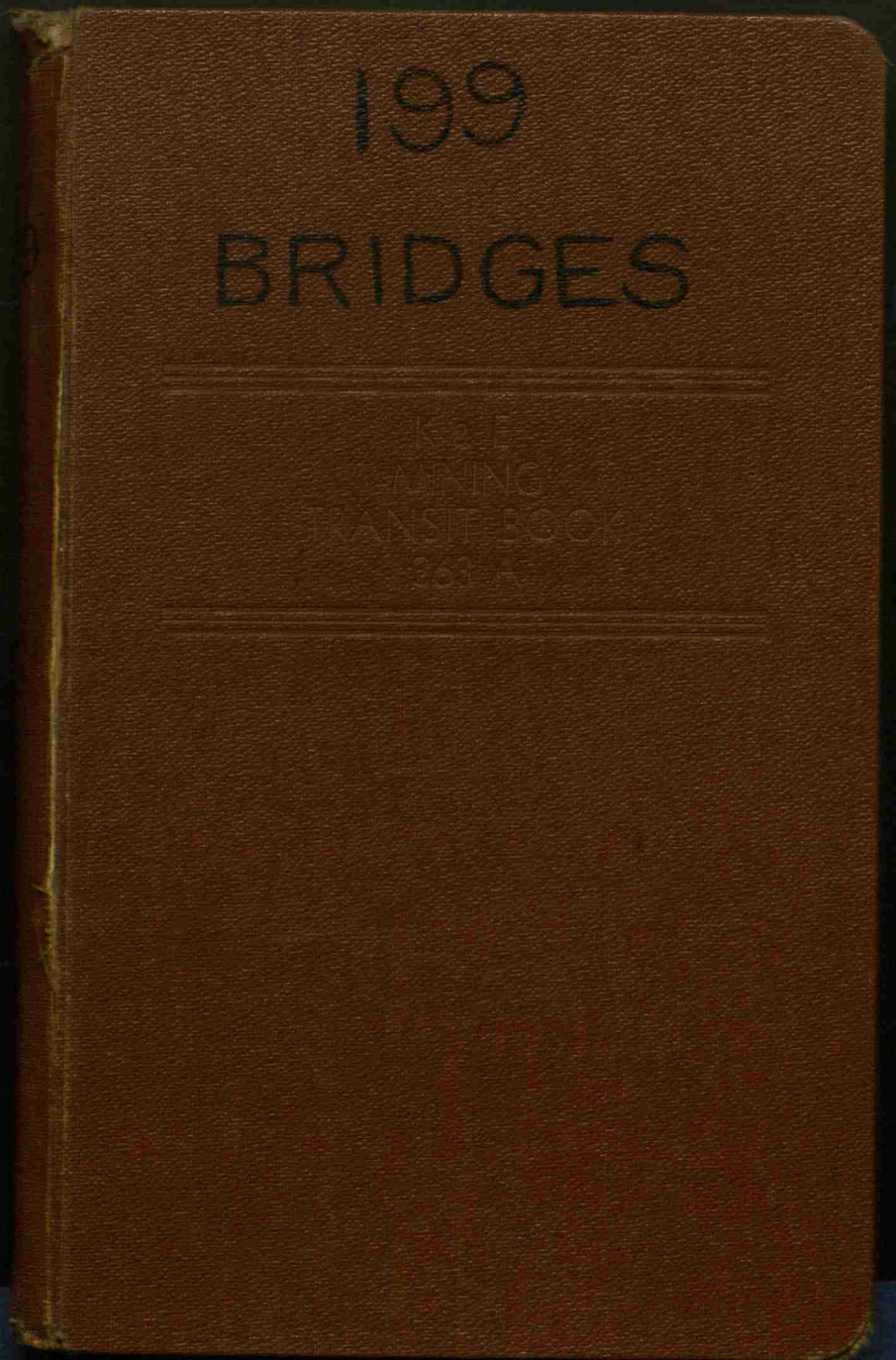
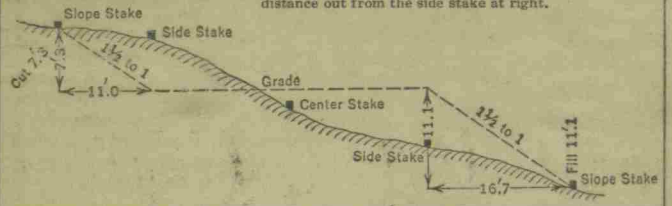

199
BRIDGES
K & E
MINING
TRANSIT BOOK
353 A

## DISTANCES FROM SIDE STAKES FOR CROSS-SECTIONING

**Roadway of any Width. Side Slopes 1½ to 1.**

In the figure below: opposite 7 under "Cut or Fill" and under .3 read 11.0, the distance out from the side stake at left. Also, opposite 11 under "Cut or Fill" and under .1 read 16.7, the distance out from the side stake at right.




| Cut or Fill | 0 | .1 | .2 | .3 | .4 | .5 | .6 | .7 | .8 | .9 | Cut or Fill |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Distance out from Side or Shoulder Stake | | | | | | | | | | |
| 0 | 0.0 | 0.2 | 0.3 | 0.5 | 0.6 | 0.8 | 0.9 | 1.1 | 1.2 | 1.4 | 0 |
| 1 | 1.5 | 1.7 | 1.8 | 2.0 | 2.1 | 2.3 | 2.4 | 2.6 | 2.7 | 2.9 | 1 |
| 2 | 3.0 | 3.2 | 3.3 | 3.5 | 3.6 | 3.8 | 3.9 | 4.1 | 4.2 | 4.4 | 2 |
| 3 | 4.5 | 4.7 | 4.8 | 5.0 | 5.1 | 5.3 | 5.4 | 5.6 | 5.7 | 5.9 | 3 |
| 4 | 6.0 | 6.2 | 6.3 | 6.5 | 6.6 | 6.8 | 6.9 | 7.1 | 7.2 | 7.4 | 4 |
| 5 | 7.5 | 7.7 | 7.8 | 8.0 | 8.1 | 8.3 | 8.4 | 8.6 | 8.7 | 8.9 | 5 |
| 6 | 9.0 | 9.2 | 9.3 | 9.5 | 9.6 | 9.8 | 9.9 | 10.1 | 10.2 | 10.4 | 6 |
| 7 | 10.5 | 10.7 | 10.8 | 11.0 | 11.1 | 11.3 | 11.4 | 11.6 | 11.7 | 11.9 | 7 |
| 8 | 12.0 | 12.2 | 12.3 | 12.5 | 12.6 | 12.8 | 12.9 | 13.1 | 13.2 | 13.4 | 8 |
| 9 | 13.5 | 13.7 | 13.8 | 14.0 | 14.1 | 14.3 | 14.4 | 14.6 | 14.7 | 14.9 | 9 |
| 10 | 15.0 | 15.2 | 15.3 | 15.5 | 15.6 | 15.8 | 15.9 | 16.1 | 16.2 | 16.4 | 10 |
| 11 | 16.5 | 16.7 | 16.8 | 17.0 | 17.1 | 17.3 | 17.4 | 17.6 | 17.7 | 17.9 | 11 |
| 12 | 18.0 | 18.2 | 18.3 | 18.5 | 18.6 | 18.8 | 18.9 | 19.1 | 19.2 | 19.4 | 12 |
| 13 | 19.5 | 19.7 | 19·8 | 20.0 | 20.1 | 20.3 | 20.4 | 20.6 | 20.7 | 20.9 | 13 |
| 14 | 21.0 | 21.2 | 21.3 | 21.5 | 21.6 | 21.8 | 21.9 | 22.1 | 22.2 | 22.4 | 14 |
| 15 | 22.5 | 22.7 | 22.8 | 23.0 | 23.1 | 23.3 | 23.4 | 23.6 | 23.7 | 23.9 | 15 |
| 16 | 24.0 | 24.2 | 24.3 | 24.5 | 24.6 | 24.8 | 24.9 | 25.1 | 25.2 | 25.4 | 16 |
| 17 | 25.5 | 25.7 | 25.8 | 26.0 | 26.1 | 26.3 | 26.4 | 26.6 | 26.7 | 26.9 | 17 |
| 18 | 27.0 | 27.2 | 27.3 | 27.5 | 27.6 | 27.8 | 27.9 | 28.1 | 28.2 | 28.4 | 18 |
| 19 | 28.5 | 28.7 | 28.8 | 29.0 | 29.1 | 29.3 | 29.4 | 29.6 | 29.7 | 29.9 | 19 |
| 20 | 30.0 | 30.2 | 30.3 | 30.5 | 30.6 | 30.8 | 30.9 | 31.1 | 31.2 | 31.4 | 20 |
| 21 | 31.5 | 31.7 | 31.8 | 32.0 | 32.1 | 32.3 | 32.4 | 32.6 | 32.7 | 32.9 | 21 |
| 22 | 33.0 | 33.2 | 33.3 | 33.5 | 33.6 | 33.8 | 33.9 | 34.1 | 34.2 | 34.4 | 22 |
| 23 | 34.5 | 34.7 | 34.8 | 35.0 | 35.1 | 35.3 | 35.4 | 35.6 | 35.7 | 35.9 | 23 |
| 24 | 36.0 | 36.2 | 36.3 | 36.5 | 36.6 | 36.8 | 36.9 | 37.1 | 37.2 | 37.4 | 24 |
| 25 | 37.5 | 37.7 | 37.8 | 38.0 | 38.1 | 38.3 | 38.4 | 38.6 | 38.7 | 38.9 | 25 |
| 26 | 39.0 | 39.2 | 39.3 | 39.5 | 39.6 | 39.8 | 39.9 | 40.1 | 40.2 | 40.4 | 26 |
| 27 | 40.5 | 40.7 | 40.8 | 41.0 | 41.1 | 41.3 | 41.4 | 41.6 | 41.7 | 41.9 | 27 |
| 28 | 42.0 | 42.2 | 42.3 | 42.5 | 42.6 | 42.8 | 42.9 | 43.1 | 43.2 | 43.4 | 28 |
| 29 | 43.5 | 43.7 | 43.8 | 44.0 | 44.1 | 44.3 | 44.4 | 44.6 | 44.7 | 44.9 | 29 |
| 30 | 45.0 | 45.2 | 45.3 | 45.5 | 45.6 | 45.8 | 45.9 | 46.1 | 46.2 | 46.4 | 30 |
| 31 | 46.5 | 46.7 | 46.8 | 47.0 | 47.1 | 47.3 | 47.4 | 47.6 | 47.7 | 47.9 | 31 |
| 32 | 48.0 | 48.2 | 48.3 | 48.5 | 48.6 | 48.8 | 48.9 | 49.1 | 49.2 | 49.4 | 32 |
| 33 | 49.5 | 49.7 | 49.8 | 50.0 | 50.1 | 50.3 | 50.4 | 50.6 | 50.7 | 50.9 | 33 |
| 34 | 51.0 | 51.2 | 51.3 | 51.5 | 51.6 | 51.8 | 51.9 | 52.1 | 52.2 | 52.4 | 34 |
| 35 | 52.5 | 52.7 | 52.8 | 53.0 | 53.1 | 53.3 | 53.4 | 53.6 | 53.7 | 53.9 | 35 |
| 36 | 54.0 | 54.2 | 54.3 | 54.5 | 54.6 | 54.8 | 54.9 | 55.1 | 55.2 | 55.4 | 36 |
| 37 | 55.5 | 55.7 | 55.8 | 56.0 | 56.1 | 56.3 | 56.4 | 56.6 | 56.7 | 56.9 | 37 |
| 38 | 57.0 | 57.2 | 57.3 | 57.5 | 57.6 | 57.8 | 57.9 | 58.1 | 58.2 | 58.4 | 38 |
| 39 | 58.5 | 58.7 | 58.8 | 59.0 | 59.1 | 59.3 | 59.4 | 59.6 | 59 7 | 59.9 | 39 |
| 40 | 60.0 | 60.2 | 60.3 | 60.5 | 60.6 | 60.8 | 60.9 | 61.1 | 61.2 | 61.4 | 40 |

KEUFFEL & ESSER CO., N. Y. MADE IN GERMANY

BRIDGE BOOK.

# 199

Stanley Shartle
20 June 1944.

Present structure O.K. except south abutment and wings need underpinning.

---

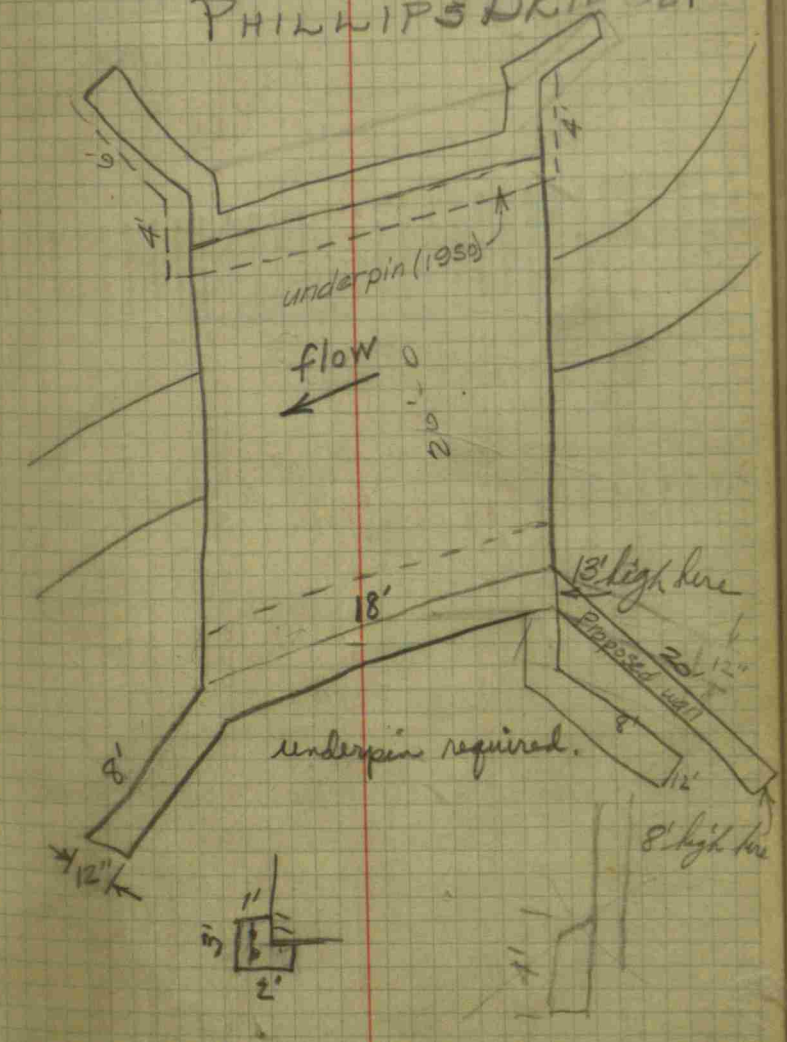
1950 Repair
Underpin N abut - down 4'

SE wall - 13' from top of footing to road level at bridge & 8' high at extremity with 3' deep footing



Near
W½ mi store 20-15-2W
Concrete arch

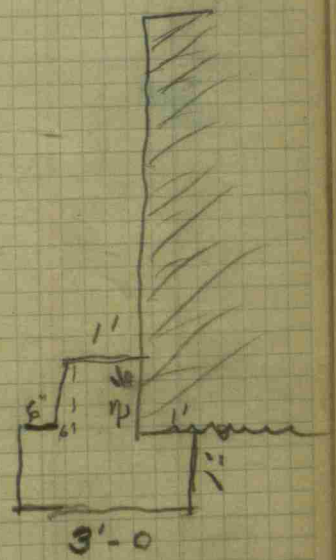
PHILLIPS BRIDGE



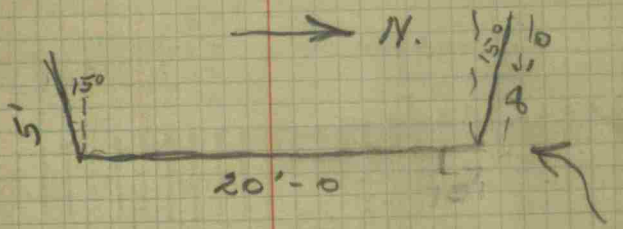
# COSTIN BRIDGE

NEAR SW. COR. 10-15-1E. → N

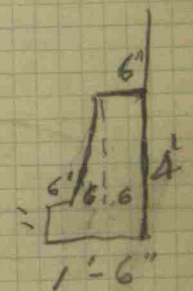

See page 58



# FRANTZ BRIDGE




FRANTZ BRIDGE
NEAR CEM. S SE¼
19-15-1W.



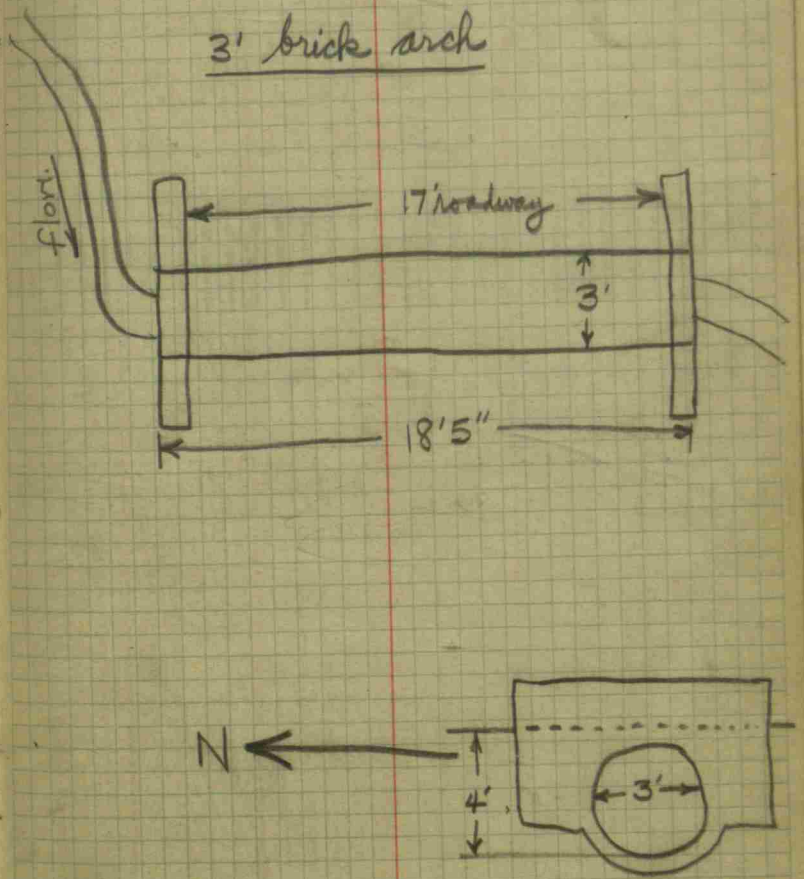
Stanley Shattle
20 June 1944.

The newly constructed bridge should be built several feet east of the present site and should be built on a skew of about 30° to right.

York Bridge
Near Cen. S. SE¼ 19-15-2W.



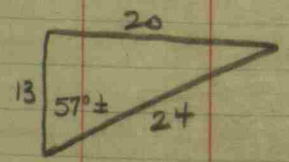
3' brick arch



Stanley Shartle
21 June 1944.

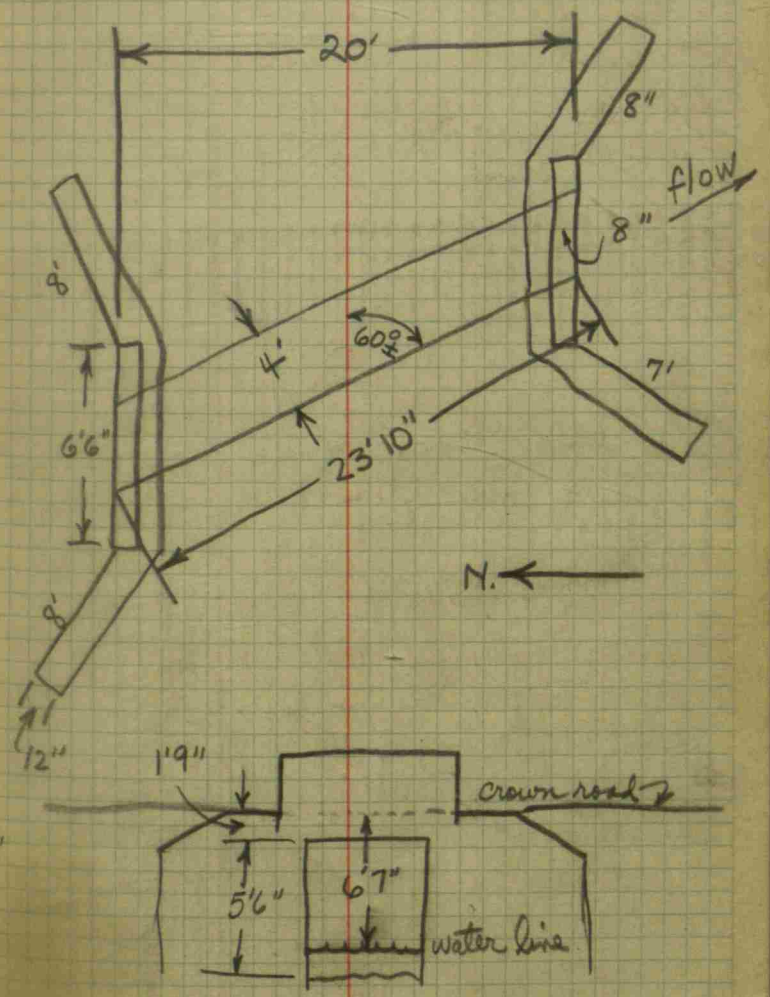
Old structure built 1913. Concrete box 4' x 5' built on 35° skew to left.

7'3" from crown roadway to flowline stream





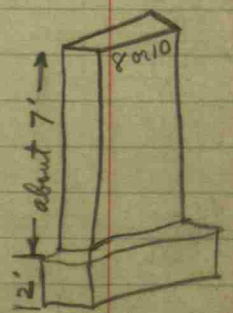

Near SE cor 14-17-1E



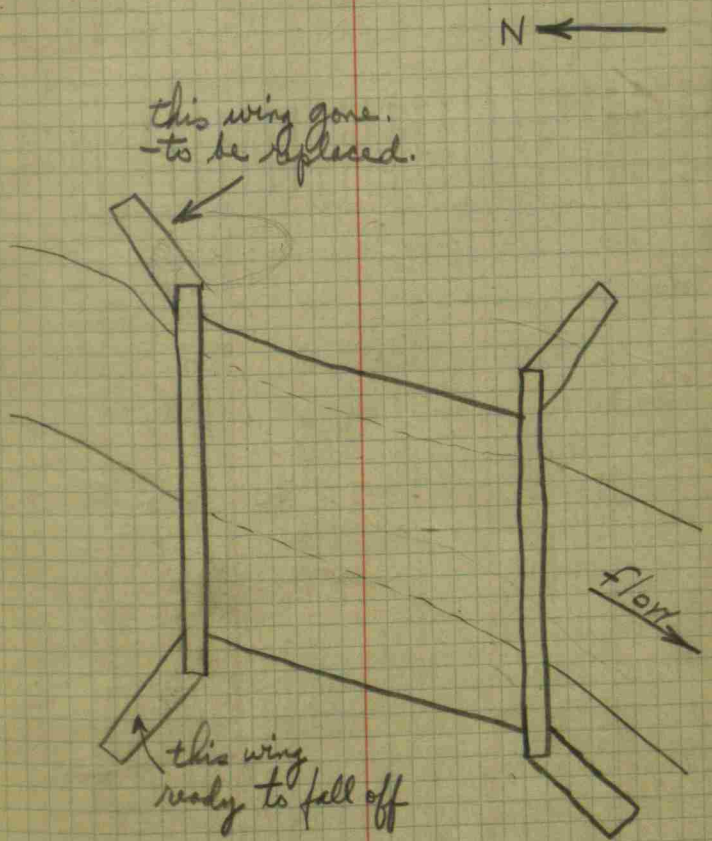
# TUCKER BRIDGE
Near 5½ mile stone 23-17-21W.

Stanley Shartle
22 June 1944.

Present structure is of concrete and is built on a skew to the right. The northeast wing has fallen off the bridge. The newly constructed wing taking its place should be 8 or 10 feet long and 6 feet high from present water line up to top. Northwest wing needs repair or replacement.



NE Wing.

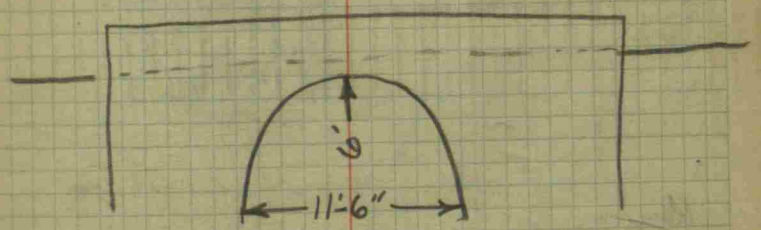


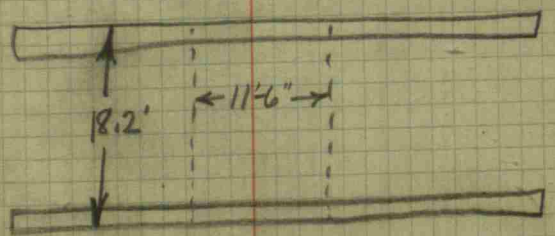
31st March 1945
Major Franklin
Stanby Shattle

Underpin abutment on S- 4 feet deep.
" " on N- 3 feet dep.
Remove old floor.

800

SW¼ 3-15-1E CARTHUESER BRIDGE 19

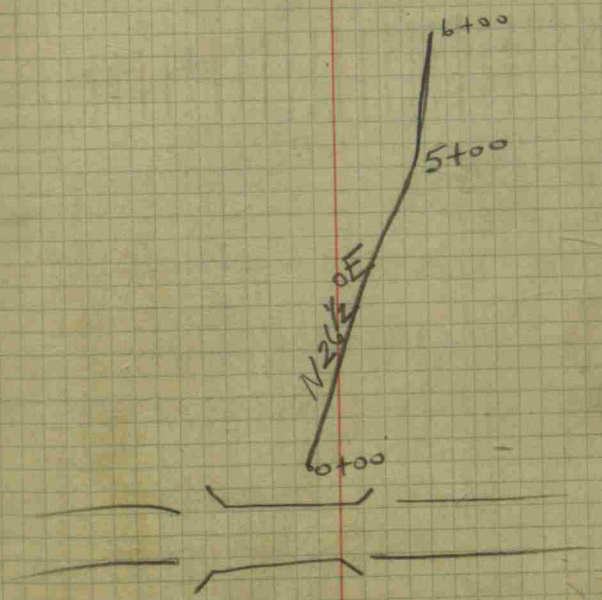


| Sta. | B.S. | H.I. | F.S. | El. |
|---|---|---|---|---|
| 0 | 10.74 | 100.00 | | 89.26 |
| 1 | | | 4.16 | 95.84 |
| 2 | 6.04 | 104.30 | 1.74 | 98.26 |
| 3 | | | 7.55 | 96.75 |
| 4 | | | 4.83 | 99.47 |
| 5 | | | 8.83 | 95.47 |
| 6 | | | 11.15 | 93.15 |

Channel for Frantz Bridge

14. Aug. 1944. Franklin Shartle



NE¼ 27-14-2W.

1948 Construction

31 Mar. 1945 R.M. Franklin
S.M. Skartle

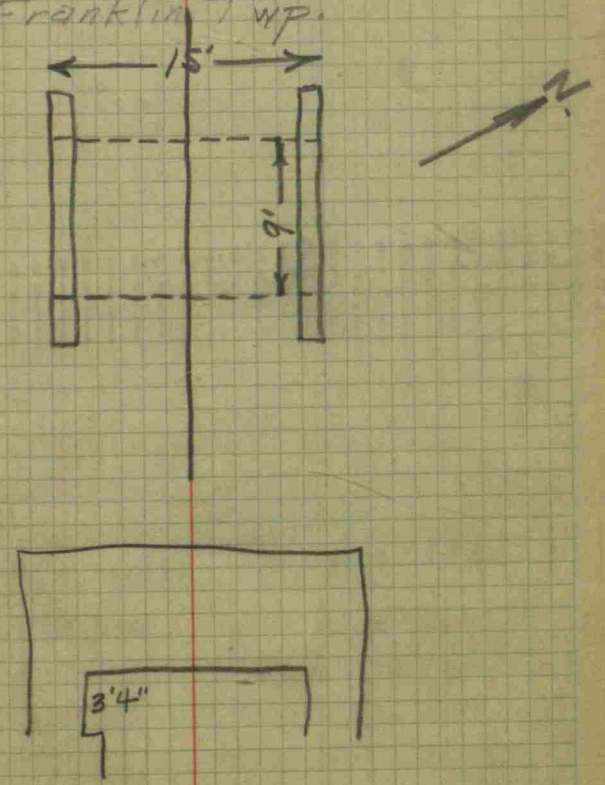
Widen to 20' roadway
Put 3' wing @ 45°

8X5 - Rfc Core Box



Cosner Bridge

Franklin Twp.

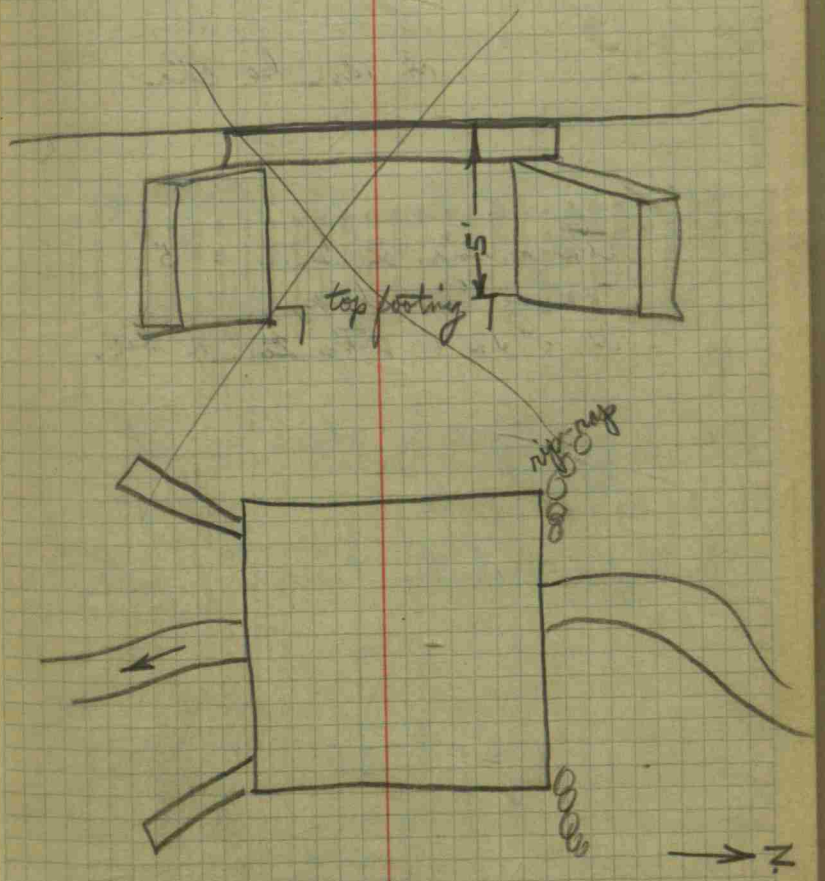


31 Mar. 1945 — R. Major Franklin
Stanley Shartle

New structure should be erected about 33 ft east of present bridge.

New struct should be 6x4 box with 20 foot roadway.
Channel change estimated @ $50.

## Wise Bridge
Near S½ mile 7-14-2W.



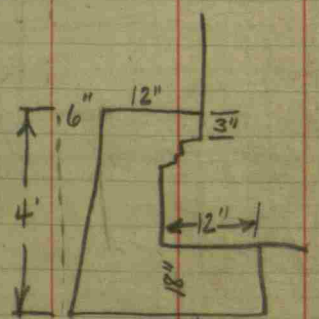
# Larrabee Bridge
Near Cen. 5-15-1E

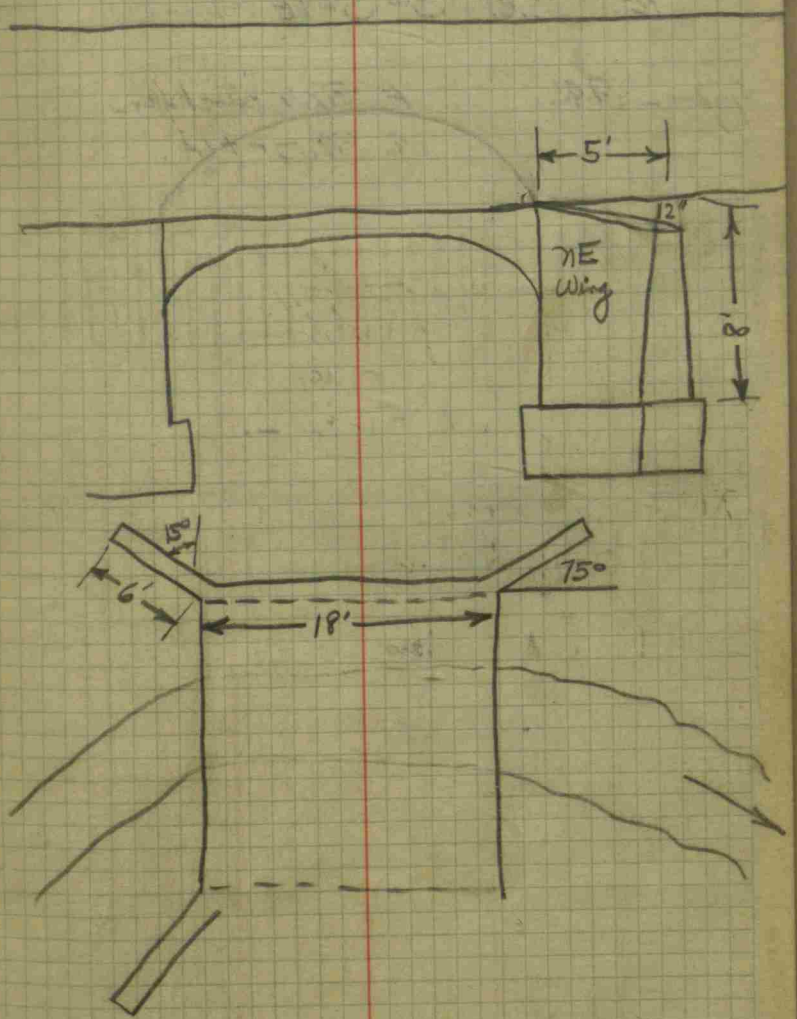
9 June 1945. R. M. Franklin
S. M. Shartle

NE Wing: 8' from top footing to top wing. Length = 5'
Footing 18" deep, 2'-6" wide.
Wing 12" on top 24" on bot.

NW. Wing: same as above except
Length = 6'

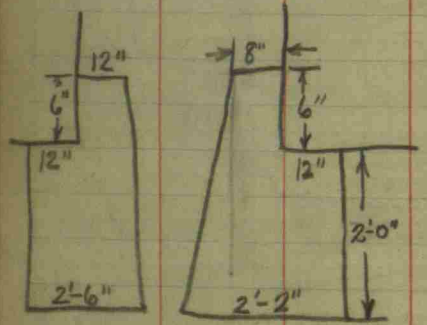
Underpin N. abutment with 4' footing



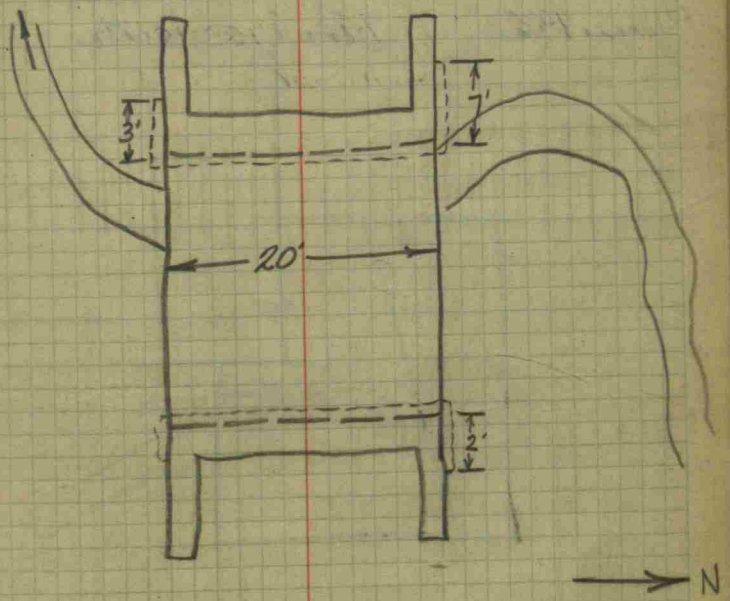



# West Bridge
## Near S½ Mile Stone 1-14-2W

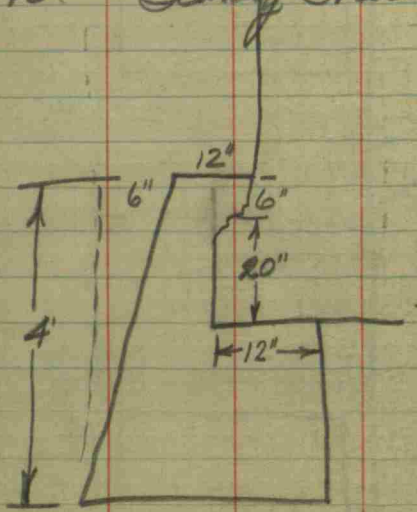
9 June 1945 R. M. Franklin
S. M. Shartle

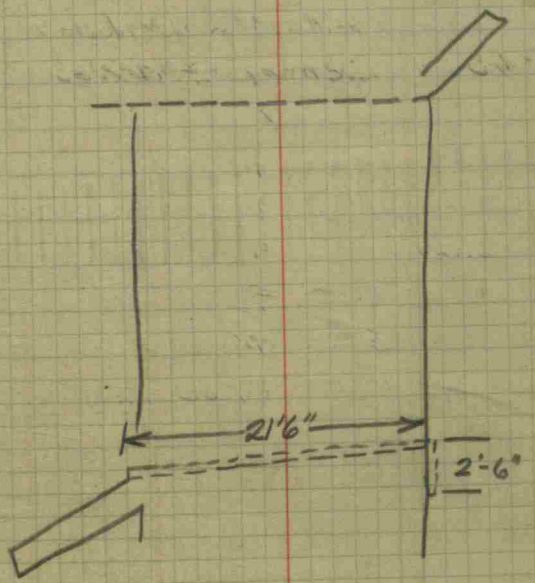



WEST EAST
3'-6" deep



Osborn Bridge
Near S½ Mi. Stone 1-14-2W.
Major Franklin
9 June 1945 Stanley Shartle



5/12/47
Fagnbl
Shutte
Claypool

Chas Edmonson
Cen Sec 4-14-1W
8X6 Rec. Box L = 22'-0.
$100 150' Channel Change on North
30' Roadway
1947 Construction

| B.S. | H.I. | F.S. | EL. | Location. |
|---|---|---|---|---|
| 2.37 | 100.00 | | 97.63 | B.M. top conc post 15' N of Cen 4-14-1W |
| | | 8.35 | 91.65 | Ito at ℄ ditch |
| | | 6.00 | 94.00 | Ito Ground at stake |
| | | 10.40 | 89.60 | Flowline at bridge |

out for Present

Chas Edmonson

New Structure Located
50' W of Present - 30'-0 Rdwy
8'-0 From Top Rdwy To Top
of Footing - 10'-6 Span
150' Channel Change On South
300' " " " North
5'-0 Average Depth - 4'-0 Bot. Width

Jacktown or Clawson
Liberty & Franklin Twps.
W-Line Sec 17-14-1W
5 X 4 Rfc. Box L = 22'-0"
1947 Construction

Wise – Franklin Twp.
I 1947 Construction
Near S½ M. Sec 8-14-2W
8X5 Rfc Box L = 22'-0
Channel Change 50' on North
150' on South 4'-0 Cut - 3'-0 Bot.

| B.S | H.I. | F.S. | EL. | Location |
|---|---|---|---|---|
| 5.03 | 100.00 | | | B.M. nail pole 814. |
| | | 8.88 | 91.12 | ditch 50' N. |
| | | 6.48 | 93.52 | ground 50' N. |
| | | 9.47 | 90.53 | ditch @ bridge |
| | | 6.35 | 93.65 | ground 40' N |
| | | 9.60 | 90.40 | " 40' S of stake |

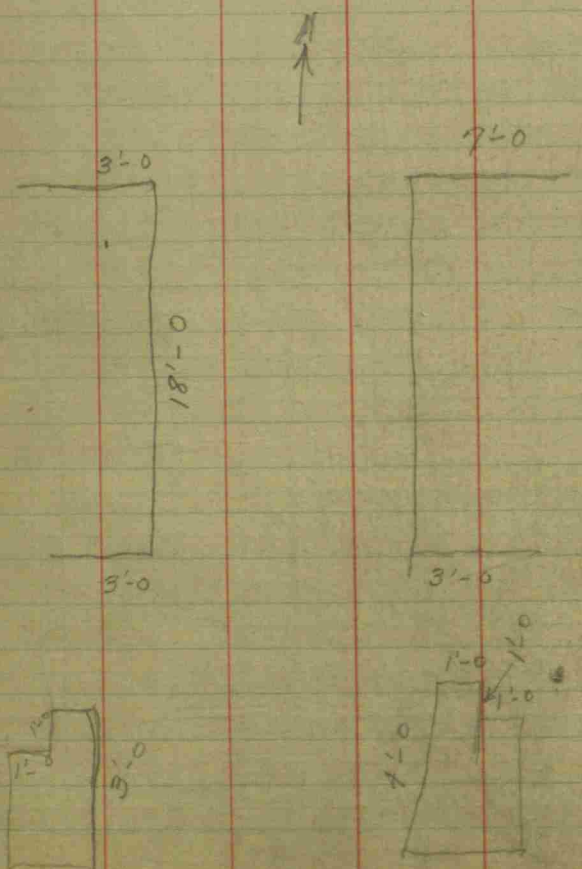
in detail

# Rudd Clay Twp

S. Line Sec 25-15-2W

1947 Construction

Underpin



Out

Mabe - Clay Twp.

E½ Mi. V - 14'-1½"

Channel Change & Piling

350' Long

~~16' Piling Driven 8'-0~~

10'-0 Bot. Width - 8'-0 Cut

Adams - Eel River
1947 Construction
S.E¼ Sec 29 - 17 - 2W
~~6X~~
~~12X6 Slab top~~ - Rdwy 36'
42" Fill Above Waterway
8X8 Rfc. Box

Smith
Eel River 1947 Construction
Near Cen S of SE¼ Sec 20-17-2W
5X5 Rfc. Box L = 26'-0
Rdwy 33'-0 - Fill 3'-0

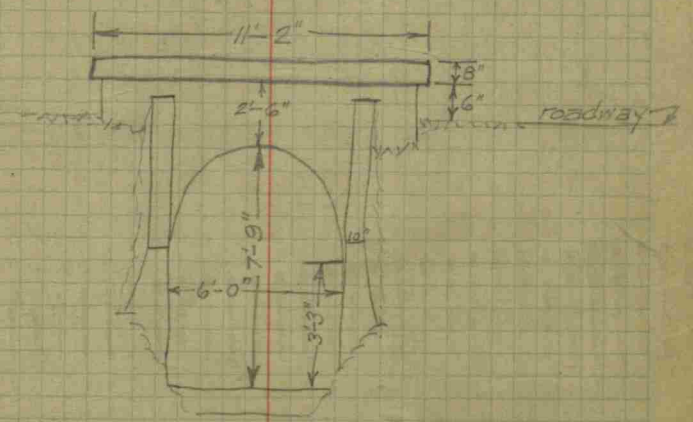
Gregor 1947 Construction
Brown Twp
Near SE Cor Sec 36-17-2E
7'-6 Top Footing To Top Floor
30'-0 Span Rwy 33'-0
10" I Beams 25" C-C
Baumer Bridge Below Has
24'-0 Span
Haag Bridge Below (Private) 20'-0 Span
Ballard " " 21'-0 "
Wilde " " 1 Mile 27'-0 "
Present Structure -
7 - 10" I Beams - 4 5/8 Flange

Pickerell - Liberty
Channel Change
Near E½ Mi Sec 36-15-1E
400' - 8'-0 Bot. Av. Cut 7'-0
9 May 1947.
R. M. Franklin
Stanley Shartle
Ophir Claypool

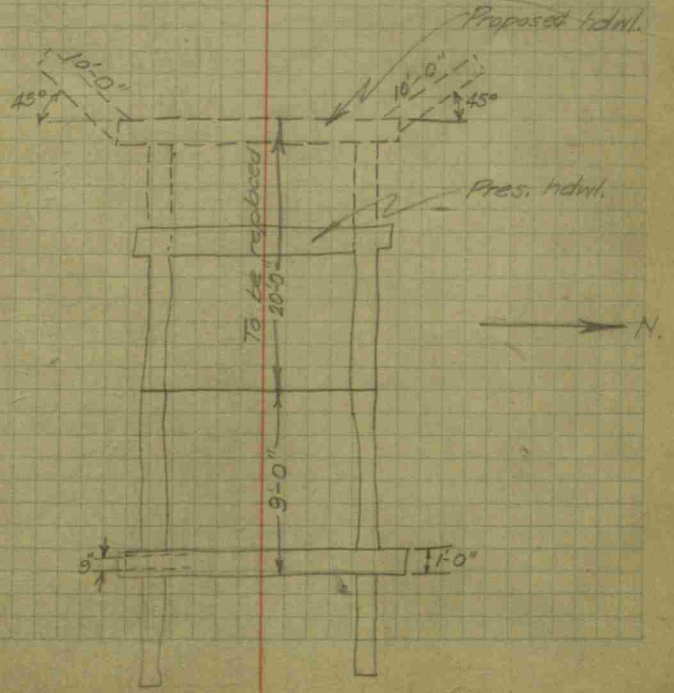
Gilbert Bridge
29-15-2E
Guilford Twp.
1948 Construction
8X6 R.C. Box
R/W between fences = 37'
Proposed roadway = 20'

~~Reeves Bridge~~
~~8-14-2E~~
~~Guilford Twp~~
~~8X5 Rfc. Conc Box~~
~~100' Channel Change~~

Mills BRIDGE
19-14-2E
Guilford Twp
Cone Arch - 3 Span
1948 Construction
100' of Channel change
End of new wings to be 5'-0" high.




EAST ELEV.



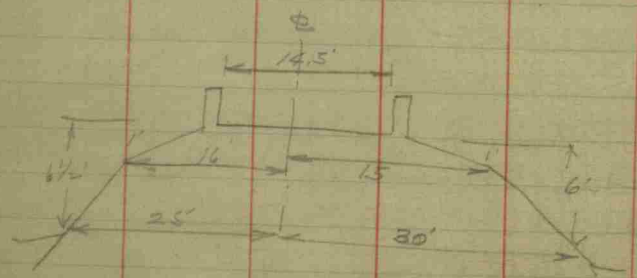
Wompner Bridge
24-15-1W
Center Twp.
8x6 Rfc Conc Box
1948 Construction

33' betw. Fences

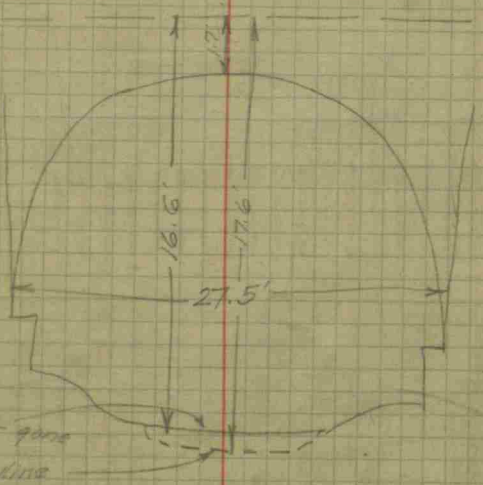
# Whyte Bridge
## Center Twp.

North of SE cor. 33-16-11W

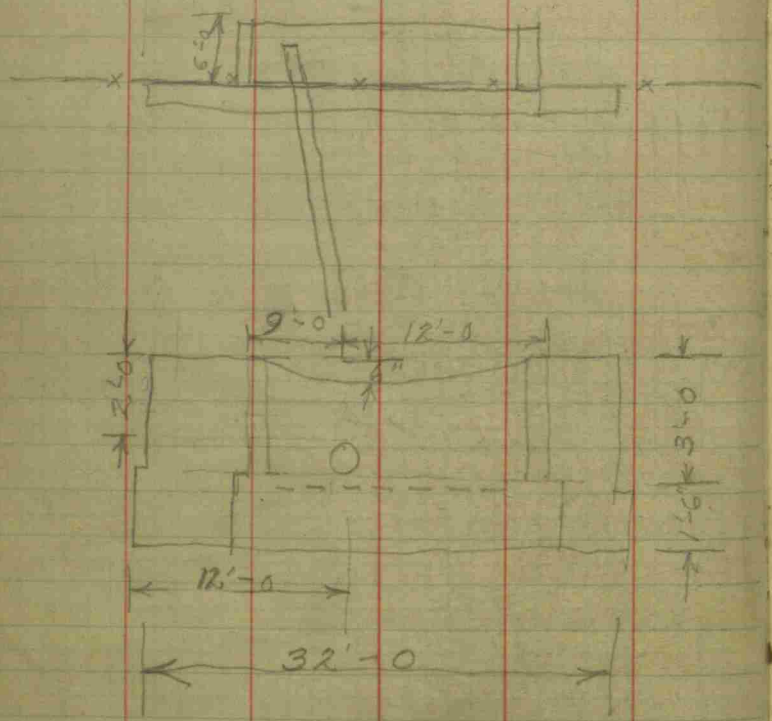
1948 Construction




3.7
2.2
11.7



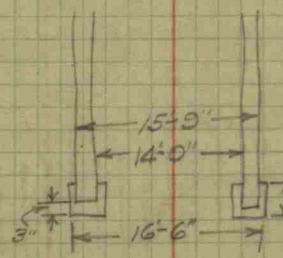
Earl Cox Headwall
Chas. F. Martin Tile





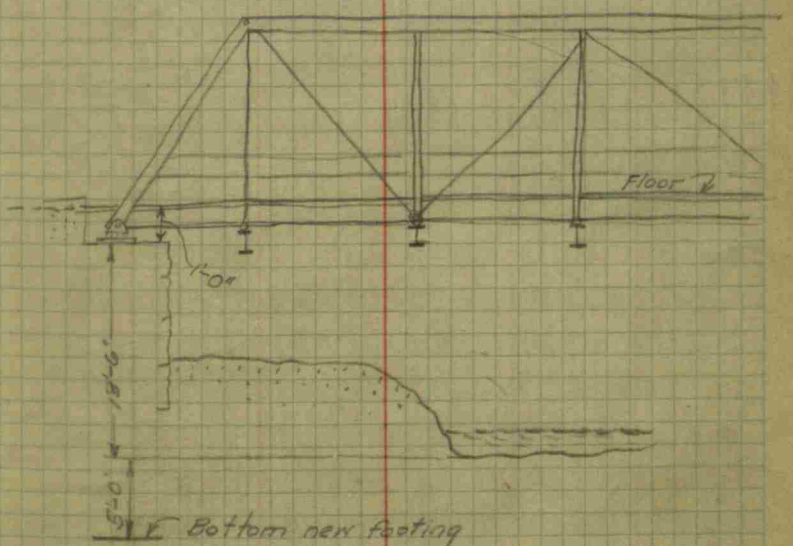

LOCKHART BRIDGE
over Mud Creek.
1947 Construction

Franklin Shartle
4 Sept. 1947.



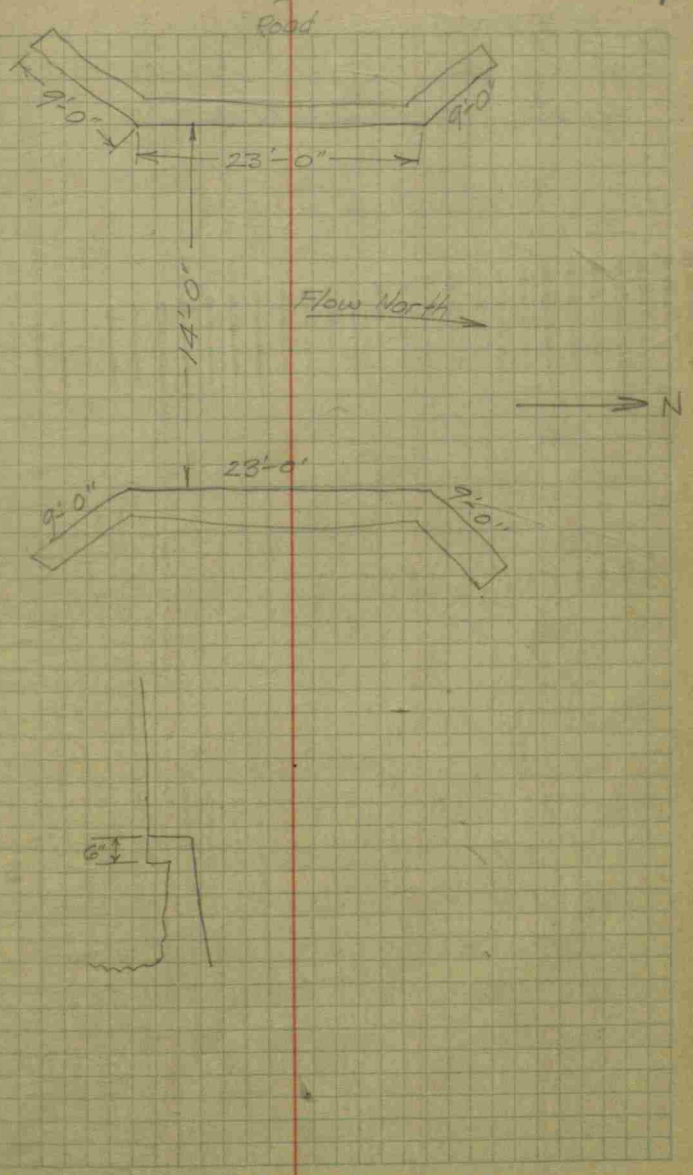

New wings = 8'-0"
" abut. for 20' roadway.

◦ PLAN ◦




W. Abut.

HEDGE BRIDGE
1948 Underpin repair
concrete bridge
W. of E½ Mi. Stone 36-17-1W
24 June 1948
Middle Twp.



REYNOLDS BRIDGE
M½ M.: 25-17-1W. Middle Twp.
1948 New Construction

8 x 8 R.C. Box
Length 22'-0"

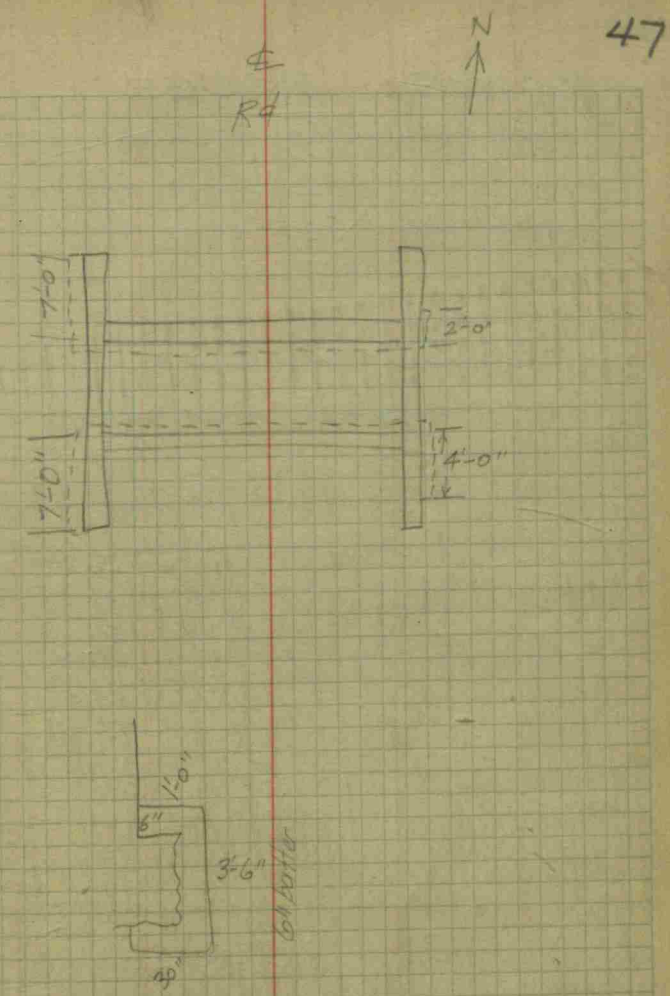
Tucker Bridge
8x8 R. C. Box
20' Roadway
Skew 30° Rt.
W. of NE cor 16-16-1W

1948 Construction

CHADD BRIDGE
20' Length
Hdwl. Wings 7'-0"
8' waterway
Underpin repair

W 19-16-2W

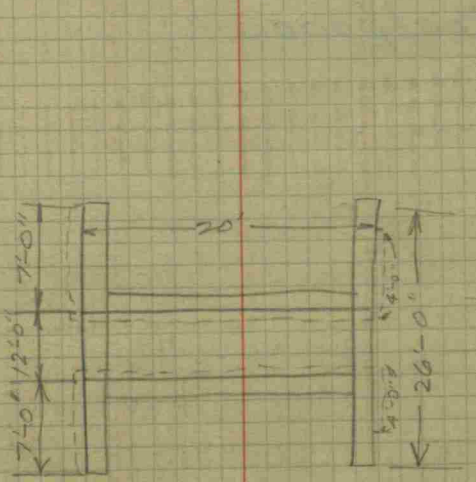
POSTPONED

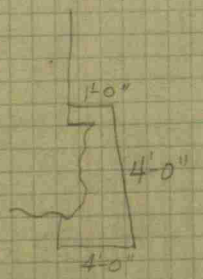


ROOKER BRIDGE
W. Line of 30-16-2W

Underpin

•POSTPONED•



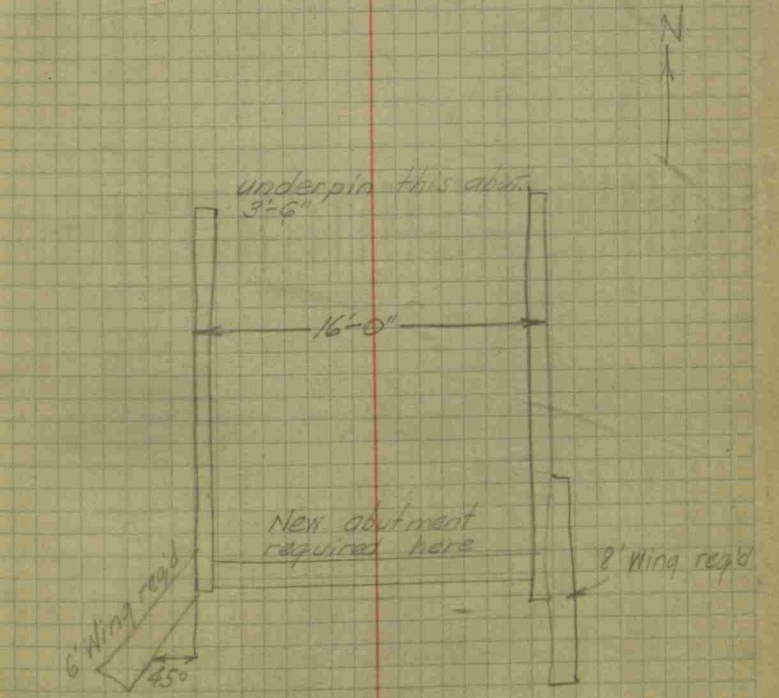
ELLIS BRIDGE
W. of NE cor. 32-16-2W

Postponed!

Stuart Bridge
W of E½ Mi Stone 21-15-2W
Waterway 12'
Height 6'
Roadway 20'
Marion Twp.

ROBARDS BRIDGE
N½ Mile 14-14-2W
1963 Repair
Clay Township

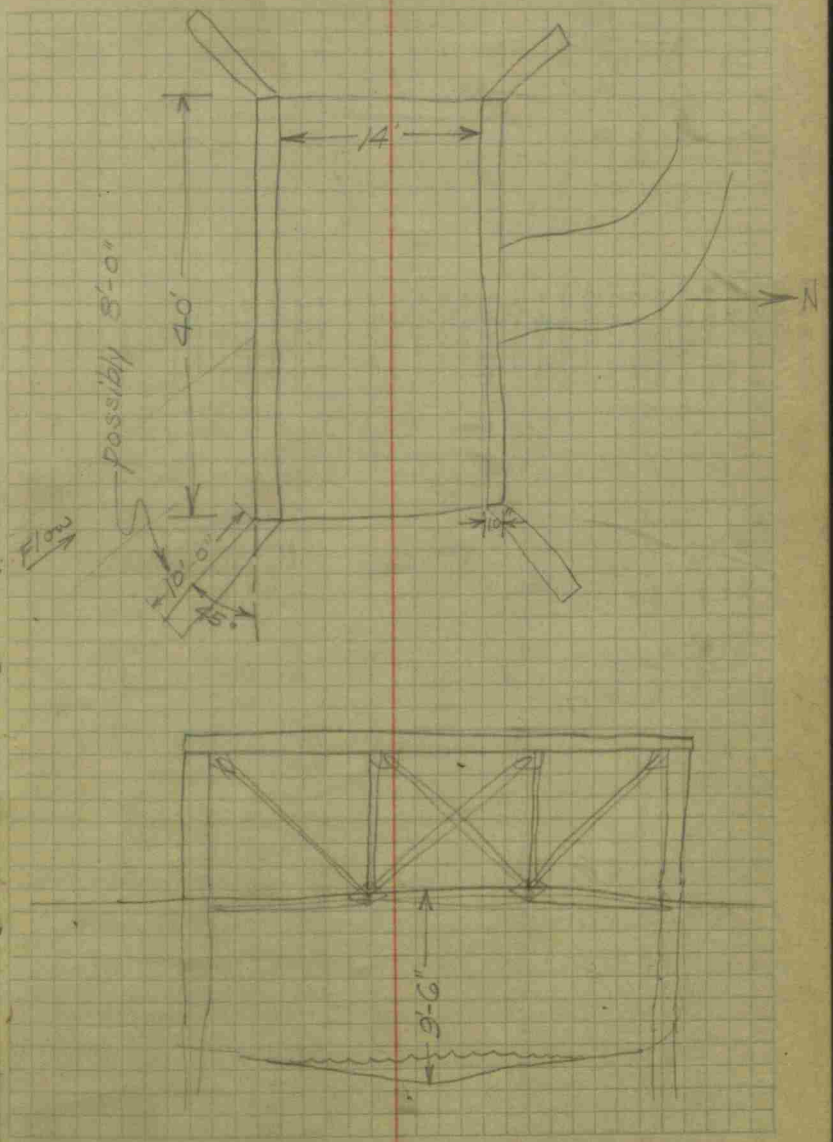
Top of footing to bottom slab = 9'-0"



# HOLTSCLAW BRIDGE

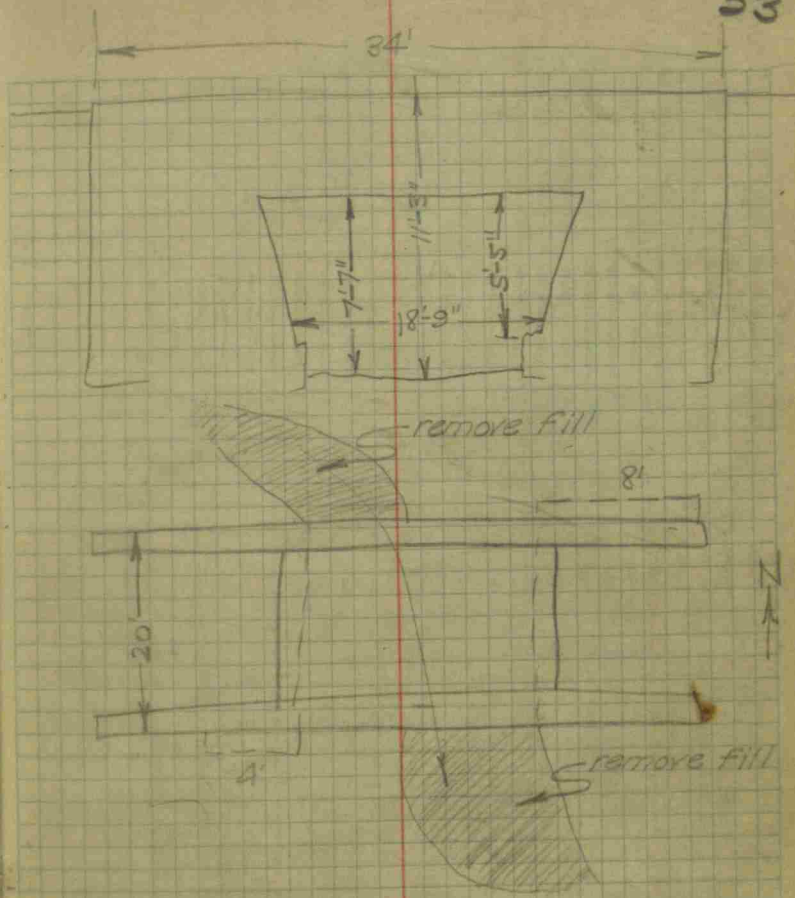
Franklin & Shartle
4 June 1949

Bottom of footings 3' below flowline

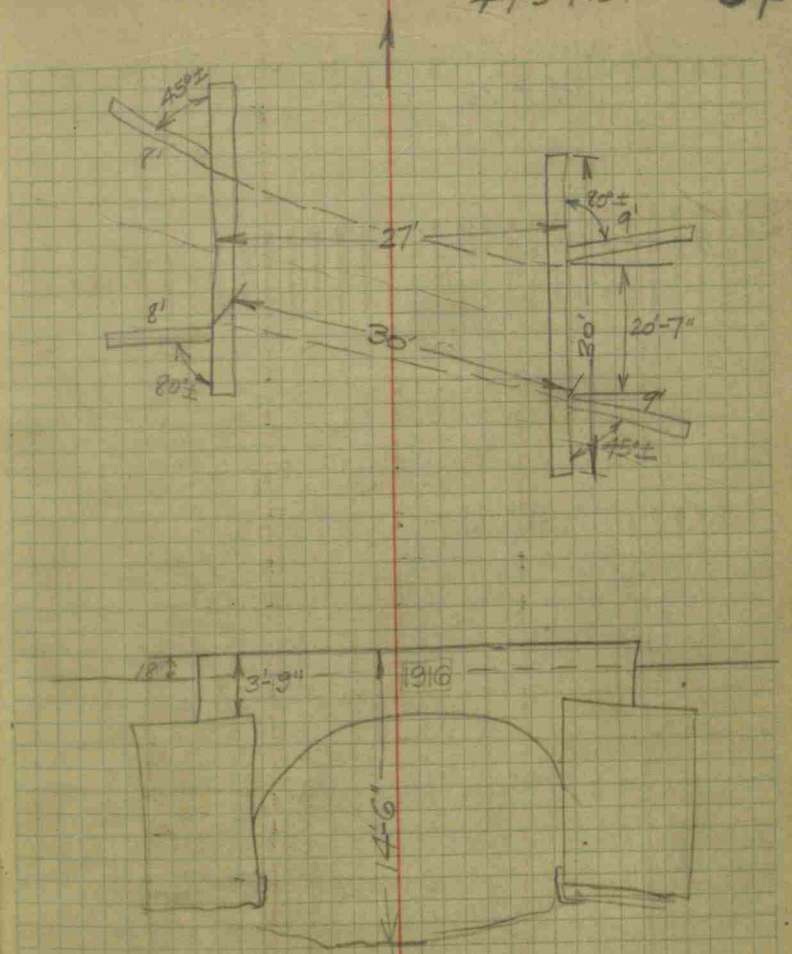


Graham Bridge
℄ Sec. 21-16-1E
Lincoln Twp.
Nov. 21, 1949
Shartle & Mason



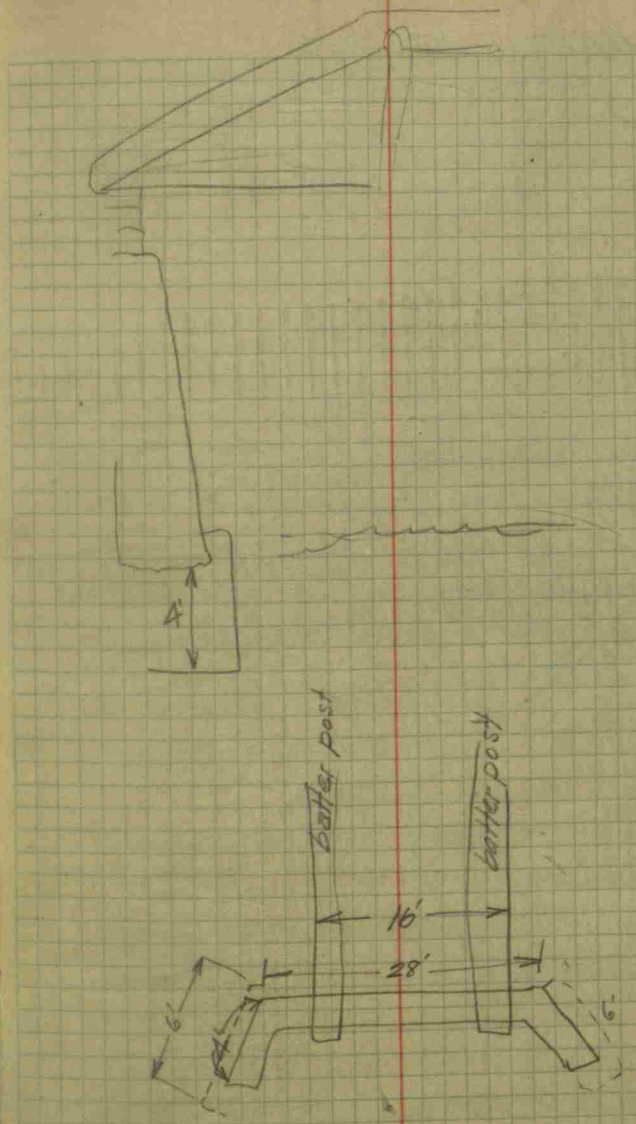


Albertson Bridge
Near Cen. E. Cen. Sec. 16-16-1E
Lincoln Twp.
Nov. 21, 1949 Shaffle & Mason



Lebanon Road Bridge
34-16-1W

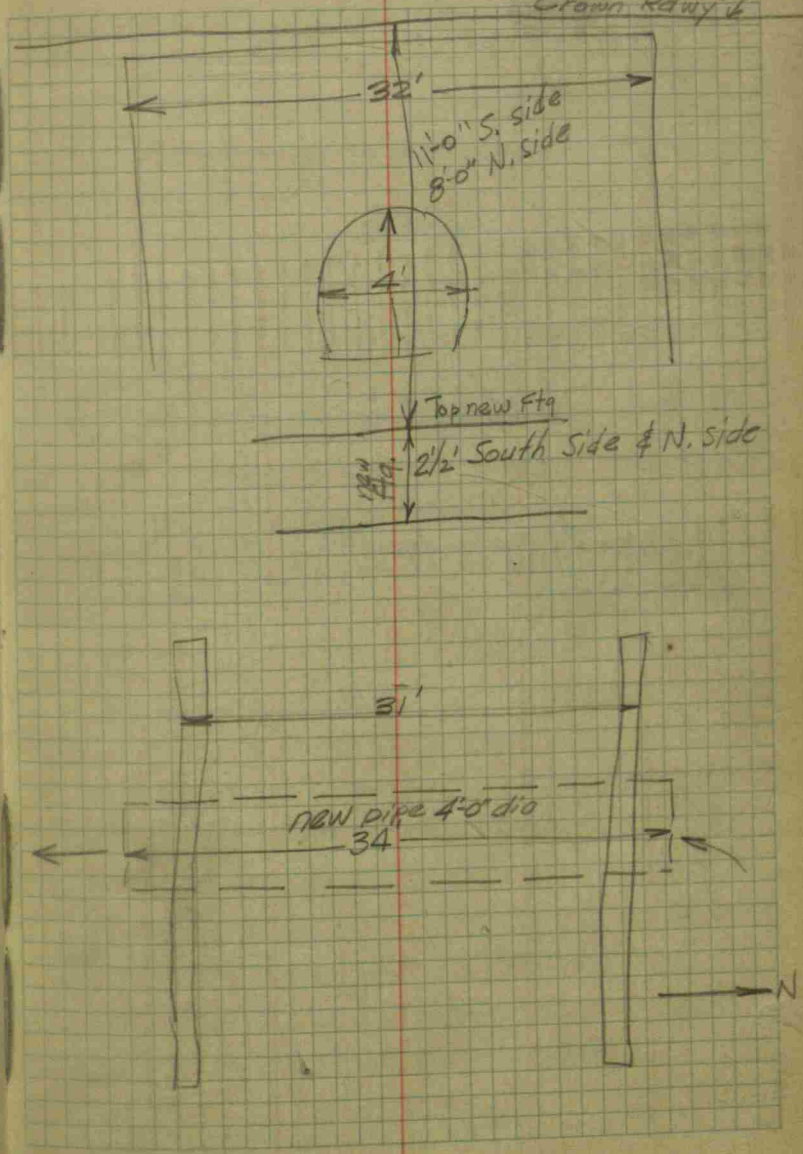
Franklin + Shartle
30 Apr. 1950



Walton Bridge
28-15-24

Franklin & Shartle
30 Apr. 1950 (Rain)

Re-examined by Shartle 1/31/53
Structure in very bad condition and needs to be replaced. May be safe for public use for some time yet if structure is not subjected to severe conditions. Recommend that this be put on list of culverts to be built.

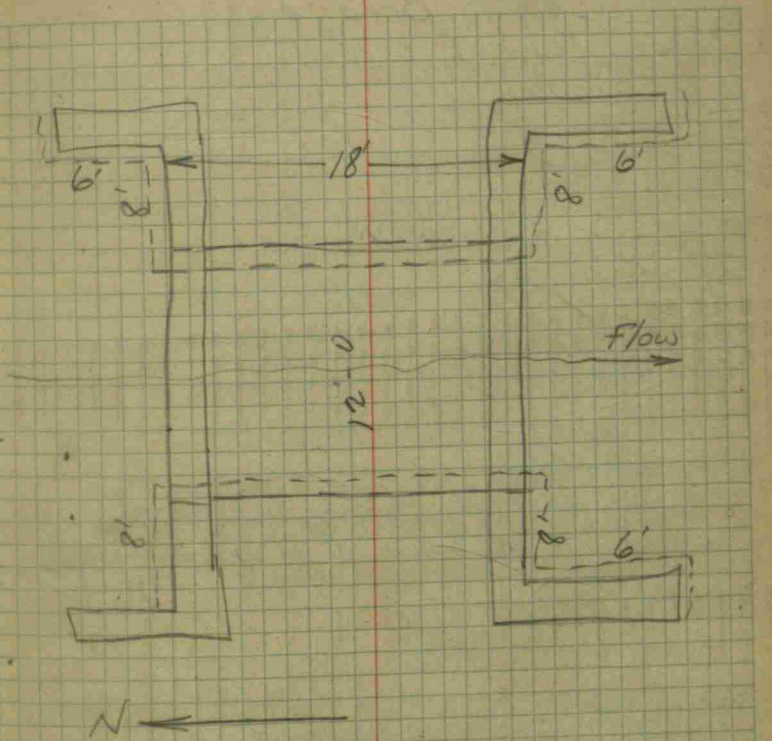


Gregory Bridge
24-14-2W

Franklin & Shartle
30 Apr 1950 (rainy)

Underpin both sides and all wings except NW.

Underpin to come up 1 ft or abut and go down 4 ft.



Costin Bridge
Near SW Cor 10-15-18
(See page 6)

Franklin & Shartle
30 Apr. 1950

80' long
16' to top of footing at bridge
8' " " " " " at West of well

16' to flowline

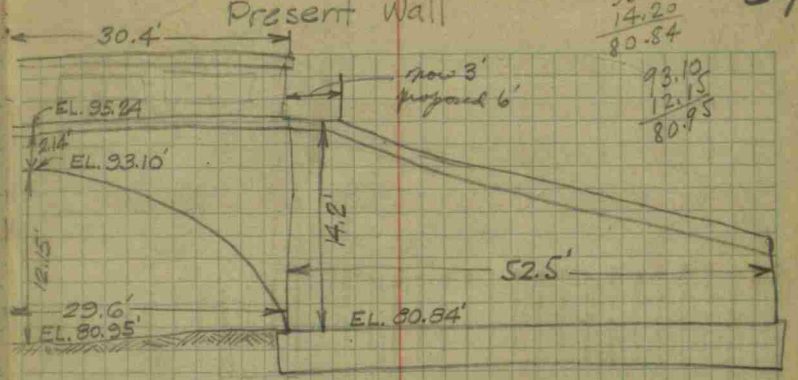
Footing should go down 3'

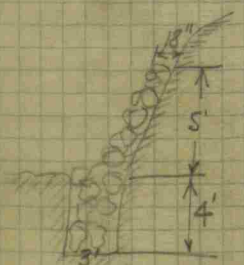
# Avon Bridge repair
## About 40 R. S. of E ¼ Mi. 3-15-1E

Shartle
Gossett
Shafer

25 April 1951.

| | | |
|---|---|---|
| Removal of present wing, spandrel & handrail | | $600 |
| 100 cu. yds Channel change | @ $1.25 | $125 |
| Dry excavation | cu yds @ $1.50 | |
| Wet excavation | cu yds @ $8.00 | |
| Class A concrete in place | cu yds @ $50.00 | |
| Class E concrete in place | cu yds @ $45.00 | |
| Reinforcing steel | lbs. @ $0.13 | |
| Placing riprap | sq yds @ $6.00 | |
| Backfilling | | |

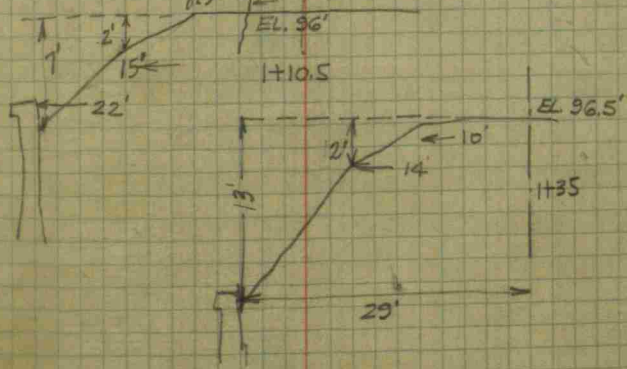


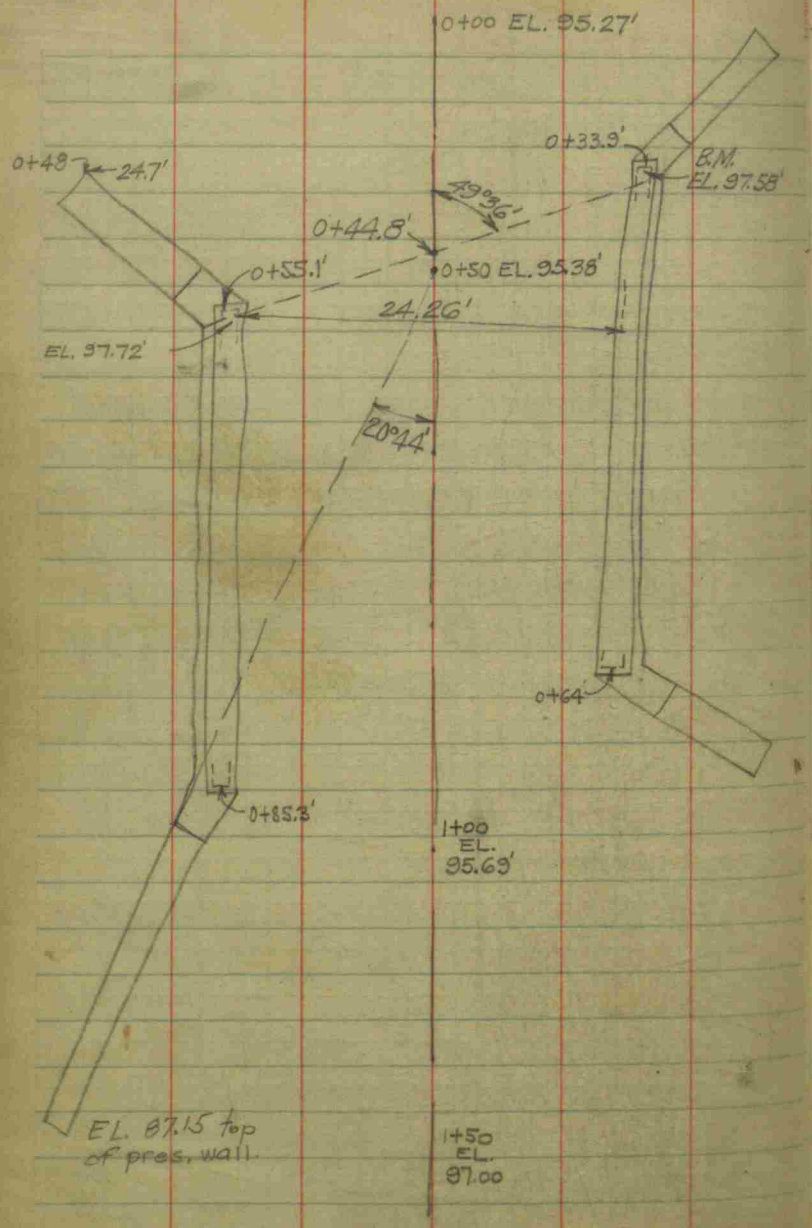




Riprap $6.00 yd.

joint new spandrel to arch reinforcing by 3/4" bars 1'-0" c.c. on L.

408# coarse agg
250 sand
1 bag cement
} 6 bags to yd

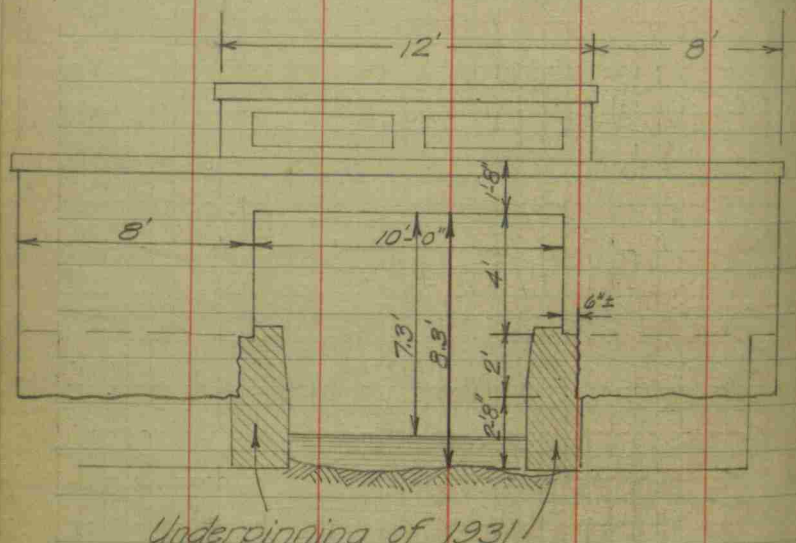



0+00 EL. 95.27'
0+48
24.7'
0+33.9'
B.M.
EL. 97.58'
39°36'
0+44.8'
0+55.1'
0+50 EL. 95.38'
24.26'
EL. 97.72'
20°44'
0+64'
0+85.3'
1+00
EL.
95.69'
EL. 87.15 top
of pres. wall.
1+50
EL.
87.00

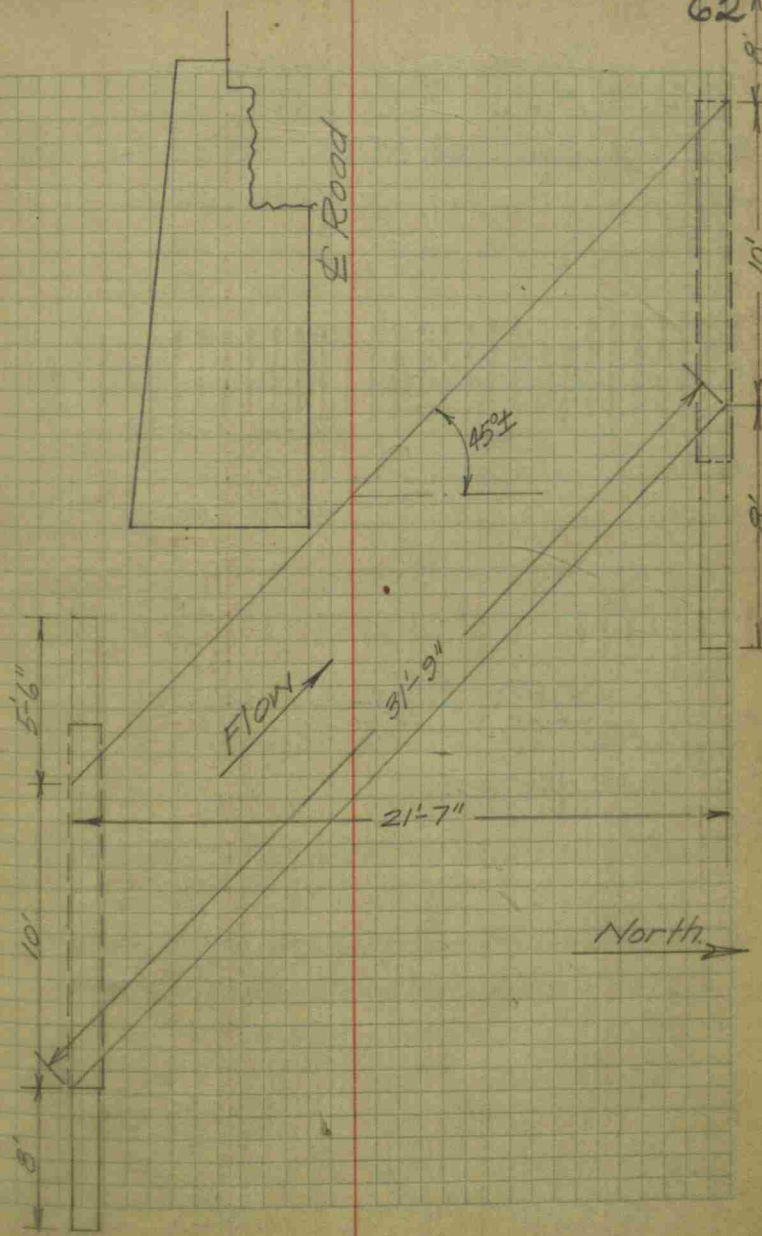
# SHOCKLEY BRIDGE

Near S² Mi. 18-17-1W Union Twp.

Shartle May 13, 1951




NORTH END ELEVATION



## Shockley Bridge

| Sta. | B.S. | H.I. | F.S. | EL. |
|---|---|---|---|---|
| B.M. | 2.50 | 64.80 | | 62.30 |
| 28+00 | | | 12.40 | 52.40 |
| 29+00 | | | 12.20 | 52.60 |
| 30+00 | | | 11.60 | 53.20 |
| 30+30 | | | 4.13 | 60.67 |
| 30+60 | | | 3.88 | 60.92 |
| 31+00 | | | 11.30 | 53.50 |
| 32+00 | | | 11.10 | 53.70 |
| 33+00 | | | 10.70 | 54.10 |

| | | | |
|---|---|---|---|
| | 60.67 | 60.92 | |
| | 52.04 | 52.10 | |
| N. end | 8.63' | 8.82' | S. end |

8.00' approved.

Spangler Ditch B.M. of 1930 on W. end NW wing of bridge.

Ceiling of box N end br.
" " " S " "

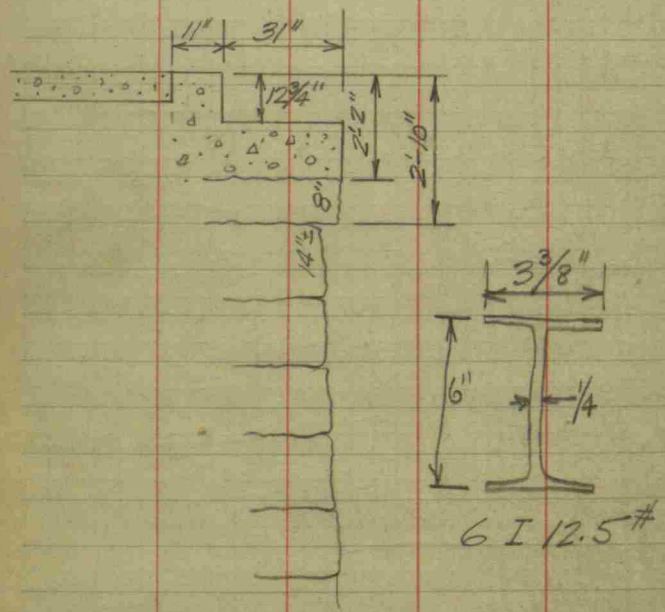
Computed from Spangler Ditch plans:
Floor @ N. end should be Elev. 52.04'
" " S. " " " " 52.10'

1400'± South (upstream) is flowline 16" D.T. with Elv. of 55.85'

N end bridge on Spangler ditch = 30+30
0+00 = lower end of ditch

Weaver Bridge
13± Rds. E. of Cen. Sec. 31-17-1E
60' Pony Truss.
failed July 16, 1951

Shartle Jan. 29, 1952



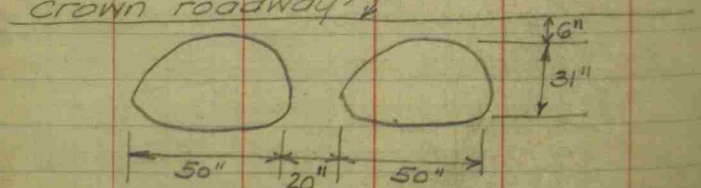
No. 1-1953 (New Const.)
Hadley Culvert
About 7 rods S. of NE. cor.
23-15-2W

Shartle 1/31/53

Present structure: Timber beams on concrete abutments. Plank floor. Waterway 8 or 9' with height of about 3' to crown of roadway. No skew.

Watershed estimated to have an area of 175 acres. $C = \frac{1}{3}$.

Recommended: Two 12-gage pipe arches 22' long placed as follows:




4 sq. yds of hand-laid riprap obtained from the old structure shall be placed 12" deep at each end of the pipes instead of headwalls

ESTIMATE

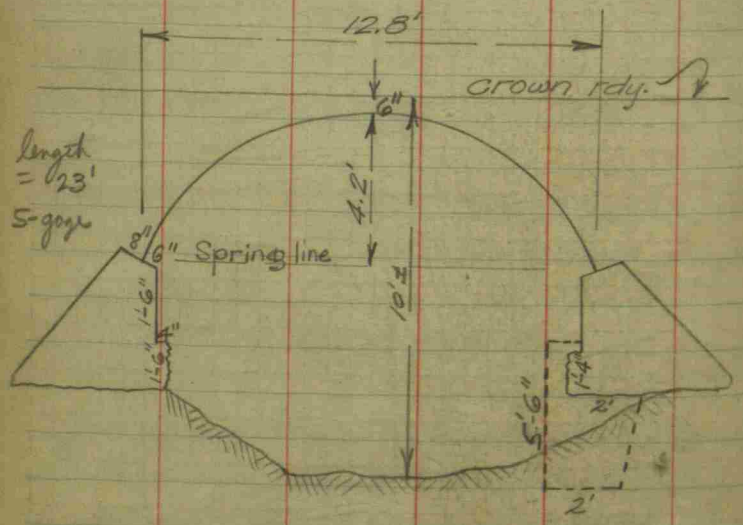
| | | | | |
|---|---|---|---|---|
| Pipe: C.M. Deformed 50x31 | 44 | Lft. | $14.00 | $616.00 |
| Removal of Pres. Structure | 1 | L.S. | $80.00 | $80.00 |
| Prewarning signs | 1 | each | $40.00 | $40.00 |
| Std Barricades (Type A) | 2 | each | $50.00 | $100.00 |
| Placing hand-laid riprap 12" | 8 | sys | $8.00 | 64.00 |
| | | | | $900.00 |

Culvert No. 2-1953 (Repair)
YEAGER BRIDGE
@ Center 18-15-2W

Shartle 1/31/53

Watershed = 300 acres C = 1/3

If present multi-plate arch is removed, I recommend either 36" or 66" dia. 10-gage C.M.P. which should be struttel during installation or a 5'x5' standard reinf. box culvert.




W. Footing

## ESTIMATE

| | | | |
|---|---|---|---|
| Class D concrete in structure | 13.3 cyd. | $80.00 | $1064.00 |
| Reinforcing steel in structure | 293 lbs. | $0.15 | $ 43.95 |
| Prewarning signs | 2 each | $40.00 | $ 80.00 |
| Std Barricades (Type A) | 2 each | $50.00 | $100.00 |
| | | | $ 1287.95 |

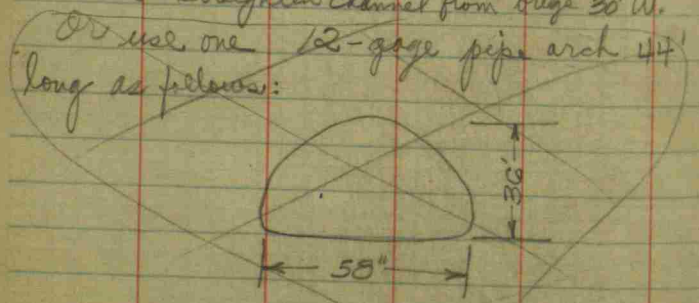
## SPECS.

Applicable provisions of Sec. E16 shall apply to the underpinning of existing footings. ~~and the applicable provisions of Sec. E4 shall apply to the construction of the wein and apron.~~

Culvert No. 3-1953 (New Const.)
Kentucky St. Bridge
Danville, Ind.
56 R. N. & 19 R. E. of SW. cor.
E½NE¼ 9-15-1W

Shartle 1/31/53

Estimated watershed = 110 acres C = 1/3
Use 54" R.C., C.I. or C.M. pipe or 4'×3' ~~standard reinforced conc. box culvert with W2 headwalls.~~ (12-gage)
2 Conc. Hdwls W2 reqd
Pipe should be 44' long.
Clean & straighten channel from bridge 30' W.
Or use one 12-gage pipe arch 47' long as follows:




~~Estimated cost of pipe arch only ... $470.00~~
~~Two connecting bands @ 23.00~~
~~$493.00~~

## ESTIMATE

| | | | | |
|---|---|---|---|---|
| Std. Barricade (Type A) | 2 | each | $50.00 | $100.00 |
| Warning signs | 2 | each | $40.00 | 80.00 |
| Pipe: R.C., C.I. or C.M. 54" | 44 | Lft. | 20.50 | 902.00 |
| Removal of pres. structure | 1 | L.S. | 350.00 | 350.00 |
| Class D. conc. in structures | 14.6 | cyo. | 75.00 | 1095.00 |
| Reinforcing steel in structures | 940 | lbs | 0.15 | 141.00 |
| Waterway Excavation | 20 | cyo. | 1.50 | 30.00 |
| Clearing & Grubbing | 1 | L.S. | 40.00 | 40.00 |
| Seeding | 50 | cyo | 0.90 | 45.00 |
| | | | | $2783.00 |

Contractor to replace subgrade but not base, combined base and surface, or surface courses.

Culvert No. 4-1953 (Repair)
BRIDGE
Near Cen. S. SE4 22-15-1E

Shartle 4/11/53

## ESTIMATE

| | | | |
|---|---|---|---|
| Fd. Barricades (Type A) | 2 each | $50.00 | $100.00 |
| Class D conc. in structures | 20.8 cys | 65.00 | 1352.00 |
| Reinf. Steel in Structures | 252 lbs | 0.15 | 37.80 |
| ~~Placing grouted riprap~~ | ~~cys~~ | ~~4.00~~ | |
| Replanting East abutment | 1 L.S. | 20.00 | 20.00 |
| | | | $ 1509.80 |

# HENNIPMAN BRIDGE

18 rods E. of N½ Mi. 32-16-2E
Wash. Twp.
Over Little White Lick Creek
Shartle 1/7/54

By careful investigation, I determine that this structure serves a watershed of 6.75 sq. miles or 4320 acres. Waterway area by Talbot's formula as follows:

$$a = C\sqrt[4]{A^3}$$

Let $C = \frac{1}{3}$, then $a = 177.6 \pm$ or 178 sq ft waterway required.

Arch Truss leg (warren deck) bridge 45'-10" long in place.
16'-4" betw trusses c to c.
Clear waterway 45'

Ave high water 4.2' below floor rdwy.
Max. high water July 4, 1938, 0.5± below floor rdwy.

Structure in place to be removed:

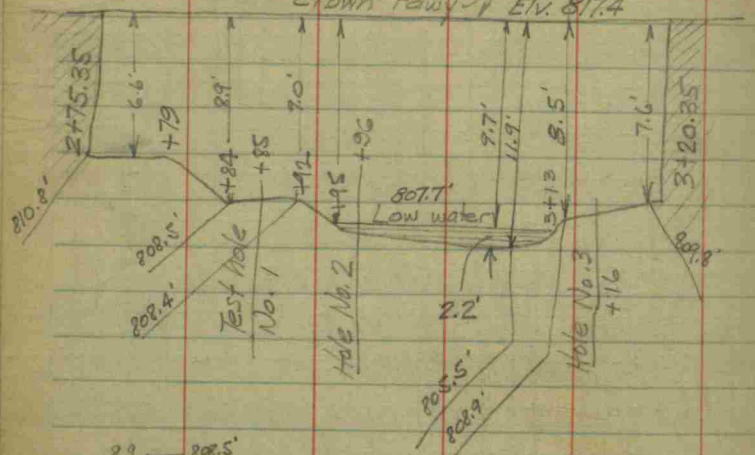
| | | | | |
|---|---|---|---|---|
| 2-16' | floor beams | 12 I 50 | | 1600 # |
| 4-12 | corner legs | 9 I 26.8 | | 1286 |
| 6-10 | columns | 6 I 12.5 | | 750 |
| 6-46 | stringers | 6 I 12.5 | | 3450 |
| 2-46 | " | 6 [ 10.5 | | 966 |
| 2-46 | upper chord | 3½ × 2½ T 9.8 | | 902 |
| 4-15 | lower " | 3½ × 2½ L 9.8 | | 588 |
| 2-16 | " " | 2½ × 2 L 5.5 | | 176 |
| 4-3 | verticals | 2 × 2 # 12.8 | | 154 |
| 144'± | diagonals | 2½ × 2 L 5.5 | | 792 |
| 2-16 | end floor beams | 5 × 5 L 16.2 | | 518 |
| 4-12 | leg diagonals | 3½ × 2½ L 6.1 | | 293 |
| 6-46 | Handrail chords | 1½ × 1½ L 1.8 | | 497 |
| Handrail lattice, battered bracing, plates, rivets | | | | 1200 |
| | | | | 13172 |

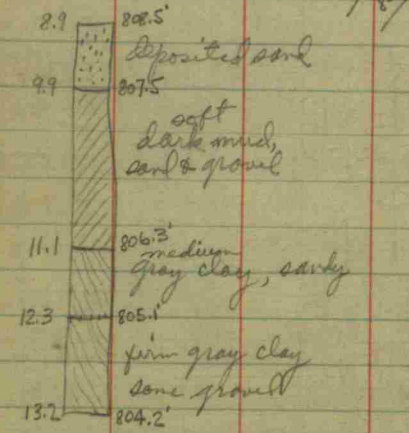
or about 6½ tons.

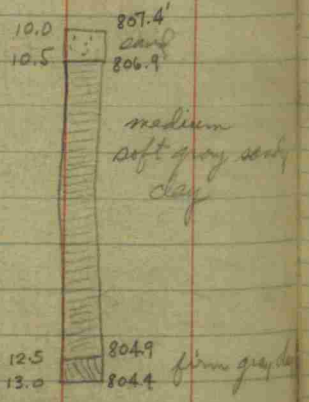
N² Mile stone 32-16-1E - small stone found on top of a large stone 2'± deep. Replaced the small 4×8×11 stone on top of original.

Power pole S 50° W 32.02'
Barbed pole N 50° W 33.60'
Old wood cor. post S 45° E 27.24'
N. fence of bond North 18.8'

2+74.65 center W. end center plank
2+74.85 F.F. stone midwall
2+75.35 W. edge clear waterway
3+20.35 E " " "

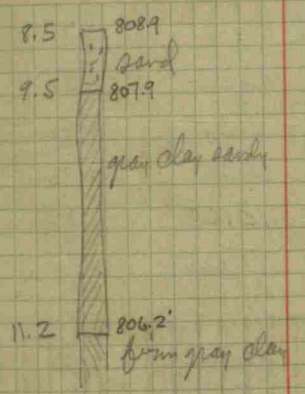



All vert. meas. below roadway surface Elv. at right.

Shartle
Burrows
Graham
Johnson
1/25/54
Fog




Estimated allowable bearing capacity 4 tons sq. ft.

Upstream from ℄ structure

| | | | | |
|---|---|---|---|---|
| B.M. #1 | 0.23 | 818.94 | | 818.71 |
| Floor W. end | | | 1.63 | 17.31 |
| " E. " | | | 1.52 | 17.42 |
| 0+50 | | | 12.55 | 06.39 |
| 0+70 | | | 10.65 | 08.29 |
| 1+00 | | | 11.06 | 07.88 |
| 1+20 | | | 11.55 | 07.39 |
| 1+50 | | | 10.13 | 08.81 |
| 2+00 | | | 9.90 | 09.04 |
| 2+50 | | | 10.40 | 08.54 |
| 3+00 | | | 9.55 | 09.39 |
| 3+80 | | | 9.40 | 09.54 |
| 4+40 | | | 10.77 | 08.17 |
| 5+00 | | | 9.75 | 09.19 |
| ⊙ | 6.33 | 815.21 | 10.06 | 08.88 |

Downstream

| | | | | |
|---|---|---|---|---|
| 0+45 | | | 7.70 | 07.51 |
| 1+00 | | | 8.13 | 07.08 |
| 1+50 | | | 8.23 | 06.98 |
| 2+00 | | | 8.72 | 06.49 |
| 2+25 | | | 8.15 | 07.06 |
| 3+00 | | | 9.00 | 06.21 |
| 4+25 | | | 8.40 | 06.81 |
| 5+00 | | | 9.00 | 06.21 |

| | ℄ Roadway | | | |
|---|---|---|---|---|
| B.M.#1 | 3.55 | 822.26 | | 818.71 |
| 0+00 | | | 4.88 | 17.38 |
| 0+50 | | | 6.53 | 15.73 |
| 1+00 | | | 7.50 | 14.76 |
| 1+50 | | | 7.84 | 14.42 |
| 2+00 | | | 7.82 | 14.44 |
| 2+50 | | | 6.77 | 15.49 |
| ~1-00 | | | 0.50 | 21.76 |
| 2+74.65 | | | 4.96 | 17.30 |
| 3+20.35 | | | 4.85 | 17.41 |
| 3+50 | | | 4.60 | 17.66 |
| 4+00 | | | 3.95 | 18.31 |
| 4+50 | | | 3.01 | 19.25 |
| 5+00 | | | 2.01 | 20.25 |
| 5+50 | | | 1.39 | 20.87 |
| 6+00 | | | 1.13 | 21.13 |
| 6+50 | | | 0.89 | 21.37 |

Proposed Cr. Rdwy.

| | |
|---|---|
| 0+00 | 817.38' |
| 0+50 | 815.73' |
| 0+75 | 815.30' |
| 1+00 | 815.18' |
| 1+25 | 815.80' |
| 1+50 | 816.72' |
| 1+75 | 817.47' |
| 2+00 | 818.05' |
| 2+25 | 818.47' |
| 2+50 | 818.72' |
| 2+75 | 818.80' |
| 3+00 | " |
| 4+00 | " |
| 4+50 | 819.25 |

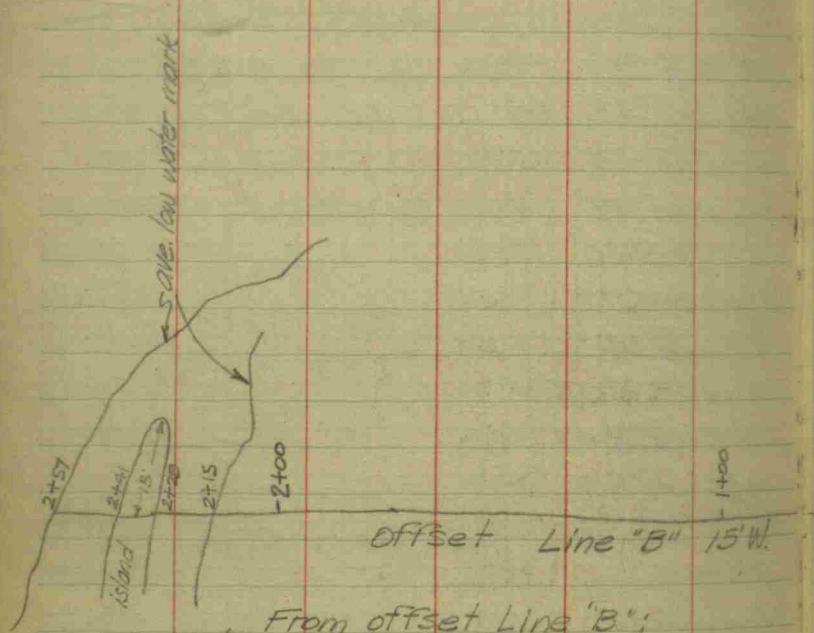
G = -2.00%

P.V.I. 1+00
V.C. El. 814.80'
V.C. 50'

G. ℄ P.R.V.C. = +4.00%

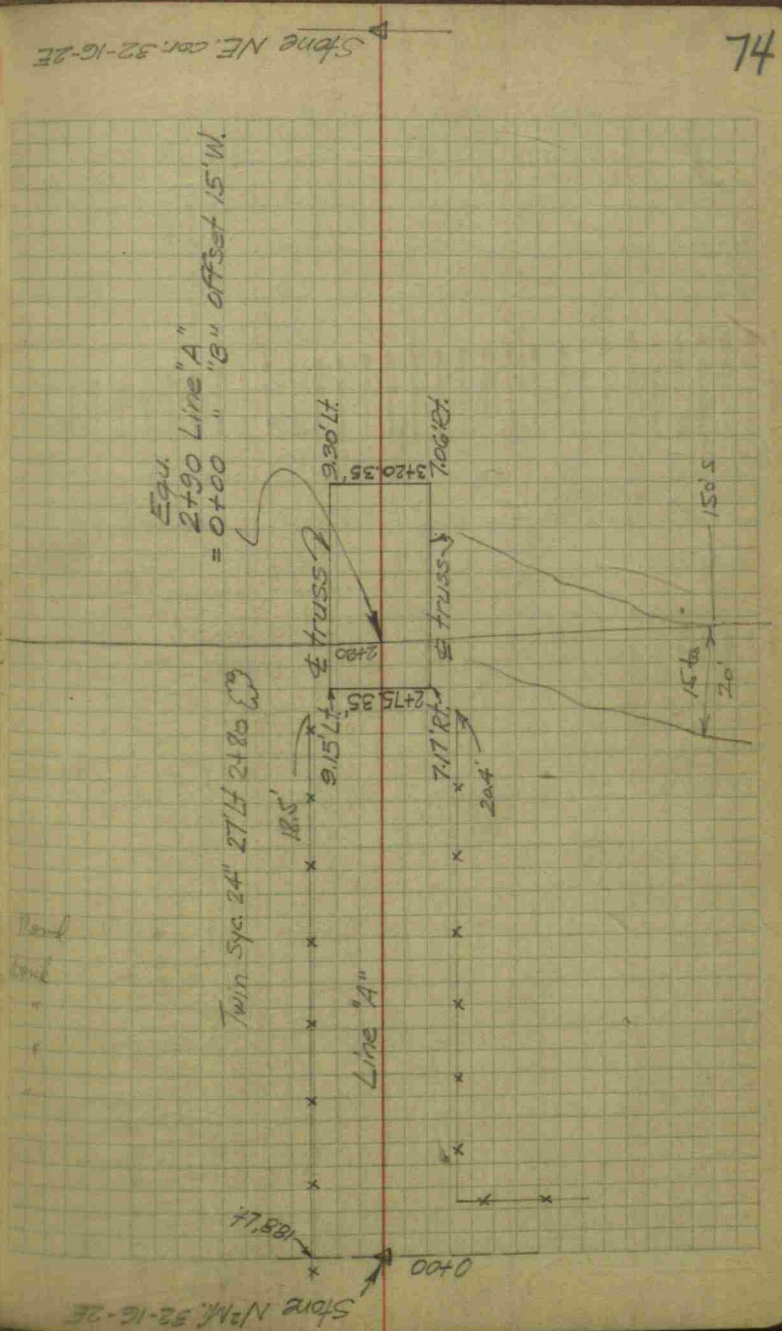
P.V.I. 2+00
V.C. El. 818.80'
V.C. 150'

G = 0.00%




From offset Line "B":

| Sta. | top Bank | Bot bank | W edge | E edge | W to E |
|---|---|---|---|---|---|
| 2+00 | 9' | 14' | 37' | 50' | |
| 1+75 | 10 | 21 | 31 | 44 | |
| 1+50 | 16 | 22 | 22 | 29 | 50 ft |
| 1+25 | 17 | 17 | 17 | 31 | 65 ft |
| 1+00 | 22 | 22 | 22 | 39 | 65 |
| 0+75 | 27 | 33 | 47 | 55 | 67 |
| 0+50 | 22 | 27 | 33 | 49 | 64 |
| 0+25 | 11 | 11 | 11 | 41 | |



| | B.S. | H.I. | offset Line "B" F.S. | offset "B" El. | Top bank F.S. |
|---|---|---|---|---|---|
| B.M. #1 | 0.70 | 819.41 | | | |
| 0+25 | | | 8.40 | 811.01 | 8.70 |
| 0+50 | | | 7.50 | 811.9 | 7.50 |
| 0+75 | | | 7.20 | 812.2 | 6.90 |
| 1+00 | | | 7.30 | 812.1 | 6.60 |
| 1+25 | | | 7.00 | 812.4 | 6.60 |
| 1+50 | | | 6.80 | 812.6 | 6.80 |
| 1+75 | | | 6.90 | 812.5 | 6.90 |
| 2+00 | | | 7.10 | 812.3 | 7.50 |
| 2+10 | | | 7.40 | 812.0 | |

El. B.M. = 818.71'

810.7
811.9
812.5
812.8
812.8
812.6
812.5
811.9

Windy, Fair
Jan 30, 1923

Levels- Clermont to Cen. N. Cen. 8-15-2E
to est. elv. of B.M. #1 T SHARTLE
of Hennipman Bridge BURGINS
Survey. WATSON

| | | | | | Miles |
|---|---|---|---|---|---|
| | | | | 833.13 | |
| BM L50 | 6.81 | | | 833.13 | 0.0 |
| | 2.43 | | 4.85 | | |
| | 11.48 | | 7.19 | | |
| | 3.84 | | 3.39 | | |
| | 4.94 | | 8.49 | | |
| | 5.53 | | 8.04 | | |
| | 2.91 | | 6.80 | | |
| | 11.47 | | 9.50 | | |
| | 2.41 | | 2.65 | | |
| | 3.41 | | 12.43 | | |
| | | | | 818.71 | |
| BM #1 | | | 6.08 | 818.64 | 2.1 |
| | 11.21 | | 0.63 | | |
| | 5.85 | | 0.61 | | |
| | 0.94 | | 5.59 | | |
| | 2.29 | | 4.70 | | |
| | 1.41 | | 7.68 | | |
| | 5.95 | | 8.56 | | |
| | 1.25 | | 6.98 | | |
| | 1.19 | | 6.44 | | |
| | 5.10 | | 4.97 | | |
| | 5.03 | | 0.84 | | |
| | | | | 808.91 | |
| B.M. A77 | | | 9.19 | 808.75 | 4.4 |
| | | | | 808.91 | |
| | | | | 0.16 | |

Adjusted elev. in ink.

USC & GS BM L50 - Clermont, Ind.

N½ Mi. 32-16-2E
R.R. spk. p. pole SW cor "T" rd.

U.S.C.&G.S. B.M. A77
S. side C.C.C. & St.L. Ry. ½ Mi. W. Co. line

637
1.2
127.4
63.7
764.4

672
764
108

Fill + 20% = 764 cys.
Cut = 872
Surplus = 108 cys.

| | | | | | |
|---|---|---|---|---|---|
| 4+00 | +1.2 / 23 | +0.8 / 20 | -1.8 / 16 | -0.3 / 13 | |
| 3+50 | | -4.5 / 22 | -1.5 / 16 | -0.6 / 13 | |
| 3+30 | | | -9.9 / 27 | -0.3 / 11 | |
| 2+70 | | | -5.4 / 18 | -0.4 / 8 | |
| 2+50 | -3.2 / 23 | -3.6 / 16 | -1.3 / 11 | -0.4 / 8 | |
| 2+00 | | -2.6 / 19 | -1.7 / 15 | -0.5 / 12 | |
| 1+50 | | | -1.1 / 19 | -0.3 / 11 | |
| 1+00 | | -1.4 / 18 | 0 / 11 | -0.2 / 8 | |
| 0+50 | -1.7 / 21 | -0.4 / 17 | +0.3 / 13 | 0 / 10 | 0 |

| | | | | |
|---|---|---|---|---|
| -0.4 / 7 | 0 / 8 | -20 / 14 | -0.5 / 19 | +0.4 / 23 |
| -0.3 / 4 | -2.4 / 16 | -2.8 / 22 | | |
| -0.2 / 7 | -1.4 / 12 | -4.5 / 19 | | |
| +0.2 / 7 | -4.7 / 17 | -4.8 / 21 | | |
| -0.5 / 8 | -0.8 / 10 | -3.4 / 15 | -7.5 / 20 | |
| -0.6 / 12 | -1.8 / 15 | -1.7 / 20 | | |
| -0.3 / 8 | -0.2 / 16 | -1.7 / 20 | | |
| -0.5 / 8 | -0.4 / 10 | -0.9 / 13 | -1.3 / 21 | |
| -0.4 / 6 | -0.2 / 9 | -1.0 / 15 | | |

Levels for Jim Vaughn. along W side
HWS road on
5/12/47 Franklin-Skarth-Chappel

| B.S. | H.I. | F.S. | EL. | |
|---|---|---|---|---|
| 11.55 | 100.00 | | 88.45 | S. ditch |
| | | 7.75 | 92.25 | top bank |
| | | 11.95 | 88.05 | 2nd. ditch |
| | | 2.65 | 97.35 | top bank |
| | | 8.70 | 91.30 | 3rd. ditch |
| | | 5.75 | 94.25 | N. ditch |

I = 64°
T = 300'
D
L =

# CURVE TABLES.

Published by KEUFFEL & ESSER CO.

## HOW TO USE CURVE TABLES.

Table I. contains Tangents and Externals to a 1° curve. Tan. and Ext. to any other radius may be found nearly enough, by dividing the Tan. or Ext. opposite the given Central Angle by the given degree of curve.

To find Deg. of Curve, having the Central Angle and Tangent: Divide Tan. opposite the given Central Angle by the given Tangent.

To find Deg. of Curve, having the Central Angle and External: Divide Ext. opposite the given Central Angle by the given External.

To find Nat. Tan. and Nat. Ex. Sec. for any angle by Table I.: Tan. or Ext. of twice the given angle divided by the radius of a 1° curve will be the Nat. Tan. or Nat. Ex. Sec.

### *EXAMPLE.*

Wanted a Curve with an Ext. of about 12 ft. Angle of Intersection or I. P. = 23° 20′ to the R. at Station 542+72.

Ext. in Tab. I opposite 23° 20′ = 120.87
120.87 ÷ 12 = 10.07. Say a 10° Curve.

Tan. in Tab. I opp. 23° 20′ = 1183.1
1183.1 ÷ 10 = 118.31.

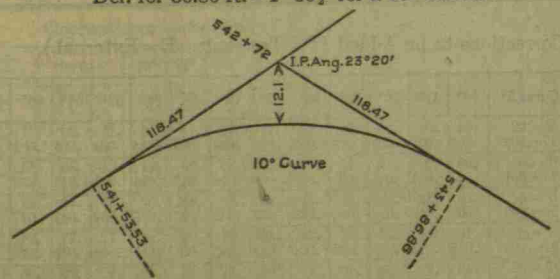
Correction for A. 23° 20′ for a 10° Cur. = 0.16
118.31 + 0.16 = 118.47 = corrected Tangent.

(If corrected Ext. is required find in same way)
Ang. 23° 20′ = 23.33° ÷ 10 = 2.3333 = L. C.

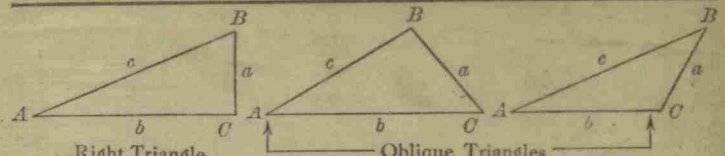
| | | | |
|---|---|---|---|
| 2° 19½′ = def. for sta. | 542 | I. P. = sta. | 542+72 |
| 4° 49½′ = " " " | +50 | Tan. = | 1.18.47 |
| 7° 19½′ = " " " | 543 | B. C. = sta. | 541+53.53 |
| 9° 49½′ = " " " | +50 | L. C. = | 2.33.33 |
| 11° 40′ = " " " | 543+ | | |
| | 86.86 | E. C. = Sta. | 543+86.86 |

100 − 53.53 = 46.47 × 3′ (def. for 1 ft. of 10° Cur.) = 139.41′ =
2° 19½′ = def. for sta. 542.

Def. for 50 ft. = 2° 30′ for a 10° Curve.
Def. for 36.86 ft. = 1° 50½′ for a 10° Curve.



# TRIGONOMETRIC FORMULÆ




Right Triangle — Oblique Triangles

## Solution of Right Triangles

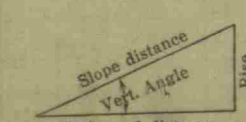
For Angle $A$. $\sin = \frac{a}{c}$, $\cos = \frac{b}{c}$, $\tan = \frac{a}{b}$, $\cot = \frac{b}{a}$, $\sec = \frac{c}{b}$, $\operatorname{cosec} = \frac{c}{a}$

| Given | Required | |
|---|---|---|
| $a, b$ | $A, B, c$ | $\tan A = \frac{a}{b} = \cot B, c = \sqrt{a^2 + b^2} = a\sqrt{1 + \frac{b^2}{a^2}}$ |
| $a, c$ | $A, B, b$ | $\sin A = \frac{a}{c} = \cos B, b = \sqrt{(c+a)(c-a)} = c\sqrt{1 - \frac{a^2}{c^2}}$ |
| $A, a$ | $B, b, c$ | $B = 90° - A, b = a \cot A, c = \frac{a}{\sin A}$. |
| $A, b$ | $B, a, c$ | $B = 90° - A, a = b \tan A, c = \frac{b}{\cos A}$. |
| $A, c$ | $B, a, b$ | $B = 90° - A, a = c \sin A, b = c \cos A$, |

## Solution of Oblique Triangles

| Given | Required | |
|---|---|---|
| $A, B, a$ | $b, c, C$ | $b = \frac{a \sin B}{\sin A}, C = 180° - (A + B), c = \frac{a \sin C}{\sin A}$ |
| $A, a, b$ | $B, c, C$ | $\sin B = \frac{b \sin A}{a}, C = 180° - (A + B), c = \frac{a \sin C}{\sin A}$ |
| $a, b, C$ | $A, B, c$ | $A + B = 180° - C, \tan \frac{1}{2}(A - B) = \frac{(a-b)\tan \frac{1}{2}(A+B)}{a+b}$, $c = \frac{a \sin C}{\sin A}$ |
| $a, b, c$ | $A, B, C$ | $s = \frac{a+b+c}{2}, \sin \frac{1}{2}A = \sqrt{\frac{(s-b)(s-c)}{bc}}$, $\sin \frac{1}{2}B = \sqrt{\frac{(s-a)(s-c)}{ac}}, C = 180° - (A+B)$ |
| $a, b, c$ | Area | $s = \frac{a+b+c}{2}$, area $= \sqrt{s(s-a)(s-b)(s-c)}$ |
| $A, b, c$ | Area | area $= \frac{bc \sin A}{2}$ |
| $A, B, C, a$ | Area | area $= \frac{a^2 \sin B \sin C}{2 \sin A}$ |

## REDUCTION TO HORIZONTAL




Horizontal distance = Slope distance multiplied by the cosine of the vertical angle. Thus: slope distance = 319.4 ft. Vert. angle = 5° 10′. From Table, Page IX. cos 5° 10′ = .9959. Horizontal distance = 319.4 × .9959 = 318.09 ft. Horizontal distance also = Slope distance minus slope distance times (1 − cosine of vertical angle). With the same figures as in the preceding example, the following result is obtained. Cosine 5° 10′ = .9959. 1 − .9959 = .0041. 319.4 × .0041 = 1.31. 319.4 − 1.31 = 318.09 ft.

When the rise is known, the horizontal distance is approximately: — the slope distance less the square of the rise divided by twice the slope distance. Thus: rise = 14 ft., slope distance = 302.6 ft. Horizontal distance = $302.6 - \frac{14 \times 14}{2 \times 302.6} = 302.6 - 0.32 = 302.28$ ft.