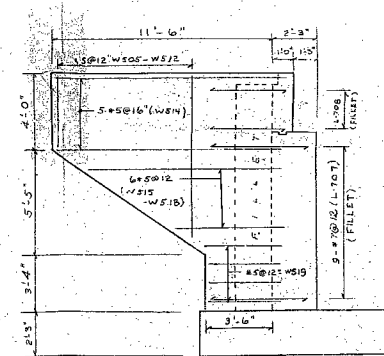
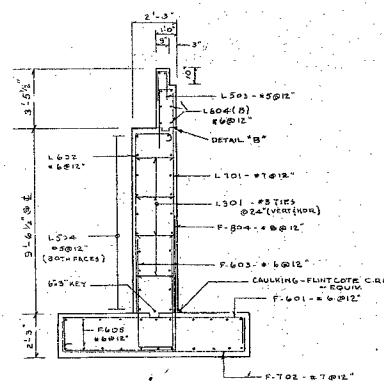


# TYPICAL BEARING DETAIL SCALE 3/4" = 1'



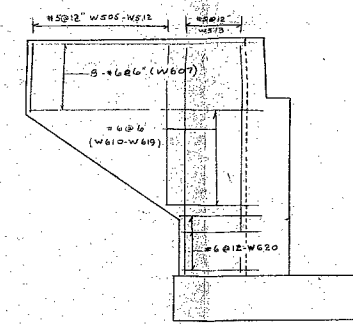
# ABUTMENT REINFORCING

FRONT FACE BACK FACE

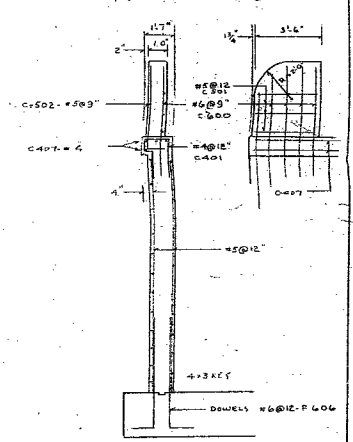


# WING WALL REINFORCING

OUTSIDE FACE INSIDE FACE (MAIN REINF.)



# WING WALL & END POST REINFORCING



COUNTY OF MIDDLESEX  
PROPOSED THORNDALE  
BRIDGE  
LOTS 15 & 16 - CON III - COR-27  
TOWNSHIP WEST MISSOURI  
SCALE: 1/4" = 1'-0"  
DRAWN BY: J.E.C.  
ENGINEER: J.E.C.

Mr. A. H. Toye,  
Bridge Engineer.  
Materials and Research Division,  
(Foundation Section)

February 26, 1962.

REVIEW OF COUNTY PLANS and  
SOILS REPORT BY DOMINION SOIL  
INVESTIGATION, LTD.  
(Our District #2)

Attention: Mr. K. L. Kleinsteinber,  
Municipal Bridge Liaison Engr.

Re: County of Middlesex,  
Thorndale Bridge,  
Twp. of W. Missouri,  
Con. III, Lots 15/16.

We have reviewed the Plans together with the Foundation Report for the above-mentioned proposed structure, and submit the following comments:-

(1) We agree with the Consultant's evaluation of the safe bearing capacity to be used for footings 10.0' wide.

(2) The Consultant has made no mention of ground water conditions. We have discussed this matter with him and feel that the following facts should be made known to the bridge designer:-

Excavations for the footings will be carried out in a fine grained subsoil which is likely to become 'quick' when subjected to an unbalanced hydrostatic head. A dewatering scheme must therefore, be chosen which will prevent this from happening. It is the opinion of the Consultant that this site can be successfully dewatered by means of well points. An alternative method would be to drive interlocking sheet piling to a depth below the footing base equal to the height of the water table above it.

If you have any further queries in connection with this project, please contact this Office.

KGS/MdeF

cc: Foundations Office✓  
Gen. Files.

A. G. Stermac,  
PRINCIPAL FOUNDATION ENGR.  
Per: *K. G. Selby*

(K. G. Selby,  
SR. PROJECT FOUNDATION ENGR.)



DEPARTMENT OF HIGHWAYS

Bridge Division.


Memo to Mr. A. Stermac,  
Principal Foundation Engineer,  
Materials and Research Section,  
Room 107, Lab. Bldg., DOWNSVIEW  
From G. C. E. Burkhardt

Date February 16, 1962.  
Subject County of Middlesex,  
Thorndale Bridge  
Twp. of W. Nissouri  
Con. III, Lots 15/16

We are enclosing, herewith, a copy of the  
Foundation Report, by Dominion Soil Investigation  
Limited, and a copy of the plans for your comments.

The County is asking for an early approval.  
We would appreciate it very much if we could have  
your comments at your earliest convenience.

GCEB/ea

  
G. C. E. Burkhardt  
for A. L. Kleinsteinber,  
Municipal Bridge Liaison Engineer.

*Lin:*

*Feb. 22. 1962*

*Reply Sent AGP 26/2/62 Ed. Bully*

BA-  
COUNTY OF MIDDLESEX  
MIDDLESEX COUNTY BUILDINGS  
LONDON ONTARIO

Report on  
SOIL INVESTIGATION

for

THORNDALE BRIDGE

LOTS 15 & 16, CONCESSION III  
COUNTY ROAD NO. 27  
TOWNSHIP OF WEST NISSOURI

by

DOMINION SOIL INVESTIGATION LIMITED  
363 Queens Avenue  
LONDON ONTARIO

Reference No. 2-1-L5

January, 1962



## CONTENTS

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I. INTRODUCTION . . . . .	1
II. FIELD WORK . . . . .	1
III. SUBSURFACE CONDITIONS. . . . .	1
IV. BEARING CAPACITY AND SETTLEMENT. . . . .	2
V. SUMMARY. . . . .	3
VI. REFERENCES . . . . .	3

## ENCLOSURES

	No.
LOCATION PLAN . . . . .	1
SUBSURFACE PROFILE . . . . .	1
ENGINEERING DATA SHEETS. . . . .	2 and 3

## I. INTRODUCTION

In accordance with verbal authorization from the Middlesex County Engineer's Office, a soil investigation has been carried out at a site in the Township of West Nissouri where it is proposed to replace an existing single-span road bridge. The bridge carries County Road No. 27 across the Wye Creek on the west side of the village of Thorndale.

It was indicated that the new structure would be of 50 foot span and would probably be carried on spread footings 10 feet wide at El. 87.5 feet. The purpose of the investigation was to reveal the subsurface conditions and to assess the suitability of the subsoil for the intended loading.

## II. FIELD WORK

Field work was carried out during the period 20th to 22nd of January, 1962 and consisted of two boreholes at the locations shown on enclosure 1. Dynamic cone penetration tests were made adjacent to each borehole and Standard Penetration Tests were made at frequent intervals using a 2" O.D. split spoon. A constant driving energy was employed in the Standard Penetration and dynamic cone tests using a 140 pound hammer dropping 30 inches. The former test provided disturbed samples of the strata and the latter, a continuous record of soil density.

Boreholes 1 and 2 were advanced to depths of 16'6" and 12'6" respectively by driving a cleaning Bx casing. Thereafter it was necessary to use water and the holes were continued by wash boring. The advantages of drilling dry in the upper layers are that a minimum of disturbance is caused to the soil and it is possible to examine it at all elevations and at its natural moisture content.

The results of the field tests are recorded on engineering data sheets comprising enclosures 2 and 3. Elevations have been referred to the level of the west end of the bridge deck which was given as El. 102.13 feet.

## III. SUBSURFACE CONDITIONS

A subsurface profile is shown on enclosure 1. In both holes the upper layers consisted of a sandy clay with traces of gravel and organics. This was probably the original soil which had been removed and used as backfill when the existing bridge was constructed.

Below this level in borehole 1, a uniform deposit of fine to medium grey sand was encountered containing small pockets of silt and gravel and at El. 76 feet this changed to a dense, grey, silty, clay till.

The conditions at borehole 2 were somewhat different in that the sand layer contained frequent seams of sandy clay and clay till.

#### IV. BEARING CAPACITY AND SETTLEMENT

A comparison of the Standard Penetration Test results will show that the soil is considerably denser in the vicinity of borehole 1 than at borehole 2. For example the blow-counts at El. 88.0 feet are 26 and 14 respectively. The values of the angle of internal friction  $\phi$  corresponding to these figures are  $35^\circ$  and  $32^\circ$  respectively, according to Terzaghi and others, and the maximum allowable soil pressures to give a factor of safety of 3 on ultimate bearing capacity are:

for borehole 1 6916 p.s.f.  
for borehole 2 4333 p.s.f.

In choosing a suitable soil pressure it is necessary to consider settlement, and especially differential settlement where the abutments of the bridge will be sitting on strata of different relative density. The soil pressures which will cause a settlement of 1 inch under a footing 10 feet wide are, (according to Terzaghi and Peck):

at borehole 1 3200 p.s.f.  
at borehole 2 1600 p.s.f.

This deflection will be elastic in nature, because the soil at both holes is essentially granular, and within limits it can be assumed proportional to the applied pressure. Thus, if both footings are loaded to an average pressure of 3200 p.s.f., a deflection of 2 inches can be expected at borehole 2, and so a differential deflection of 1 inch.

For the purpose of design it should be assumed that deflections will be proportional to applied pressure, within the limits of the maximum allowable pressures quoted above, and working soil pressures should be so chosen as to give tolerable total and differential settlements.

V. SUMMARY

1. The soil consists of an upper layer of sandy clay backfill overlying a deposit which is essentially granular. At borehole 1 this is a uniform deposit of fine to medium sand, while at borehole 2 the sand contains seams of sandy clay and clay till. A bed of dense grey till was encountered in borehole 1 below El. 76.0 feet.
2. The soil at borehole 1 was appreciably denser than at borehole 2.
3. Maximum allowable soil pressures are quoted to give a factor of safety of 3 on the ultimate bearing capacity.
4. In view of the variation in relative density of the soil, differential settlement between the abutments can be expected if the same soil pressure is used. However, sufficient information is provided here to enable working pressures to be chosen which will limit total and differential settlements to a predetermined amount.

VI. REFERENCES

1. Procedures for Testing Soils, ASTM, April 1958. pp. 186 to 198. (Unified Soil Classification System - by A. A. Wagner)
2. Proceedings of the 4th International Conference on Soil Mechanics and Foundation 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.)
3. Terzaghi and Peck: Soil Mechanics in Engineering Practice. John Wiley and Sons, New York 1948.
4. Standard Penetration Tests and Bearing Capacity of Cohesionless Soils, ASCE Paper 866, Jan. 1956 by G. G. Meyerhof.

DOMINION SOIL INVESTIGATION LIMITED



*James Park*

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

## Dominion Soil Investigation Ltd.

## Engineering Data Sheet for Borehole: 1

Date: 20 JAN. 62

Project: THORNDALE BRIDGE

Location: TOWNSHIP OF WEET, MISSOURI

Hole Location: SEE ENCLOSURE #1

Hole Elevation and Datum:

Field Supervisor: J.P. Prep.: J.T.

Driller: G.G. Checked: J.P.

## LEGEND

Shear Strength (C)

Unconfined compression  
Vane test and sensitivity (S)

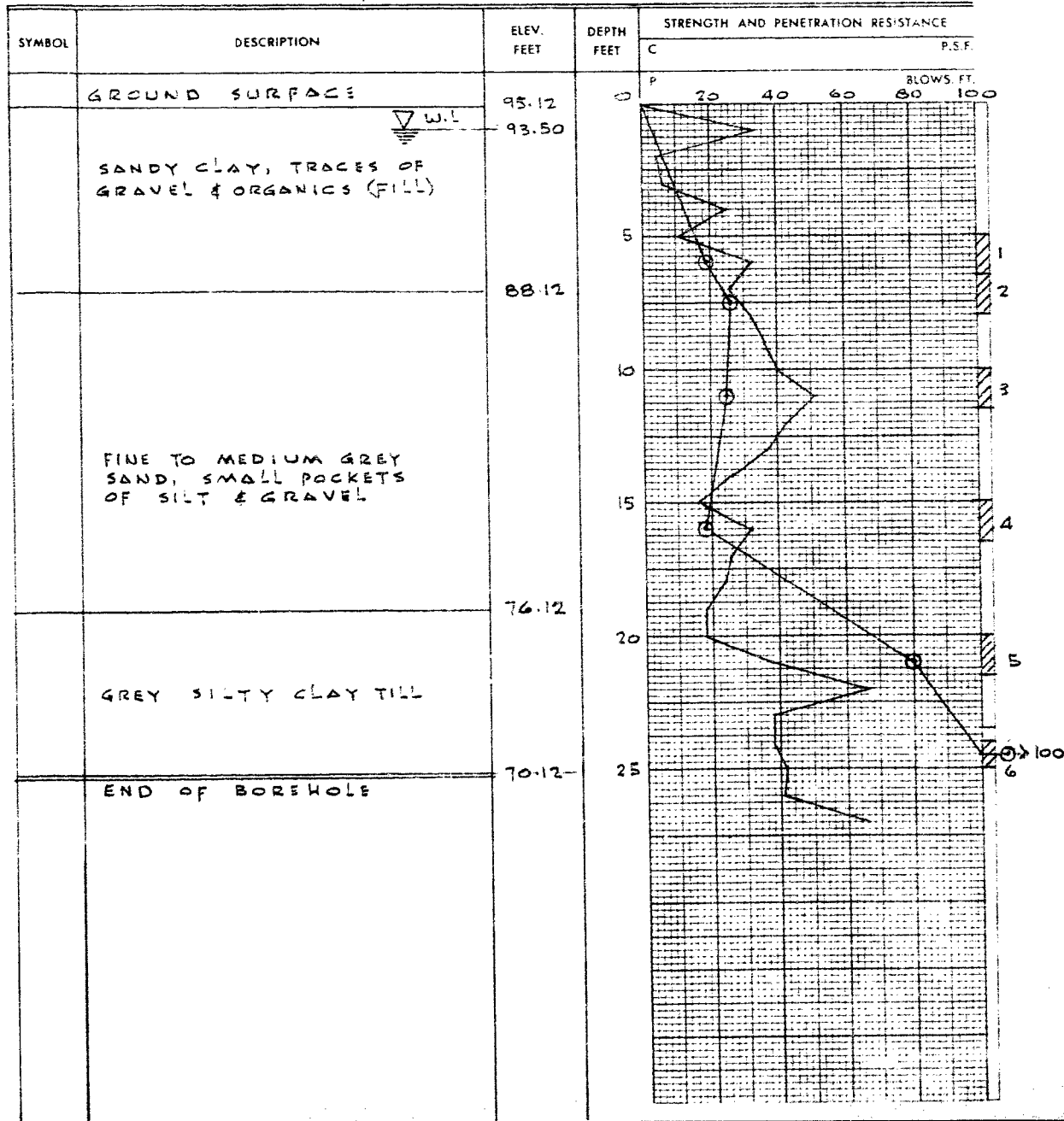
Penetration Resistance (P)

2" Split tube  
2" Dia. Cone  
Casing⊕  
+s⊕  
⊕

Sampling Method

2" Dia. split tube

2" Shelby tube



## Dominion Soil Investigation Ltd.

Engineering Data Sheet for Borehole: 2

Date: 22 JAN. 62

Project: THORNDALE BRIDGE  
 Location: TOWNSHIP OF WEST MISSOURI  
 Hole Location: SEE ENCLOSURE #1  
 Hole Elevation and Datum:  
 Field Supervisor: J. P. Prep: J. T.  
 Driller: G. G. Checked: J. P.

## LEGEND

Shear Strength (C)

Unconfined compression  
 Vane test and sensitivity (S)

Penetration Resistance (P)

2" Split tube  
 2" Dia. Cone  
 Casing

Sampling Method

2" Dia. split tube

2" Shelby tube

