OHIO DEPARTMENT OF TRANSPORTATION

PLANNING & ENGINEERING DEPARTMENT, DISTRICT 4

Project _____ Calc By CLG Date 2/13/24

Desc Bridge Repair Calculations Chk By MJA Date 3/22/24

PID/PROJ 113086

SUM-277-2.341 PARTIAL DEPTH PAVEMENT REPAIRS:

Knowns:

1. Scope states to repair area at bridge approach slab termination joint @ a 4" depth.
2. Referring to the existing bridge photos: The repair length is 4 FT +/- by width of roadway.
3. Referring to existing plans, the existing approach width is 67'-0".

Calculation:

$$\left[(4' \times 67') \cdot (2 \text{ sides})\right] \div 9 \text{ SY} \approx 60 \text{ SY}$$

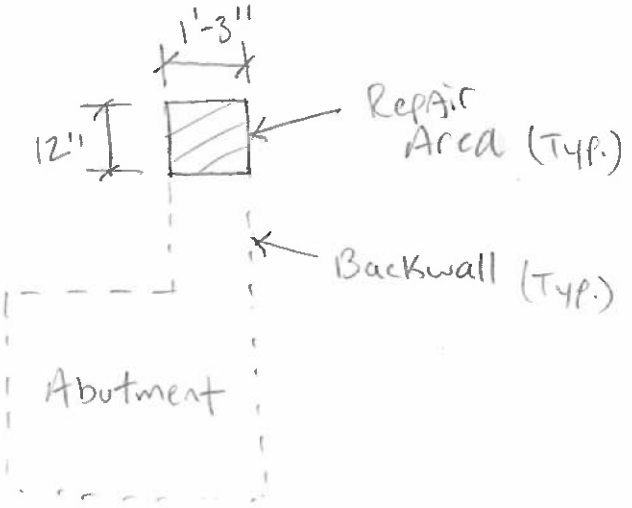
Project _____ Calc By CLG Date 2/13/24
Desc Bridge Repair Calculations Chk By MJA Date 3/22/24
PID/PROJ 113086

SUM-76-6.474R BACKWALL REPAIR:

Knowns:
1. Repair depth shall be 12" from the top of the backwall at the forward and rear abutments.
2. Repair length is the total length of the abutments.

Calculations:

Abutment Length = 75'-8¼" = 75.69' (forward and rear)



Repair Cross sectional Area =

$1.25' \times 1' = 1.25\ ft^2$

Volume of Repair =

$$\frac{1.25\ ft^2 \times 75.69\ ft}{27\ CY} \times 2\ \text{Abutments}$$

$$= \underline{\underline{7\ CY}}$$

Project
Desc Bridge Repair Calculations

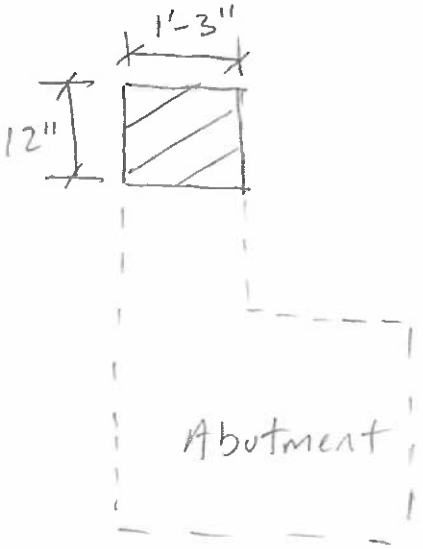
Calc By CLG Date 2/13/24
Chk By MJA Date 3/22/24
PID/PROJ 113081.0

SUM-76-6.843 BACKWALL REPAIR:

Knowns:
1. Repair depth shall be 12" from the top of the backwall at the forward and rear abutments.
2. Repair length is under lanes only (both directions of travel), (total of 7 lanes).

Calculations:

Repair Length along Abutments = NB 48' + SB 36' = 84'



Repair Cross Sectional Area =

$1.25' \times 1' = 1.25\ ft^2$

Volume of Repair =

$$\frac{1.25\ ft^2 \times 84\ ft}{27\ CY} \times 2\ \text{Abutments}$$

$= 7.78$

$\approx 8\ CY$

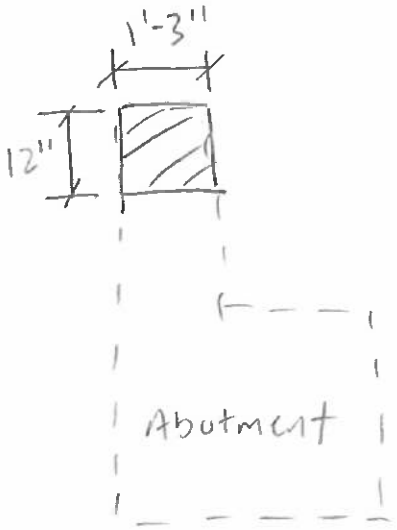
Project _____ Calc By CLG Date 2/13/24
Desc Bridge Repair Calculations Chk By MJA Date 3/22/24
PID/PROJ 113086

SUM-76-6.999 BACKWALL REPAIR:

Knowns:
1. Repair depth shall be 12" from the top of the backwall at the forward and rear abutments.
2. Repair length is under lanes only (both directions of travel), (total of 7 lanes).

Calculations:

Repair Length along Abutments = NB 48' + SB 36' = 84'



Repair Cross Sectional Area =

$1.25' \times 1' = 1.25\ ft^2$

Volume of Repair =

$$\frac{1.25\ ft^2 \times 84'}{27\ CY} \times 2 \text{ Abutments}$$

$= 7.78$

$\approx$ 8 CY

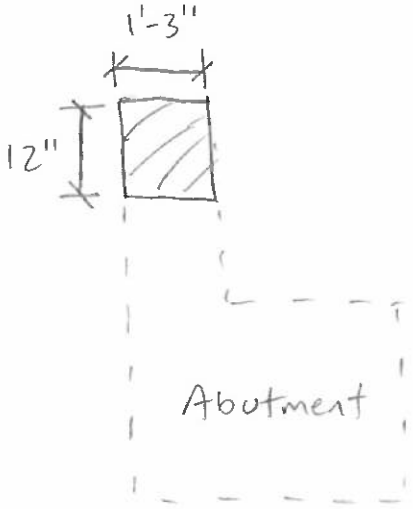
Project _____ Calc By CLG Date 2/13/24
Desc Bridge Repair Calculations Chk By MJA Date 3/22/24
PID/PROJ 113086

SUM-76-7.366 BACKWALL REPAIR:

Knowns:
1. Repair depth shall be 12" from the top of the backwall at the forward and rear abutments.
2. Repair length is under lanes only (both directions of travel), (total of 6 lanes).

Calculations:

Repair Length along Abutments = $\overbrace{36' + 36'}^{NB \quad SB} = 72'$



Repair Cross-sectional Area =

$1.25' \times 1' = 1.25\ ft^2$

Volume of Repair =

$$\frac{1.25\ ft^2 \times 72'}{27}$$

$= 3.33$

$\approx$ 4 CY

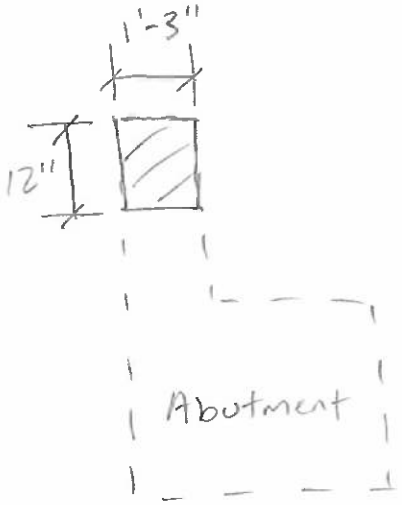
Project _____ Calc By CLG Date 2/13/24
Desc Bridge Repair Calculations Chk By MJA Date 3/22/24
PID/PROJ 113086

SUM-76-8.237L BACKWALL REPAIR:

Knowns:
1. Repair depth shall be 12" from the top of the backwall at the forward and rear abutments.
2. Repair length is under lanes only.

Calculations:

Repair Length Along Abutments = 50'-0" (3 Lane width Approx.)



Repair Cross-Sectional Area =

$1.25' \times 1' = 1.25\ ft^2$

Volume of Repair =

$$\frac{1.25\ ft^2 \times 50'}{27} \times 2 \text{ Abutments}$$

$= 4.63$

$= 5\ CY$

Project
Desc Bridge Repair Calculations

Calc By CLG Date 2/13/24
Chk By MJA Date 3/22/24
PID/PROJ 113086

SUM-76-5.910 CONCRETE PARAPET REPAIRS:

Calculations:

- See sheet 12/13 of the structure plans.
- Item 511 - Concrete Misc.: Parapet Repair (CY)

DETAIL A

Repair Length = 76' + 172' = 248'

$$\text{Repair Volume} = \frac{\left(\frac{12''}{12} \times \frac{8''}{12}\right) \times (248')}{27} = 6.12 \text{ CY} \approx \underline{7.00 \text{ CY}}$$

DETAIL B

Repair Length = 61' + 68' = 129'

Repair Volume = 12" top repair + 3" Perimeter repair

$$= \frac{\left[\left(\frac{12''}{12} \times \frac{8''}{12}\right) + (129')\right]}{27}$$

$$= 3.19$$

$$\approx \underline{4 \text{ CY}}$$

- Item 509 - Concrete Reinforcement, Replacement of Concrete Reinforcemer
  - 2 - #5 bar
  - Weight per bar = 1.043 lb
  - Total Repair Length = 377'

1.043 lb x 2 bar x 377 ft ≈ 787 lb

Project _____ Calc By CLG Date 2/13/24
Desc Bridge Repair Calculations Chk By MJA Date 3/22/24
PID/PROJ 113086

ITEM 844, CONCRETE PATCHING WITH GALVANIC ANODE PROTECTION: ANODE SPACING

Calculations:

Density Check = Total surface Area of Bar (ft^2) within a square foot of concrete (regardless of depth).

SUM-76-6.474R

MAX. Spa

Columns of Pier 1 = 0.313 (28 in)

Backwalls = 0.115 (30 in)

SUM-277-0.898

Abutment Face = 0.271 (30 in.)

Rail Top = 0.156 (30 in.)

SUM-277-1.129

Rail Top = 0.156 (30 in)

Pier Cap = 0.240 (30 in)

Sum-277-2.341

Pier = 0.337 (28 in)

Sum-277-2.890

MAX. Spa.

Abutment Face = 0.159 (30 in.)

SUM-76-6.47 4R

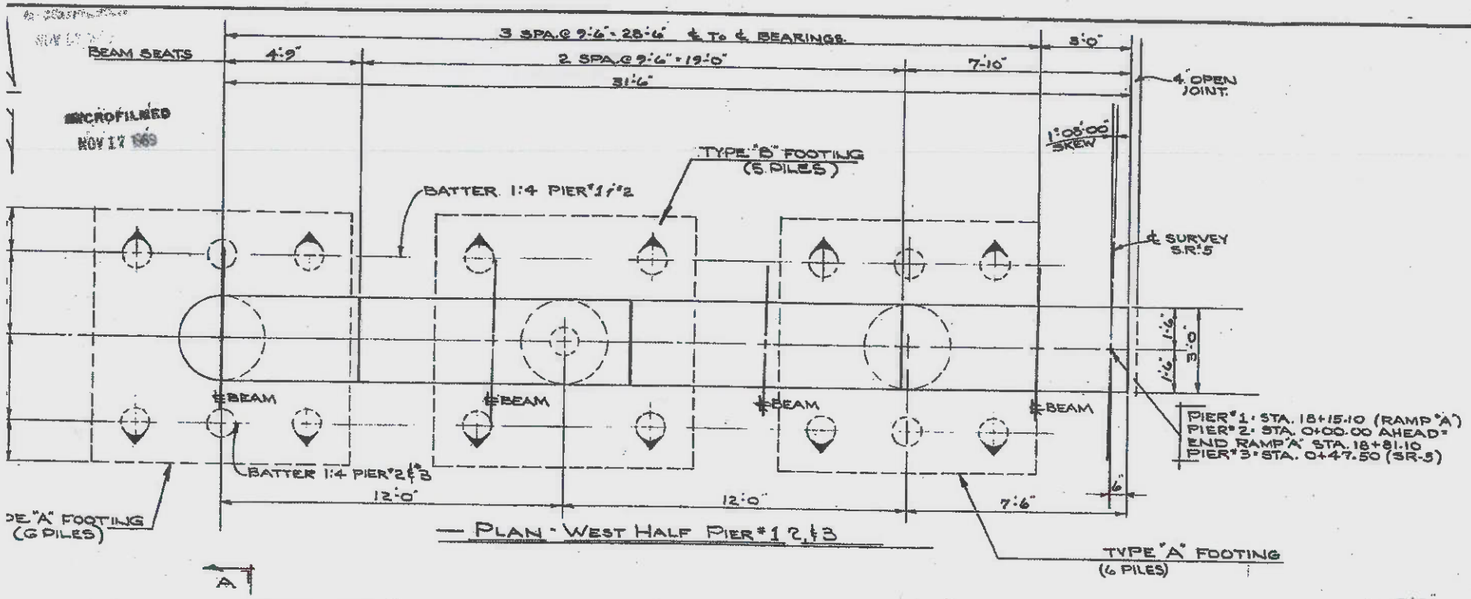
FED. RD.	STATE	PROJECT	
2	OHIO		

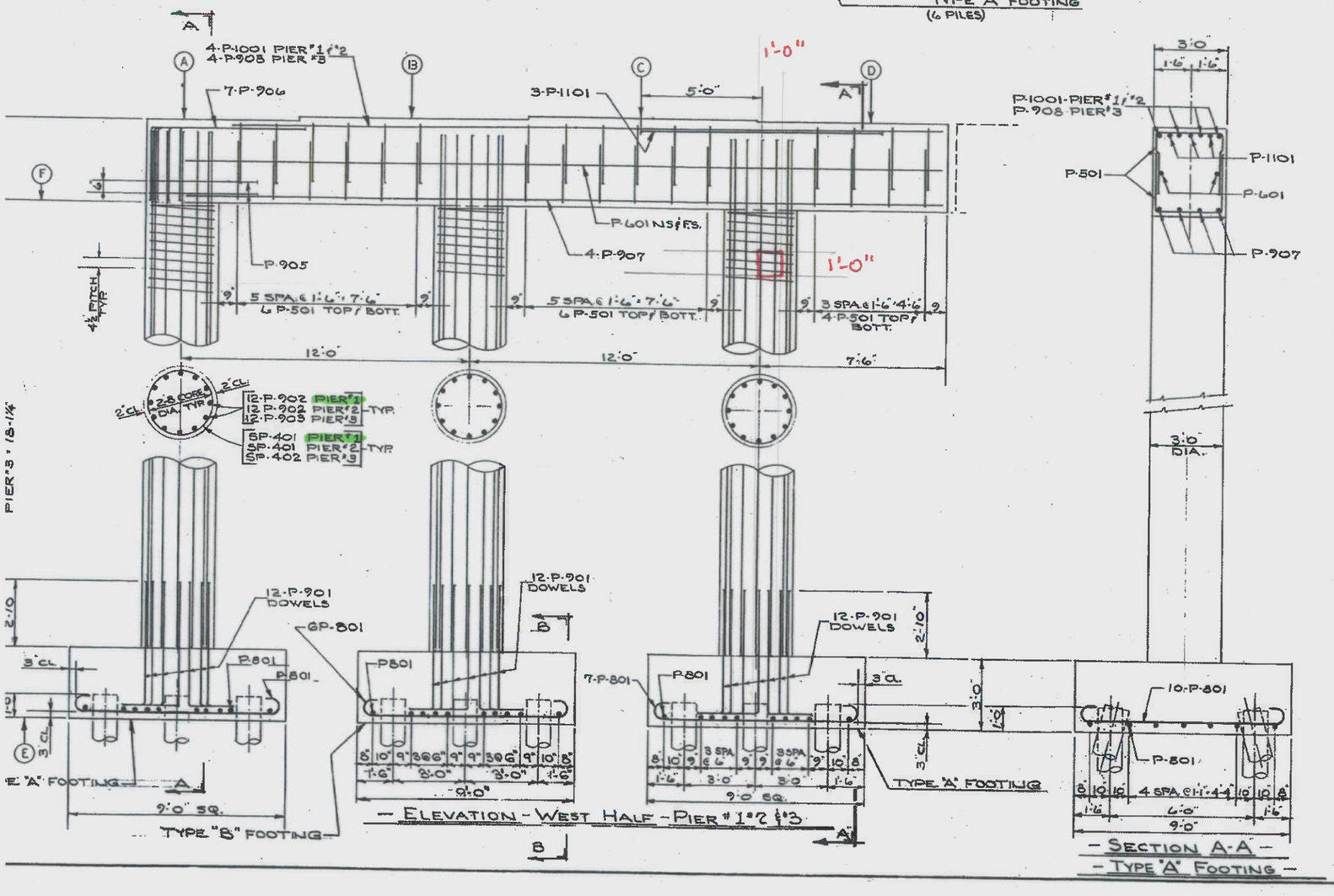
SUM-5-933

279
388

— ELEVATIONS —

	PIER #1	PIER #2	PIER #3
A	990.57	992.31	994.1
B	990.73	992.46	994.2
C	990.88	992.62	994.4
D	990.86	992.60	994.3
E	968.75	970.50	972.5
F	987.07	988.82	990.6





Surface Area of Steel within ft² Box :

- 3-#4 @ 1'-0" ± Length, 0.50" Dia.

  3 bar × 1'-0" × $\frac{0.50}{12}$ = 0.125 ft²

- 2-#9 @ 1'-0" ± Length, 1.128" Dia.

  2 bar × 1'-0" × $\frac{1.128}{12}$ = 0.188 ft²

- $\Sigma_{\text{Steel Density}} = 0.125 + 0.188 = 0.313\ \text{ft}^2$

STATE OF OHIO
DEPARTMENT OF HIGHWAYS
BUREAU OF BRIDGES

BEISWENGER & HOCH, Consulting Engineers
AKRON, OHIO

PIER #1, #2 & #3 DETAILS - LEFT STRUCTURE

BRIDGE № SUM-5-0949
OVER U.S. 224
KENMORE EXPWAY. AKRON EXPWAY. SYSTE
SUMMIT COUNTY
STA. 17+66.60 To STA. 0+89.25

DESIGNED	DRAWN	TRACED	CHECKED	REVIEWED	DATE	REVS
ES	JWP		BWS 11/1/62	RDH	11/16/62	

Sum-76-6.474R

FED. RD.	STATE	PROJECT	
2	OHIO		

SUM-5-9.

Surface Area of Steel within ft² Box:

- 1-#6 @ 1'-0" Length, 0.75" Dia.
  1 bar x 1'-0" x $\frac{0.75}{12}$ = 0.0625
- 1-#5 @ 1'-0" Length, 0.625" Dia.
  1 bar x 1'-0" x $\frac{0.625}{12}$ = 0.052

Steel Den. = 0.0625 + 0.052 = 0.115

KEY PLAN

PLAN - ABUTMENT #1 (AS SHOWN)
PLAN - ABUTMENT #2 (OPP. HAND & AS NOTED)

ELEVATION - ABUTMENT #1 (AS SHOWN)
ELEVATION - ABUTMENT #2 (REFLECTED VIEW)

ELEVATION TABLE

	A	B	C	D	E	F	G	H	J	K	L	N	P	R	S	T	V
ABUT #1	989.19	989.35	989.51	989.49	989.50	989.65	989.77	989.72	989.67	993.70	993.81	993.53	993.53	993.60	993.23	988.19	982.17
ABUT #2	995.32	995.46	995.62	995.61	995.62	995.77	995.86	995.72	995.58	999.68	999.99	999.72	999.71	999.79	999.42	994.32	988.30

*ELEVATION GIVEN TO HEEL OF ANGLE.

STATE OF OHIO
DEPARTMENT OF HIGHWAYS
BUREAU OF BRIDGES

BEISWENGER & HOCH, Consulting Eng
AKRON, OHIO

ABUTMENT #1&2 DETAIL

BRIDGE NO. SUM-5-094
OVER U.S. 224
KENMORE EXPWAY. AKRON EXPWAY.
SUMMIT COUNTY
STA. 17+66.60 To STA. 0+89.25

DESIGNED	DRAWN	TRACED	CHECKED	REVIEWED
mrc	lww		11/1/93	RDH 11/8/93

F.H.W.A. REGION	STATE	PROJECT NO.	FUNDS
5	OHIO		

SUM-277/224-0.00/6.31/10

Surface Area of Steel within ft^2 Box:

- 2-#8 bar @ 1'-0", 1.00" Dia.

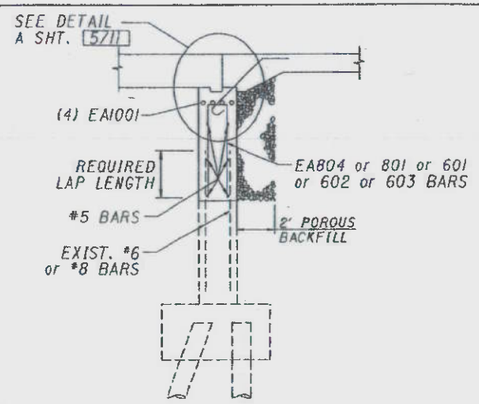
  $2 \text{ bar} \times 1'\text{-}0'' \times \frac{1}{12} = 0.167$

- 2-#5 bar @ 1'-0", 0.625" Dia

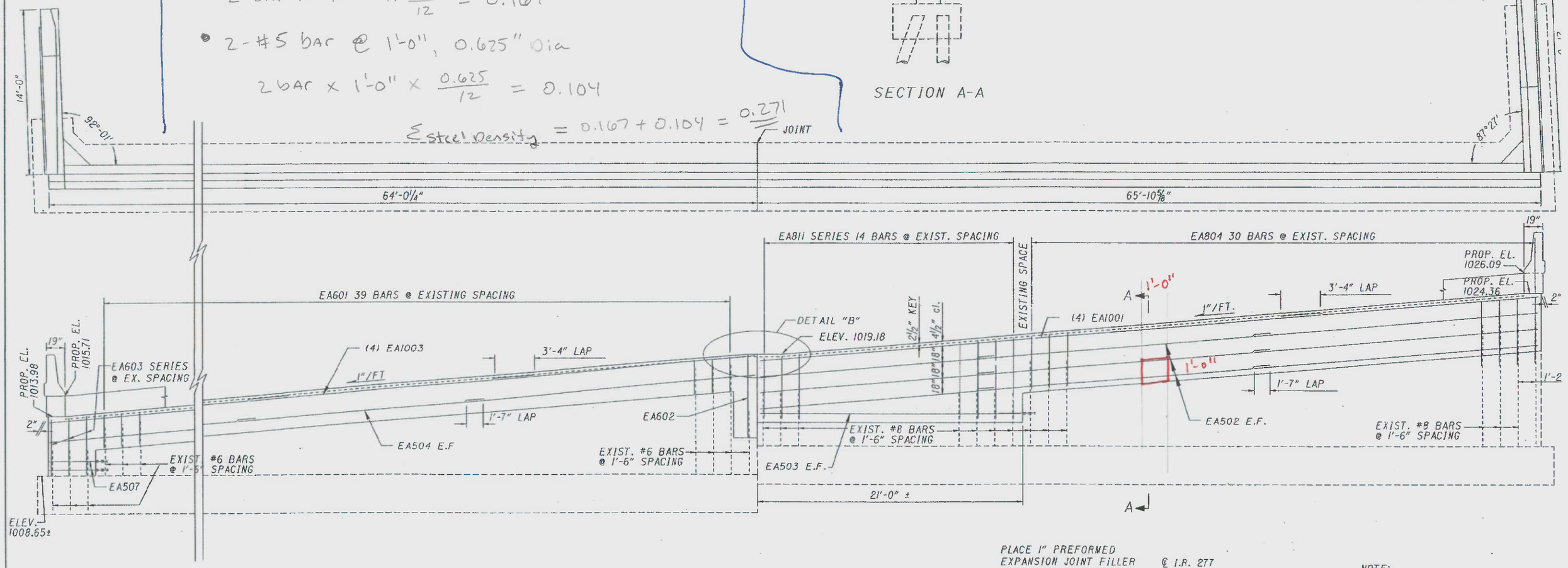
  $2 \text{ bar} \times 1'\text{-}0'' \times \frac{0.625}{12} = 0.104$

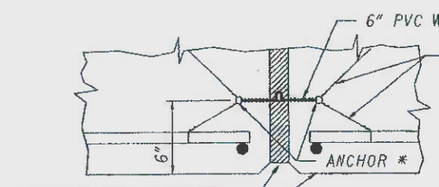
Σ Steel Density $= 0.167 + 0.104 = 0.271$

Sum-277-0.898



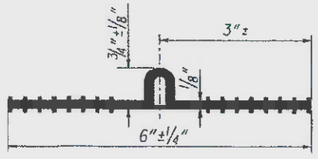
SECTION A-A

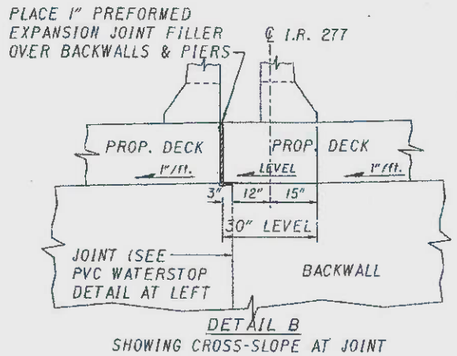




* FOR THE FIRST POUR, THE WATERSTOP SHOULD BE HELD SECURELY IN PLACE BY THE USE OF SPLIT FORMS AND TIE-WIRES. FOR THE SECOND POUR, SECURE THE FREE END OF WATERSTOP IN PROPER POSITION WITH TIE-WIRES. ALTERNATE METHODS, AS APPROVED BY THE ENGINEER, MAY BE USED TO INSURE THE CORRECT POSITIONING OF THE WATERSTOP.

WATERSTOP DETAILS





DETAIL B
SHOWING CROSS-SLOPE AT JOINT

NOTE:
ALL DOWEL HOLES ARE 1' IN DEPTH.

FOR WINGWALL PARAPET SAFETY SHAF DIMENSIONS SEE SHT. No. 7/11.

SHEET [

STATE OF OHIO
DEPARTMENT OF TRANSPORTATION
BUREAU OF BRIDGES

REAR ABUTMENT DETAILS

BRIDGE NO. SUM-277-0092
OVER A & B.B. RAILROAD

I-277 SUMMIT COUNT

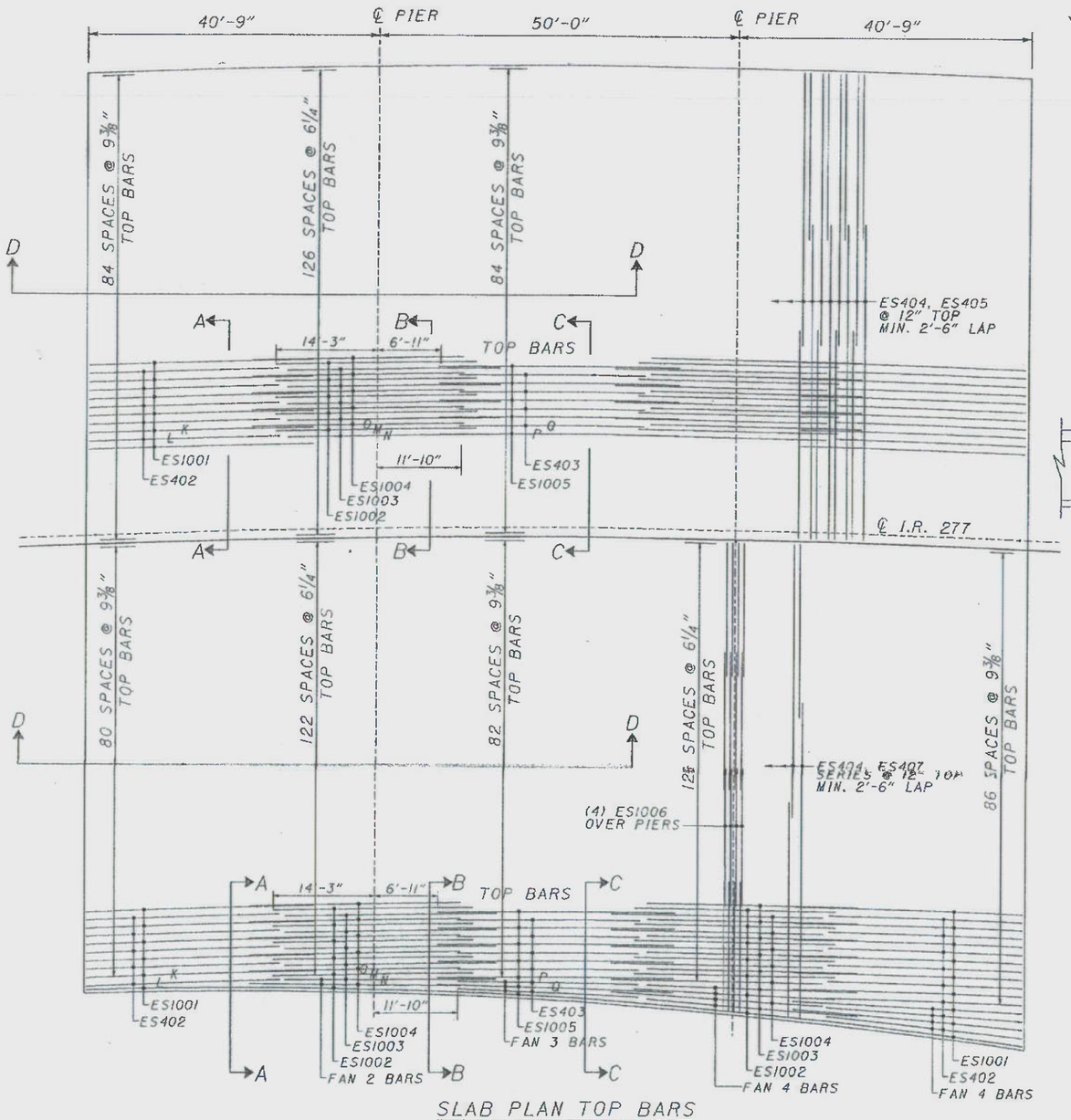
DESIGNED	DRAWN	TRACED	CHECKED	REVIEWED	DATE
ST	RB		KS	GLB	7-139

7FA2:(20.7) SU277050.DGN

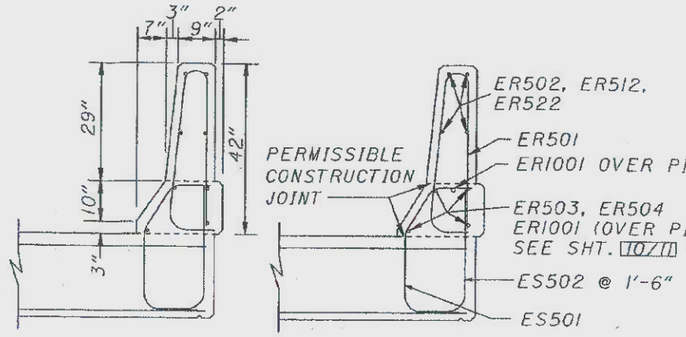
SUM-76-0.898

F.H.W.A. REGION	STATE	PROJECT NO.	FUNDS
5	OHIO		

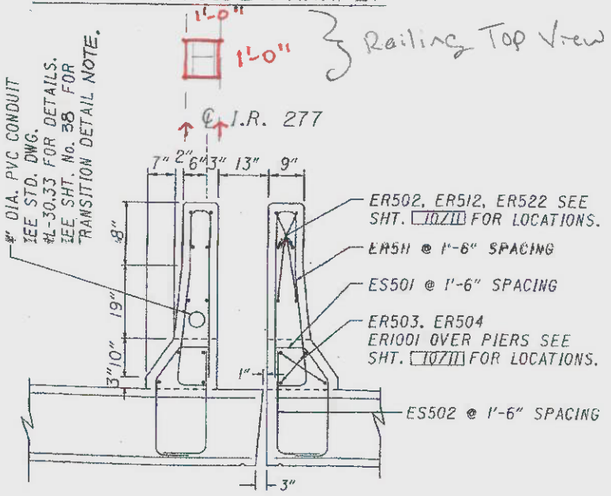
SUM-277/224/-0.00/6.3



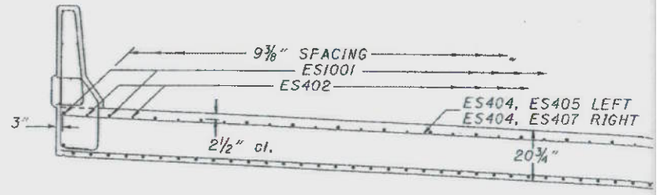
SLAB PLAN TOP BARS



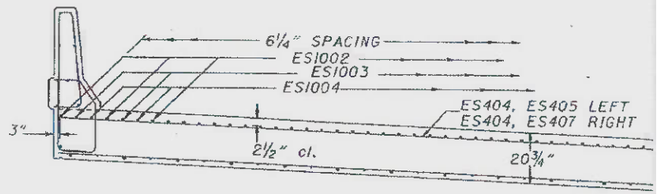
TYPICAL OUTSIDE PARAPET



MEDIAN BARRIER DETAILS



SECTION A-A

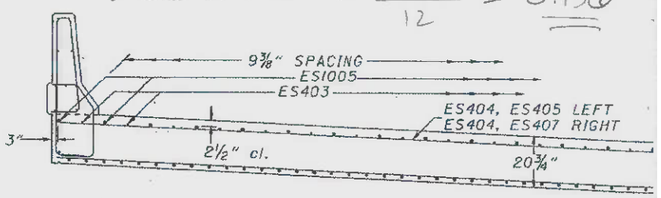


SECTION B-B

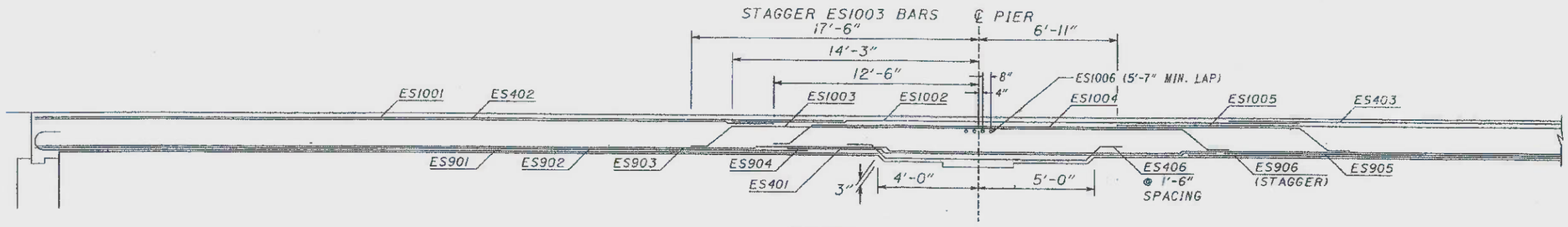
Surface Area of Steel within ft² Box:

• 3-#5 bar @ 1'-0", 0.625" Dia:

3 bar × 1'-0" × $\frac{0.625}{12}$ = 0.156



SECTION C-C



SECTION D-D

STATE OF OHIO
DEPARTMENT OF TRANSPORTA

SUPERSTRUCTUI

STRUCTURE No. SUM - 2

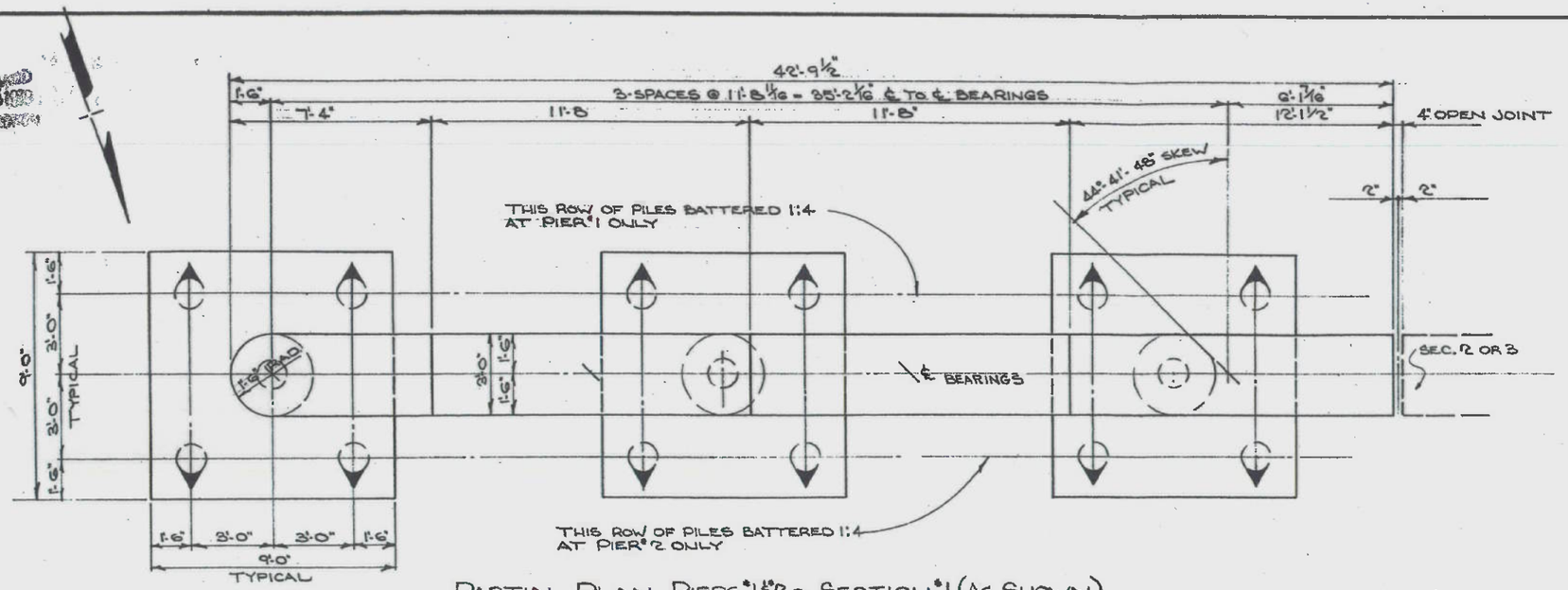
DESIGNED	DRAWN	TRACED	CHECKED	REVIEWED

SUM-277-1.129

FED. RD.	STATE	PROJECT	
2	OHIO		

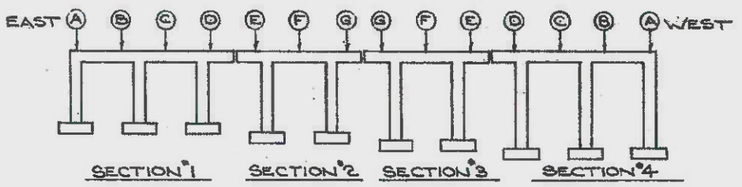
SUM-277-0.46

ELEVATION TABLE							
	A	B	C	D	H	K	L
PIER #1 SECTION #1	1012.90	1013.00	1013.10	1013.20	1009.14	990.00	16-1 5/8"
PIER #1 SECTION #4	1012.64	1012.76	1012.92	1013.07	1009.14	985.50	20-7 5/8"
PIER #2 SECTION #1	1013.50	1013.63	1013.75	1013.87	1009.66	998.50	13-1 7/8"
PIER #2 SECTION #4	1013.16	1013.31	1013.49	1013.65	1009.66	987.50	19-1 7/8"

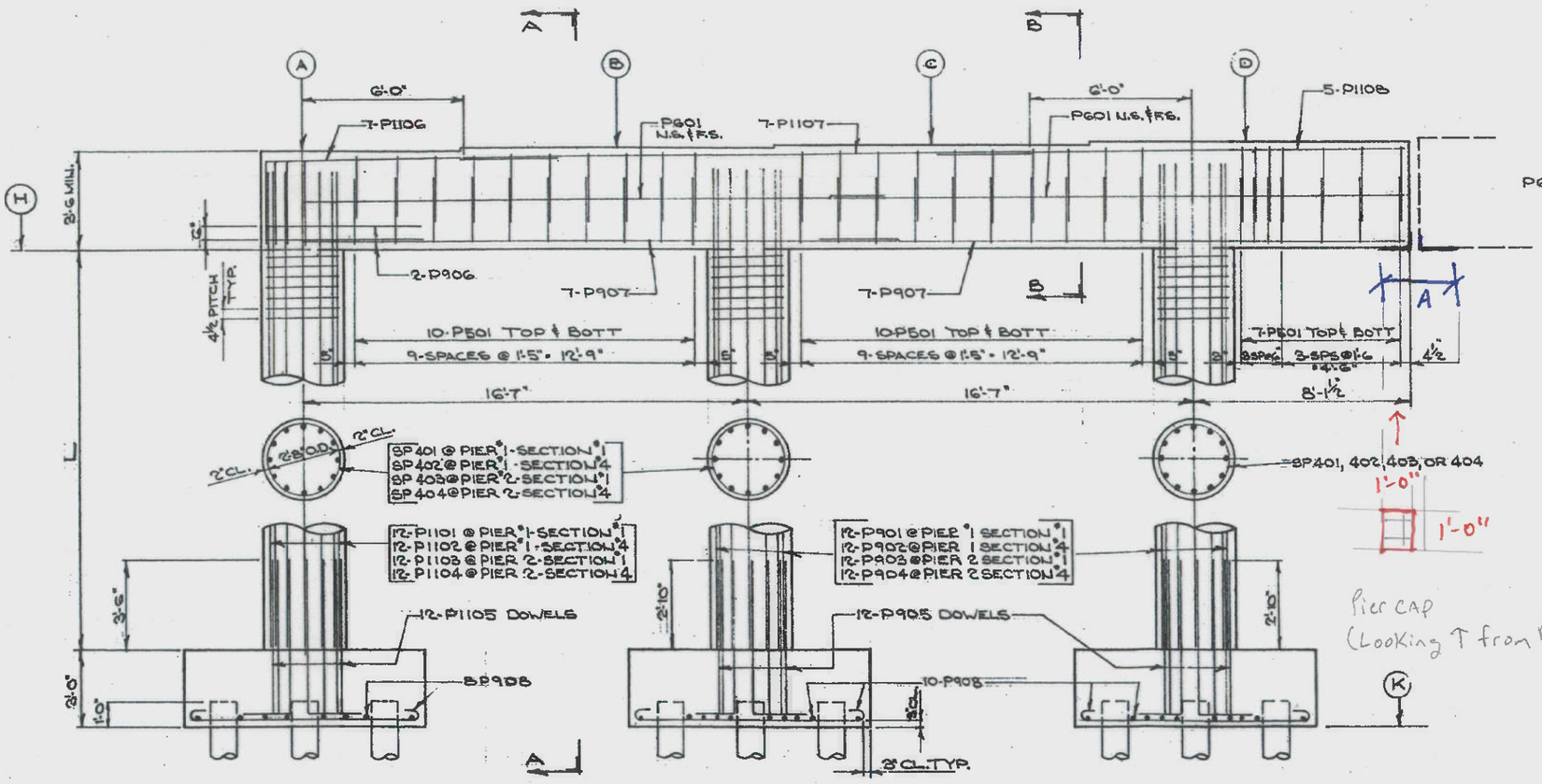


PARTIAL PLAN PIERS #1 & #2 ~ SECTION #1 (AS SHOWN)

PARTIAL PLAN PIERS 1 & 2 ~ SECTION #4 (OPPOSITE HAND EXCEPT FOR SKEW)

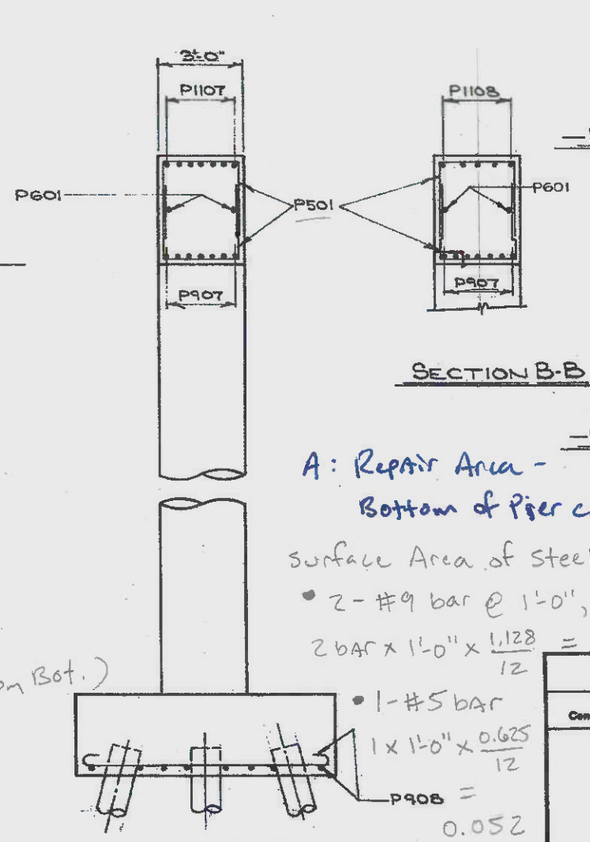


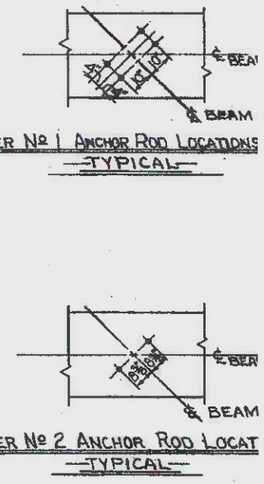
KEY PLAN - PIERS #1 & #2



PARTIAL ELEVATION PIERS #1 & #2 ~ SECTION #1 (AS SHOWN)

PARTIAL ELEVATION PIERS 1 & 2 ~ SECTION #4 (SIMILAR EXCEPT OPPOSITE HD)





A: Repair Area - Bottom of Pier cap.

Surface Area of Steel in ft² Box:

- 2 - #9 bar @ 1'-0", 1.128" dia.

2 bar × 1'-0" × 1.128/12 = 0.188

- 1 - #5 bar

1 × 1'-0" × 0.625/12 = 0.052

Σ = 0.188 + 0.052 = 0.24

STATE OF OHIO
DEPARTMENT OF HIGHWAYS
BUREAU OF BRIDGES

BEISWENGER, HOCH & ARNOLD
Consulting Engineers — Akron

PIERS 1 & 2 DETAILS

BRIDGE № SUM-277-0259
OVER WATERLOO ROAD
I-277 — SUMMIT CO
STA 119+91.47 TO STA 122+11.8

DESIGNED	DRAWN	TRACED	CHECKED	REVIEWED	DATE
JP	JWW		CLS	RDN	3-18-65

SUM-277-2.890

FED. RD.	STATE	PROJECT	
2	OHIO		

SUM-277-0.46

Surface Area of Steel with ft^2 Box

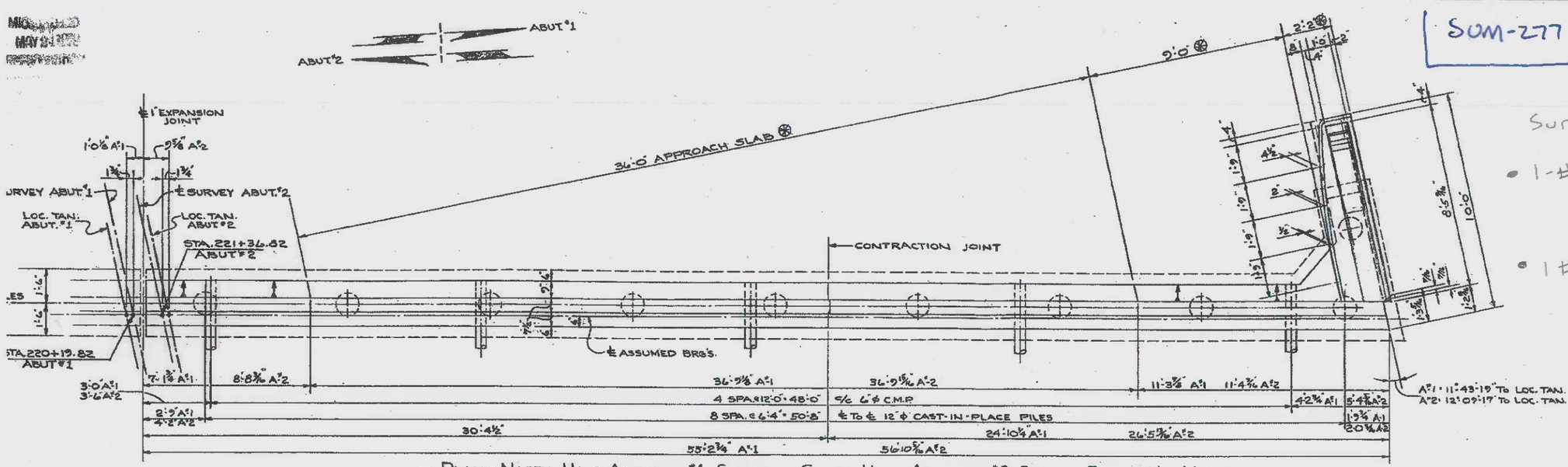
- 1-#10 Bar @ 1'-0" Length, 1.27" Dia

$$1\,Bar \times 1'\text{-}0'' \times \frac{1.27}{12} = 0.106$$

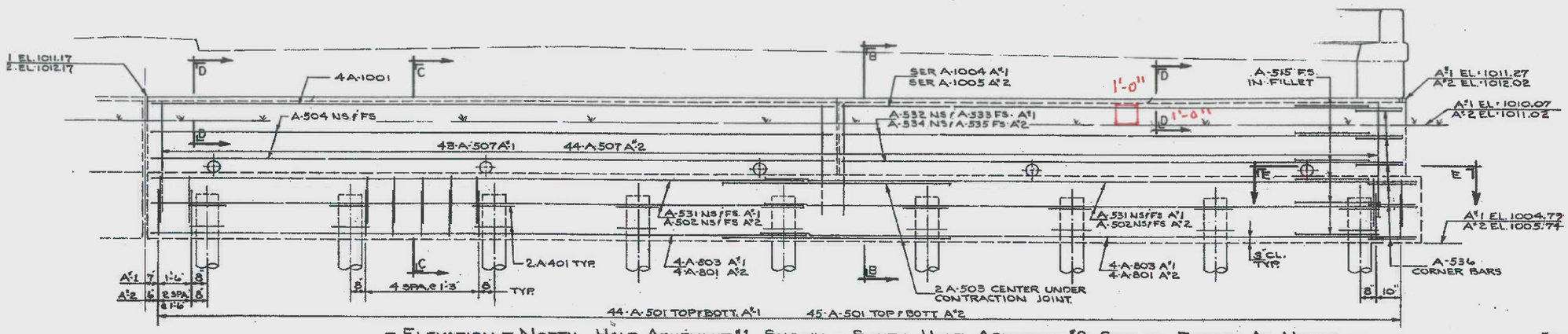
- 1 #5 bar @ 1'-0" Length, 0.625" Dia

$$1\,Bar \times 1'\text{-}0'' \times \frac{0.625}{12} = 0.053$$

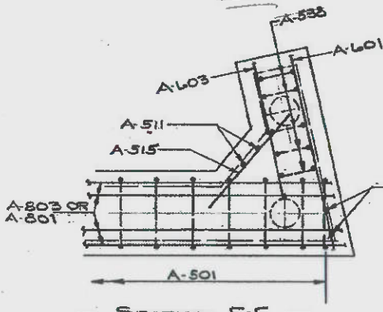
$$\Sigma_{Steel\ Density} = 0.106 + 0.053 = 0.159$$



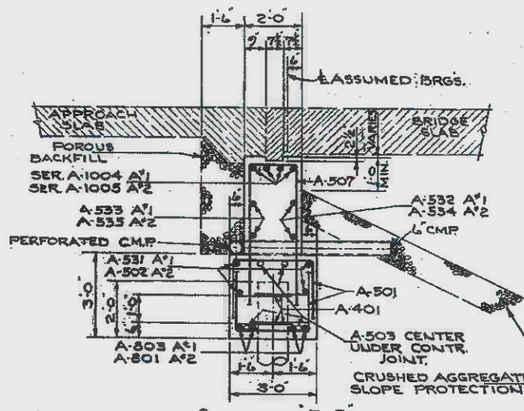
— PLAN — NORTH HALF ABUTMENT°1 SHOWN — SOUTH HALF ABUTMENT°2 SIMILAR EXCEPT AS NOTED. —



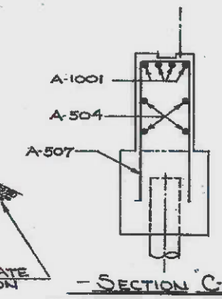
— ELEVATION — NORTH HALF ABUTMENT°1 SHOWN — SOUTH HALF ABUTMENT°2 SIMILAR EXCEPT AS NOTED. —



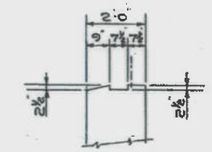
— SECTION E-E —



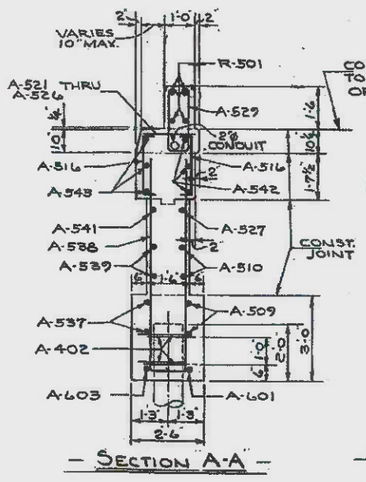
— SECTION B-B —



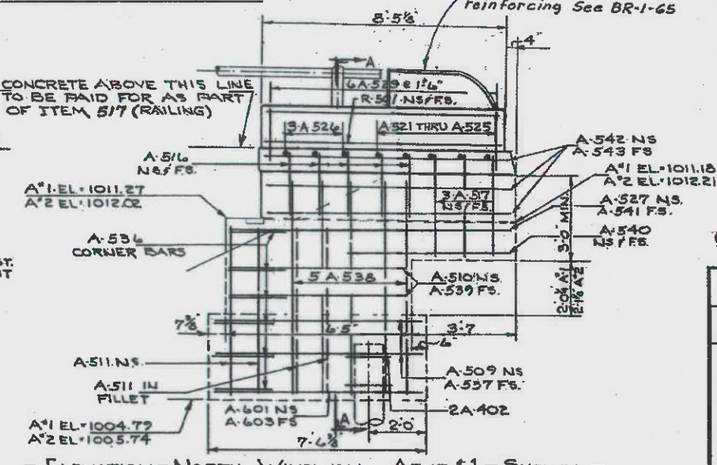
— SECTION C-C —
SEE SECTION B-B FOR DETAILS, DIMENSIONS AND REINF. STEEL NOT SHOWN



— SECTION D-D —
SEE SECTION B-B & C-C FOR DETAILS NOT SHOWN



— SECTION A-A —



— ELEVATION — NORTH WINGWALL ABUT.°1 — SHOWN —
— SOUTH WINGWALL — ABUT.°2 — SIMILAR — EXCEPT AS NOTED —

POROUS BACKFILL SHALL EXTEND UPWARD TO THE APPROACH SLAB AND TO THE SURFACE OF THE EARTH SHOULDERS AND OUTWARD TO WINGWALLS. EXCAVATION THEREFORE, IN EXCESS OF THAT REQUIRED FOR CONSTRUCTION OF THE ABUTMENTS, SHALL BE CONSIDERED AS PAID FOR IN THE BID PRICE PER CU. YD. PAID FOR POROUS BACKFILL.

⊛ DENOTES RADIAL DIMENSION

STATE OF OHIO
DEPARTMENT OF HIGHWAYS
BUREAU OF BRIDGES

BEISWENGER, HOCH & ARNOLD
Consulting Engineers — Akron

ABUTMENT DETAILS

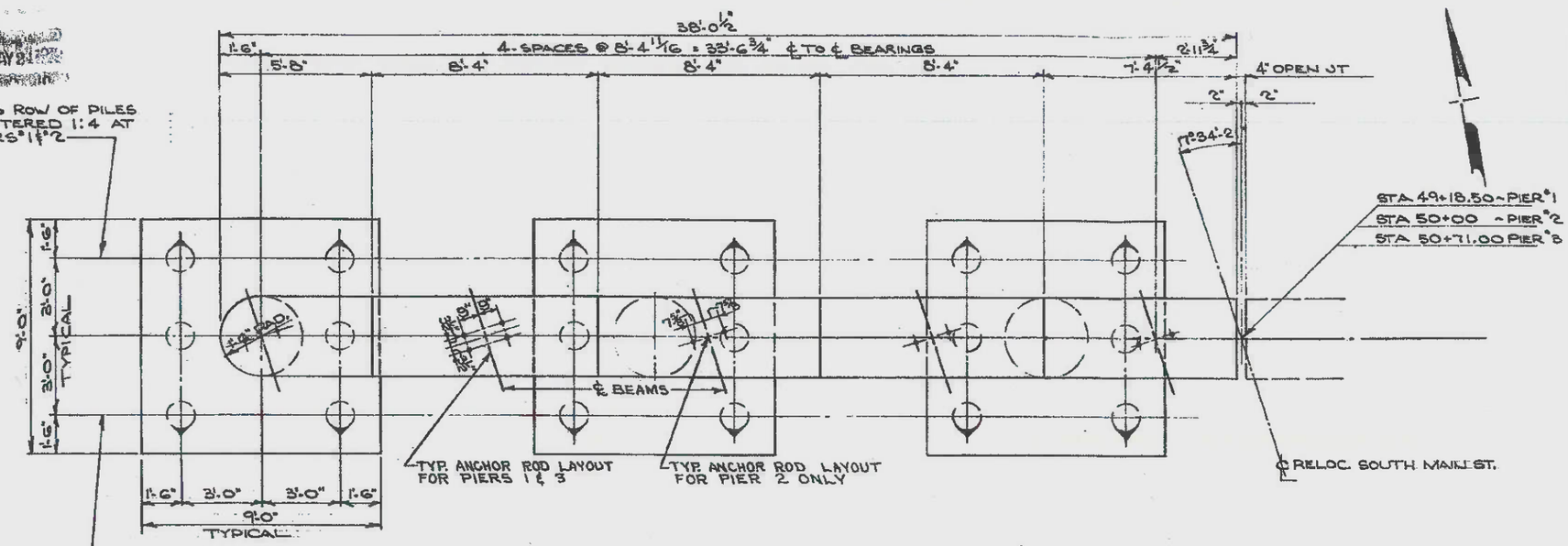
BRIDGE NO. SUM.-277-0071
OVER GLENMOUNT AVE.
I-277 SUMMIT COU
STA. 220+19.05 To STA. 221+37.

DESIGNED	DRAWN	TRACED	CHECKED	REVIEWED	DATE
R.D.H.	J.F.		7/16/64	R.D.H.	5-13-65

Sum-277-2.341

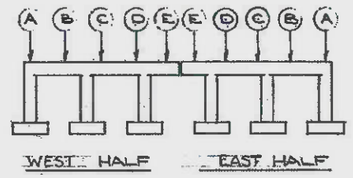
FED. RD.	STATE	PROJECT	
2	OHIO		

SUM 277 -0.46



PARTIAL PLAN PIERS 1, 2, & 3 ~ WEST HALF (AS SHOWN)

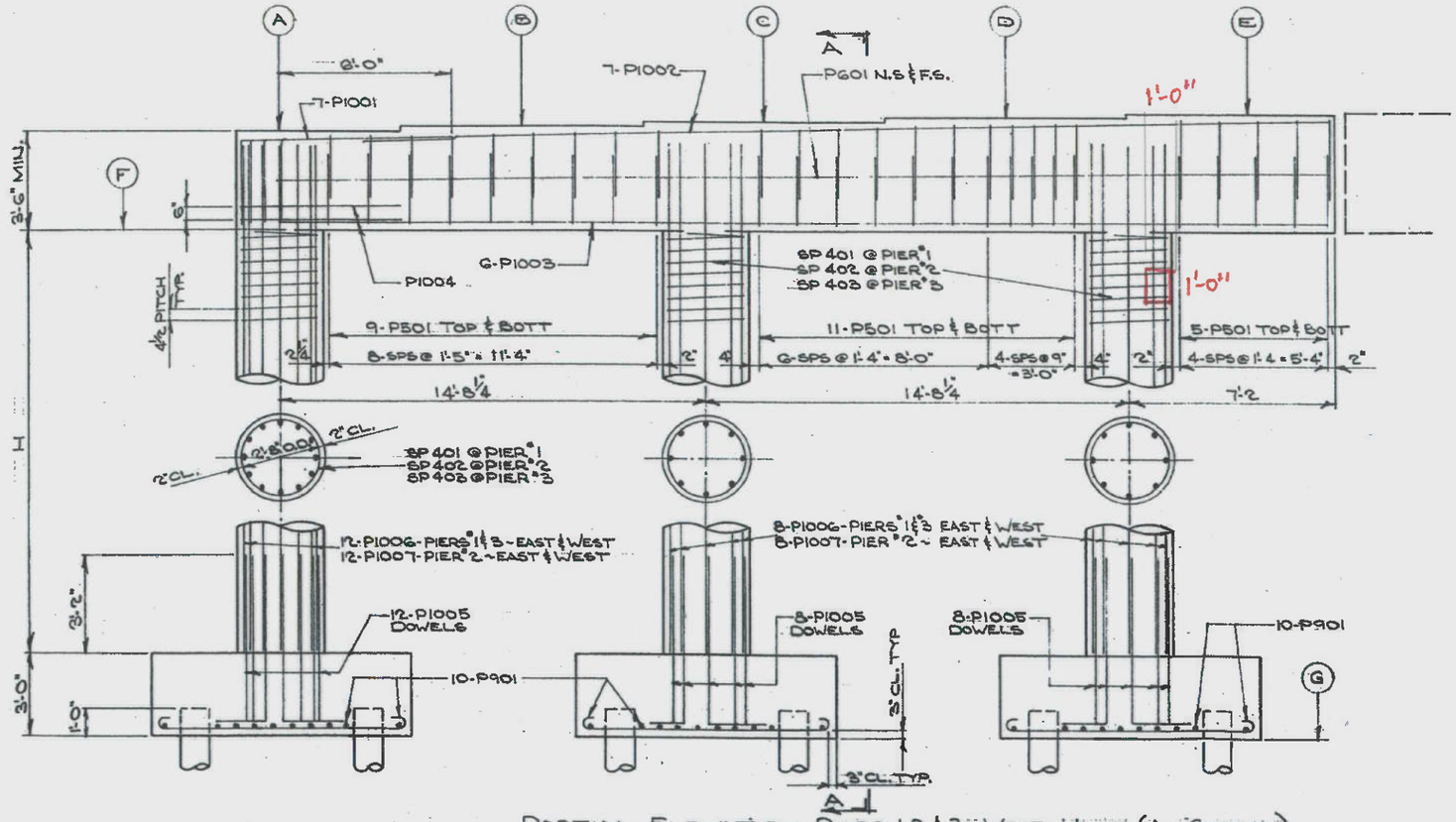
PARTIAL PLAN PIERS 1, 2, & 3 ~ EAST HALF (OPPOSITE HAND EXCEPT FOR SKEW)



KEY PLAN

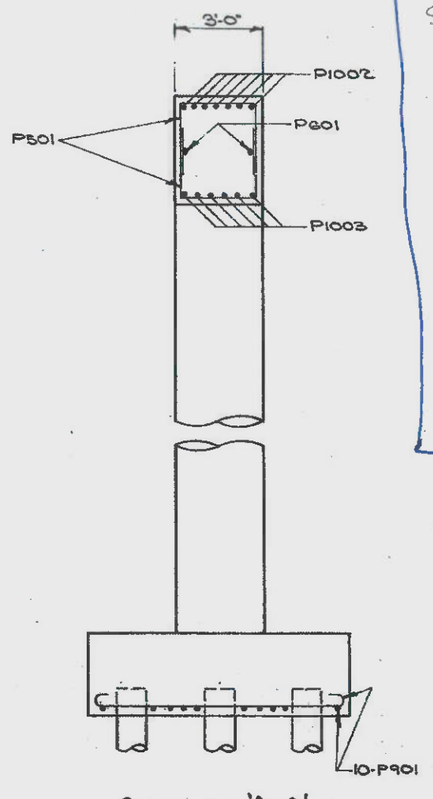
ELEVATION TABLE

	A	B	C	D	E	F	G	H
PIER #1 WEST HALF	1008.68	1008.83	1008.98	1009.13	1009.27	1005.18	986.00	16'-
PIER #1 EAST HALF	1008.88	1008.98	1009.08	1009.19	1009.29	1005.18	986.00	16'-
PIER #2 WEST HALF	1007.65	1007.80	1007.95	1008.10	1008.25	1004.15	986.75	14'-
PIER #2 EAST HALF	1007.85	1007.96	1008.06	1008.16	1008.27	1004.15	986.75	14'-
PIER #3 WEST HALF	1006.99	1007.15	1007.32	1007.49	1007.66	1003.49	984.25	16'-
PIER #3 EAST HALF	1007.35	1007.44	1007.52	1007.60	1007.69	1003.49	984.25	16'-



PARTIAL ELEVATION PIERS 1, 2, & 3 ~ WEST HALF (AS SHOWN)

PARTIAL ELEVATION PIERS 1, 2, & 3 ~ EAST HALF (OPPOSITE HAND)



SECTION 'A-A'

Surface Area of steel within ft² Box :

- 3-#4 bar @ 1'-0" Length, 0.50" dia

3 bar × 1'-0" × $\frac{0.50}{12}$ = 0.125

- 2-#10 bar @ 1'-0" Length, 1.27" dia

2 bar × 1'-0" × $\frac{1.27}{12}$ = 0.212

$\Sigma_{\text{steel density}}$ = 0.125 + 0.212

= 0.337

STATE OF OHIO
DEPARTMENT OF HIGHWAYS
BUREAU OF BRIDGES

BEISWENGER, HOCH & ARNOL
Consulting Engineers

PIERS 1, 2 & 3

BRIDGE Nº SUM-277-0131

UNDER RELOC. SOUTH MAIN

I-277 SUMMI

STA 189+66.35

DESIGNED	DRAWN	TRACED	CHECKED	REVIEWED
JFP	JWW		CLS	LDH 9-1

OHIO DEPARTMENT OF TRANSPORTATION

PLANNING & ENGINEERING DEPARTMENT, DISTRICT 4

Project _____ Calc By CLG Date 2/13/24

Desc Bridge Repair Calculations Chk By MJA Date 3/22/24

PID/PROJ 113086

ITEM 844, CONCRETE PATCHING WITH GALVANIC ANODE PROTECTION: ANODE SPACING

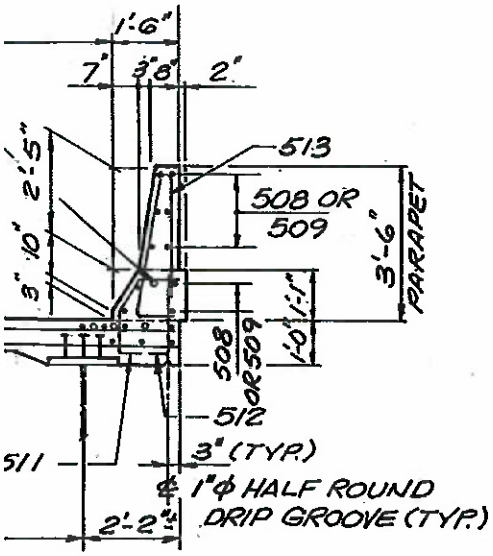
SUM-76-5.910

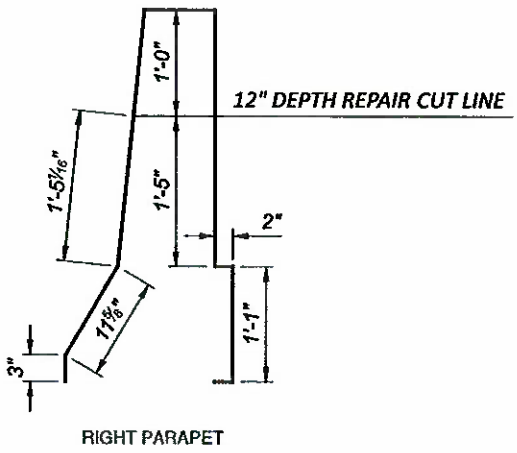
* Estimated percentage of surface area that will need patching.

Knowns:

1. Patch area will be on right parapet.
2. Repair length is 248' (Detail A in the plans) and 129' (Detail B in the plans).
3. For detail A repair, assume patching 25% of the total surface area.
3. For detail B repair, assume patching 100% of the total surface area.

Calculation:





RIGHT PARAPET

Right parapet perimeter below cut line = $3" + (11\frac{5}{8}") + (1'-5\frac{5}{16}") + (1'-5") + (2") + (1'-1")$

$= 5.03$ ft.

Detail A Surface Area = $248' \times 5.31' = 1{,}316.88$ SF $\times (0.25)^{*} \approx 330$ SF

Detail B surface Area = $129' \times 5.31' = 684.99$ SF $\times (1.00)^{*} \approx 685$ SF

$\Sigma = 1{,}015$ SF

⇒ give a little more quantity, bump to an even 1,020 SF

Project _____ Calc By CLB Date 3/6/24

Desc Bridge Repair Calculations Chk By MJA Date 3/22/24

PID/PROJ 113086

ITEM 509, CONCRETE REINFORCEMENT, REPLACEMENT OF EXISTING CONCRETE REINFORCEMENT USED ON STRUCTURE SUM-76-5.790 FOR THE TYPE C SLEEPER SLAB REPAIR

Calculations:

The repair length ≈ 4'-0" for Item 526 - Approach Slabs, Misc.: Type C Sleeper Slab Repair.

=> Total of 4-#5 straight bars may need replaced at 4'-0" ±. Add additional 2'-0" contingency length.

=> Weight of Steel = (4 bar) × (6 ft) × (1.043 lb/ft)

≈ 25 lb