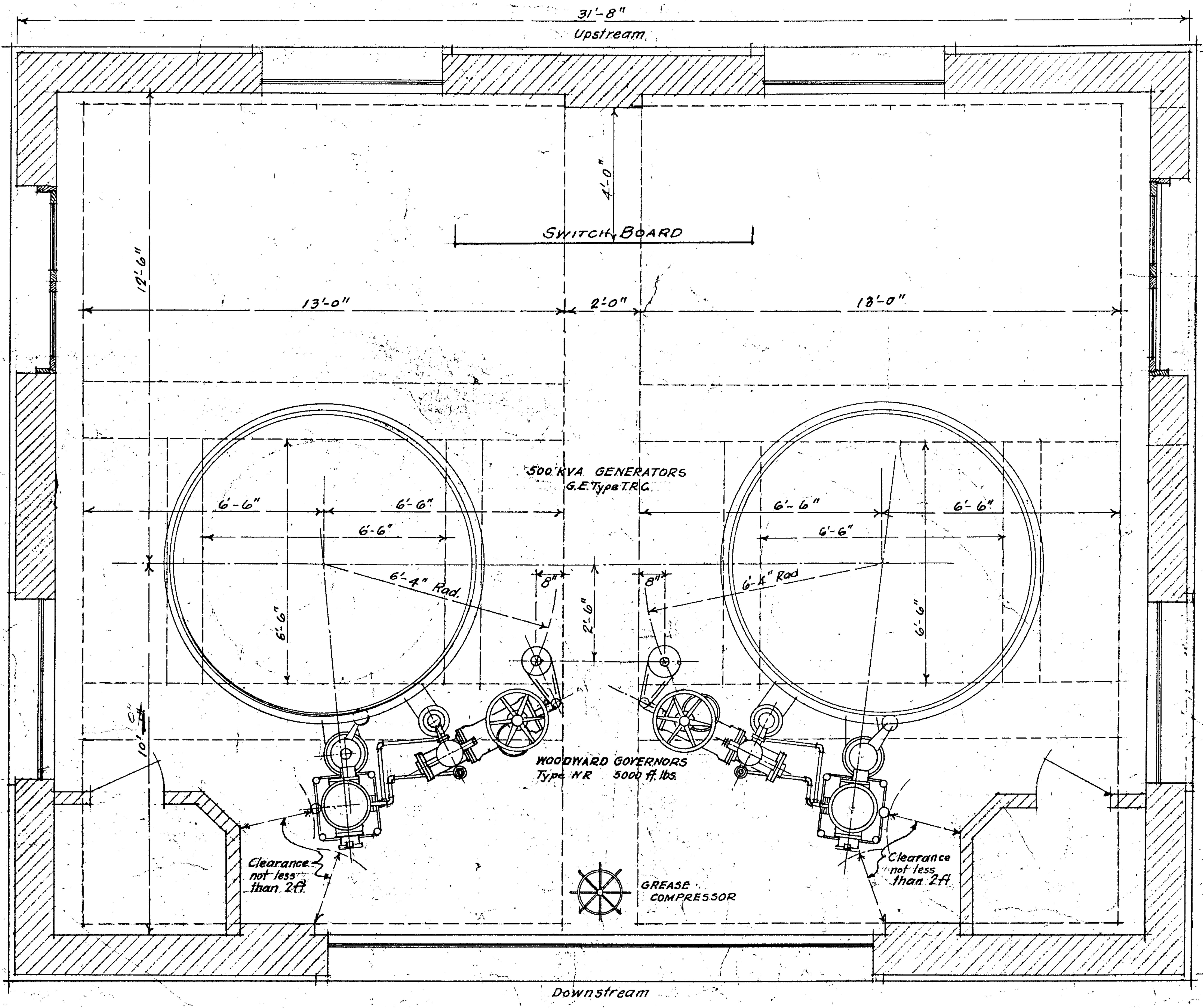
Appendix D – Historic Soil Borings and Construction Plans

ATTACHMENT A

BROWN BRIDGE DAM RECORD DRAWINGS

H4984A

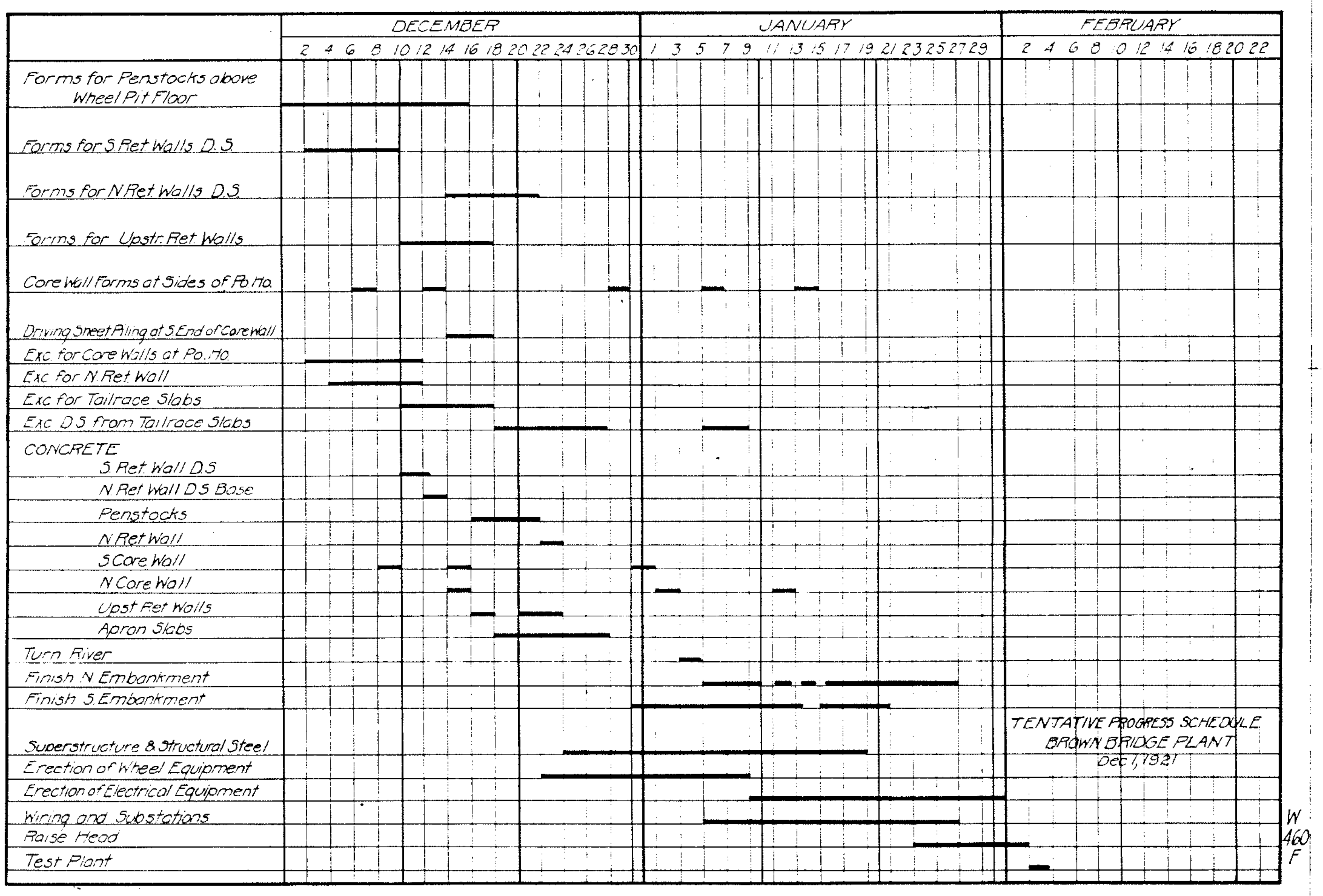


GENERATOR FLOOR PLAN

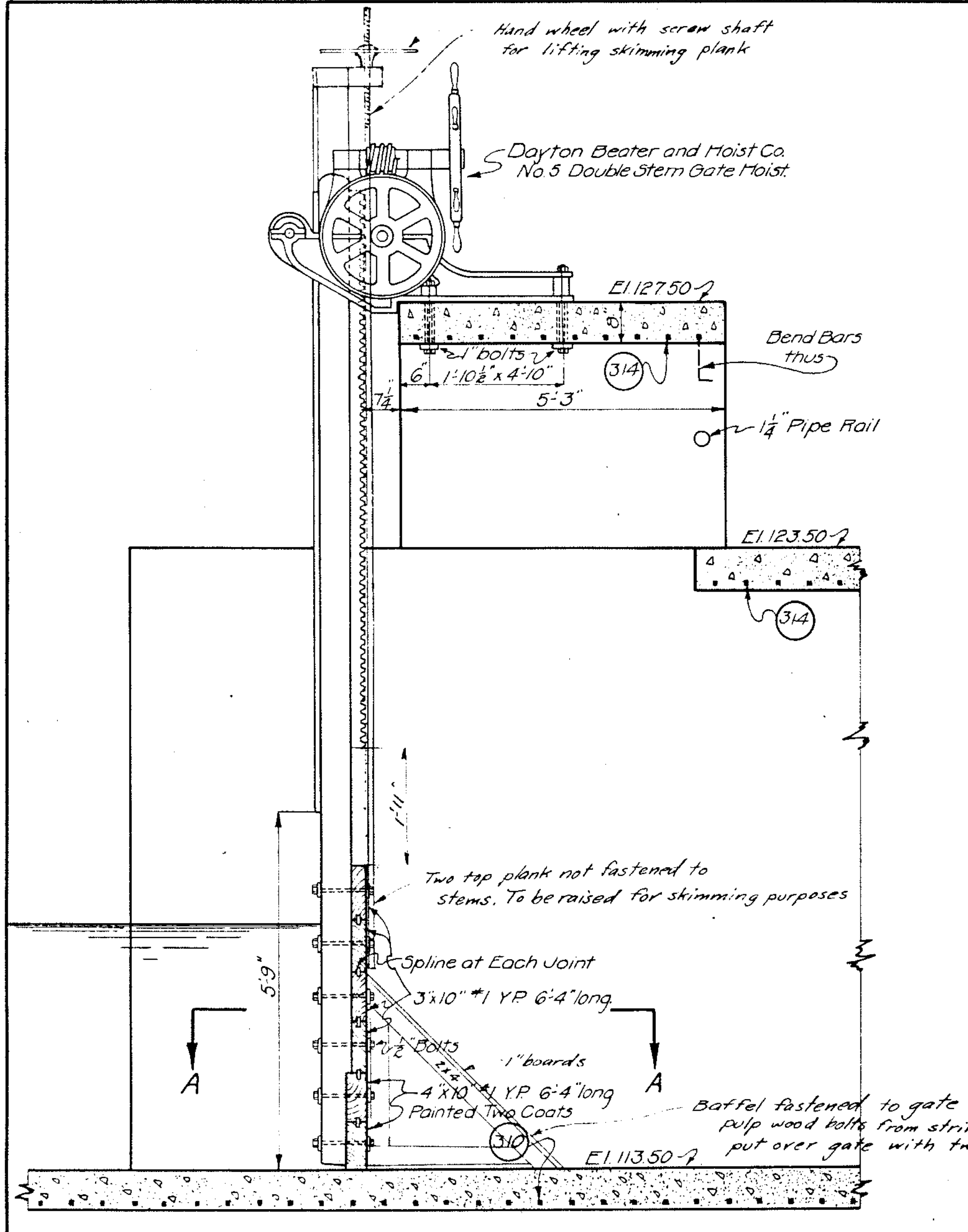
PROPOSED MACHINERY LAYOUT
PLANS FOR
BROWNS BRIDGE
HYDRO - ELECTRIC PLANT
ON THE BOARDMAN RIVER
FOR THE
CITY OF TRAVERSE CITY
MICHIGAN.

FARGO
ENGINEERING
COMPANY
JACKSON, MICH.

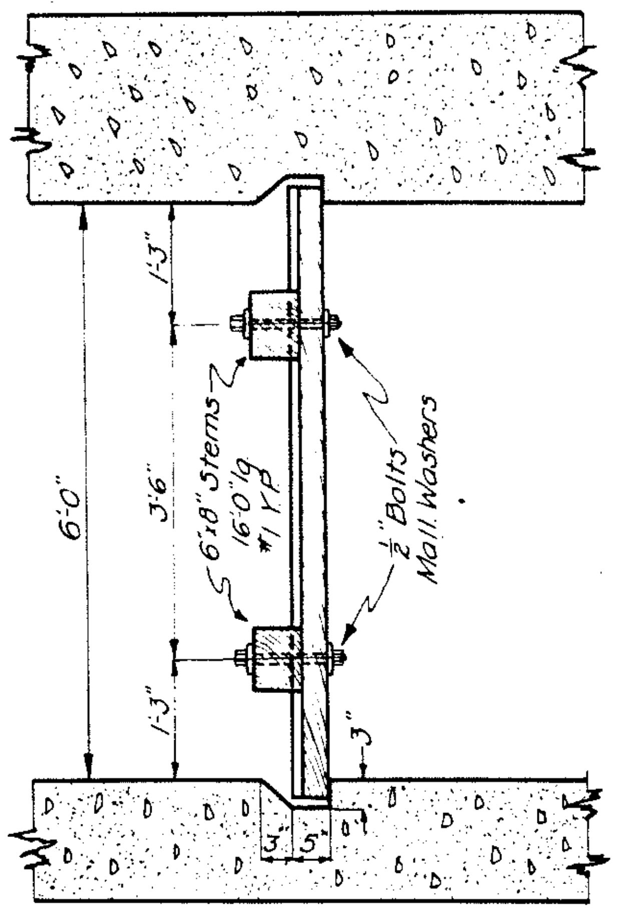
SCALE: $\frac{1}{2}$" = 1 FT.



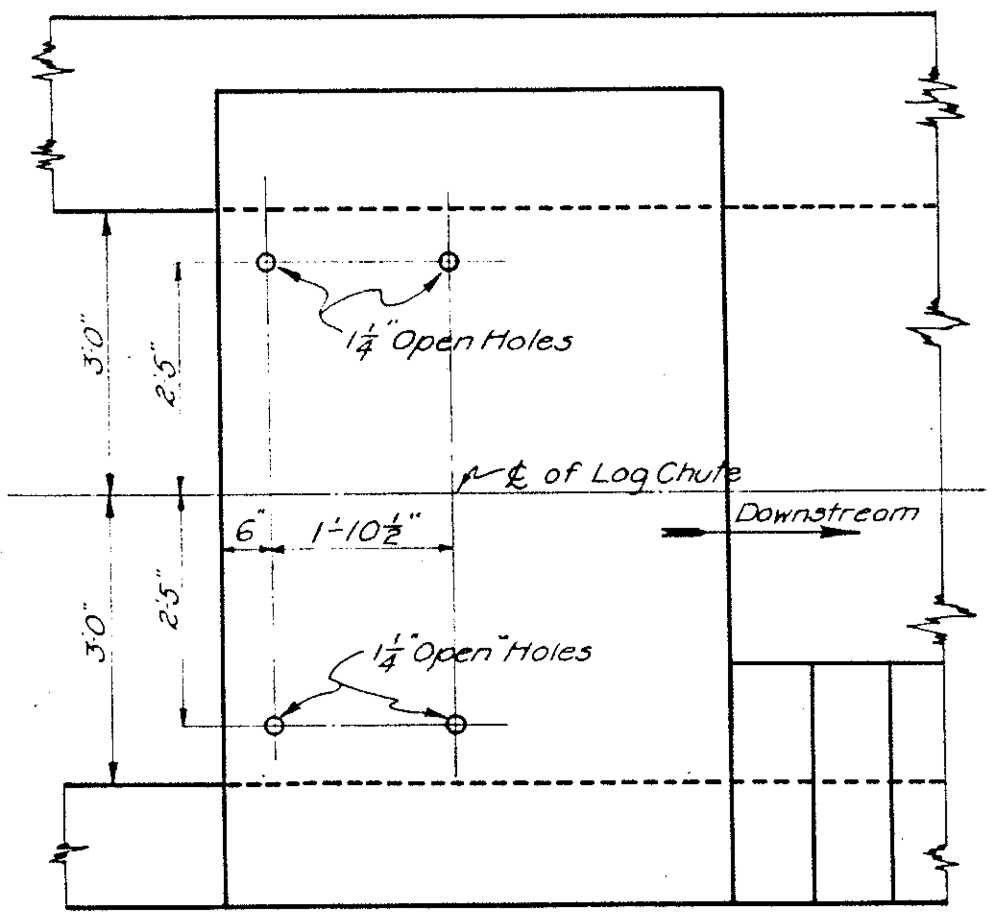
TENTATIVE PROGRESS SCHEDULE
BROWN BRIDGE PLANT
Oct 1, 1921



SECTION AT CENTER OF GATE



SECTIONAL PLAN A-A



PLAN OF BOLT SETTING

DETAILS OF
LOG CHUTE GATE AND HOIST
PLANS FOR
BROWN'S BRIDGE
HYDRO-ELECTRIC PLANT
ON THE BOARDMAN RIVER
FOR THE
CITY OF TRAVERSE CITY
MICHIGAN

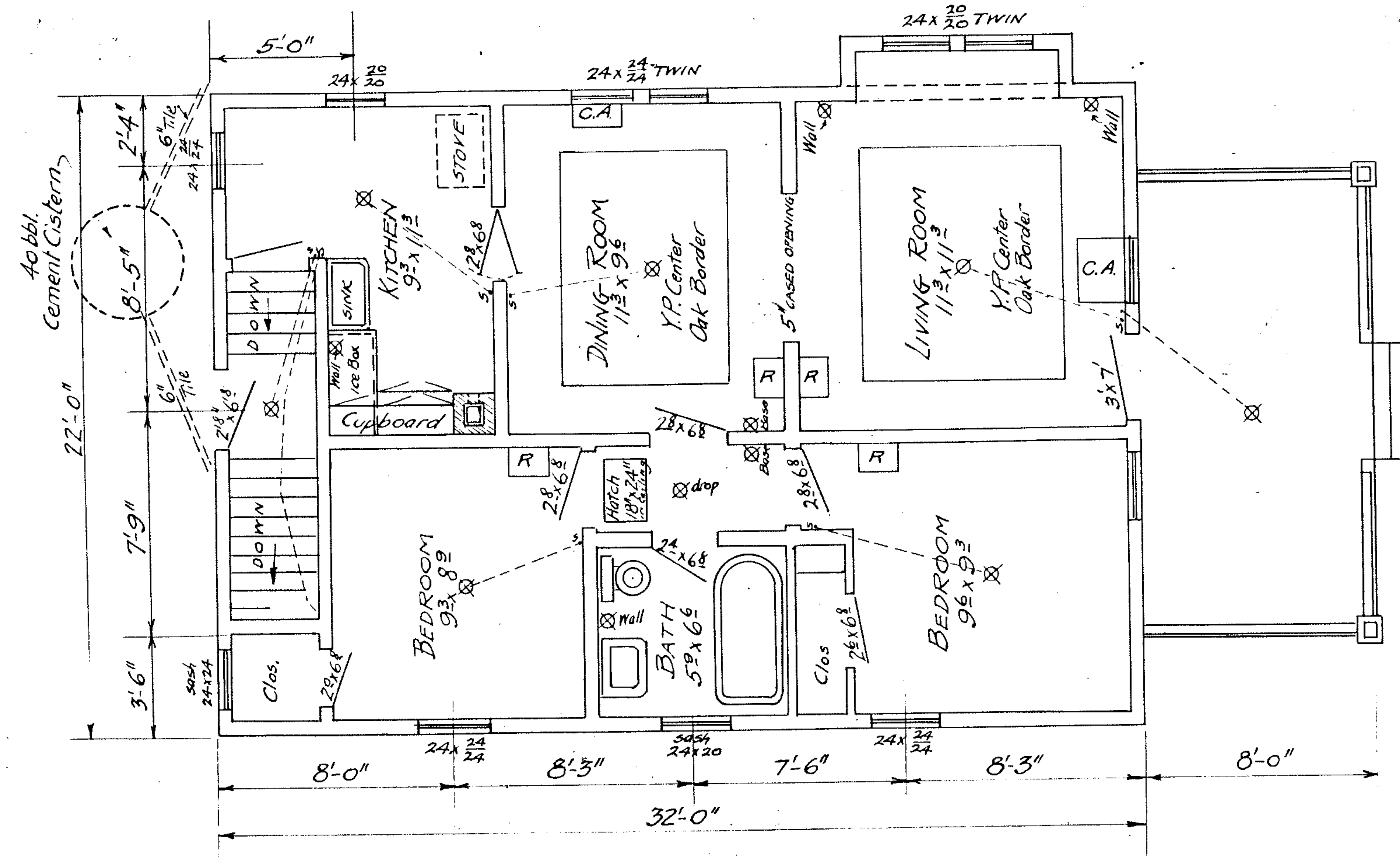
Nov. 30, 1921
9-21-22

FARGO
ENGINEERING
COMPANY
Jackson, Mich

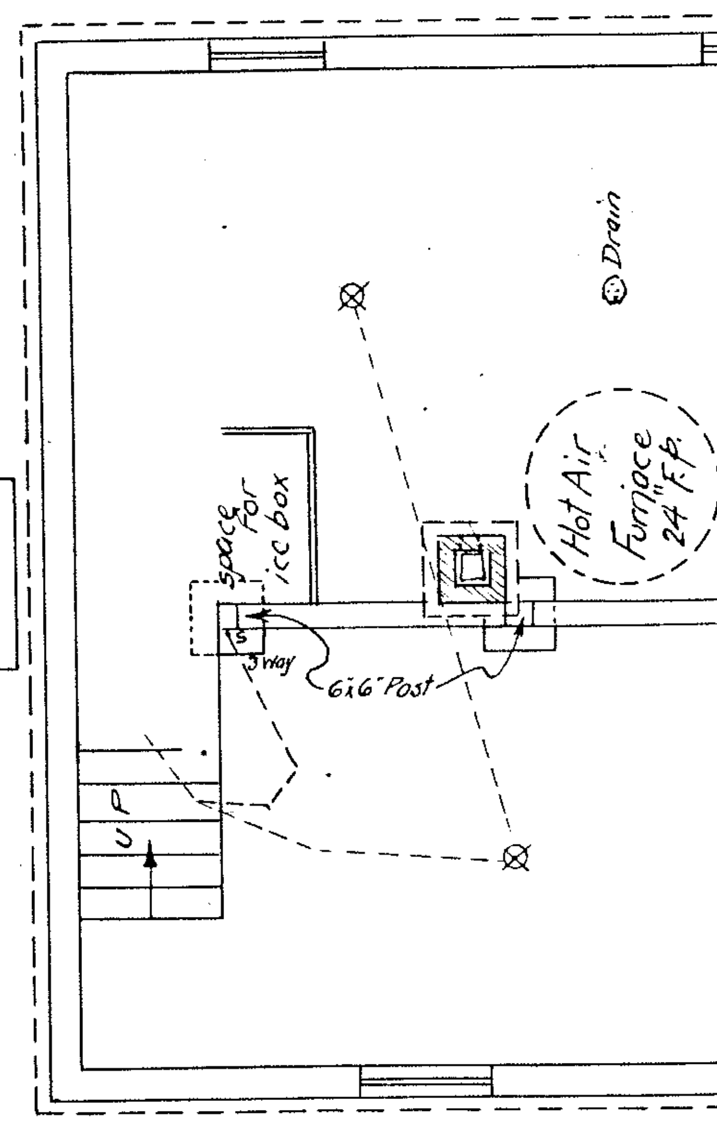
Scale ½" = 1 Ft.

Burd and Giffels, Associate Engineers
Grand Rapids, Mich

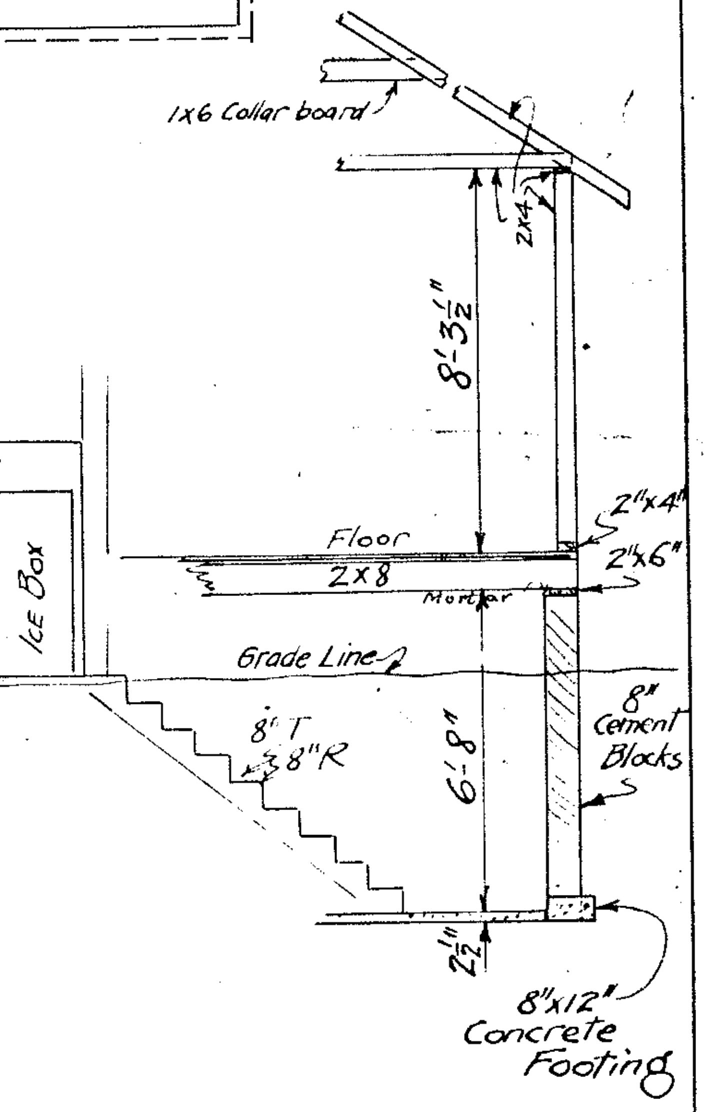
L4983L



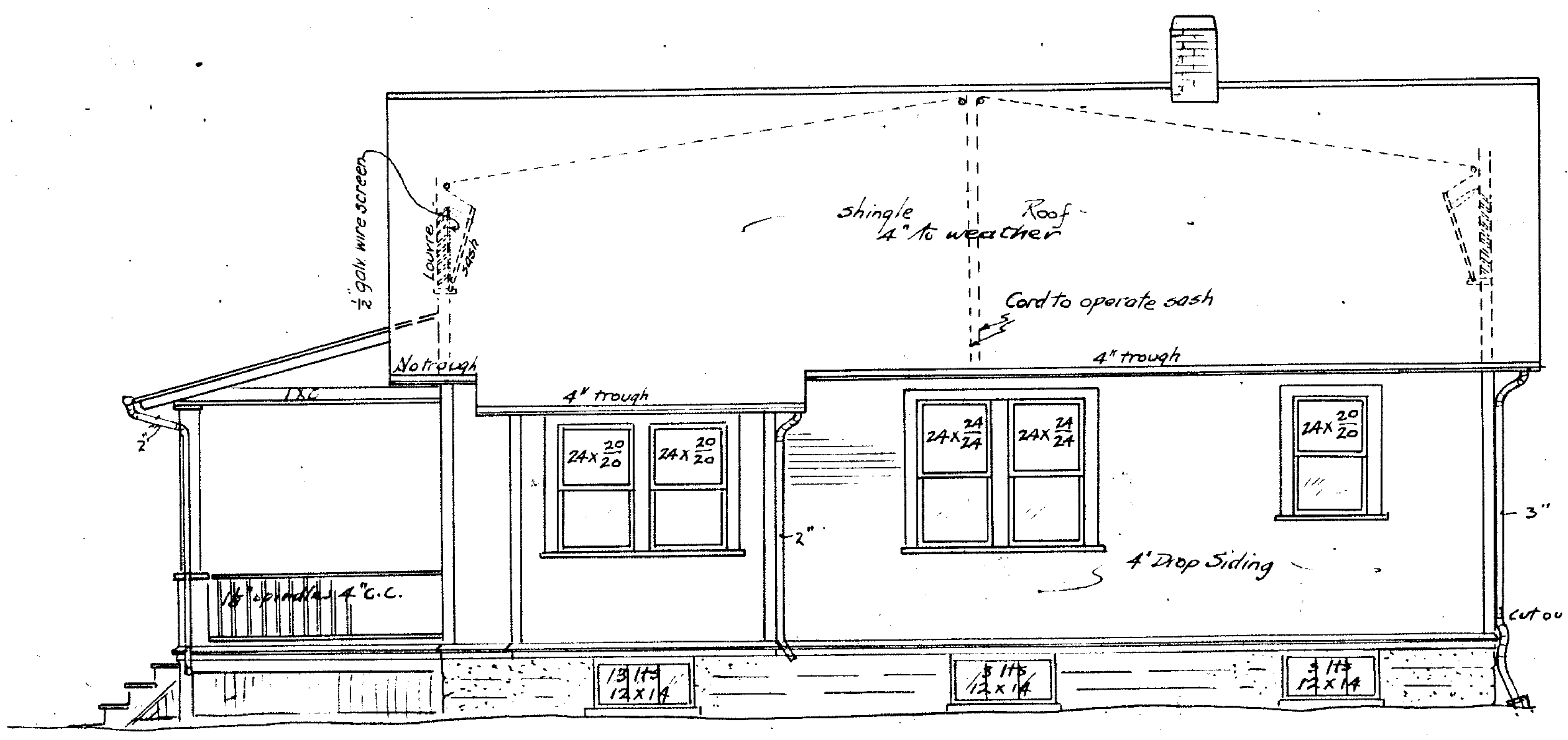
FLOOR PLAN



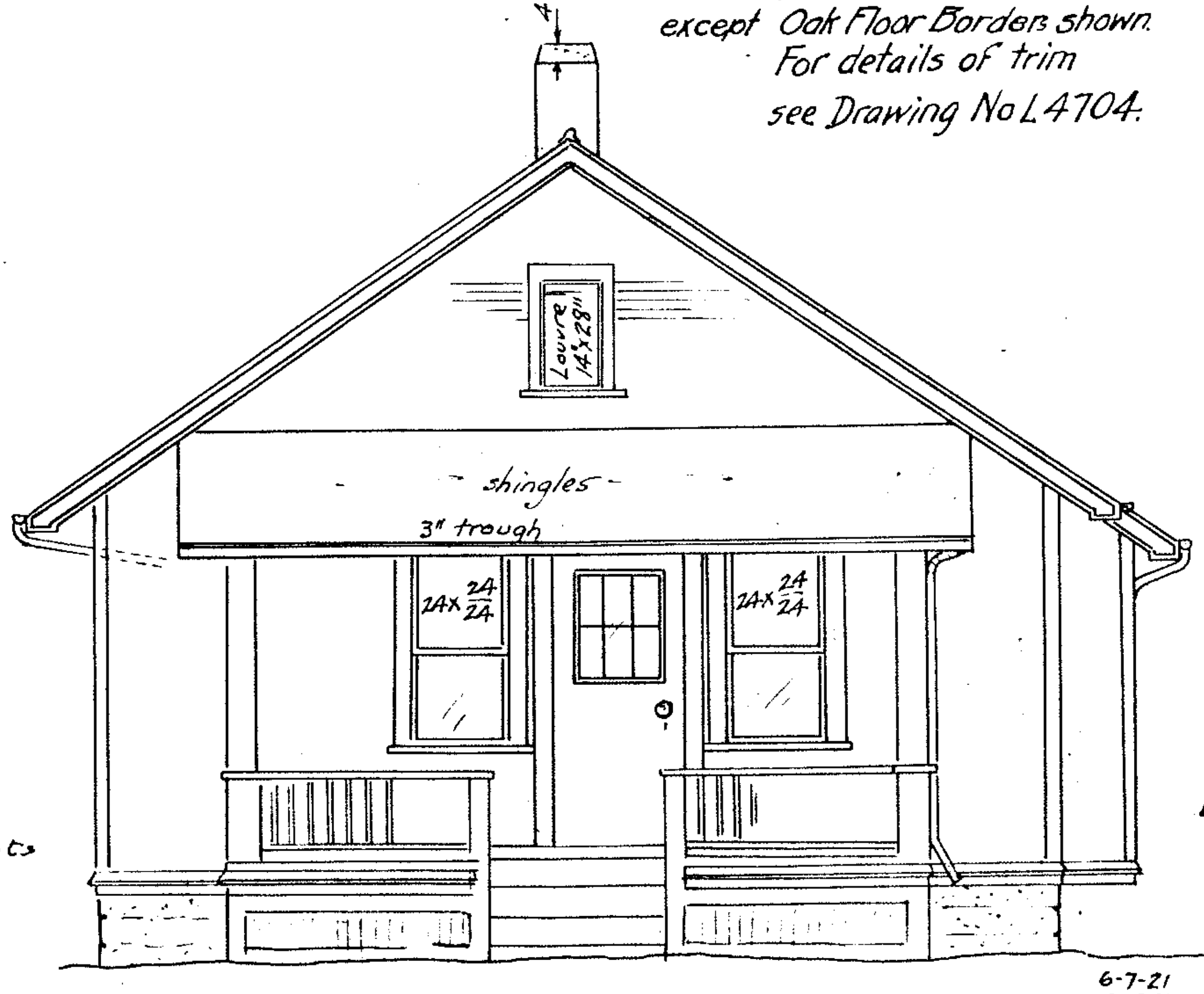
BASEMENT PLAN.



All trim to be No1 Yellow Pine except Oak Floor Borders shown. For details of trim see Drawing No L4704.



RIGHT SIDE ELEVATION.



FRONT ELEVATION

6-7-21
6-17-21

PLANS FOR
OPERATORS COTTAGE
2 REQUIRED AT
BROWN BRIDGE DAM [illegible]
NEAR TRAVE[illegible]
MIC[illegible]

W
460
F

Scale: 1/4"=1'-0"

Fargo
Engineering
Company,
Jackson, Mich.

H497

B.M. on 4" Black cherry, approximately on ℄ of Dam, east bank, 30' from river. Notch in root Elev. 100.00.

Underlined elevations on land and at B21 + B17 are clay surfaces reported by driller.
Underlined elevations in river are river bottom.
All water surface elevations taken May 10, 1921
Surveyed by W.B.R. May 10, 1921.

BURD & GIFFELS
Associate Engineers,
Grand Rapids, Mich.

9-20-22
5/13/21
7/30/21

TOPOGRAPHY AT DAMSITE

PLANS FOR

BROWN'S BRIDGE HYDRO-ELECTRIC PLANT

ON THE BOARDMAN RIVER
FOR THE
CITY OF TRAVERSE CITY
MICHIGAN

FARGO ENGINEERING COMPANY
Jackson, Mich

Scale 1" = 40'

4978

W 460 F

Chkd July 30 - 1921 J.S.B.

4978

BAR LIST - CORE WALL

Item No	Location	No Reqd	Size	Length
151	8 ft. Wall Vert.	1550	3/8"	7'-6"
152	" " Horiz.	504	"	30'-0"
153	High Wall - Vert.	140	"	24'-0"
154	" " Horiz.	140	"	20'-0"

DOWNSTREAM WING WALL SECTIONS
SCALE: 1/4" = 1'-0"

SECTION A-A
FOR PLAN SEE THIS SHEET

SECTION C-C
FOR PLAN SEE THIS SHEET

SECTION B-B
FOR PLAN SEE THIS SHEET

SECTION D-D
FOR PLAN SEE THIS SHEET

BEND "A"

PLAN OF DOWNSTREAM APRON
Scale 1/8" = 1 Ft.

TYPICAL SECTION ACROSS STREAM

SECTION G-G
FOR PLAN SEE THIS SHEET
SCALE: 1/4" - 1'-0"

PLAN OF DOWNSTREAM WING WALLS
SCALE 1/8" = 1'-0"

PLAN OF UPSTREAM WING WALLS
SCALE 1/8" - 1'-0"

SECTION E-E
FOR PLAN SEE THIS SHEET

END ELEVATION F-F
FOR PLAN SEE THIS SHEET

UPSTREAM WING WALL SECTIONS
SCALE 1/4" = 1'-0"

BAR LIST WING WALLS

NO REQ'D ARE FOR BOTH WALLS

ITEM No	LOCATION	SIZE	LENGTH	NO REQ'D	REMARKS	ITEM No	LOCATION	SIZE	LENGTH	NO REQ'D	REMARKS	ITEM No	LOCATION	SIZE	LENGTH	NO REQ'D	REMARKS
	DOWNSTREAM WING - WALLS					105	LONGITUDINAL	1/2"φ	15'-0"	4	"	129	VERTICAL 23'-0" LENGTH OF WALL	3/4"φ	6'-0"	28	WITH HOOK
82	BOTTOM FOOTING 35' WALL	3/4"φ	13'-0"	28		106	"	"	19'-0"	10		130	"	"	3'-0"	28	"
83	"	"	16'-0"	20		107	"	"	8'-6"	6			UPSTREAM WING WALLS				
84	"	"	14'6	6		108	VERTICAL 9'-0" LENGTH OF WALL	1"φ	11'-0	18	WITH HOOK	132	TOP OF HEEL	1"φ	10'-0	32	WITH HOOK
85	30' WALL	"	10'0"	10		109	"	"	25'-0"	18	"	133	"	"	11'-0	32	"
86	"	"	13'6	6		110	"	"	22'-0"	6	"	134	"	"	11'-6	26	"
87	"	"	12'-0"	4		111	"	"	20'-6"	6	"	135	BOTTOM FOOTING	3/4"φ	12'-0"	26	
88	23' WALL	"	8'-0	14		112	"	"	19'-0"	6	"	136	"	"	9'-0"	24	
						112a	"	3/4"φ	19'-0"	18	"						
89	"	"	11'-0"	6		113	"	1/2"φ	12'-0	10		137	"	"	13'-0"	22	
90	"	"	9'-6"	8		114	"	"	8'-0"	4		138	"	"	10'-0"	20	
91	28' WALL	"	5'-6"	10		115	VERTICAL 5'-3" LENGTH OF WALL	1"φ	15'-0"	10	WITH HOOK	139	"	"	14'-0"	14	
92	"	"	9'-0	4		116	"	3/4"φ	19'-0"	10	"	140	"	"	11'-0	14	
93	"	"	7'-6"	6		117	"	"	29'0"	4	"	141	ANCHORS	1/2"φ	4'-0"	22	
94	13' WALL	"	6'0	40		118	"	"	27'-0"	4	"	142	LONGITUDINAL	1/2"φ	29'-0	8	
95	TOP & HEEL 35' WALL	1"φ	12'-6"	30	WITH HOOK	119		"	25'-0"	2	"	143	VERTICAL	1"φ	15'-0"	60	WITH HOOK
96	30' WALL	"	11'-0"	16	"	120	VERTICAL 8'-0" LENGTH OF WALL	"	9'-0"	16	"	144	"	3/4"φ	19'-0"	60	"
97	"	"	9'-6	12	"	121	"	"	14'-0"	10	"	145	"	"	26'-0"	14	"
98	23' WALL	"	8'-6"	18	"	122	"	"	23'-0"	8	"	146	"	"	27'-0"	12	"
99	20' WALL	3/4"φ	7'0"	26	"	123	"	"	21'-0"	8	"	147	"	"	28'-0	12	"
100	13' WALL	"	6'-0"	42	"	124	VERTICAL 3'-0" LENGTH OF WALL	"	7'-0"	16	"	148	"	"	29'-0	12	"
101	ANCHORS	1/2"φ	4'-0"	10		125	"	"	10'-0"	16	"	149	"	"	30'-0	10	"
102	LONGITUDINAL	3/4"φ	24'-0"	2		126	"	"	16'-0"	8	"	150	LONGITUDINAL	"	29'-0	2	
103	"	1/2"φ	20'-0	8		127	"	"	18'-0"	8	"						
104	"	"	17'-0"	2													

APRON BAR LIST

ITEM No	LOCATION	No REQ'D	SIZE	LENGTH
	2 SLABS "A"			
15	TOP ACROSS STR.	4	1/2"φ	5'-0"
16	" "	2	"	7'-8
17	" "	4	"	9'-0
17a	" "	4	"	11'-6
18	" UP & DOWNSTR.	8	"	12'6
19	" " "	4	"	10'-0
20	" " "	4	"	6'-0
20a	" " "	2	"	4'-0"
21	BOTTOM ACCROSS STREAM.	2	"	5'-0"
22	" "	4	"	7'-0"
23	" "	4	"	9'-0"
24	" "	6	"	12'-6
25	" UP & DOWNSTR.	8	"	12'-6"
26	" "	4	"	10'-0"
27	" "	4	"	6'-0"
28	" "	2	"	4'-0"
29	DIAG. BENT. ACR. STR.	2	1/4 x 1/8	12'0
29a	"	2	"	11'-0
30	"	2	"	9'-0
30a	"	2	"	7'-0
31	" " UP & DOWNSTR.	2	"	15'-6"
31a	" " "	2	"	13'-6
32	" " "	2	"	11'-6
32a	" " "	2	"	10'-6
	2 SLABS "B"			
33	TOP ACROSS STR.	4	1/2"φ	13'-6"
34	" " "	4	"	16'-0"
35	" " "	4	"	18'-0"
36	" " "	2	"	20'-0"
37	" UP & DOWNSTR. BENT	22	"	19'-0
38	" " "	4	"	16'-6"
39	" " "	4	"	11'-6"
40	BOTTOM ACROSS STR.	2	"	14'-0"
41	" "	4	"	15'-6"
42	" "	4	"	17'-6"
43	" "	4	"	20'-0"
44	" UP & DOWNSTR.	22	"	12'-6"
45	" "	4	"	10'-0"
46	" "	4	"	5'-0"
47	DIAG. BENT. ACROSS STR.	2	1/4 x 1/8	20'-0"
48	" "	2	"	18'-0"
49	" " "	2	"	16'-6"
49a	" " "	2	"	15'-0"
50	Diag's up & downstr.	6	"	18'-0"
51	" " "	6	"	14'-0"
52	" " "	2	"	13'-0"
	2 SLABS "C"			
53	TOP ACROSS STR.	14	1/2"φ	12'-6"
54	" UP & DOWNSTR.	22	"	12'-6"

APRON BAR LIST

ITEM No	LOCATION	No REQ'D	SIZE	LENGTH
	2 SLABS "C" CONT'D			
55	BOTTOM ACCROSS STR.	16	1/2"φ	12'-6"
56	" UP & DOWNSTR.	22	"	12'-6"
57	DIAG. BENT. ACCROSS STR.	6	1/4 x 1/8	17'-0"
58	" "	4	"	15'-6"
59	" " UP & DOWNSTR.	6	"	16'-0"
60	" " "	4	"	14'-0"
	2 SLABS D			
61	TOP ACCROSS STR.	14	1/2"φ	12'-6"
62	" UP & DOWNSTR.	22	"	19'-0"
63	BOTTOM ACCROSS STR.	14	"	12'-6"
64	" UP & DOWNSTR.	22	"	12'-6"
65	DIAG. BENT ACCROSS STR.	6	1/4 x 1/8	17'-0"
66	" " "	4	"	15'-6
67	" " UP & DOWNSTR.	6	"	8'-0"
68	" " "	4	"	14'-0"
	2 SLABS "E"			
69	ACROSS STR. TOP & BOT.	8	3/4"φ	7'-6"
70	" "	6	"	9'-0"
71	" "	12	"	11'-0
72	" "	8	"	14'-0"
73	TOP UP & DOWNSTR.	16	"	19'-6"
74	" " "	4	"	10'-6"
75	" " "	4	"	7'-0"
76	" " "	4	"	4'-6"
77	BOTTOM " "	12	"	14'-6
78	" " "	2	"	10'-0"
79	" " "	2	"	7'-0"
80	" " "	2	"	4'-6"
81	ANCHORS BETW. SLABS (BENT)	64	1"φ	5'-0"
	SPLICE CLIPS	54		

DOWNSTREAM APRON
EMBANKMENT WALLS

PLANS FOR
BROWN'S BRIDGE
HYDRO-ELECTRIC PLANT
ON THE BOARDMAN RIVER
FOR THE
CITY OF TRAVERSE CITY
MICHIGAN

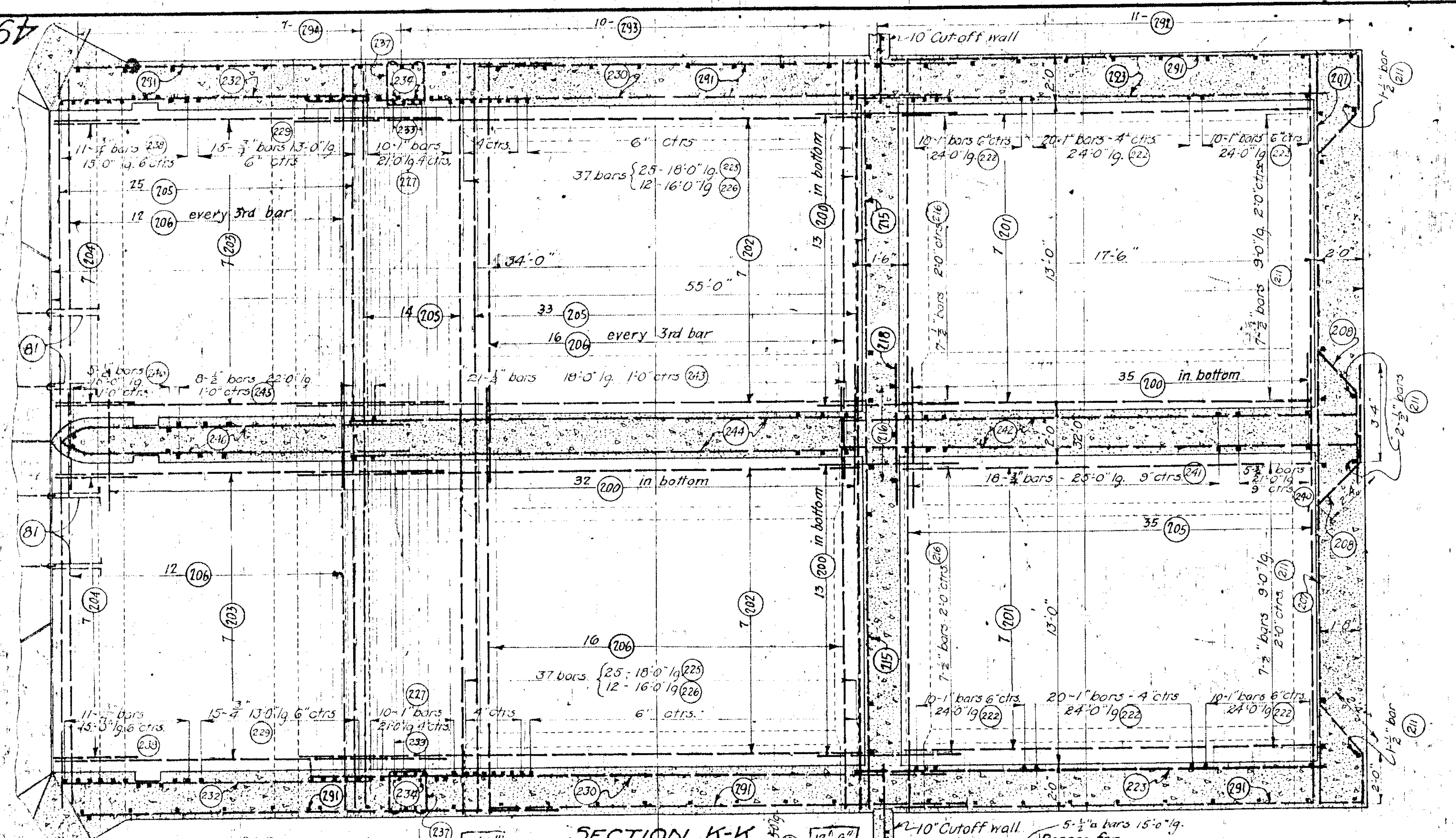
FARGO
ENGINEERING
COMPANY
JACKSON, MICH.

SCALE AS NOTED

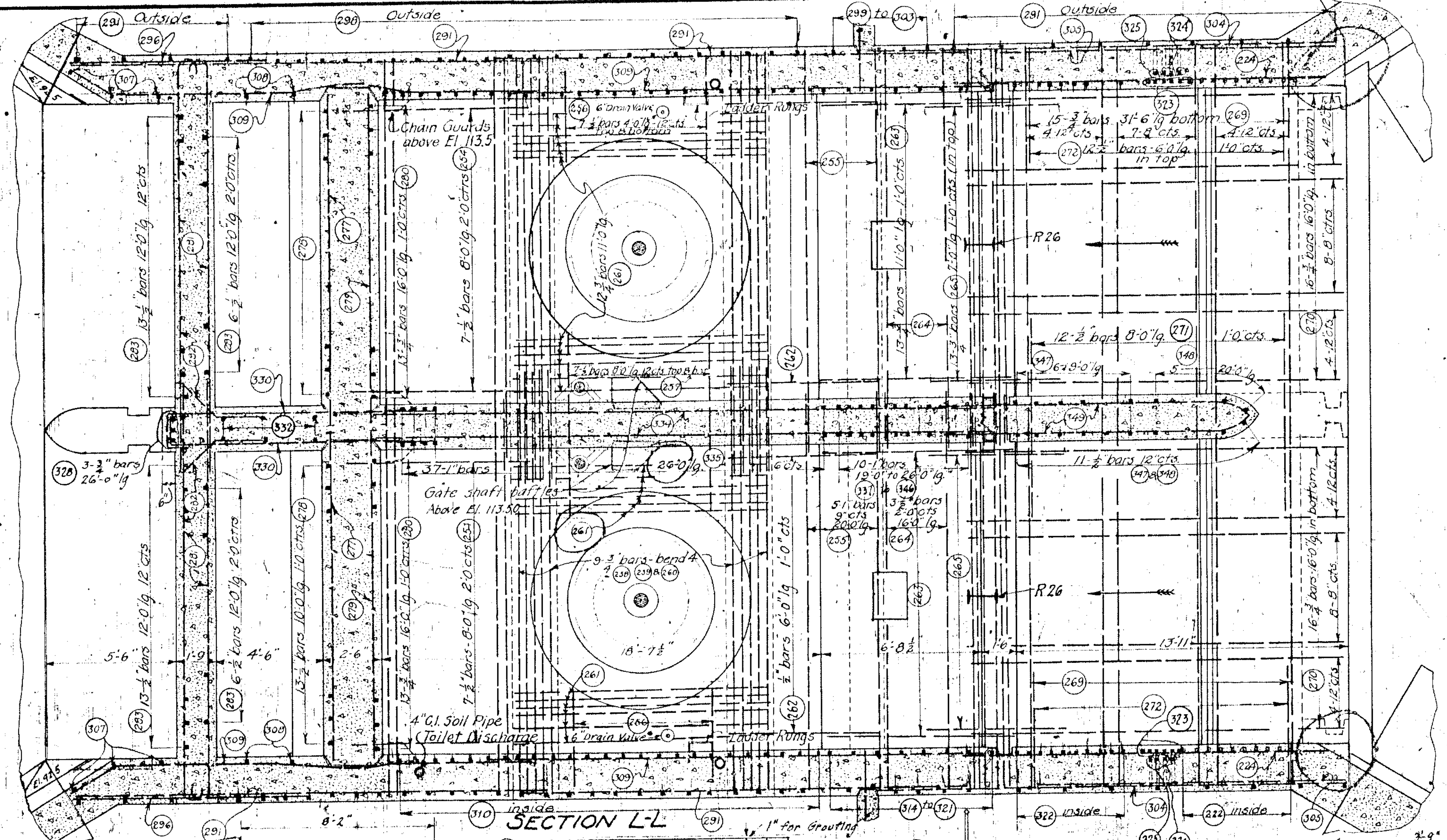
JUNE 29, 1921
JULY 11, 1921
" 27, 1921
AUG. 11, 1921
OCT. 3, 1921
Oct. 19, 1921

4980

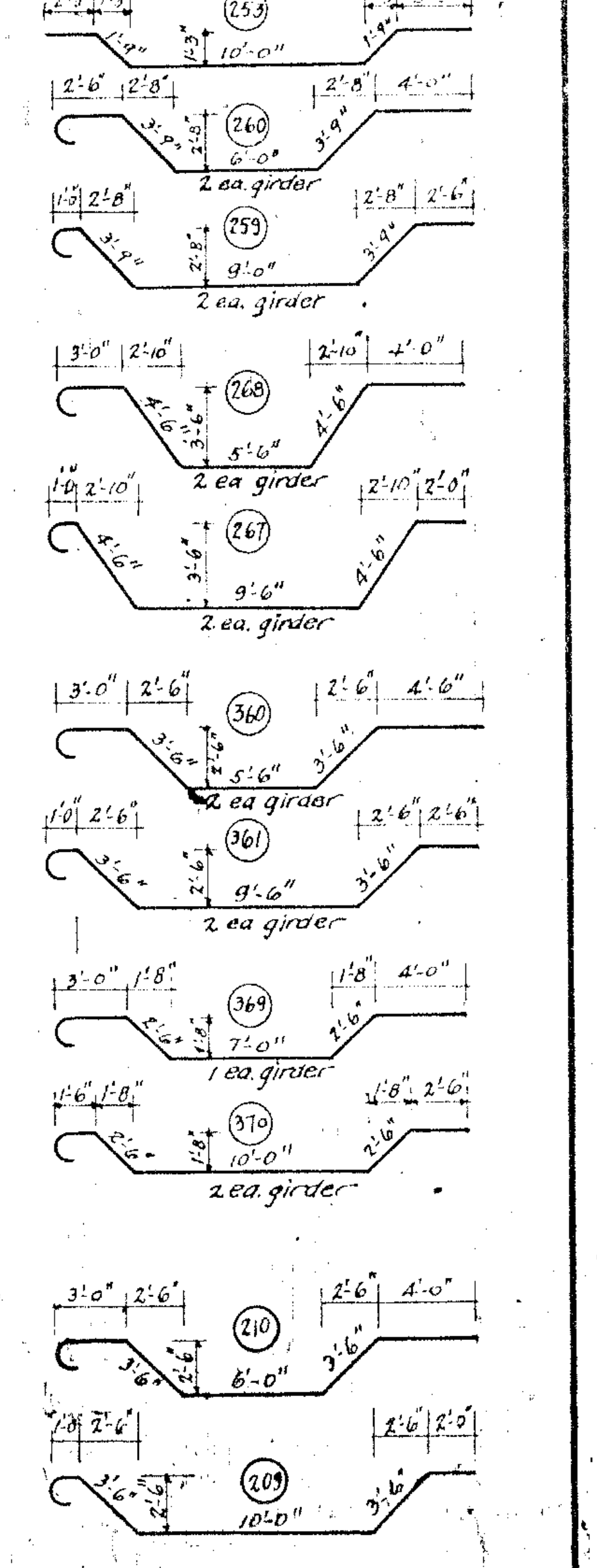
4981

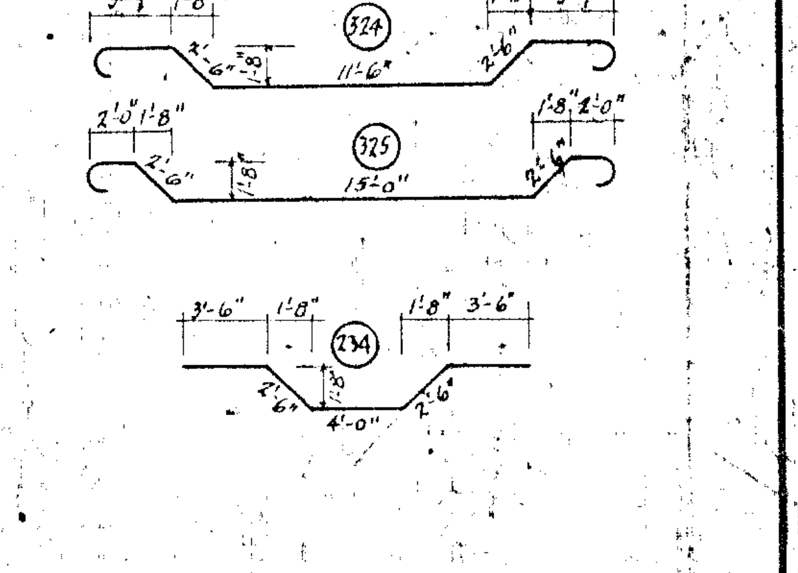


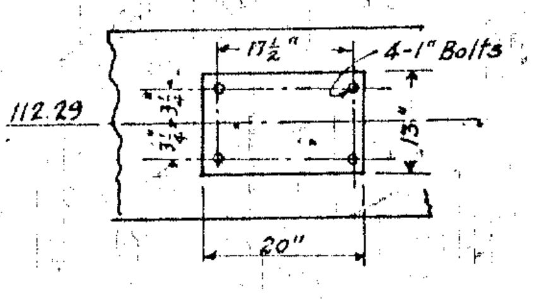
SECTION K-K



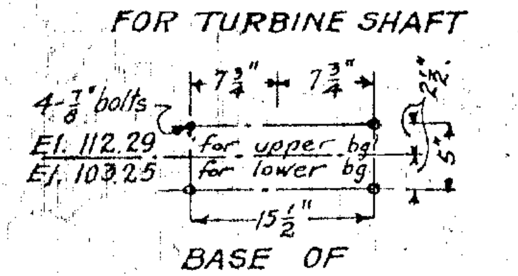
SECTION L-L



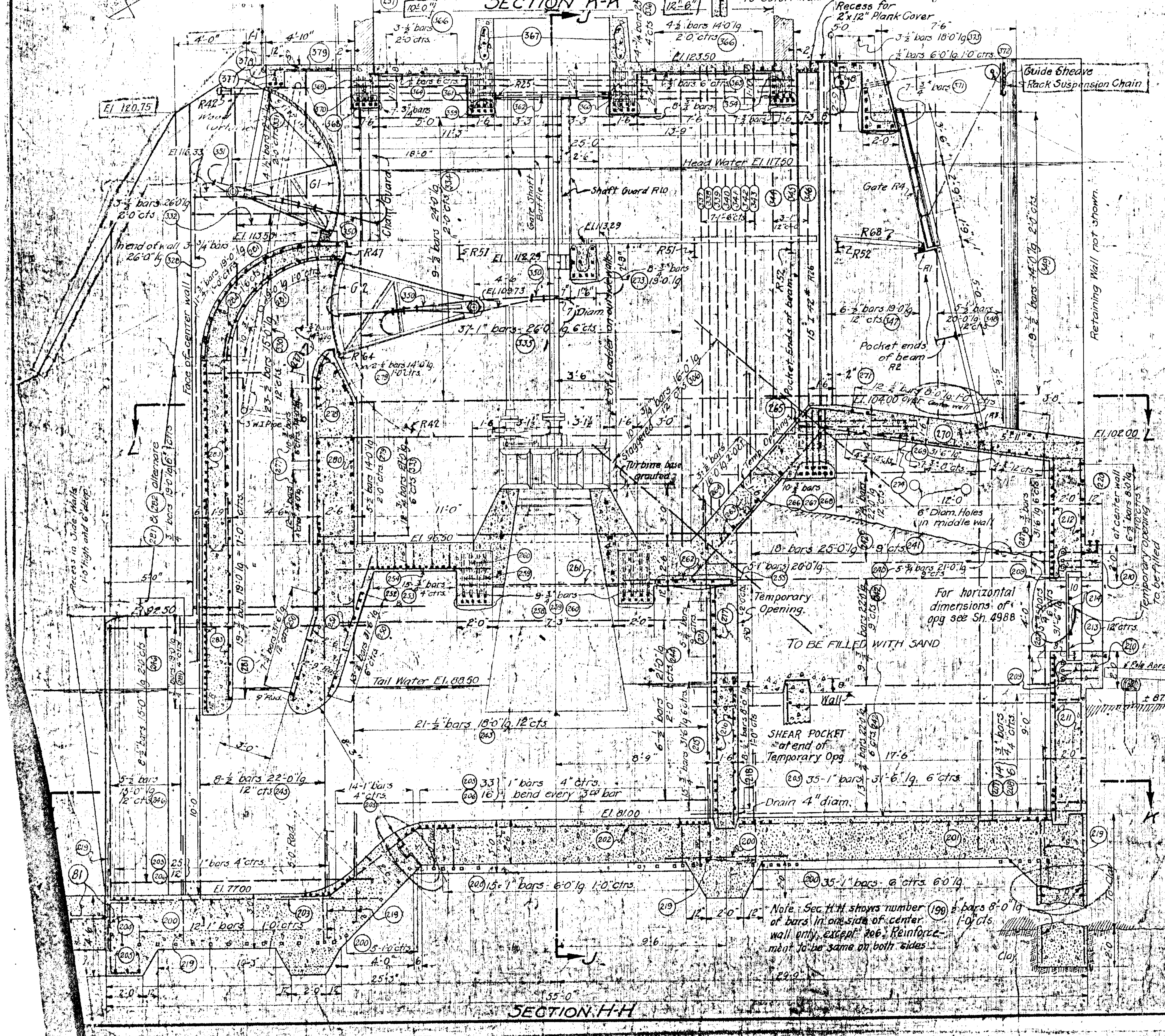




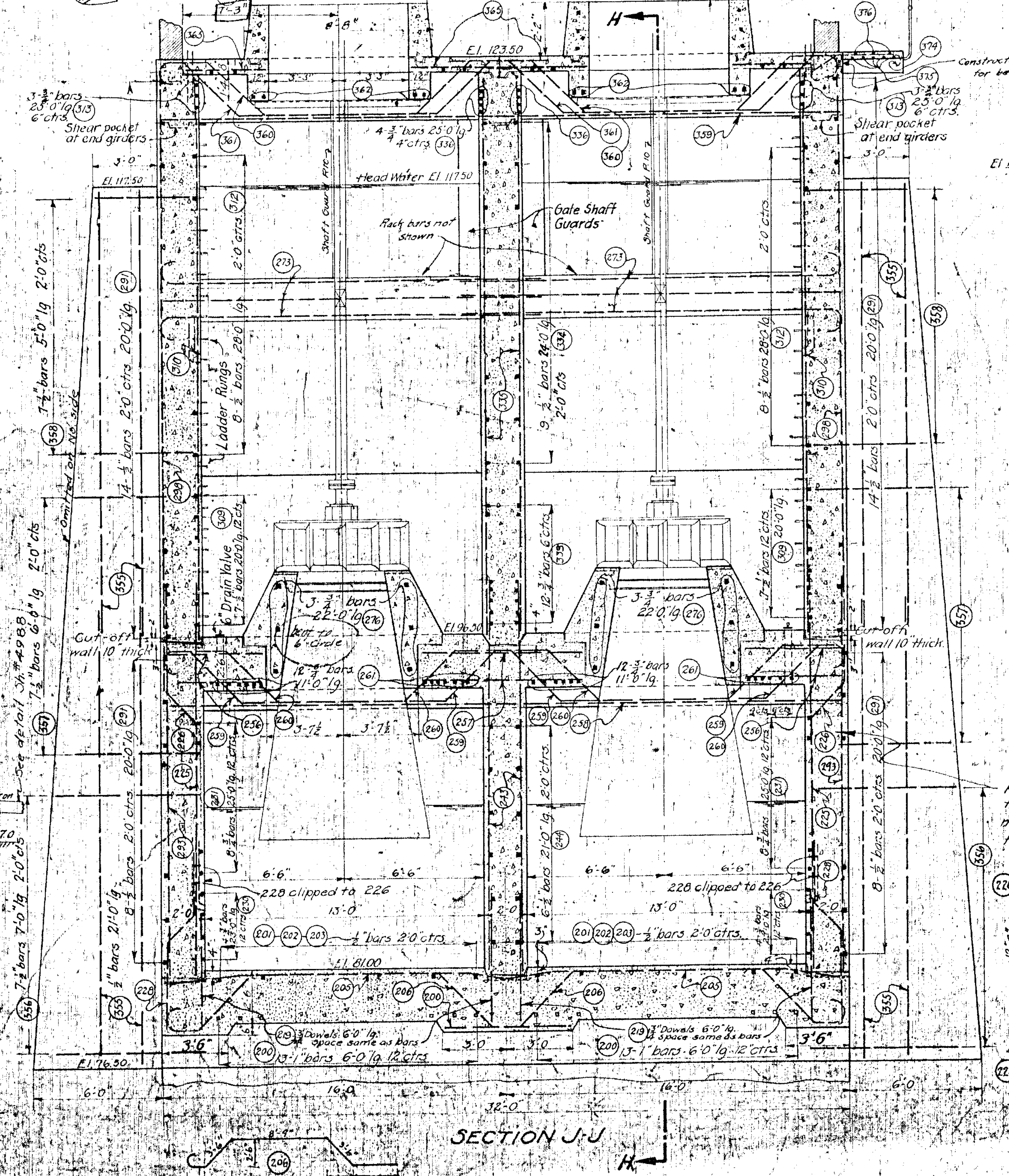
BASE OF STEADY BEARING FOR TURBINE SHAFT



BASE OF STEADY BEARINGS FOR GATE SHAFT

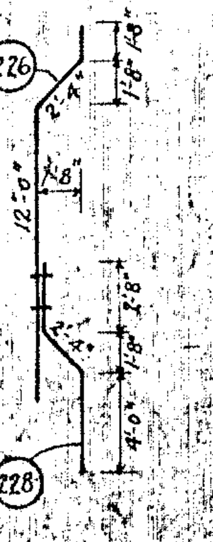


SECTION H-H



SECTION J-J

Pour up to floor slab and allow to set not less than 3 hrs. nor more than 6 hrs before pouring floor slab



LIST OF SHEETS

Topography and General Layout	4978
Downstream Apron and Embankment Walls	4980
This Sheet	4981
Reinforcing in Outside Walls	4982
Power House Plans and Elevations	4984
Steel Details	4985
Penstock Tainter Gates	4986
Fish Chute	4987
Miscellaneous Details	4988

PENSTOCK and SPILLWAY
DETAILS
PLANS FOR
BROWNS BRIDGE
HYDRO-ELECTRIC PLANT
ON THE BOARDMAN RIVER
FOR THE
CITY OF TRAVERSE CITY
MICHIGAN

Scale 1/4" = 1'-0"

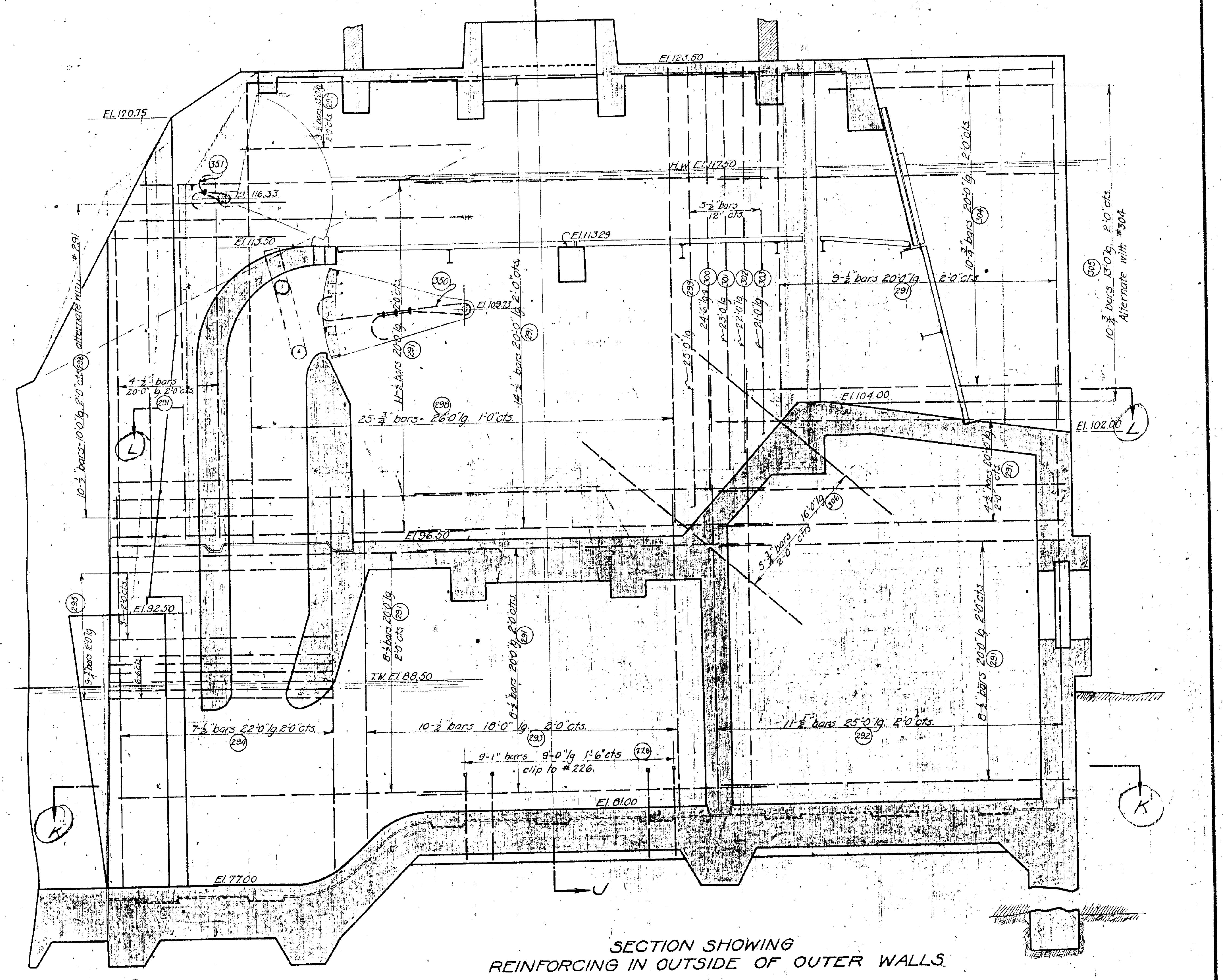
6-23-21
7-22-21
8-11-21
9-29-21
10-20-21
12-13-21

BURD AND GIFFELS
Associate Engineers
Grand Rapids
Mich.

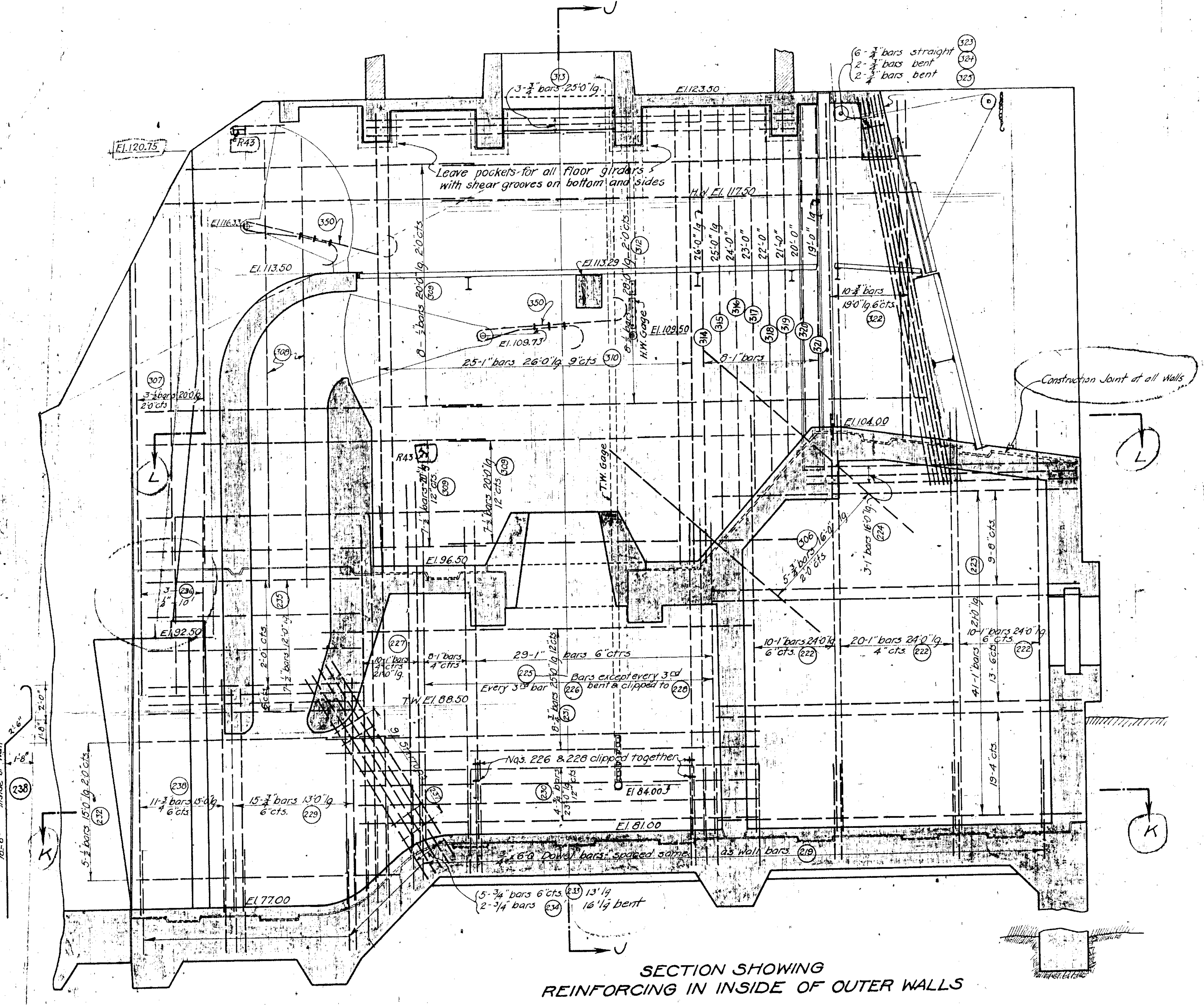
FARGO
ENGINEERING
COMPANY
Jackson, Mich.

4981

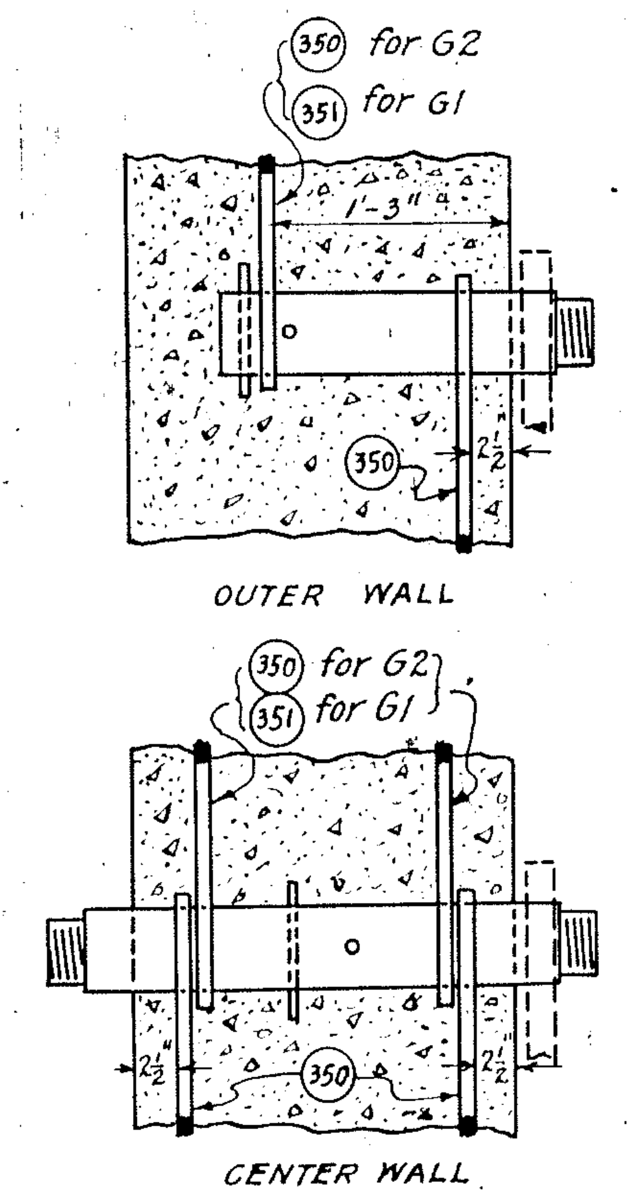
Res Engr's Cor. back ck'd



SECTION SHOWING REINFORCING IN OUTSIDE OF OUTER WALLS



SECTION SHOWING REINFORCING IN INSIDE OF OUTER WALLS



OUTER WALL

CENTER WALL

Rear half of loop to be bent accurately to fit pin and held to firm bearing in concreting

DETAIL OF REINFORCING AROUND GATE PINS

Scale 1" = 1 ft.

PENSTOCK AND SPILLWAY DETAILS
SHOWING REINFORCING IN OUTER WALLS
PLANS FOR
BROWN'S BRIDGE
HYDRO ELECTRIC PLANT
ON THE BOARDMAN RIVER
FOR THE
CITY OF TRAVERSE CITY
MICHIGAN

Burd & Giffels
Associate Engineers
Grand Rapids, Mich.

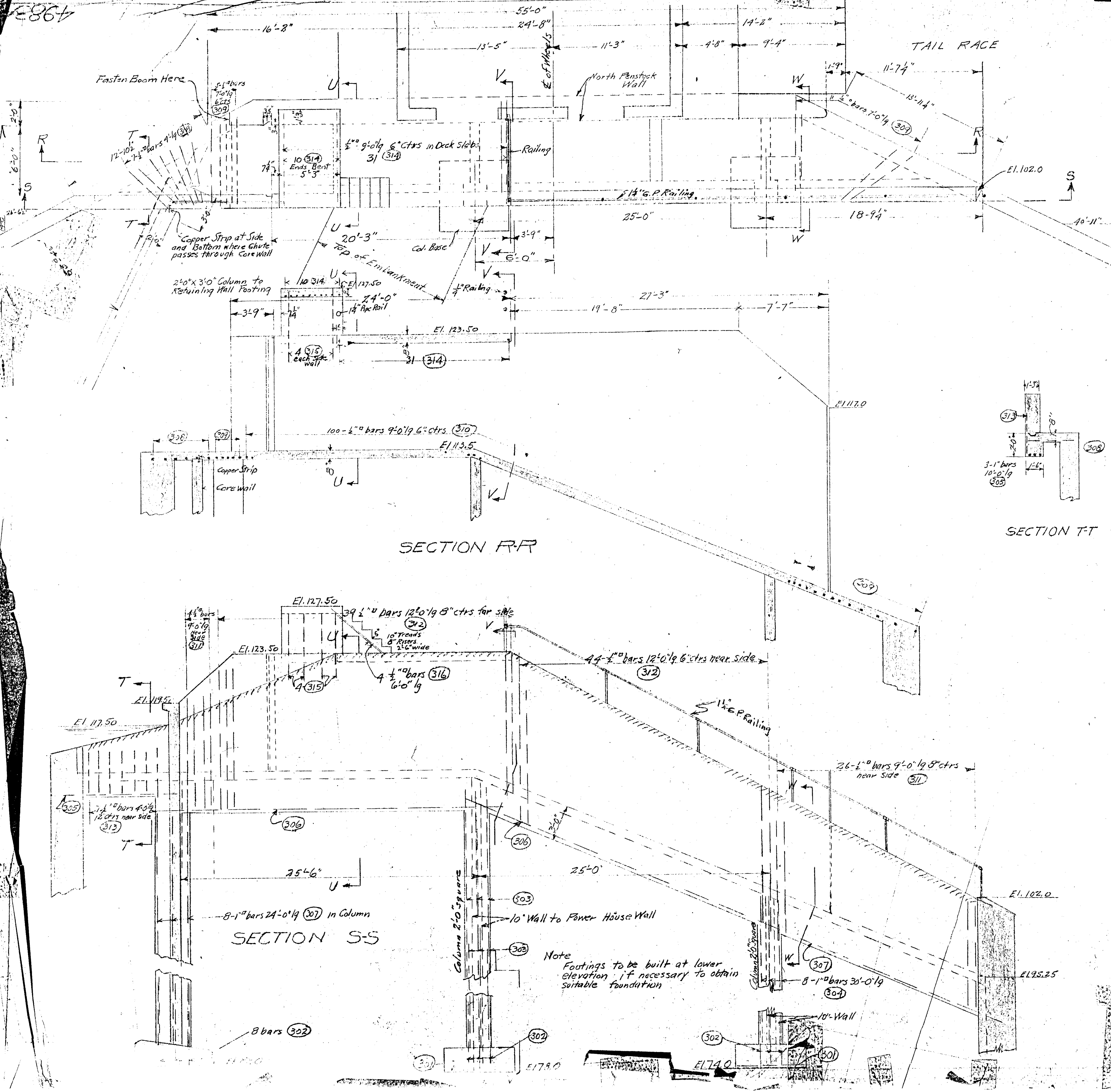
August 9, 1921
October 3, 1921
10-20-21

FARGO
ENGINEERING
COMPANY
Jackson, Mich.

Scale 1/4" = 1 ft.

4982

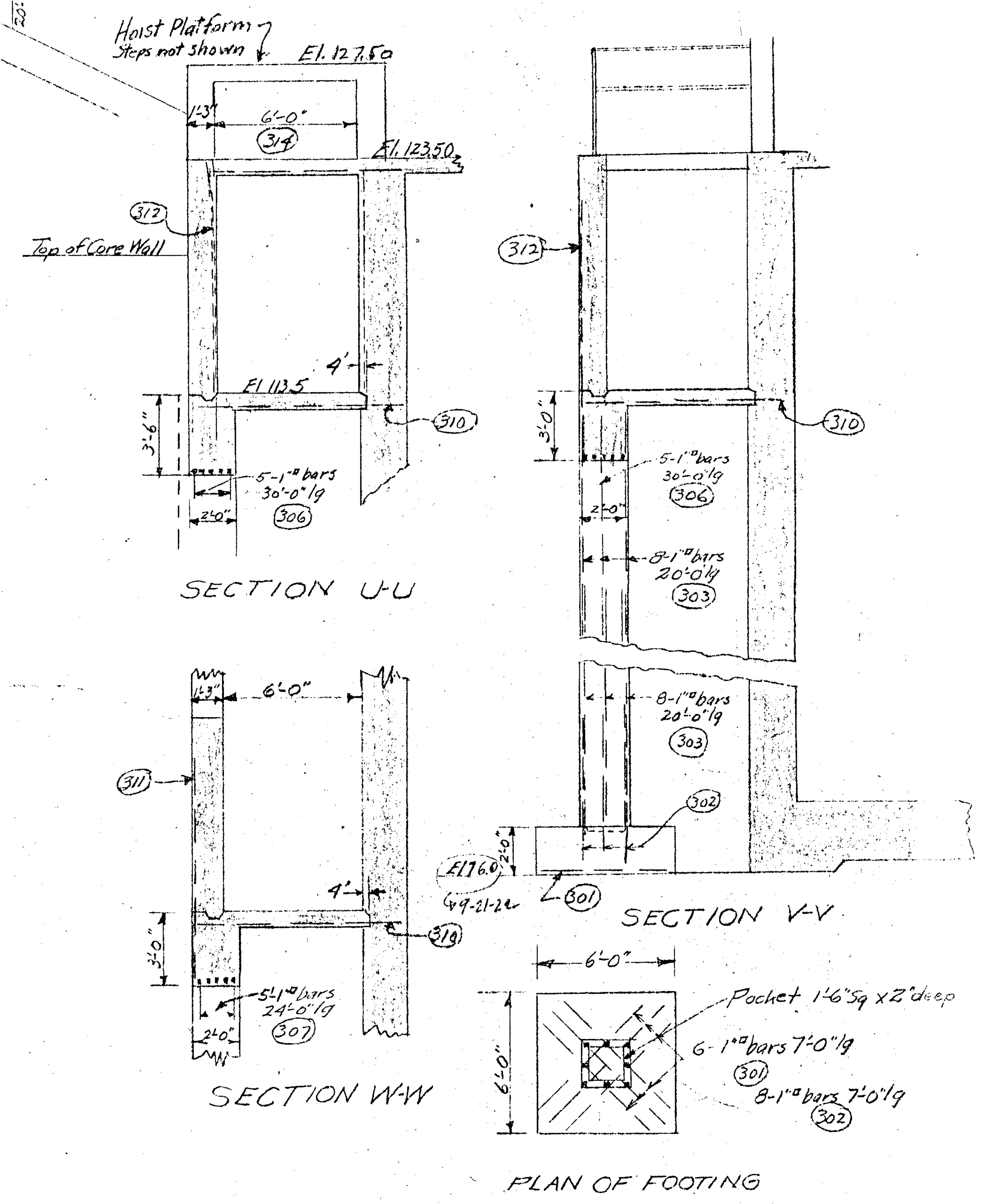
Chd August 13 1921 J.S.H.
Res. Engrs for Back ... 4-28-22



SECTION R-R

SECTION S-S

SECTION T-T



SECTION U-U

SECTION V-V

SECTION W-W

PLAN OF FOOTING

BAR LIST

MARK	NO	SIZE	LENGTH	LOCATION
301	12	1"□	7'-0"	Footings
302	24	"	7'-0"	"
303	16	"	20'-0"	Columns
304	8	"	30'-0"	"
305	3	"	10'-0"	Girders
306	10	"	30'-0"	"
307	13	"	24'-0"	Girders & Col
308	7	½"□	4'-0"	Floor Slab
309	16	"	7'-0"	" "
310	100	"	9'-0"	" "
311	30	"	9'-0"	Side wall
312	83	"	12'-0"	" "
313	7	"	4'-0"	" "
314	41	"	9'-0"	Deck Slabs
315	8	"	6'-0"	Side walls
316	4	"	6'-0"	Stairs

LOG CHUTE DETAILS
PLANS FOR
BROWN BRIDGE
HYDRO-ELECTRIC PLANT
ON THE BOARDMAN RIVER
FOR THE
CITY OF TRAVERSE CITY
MICHIGAN

DETAILED BY
BURD & GIFFELS
ASSOCIATE ENGRS.
GRAND RAPIDS, MICH.

11-16-21
Revised 11-25-21
9-21-22

9/28/22
Res Engrs Cor. Back Ck. J.

FARGO
ENGINEERING
COMPANY
JACKSON, MICH.

SCALE ¼"=1'-0"

4983A

W
46
F

NOTE

ONE DOOR OPENING TO BE LEFT 9'-0" WIDE UNTIL MACHINERY IS IN BUILDING. ONE DOOR LINTEL TO BE OF LENGTH FOR THIS OPENING.

ALL WINDOW SASH TO BE STEEL 14" x 20" - 24 LTS.
SASH FURNISHED BY CONTRACTOR
VENTILATORS SHOWN BY DOTTED DIAGONAL LINES

FOR DETAILS OF STEEL WORK SEE SHEET No 4985
ALL STRUCTURAL STEEL TO BE FURNISHED BY OWNER

POWERHOUSE DETAILS

PLANS FOR
BROWNS BRIDGE
HYDRO - ELECTRIC PLANT
ON THE BOARDMAN RIVER
FOR THE
CITY OF TRAVERSE CITY
MICHIGAN

9-21-22
6-27-21
7-29-21
9-29-21

FARGO
ENGINEERING
COMPANY
JACKSON, MICH.

SCALE AS NOTED

BURD & GIFFELS
ASSOCIATE ENGRS
GRAND RAPIDS, MICH.

PAINT NOTE

SHOP: One thorough coat of red lead (See Specifications. All contact surfaces to have one heavy coat before assembling. Parts difficult of access after erection shall have two coats. Steel surfaces imbedded in concrete not to be painted (See notations)

FIELD: All steel pieces not subject to water action to have two coats of Detroit Graphite No. 30. All steel subject to water action to have two coats of Solvay Hydraulic paint (Use Crysolite Thinner in small quanities for winter work). Both mfg by Solvay Process - Semet Solvay Co., Syracuse, N.Y.

RIVETS ¾" Unless noted
HOLES 13/16" " "

6-30-21
7-20-21
8-11-21
9-29-21
9-21-22

STEEL DETAILS
PLANS FOR
BROWN BRIDGE HYDRO-ELECTRIC PLANT
ON THE BOARDMAN RIVER
FOR THE
CITY OF TRAVERSE CITY
MICHIGAN

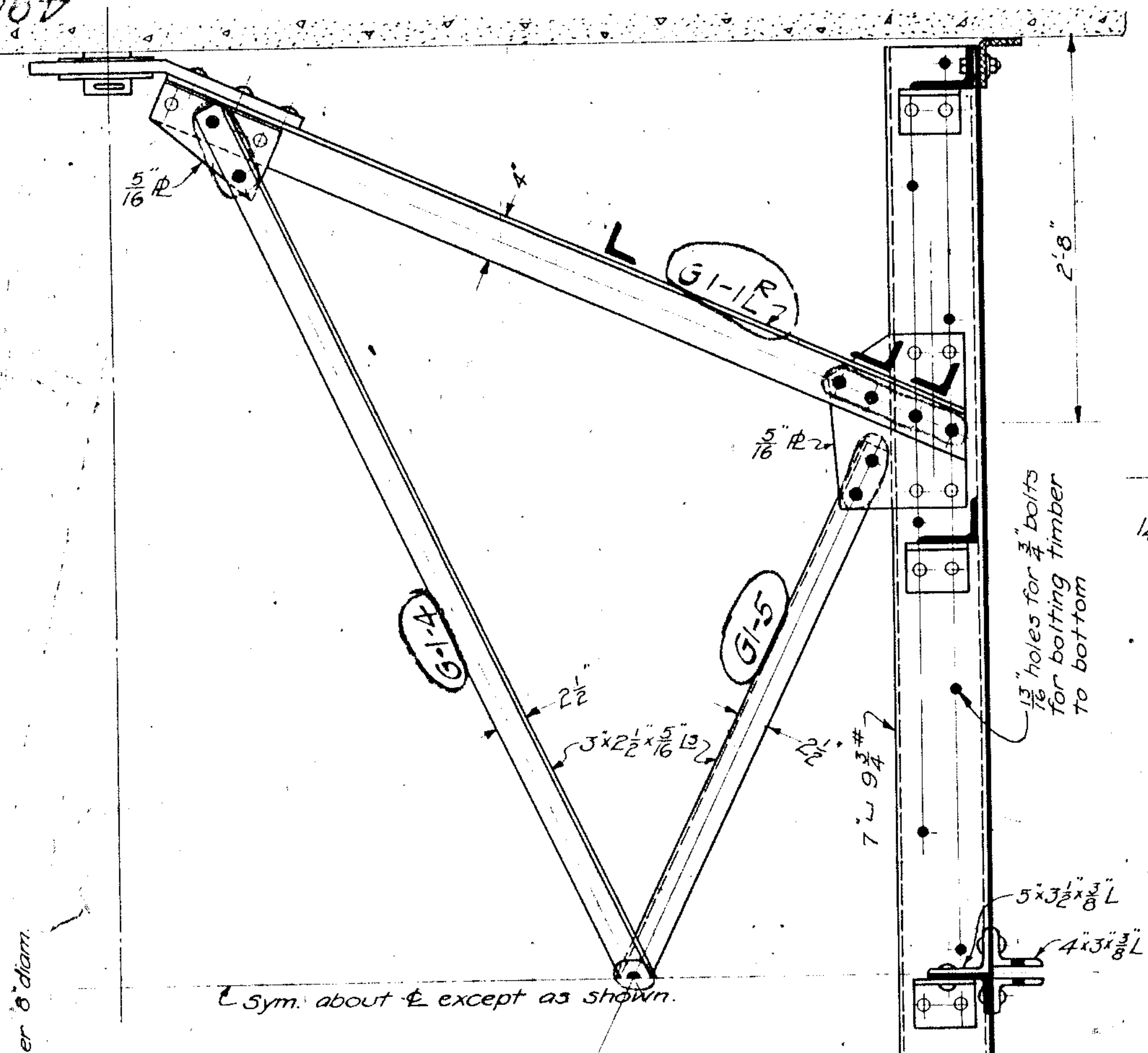
Scales as shown

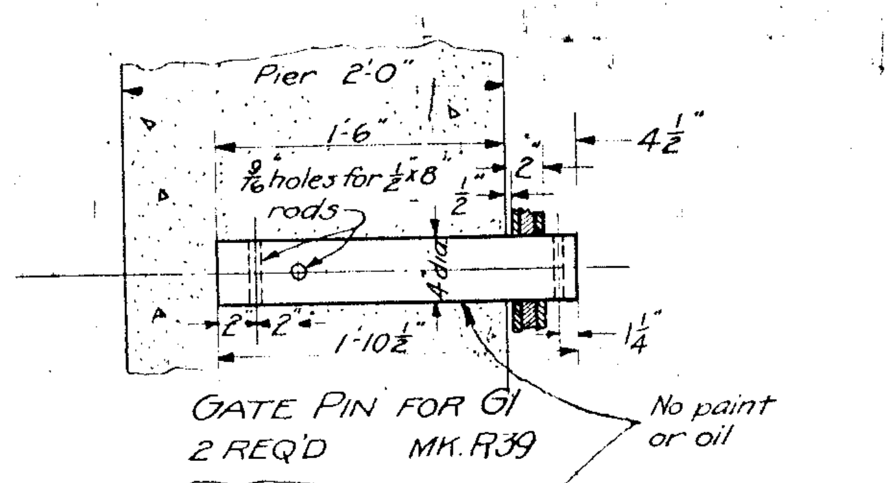
BURD AND GIFFELS
Associate Engineers
Grand Rapids, Michigan

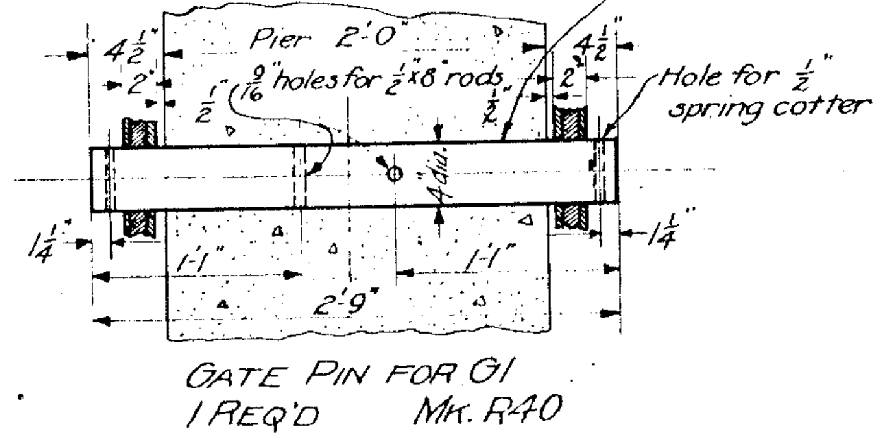
FARGO ENGINEERING COMPANY
Jackson, Mich.

4985

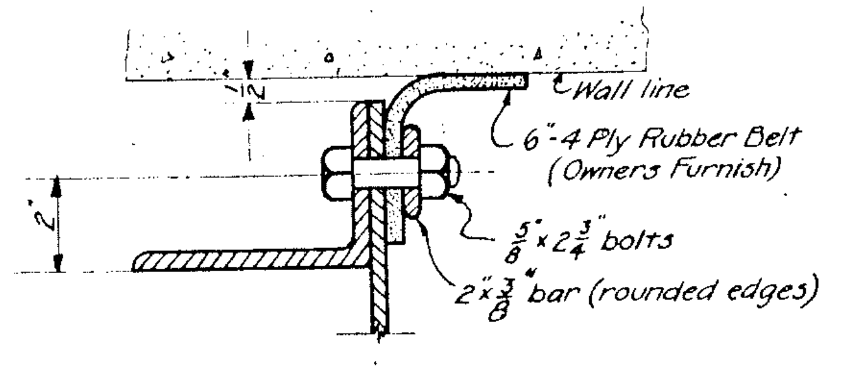
4986



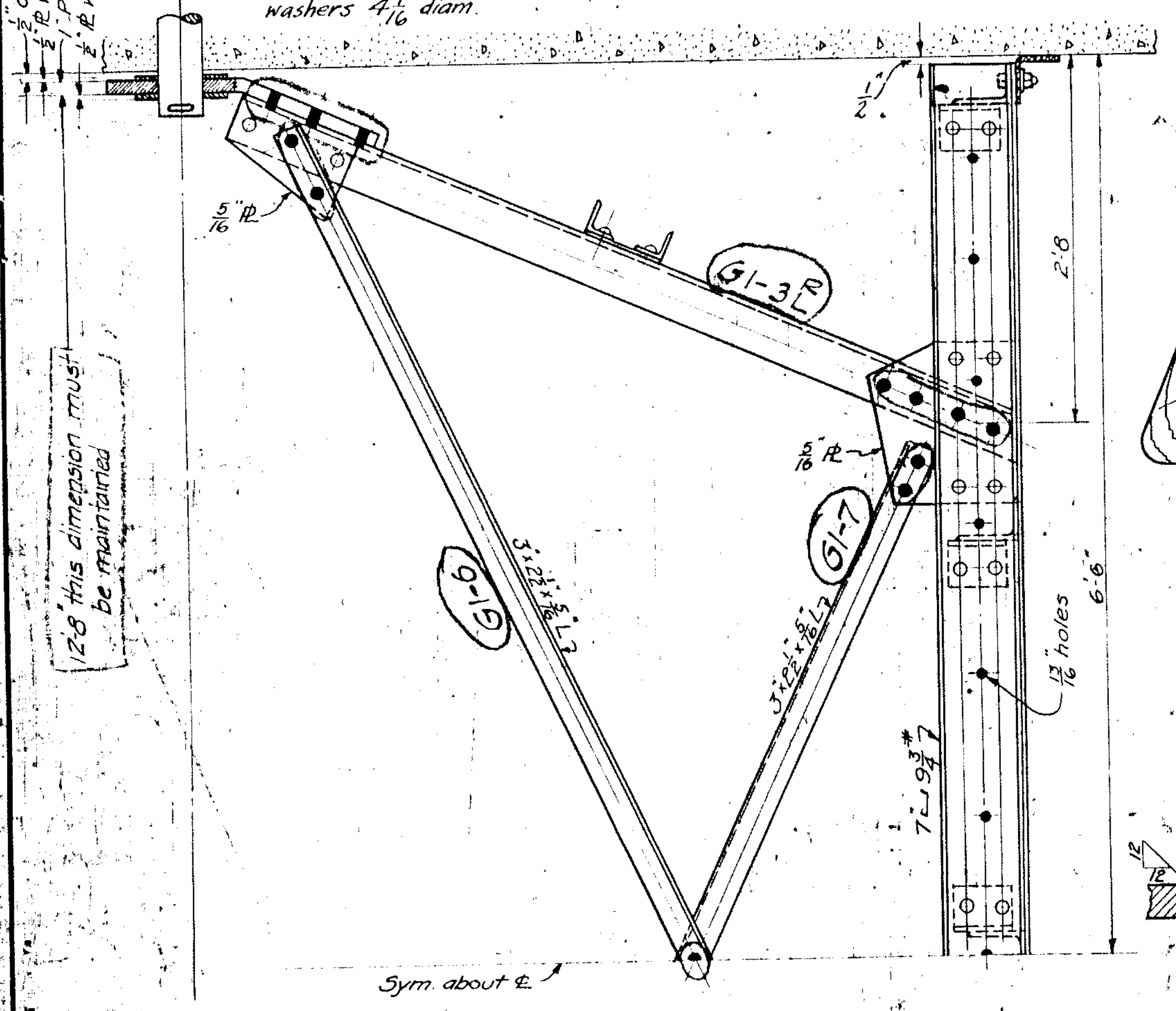

GATE PIN FOR G1
2 REQ'D MK.R39

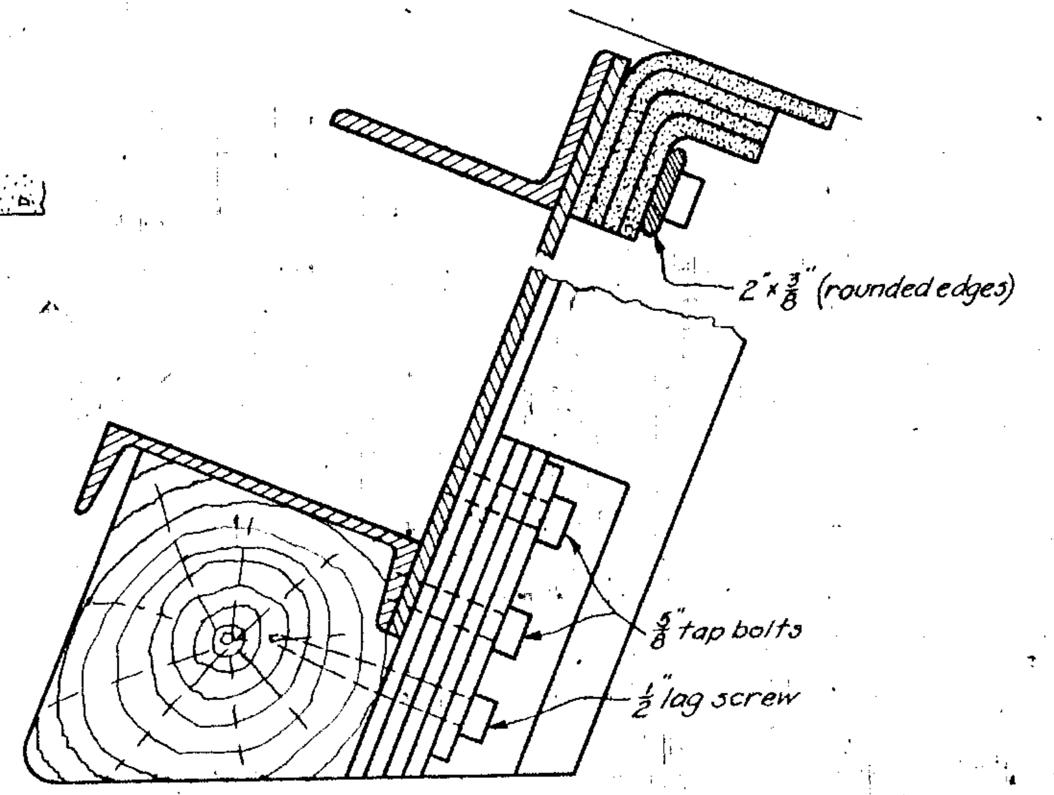


GATE PIN FOR G1
1 REQ'D MK.R40

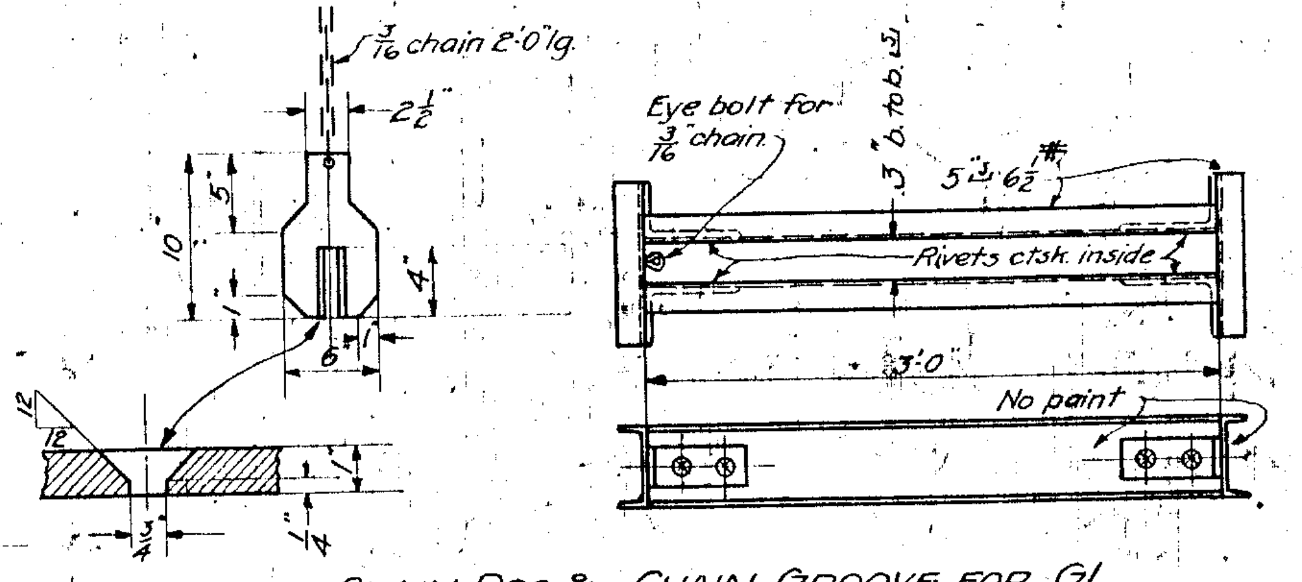


BELT CONNECTION DETAIL FOR G1

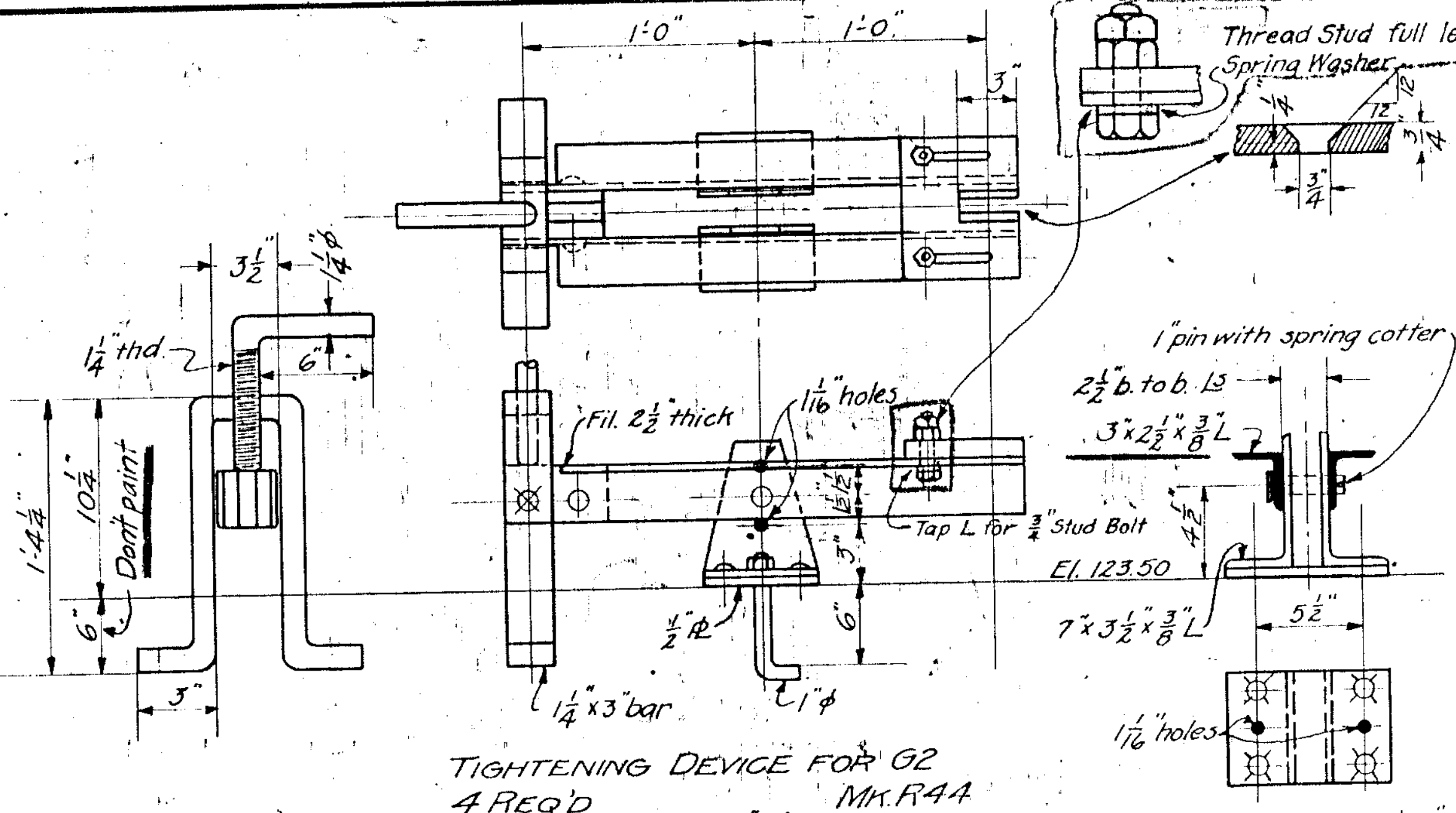




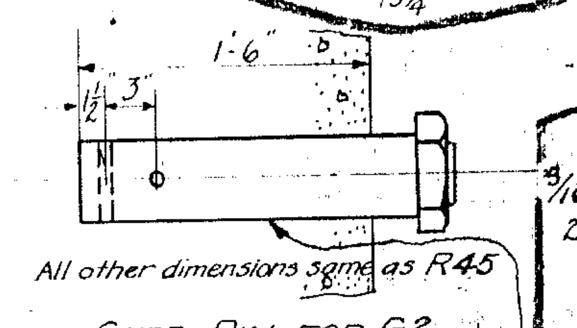
ARRANGEMENT OF BELT AT CORNER FOR G1



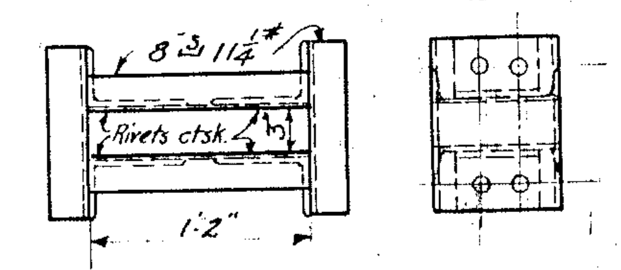
CHAIN DOG and CHAIN GROOVE FOR G1
2 REQ'D MK.R41



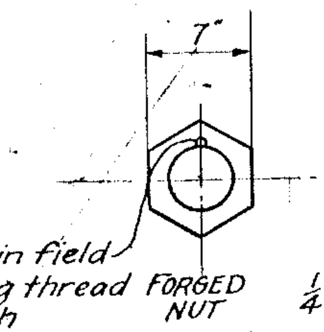
TIGHTENING DEVICE FOR G2
4 REQ'D MK.R44
Scale 1½"=1'-0"

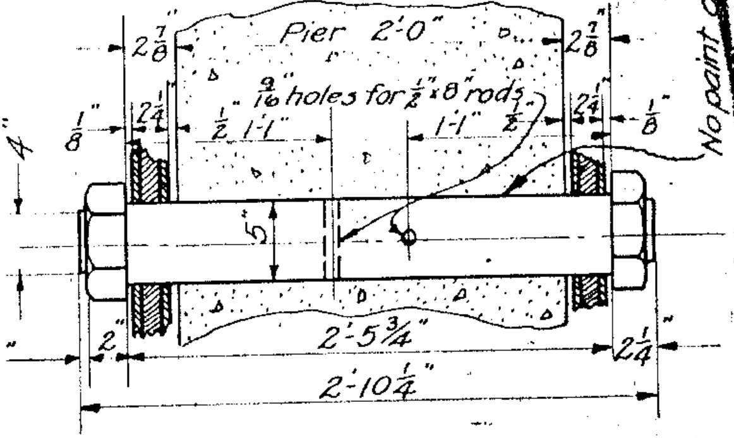


GATE PIN FOR G2
2 REQ'D MK.R46

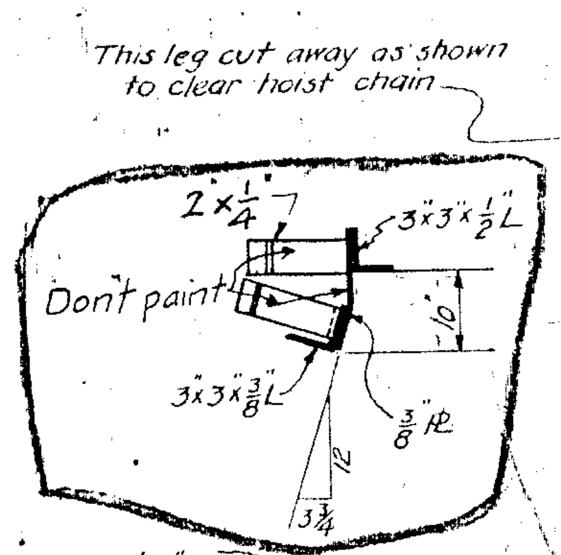


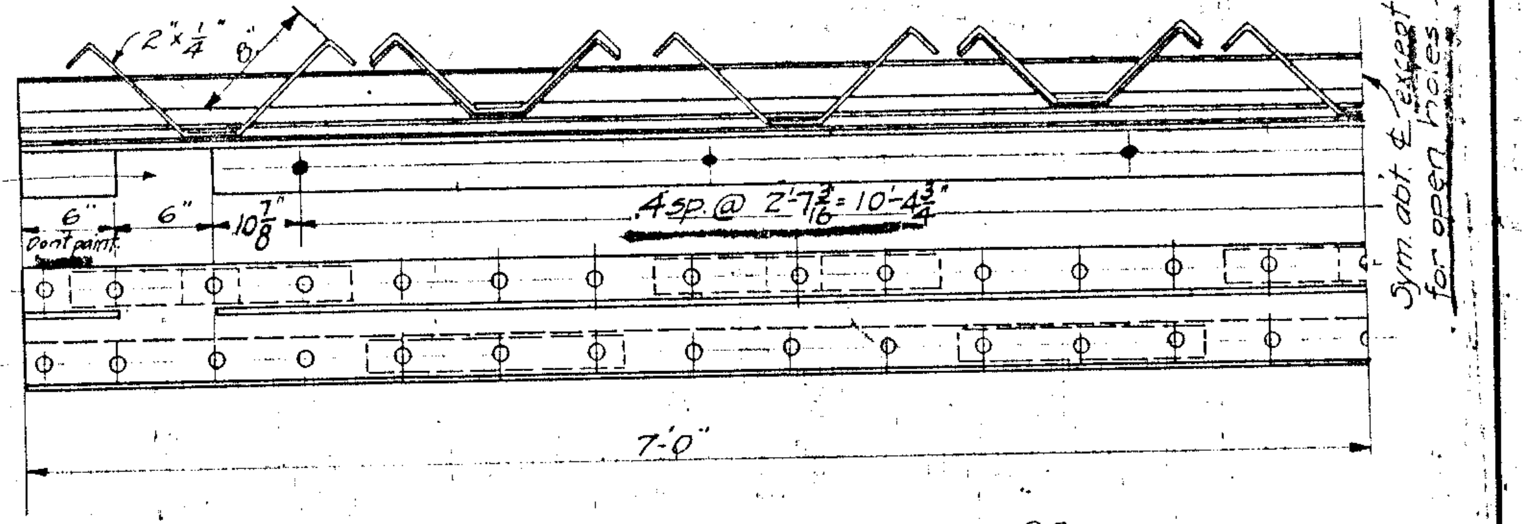
CHAIN GROOVE FOR G2
4 REQ'D MK.R48


Lock nut in field by peening thread into notch
FORGED NUT

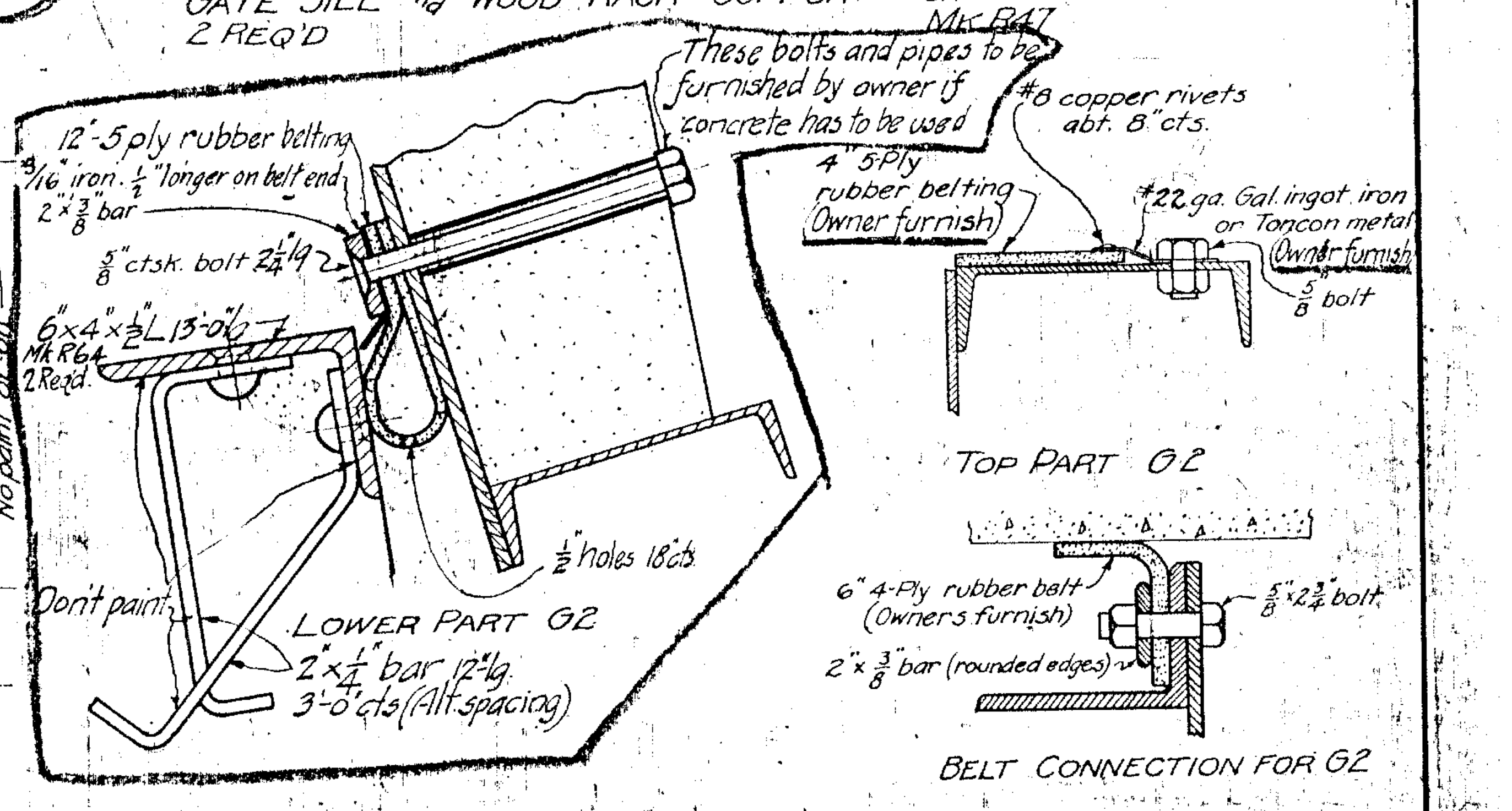


GATE PIN FOR G2
1 REQ'D MK.R45





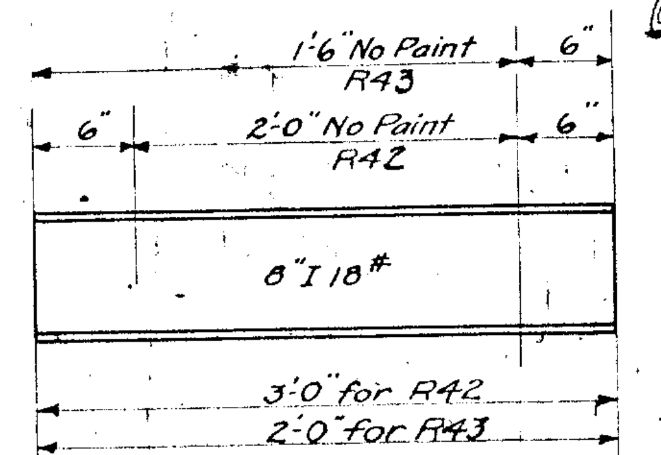
GATE SILL and WOOD RACK SUPPORT FOR G2
2 REQ'D MK.R47



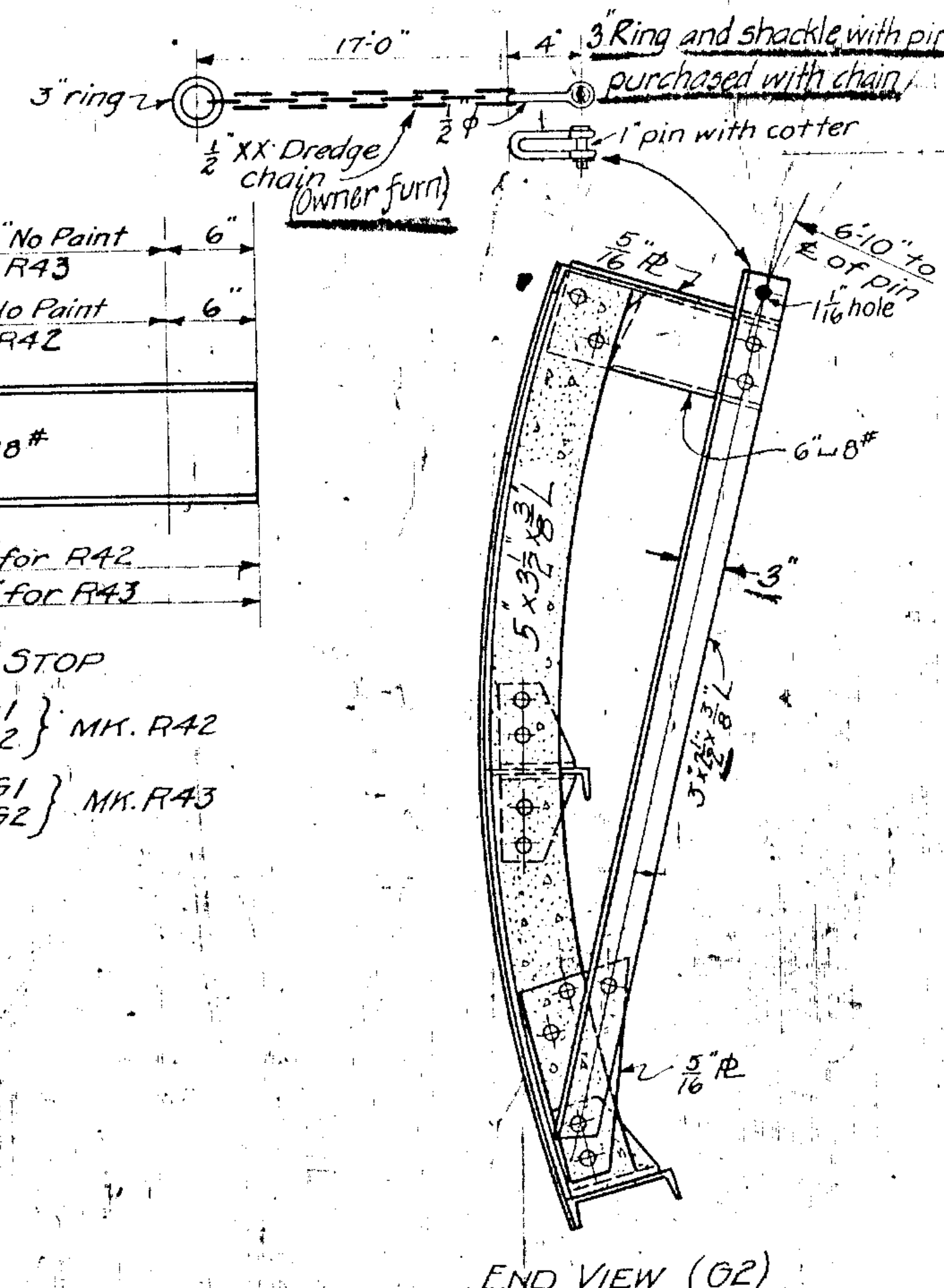
LOWER PART G2

TOP PART G2

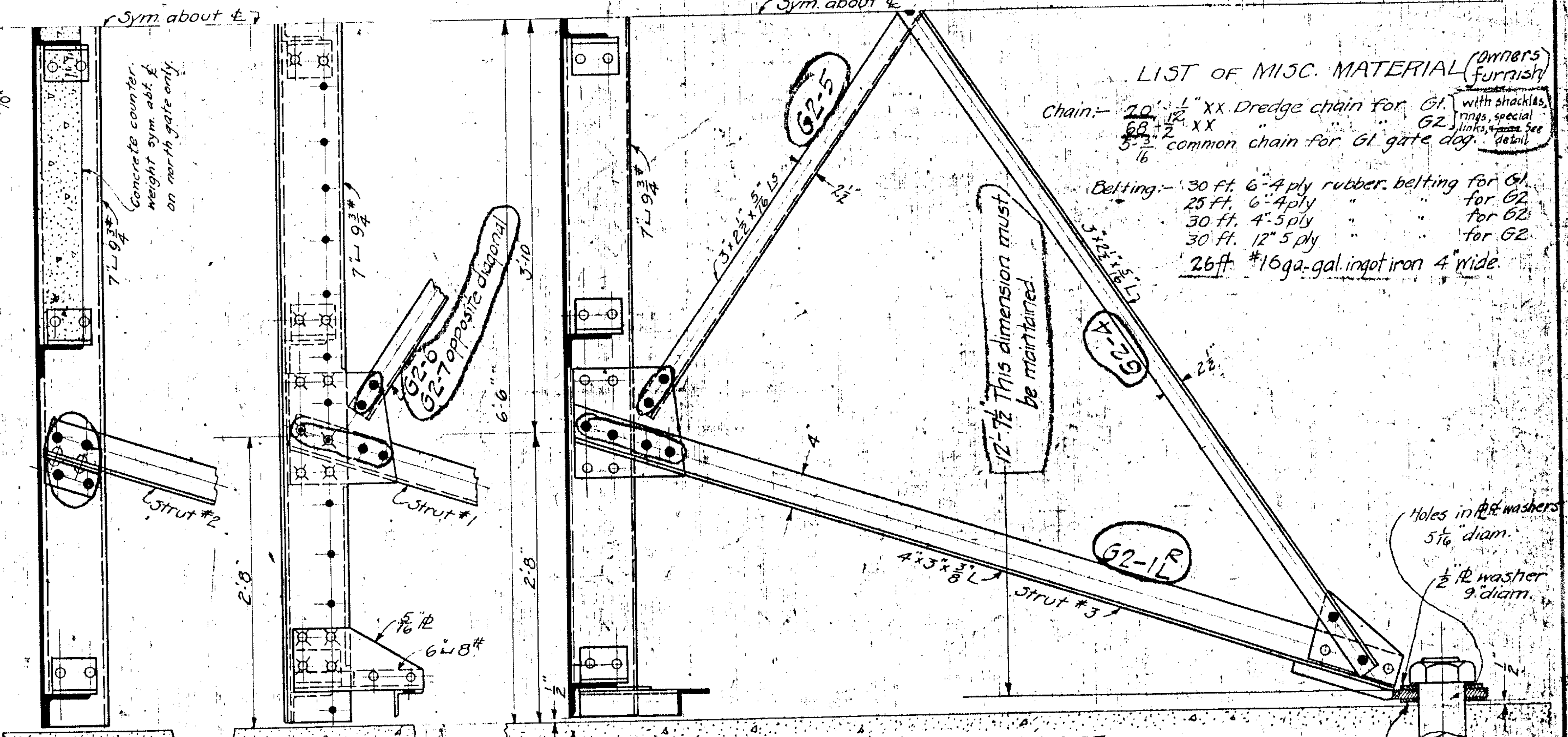
BELT CONNECTION FOR G2



GATE STOP
1 Req'd for G1, 1 Req'd for G2 } MK. R42
2 Req'd for G1, 2 Req'd for G2 } MK. R43



END VIEW (G2)
Showing chain connection to gate



LIST OF MISC. MATERIAL (Owners furnish)

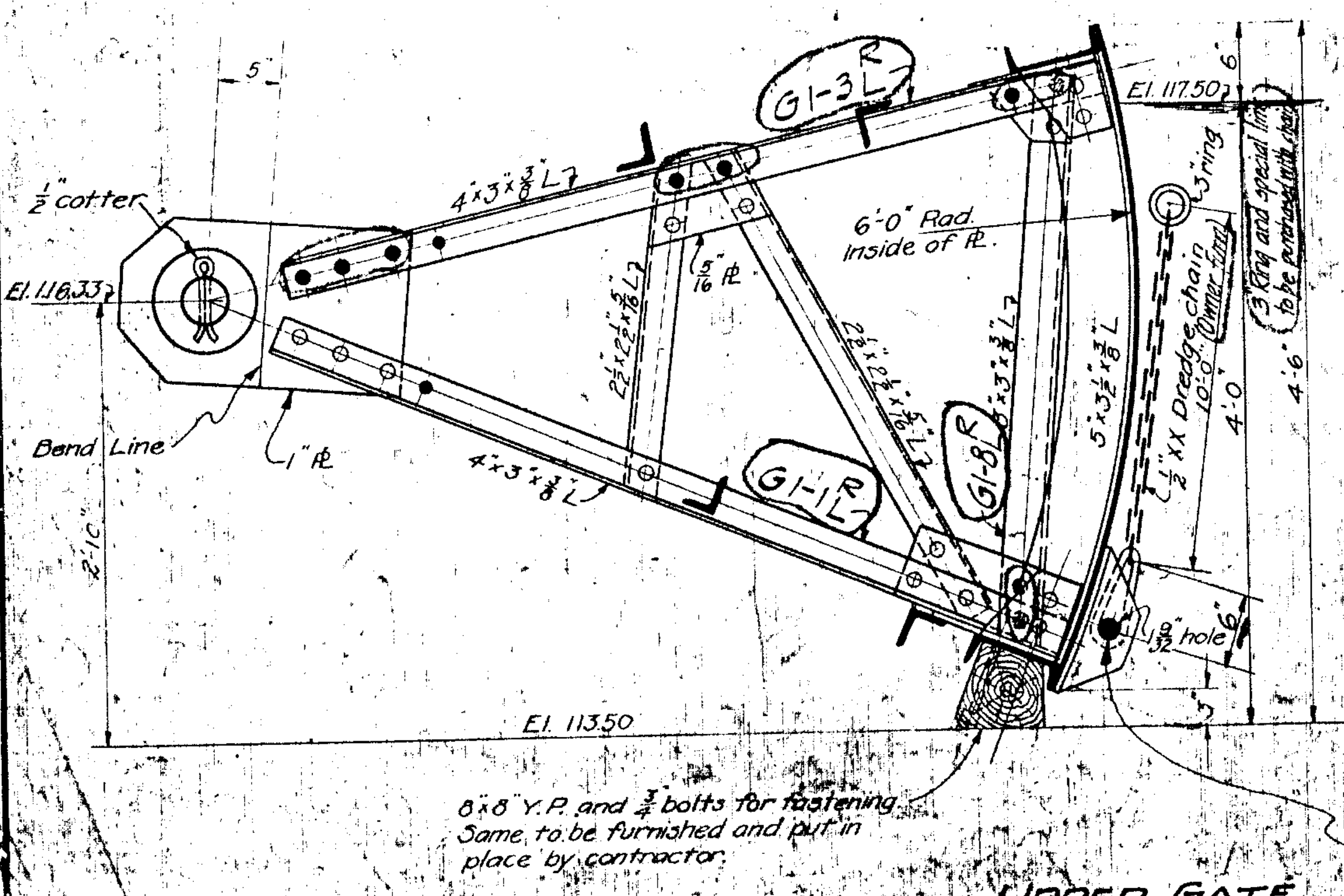
Chain:— ~~20'~~ 68' ½" XX Dredge chain for G1 } with shackles, rings, special links, ~~+pins~~ See detail
~~12~~ ½" XX " " " G2 }
5'-3/16" common chain for G1 gate dog.

Belting:— 30 ft. 6"-4 ply rubber belting for G1.
25 ft. 6"-4 ply " " for G2
30 ft. 4"-5 ply " " for G2
30 ft. 12" 5 ply " " for G2
26 ft #16 ga.-gal. ingot iron 4" wide.

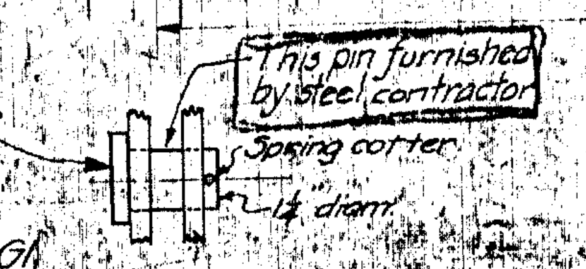
PAINT NOTE

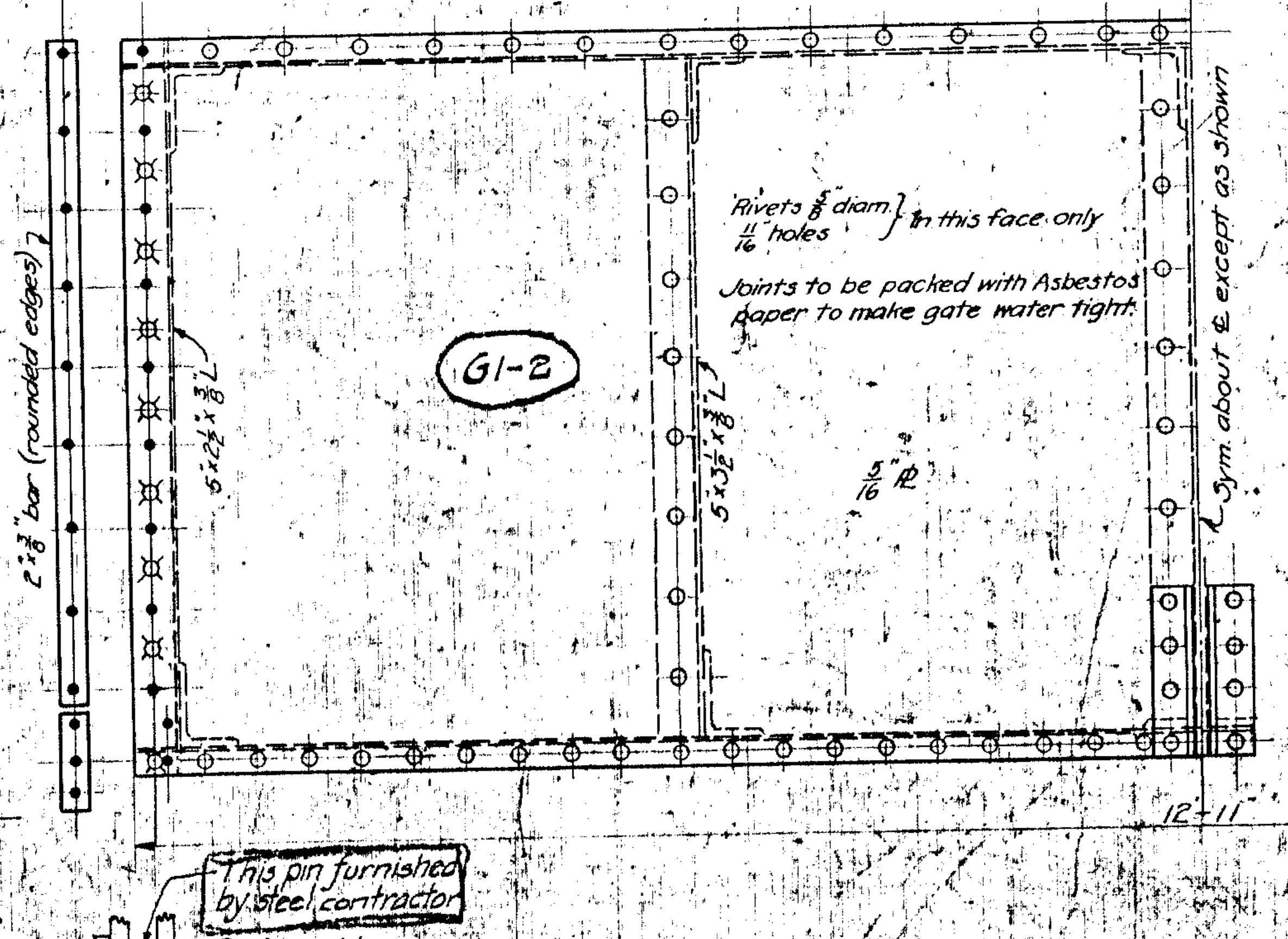
SHOP: One thorough coat of red lead (See Specifications). All contact surfaces to have one heavy coat before assembling. Parts difficult of access after erection shall have two coats. Steel surfaces imbedded in concrete not to be painted (See notations).

FIELD: Steel pieces R41, ~~R42, R43,~~ R44 + R48 to have two coats of Detroit Graphite Co's #30. All other steel to have two coats of Solvay Hydraulic Paint. Price per gal. (Use Crysolite Thinner in small quanities for winter work) Both mfg'd. by Solvay Process - Semet Solvay Co., Syracuse, N.Y.

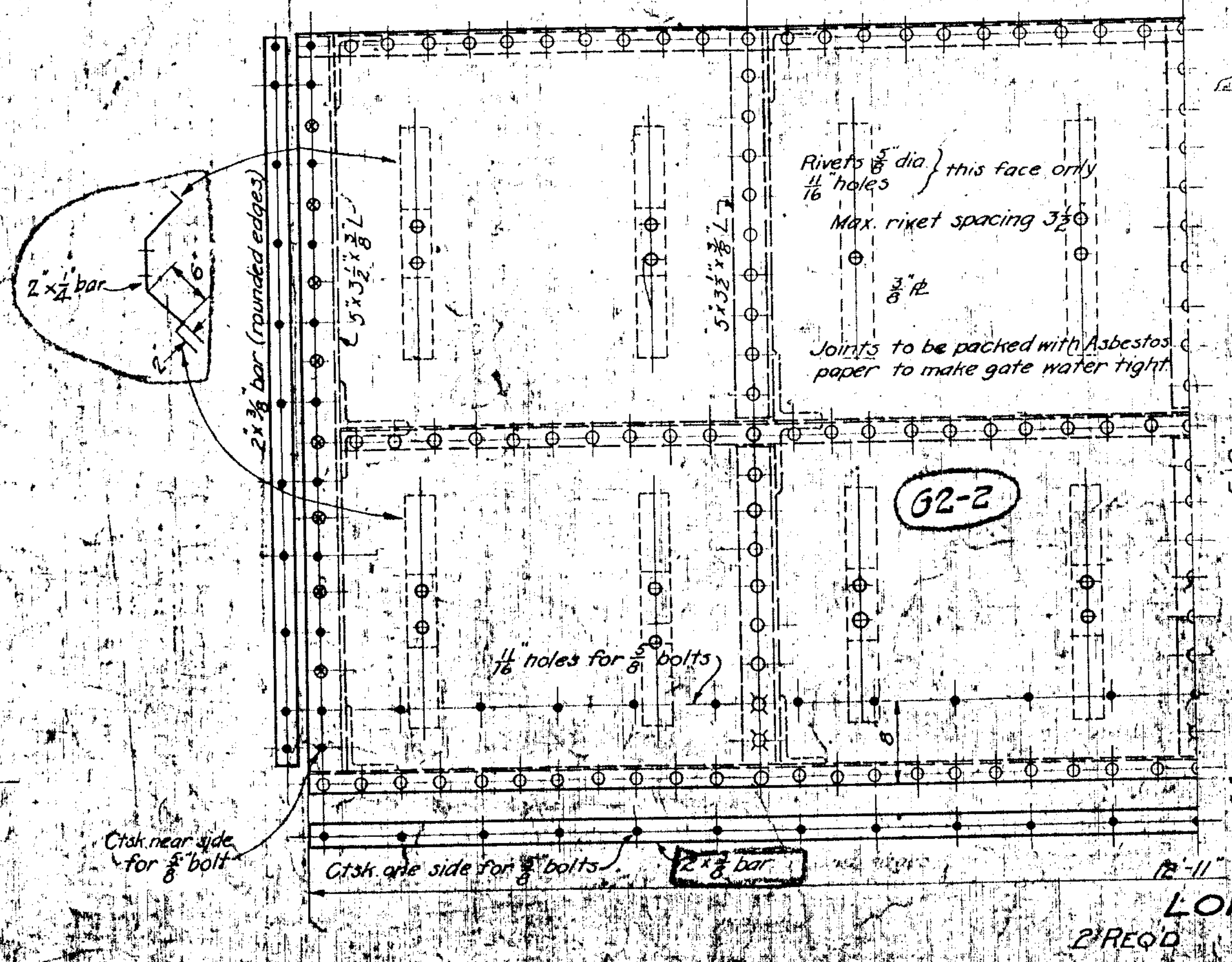


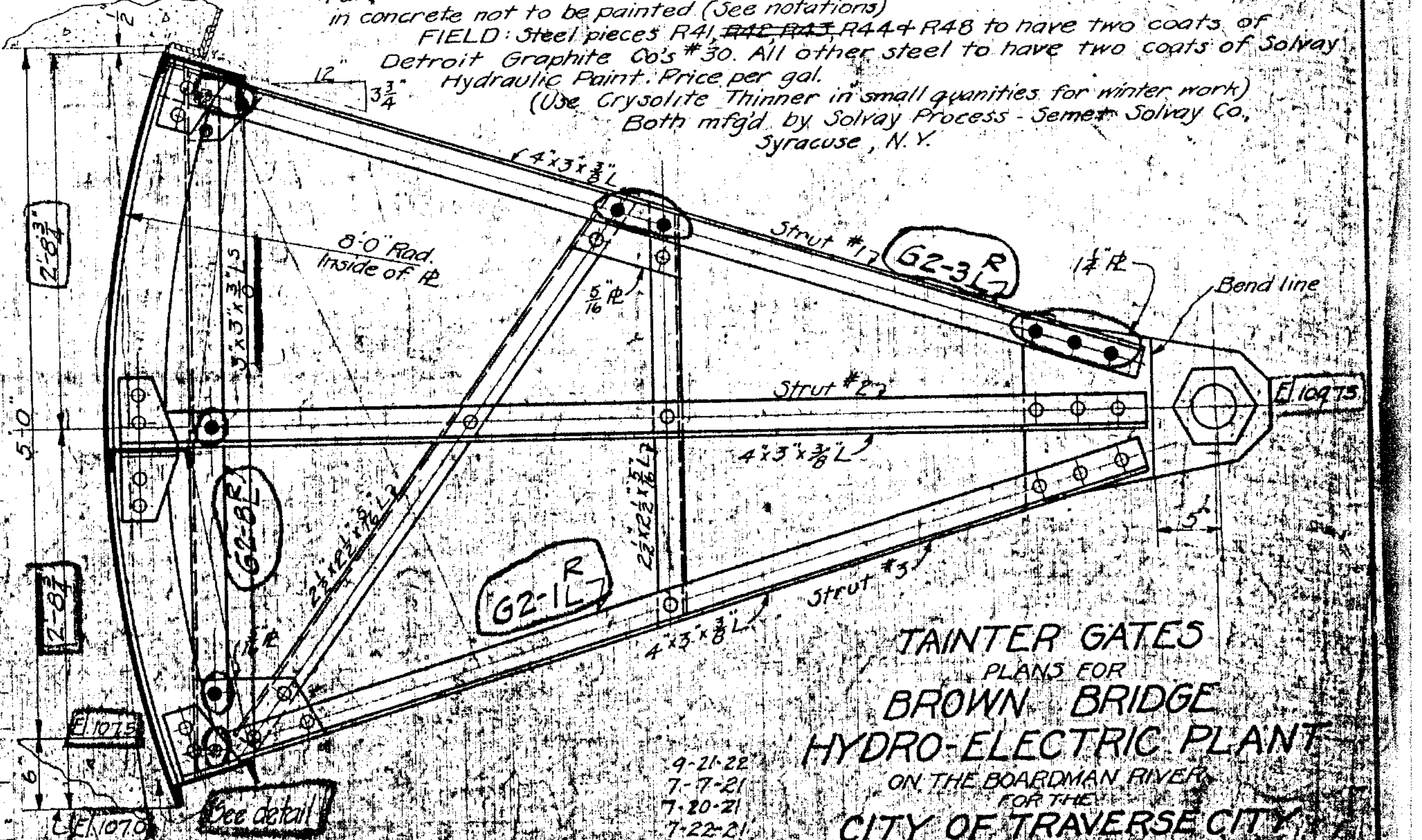
UPPER GATE
2 REQ'D MK. G1
Scale 1"=1'-0"


This pin furnished by steel contractor
Spring cotter
¾ diam.



Note: Price of ½" XX Dredge chain f.o.b. Columbus, O. $1980 per cwt.; @ 37.5 ft. per cwt.





LOWER GATE
2 REQ'D MK. G2
Scale 1"=1'-0"

9-21-22
7-7-21
7-20-21
7-22-21
8-13-21
encircled connections changed 9-15-21 from shop to field connections

BURD AND GIFFELS
Associate Engineers
Grand Rapids, Michigan

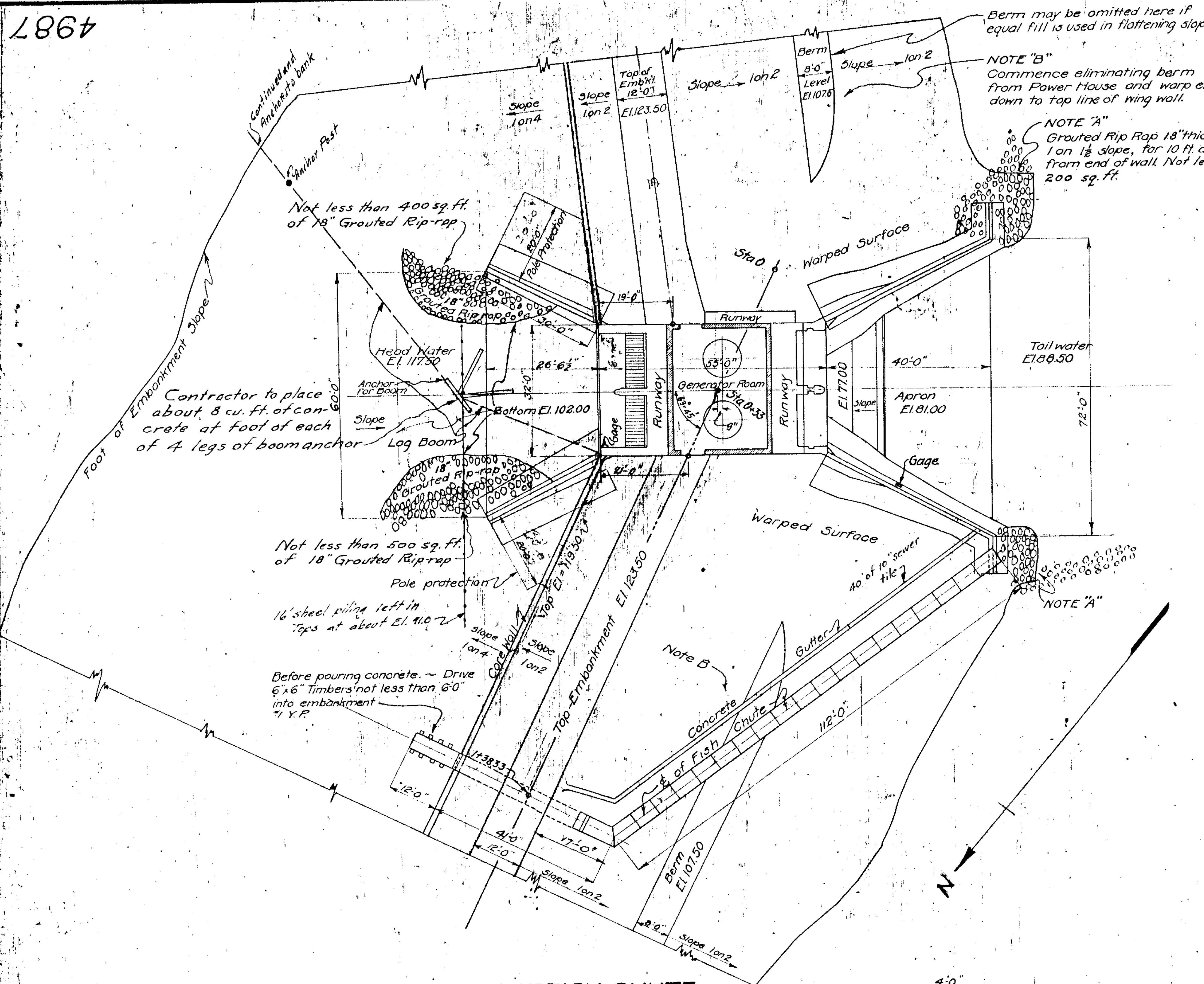
TAINTER GATES
PLANS FOR
BROWN BRIDGE
HYDRO-ELECTRIC PLANT
ON THE BOARDMAN RIVER
FOR THE
CITY OF TRAVERSE CITY
MICHIGAN

Scale as shown

FARGO
ENGINEERING
COMPANY
Jackson, Mich.

4986

4987



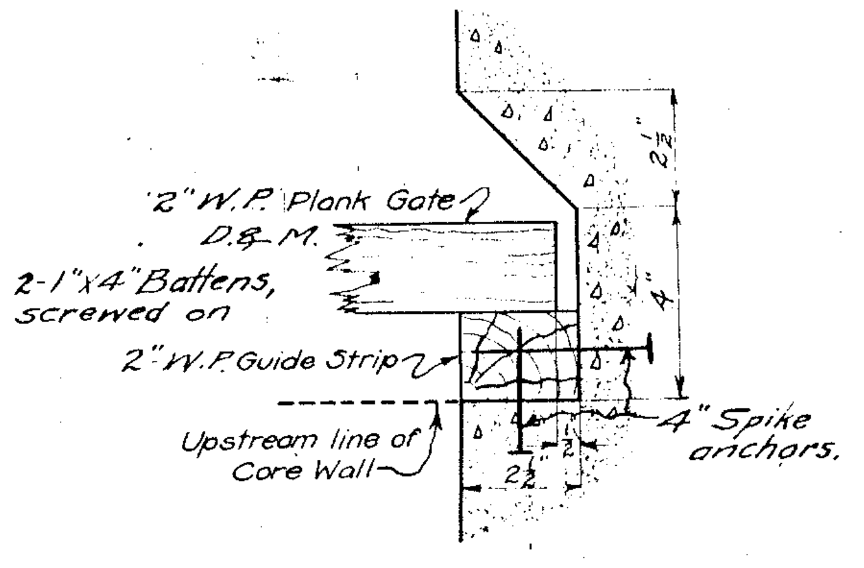
PLAN SHOWING LOCATION OF FISH CHUTE

Scale ~ 1" = 20 ft.

OPENINGS IN BAFFLES		
Baffle Nº	Approx. area of Opening Sq. Inches	Dimensions of Opening to Nearest ⅛ inch.
1	108	10⅜" x 10⅜" Bottom
2	112.8	10⅝" x 10⅝"
3	117.6	10⅞" x 10⅞"
4	122.5	11" x 11"
5	127.3	11¼" x 11¼"
6	132.1	11½" x 11½"
7	136.9	11¾" x 11¾"
8	141.7	11⅞" x 11⅞"
9	146.6	12⅛" x 12⅛"
10	151.4	12¼" x 12¼"
11	156.2	12½" x 12½"
12	161.0	12¾" x 12¾"
13	165.8	12⅞" x 12⅞"
14	170.7	13" x 13"
15	175.5	13¼" x 13¼"
16	180.3	13⅜" x 13⅜"
17	185.1	13⅝" x 13⅝"
18	189.9	13¾" x 13¾"
19	194.8	14" x 14"
20	199.6	14⅛" x 14⅛"
21	204.4	14¼" x 14¼"
22	209.2	14½" x 14½"
23	214.0	14⅝" x 14⅝"
24	218.9	14¾" x 14¾"
25	223.7	15" x 15"
26	228.5	15⅛" x 15⅛
27	233.3	15¼" x 15¼"
28	238.1	15⅜" x 15⅜"
29	243	15⅝" x 15⅝" Top

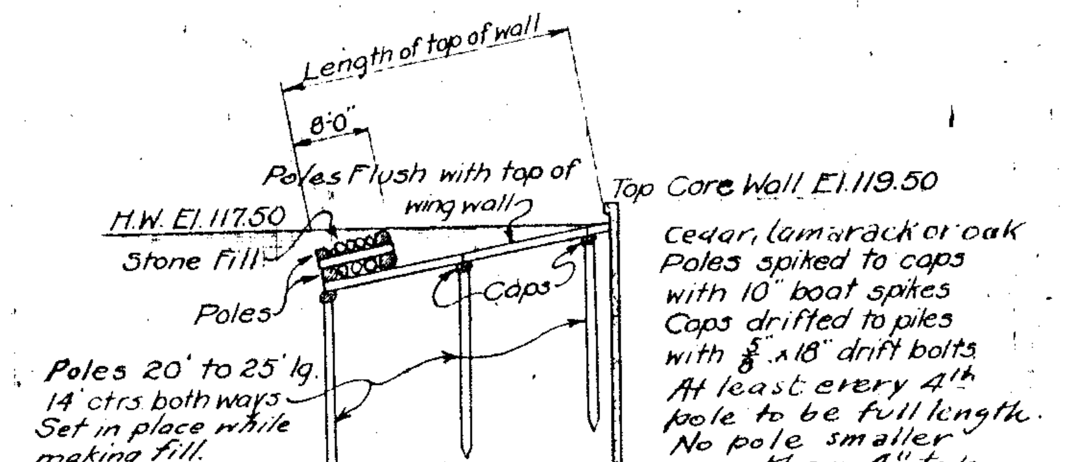
LIST OF BARS

BAR Nº	LOCATION	SPACING	Number Req'd.	Size	LENGTH	REMARKS
	LONGITUDINAL BARS					
1	Side Walls - inside upstr. section	See Section	12	½" □	28'-0"	Bend upstr. sets
2	" " " downstr. "	12"	16	½" □	29'-0"	
2a	" " " middle "	12"	16	½" □	32'-0"	
	Base slab ~ top and bottom					
3	Downstr. Section	See Section	8	½" □	29'-0"	
3a	Middle "	"	8	½" □	32'-0"	
3b	Upstr. "	"	8	½" □	28'-0"	
	Side Walls ~ top and bottom					
4	Downstr. Section	See Section	16	¾" □	29'-0"	
4a	Middle "	"	16	¾" □	32'-0"	
4b	Upstr. "	"	16	¾" □	28'-0"	Bend top bars upstr.
5	At "A" {Outside of wall downstr to 8"x8" Tie	See Plan	4	½" □	8'-0"	For water press. inside.
5a	" Inside of wall	" "	4	"	6'-0"	" " " "
	TRANSVERSE BARS					
6	Baffles - tie bars in tops	See Section	29	½" □	5'-0"	Bent
7	" - horizontals	"	58	½" □	3'-2"	
8	Top base slab - on slope	15" ctrs.	93	½" □	4'-0"	See sect. for bending
9	" " " Upstream	12" "	53	½" □	4'-0"	" " " "
10	Hor. in 8"x8" conc. tie upstr.		4	½" □	6'-0"	⊓ Bend for tie
11	U-bars ~ sides and bottom upstr.	12" ctrs. for distance "A"	10	½" □	15'-6"	See sect. for bending
11	" " " " "	3'-0" ctrs. upstr. from A	10	½" □	15'-6"	" " " "
11a	" " " Upstr. from core wall	3'-0" ctrs.	3	½" □	10'-0"	" " " "
11b	" " " " "	3'-0" "	2	½" □	7'-0"	" " " "
12	Vert. - upstr. inside of wall	15" ctrs	33	½" □	6'-4"	None upstr. from core.
13	Horiz. in cover slab - upstream	12" ctrs.	33	½" □	3'-9"	
14	U-bars - sides and bottom on slope	1'-4"	89	½" □	16'-0"	See sect. for bending



DETAIL OF GATE SLOT

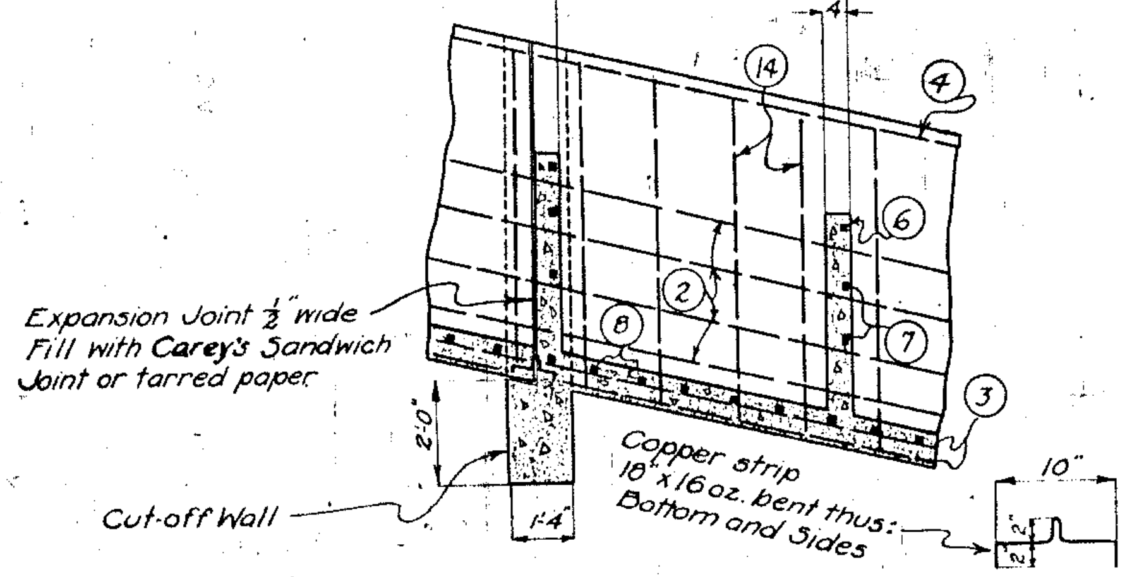
Scale 3" = 1 ft.



POLE PROTECTION

DETAIL AT UPSTREAM WING WALLS

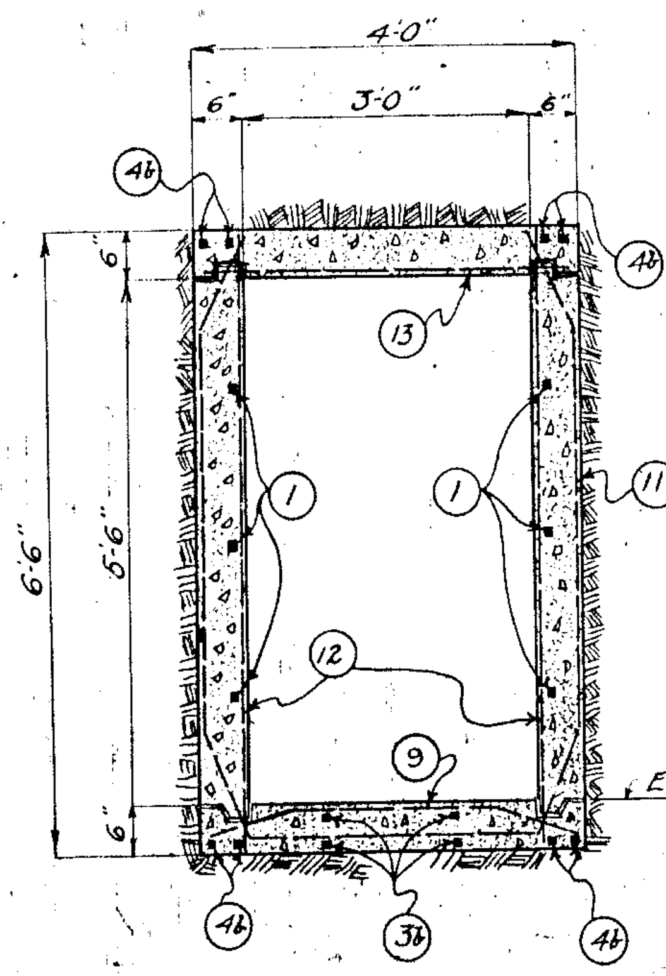
See Plan



PART LONGITUDINAL SECTION

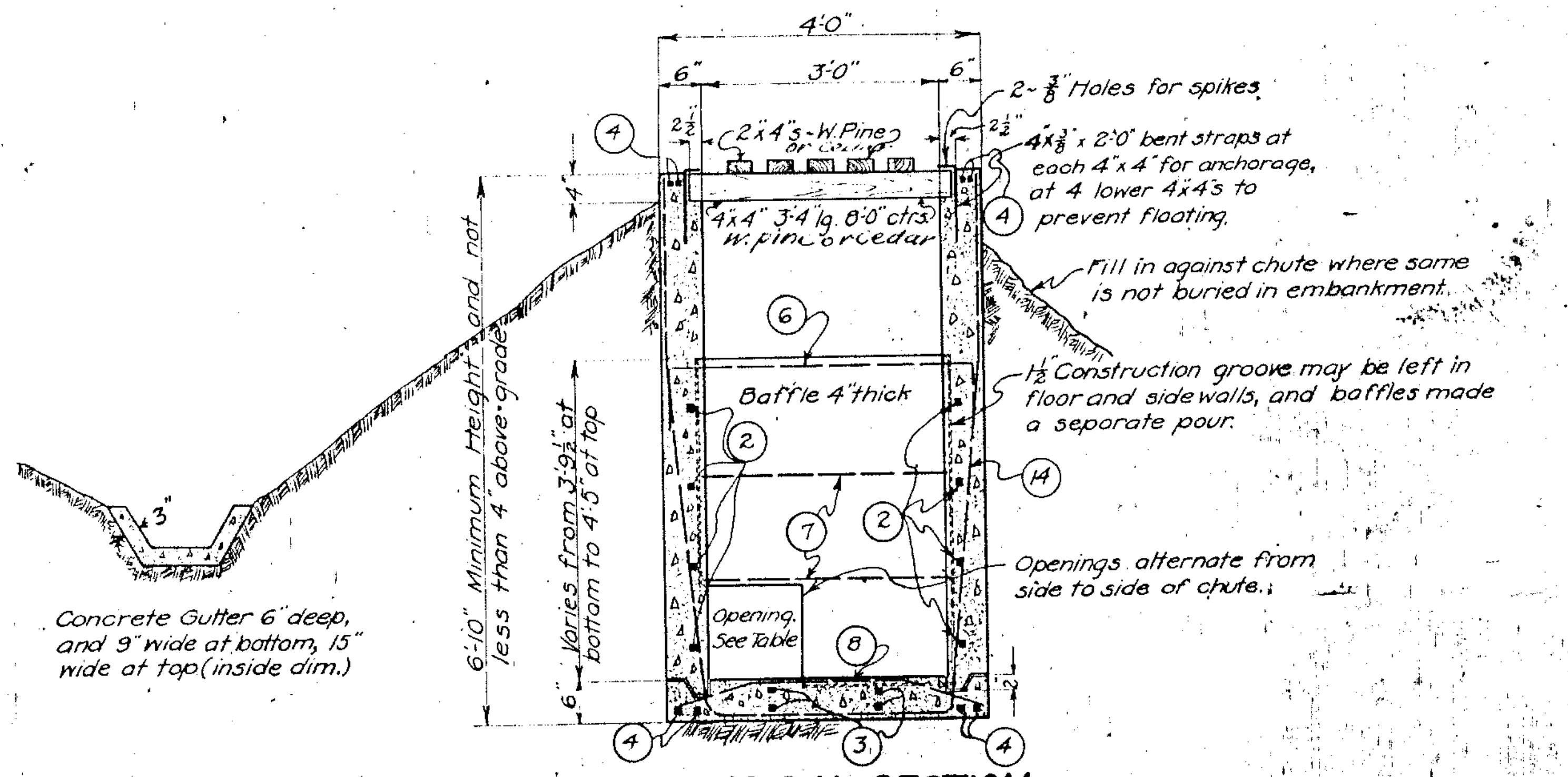
Showing Expansion Joint

Scale ¼" = 1 ft.



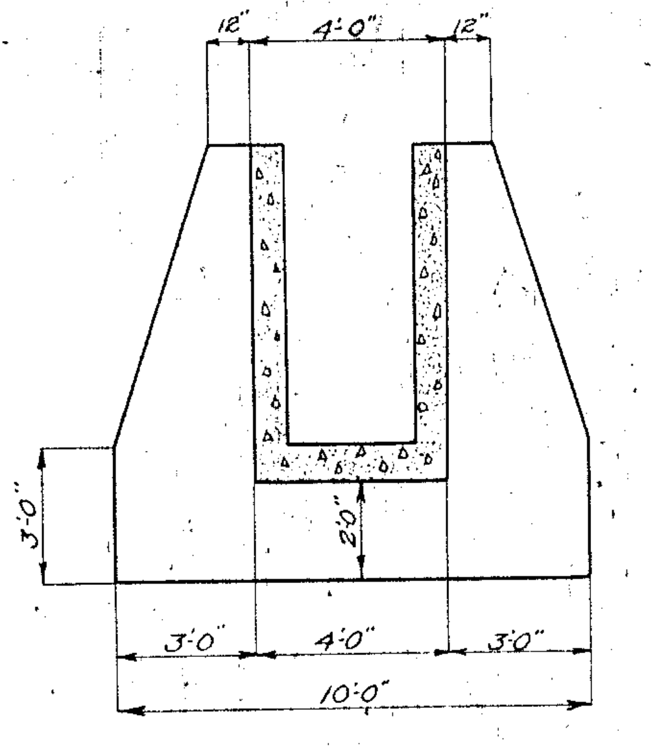
TYPICAL SECTION ON HORIZONTAL RUN

Scale ½" = 1 ft.



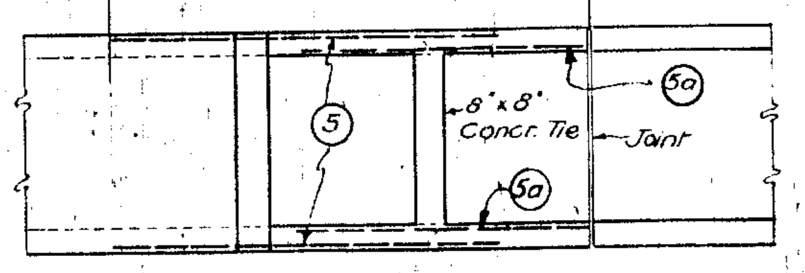
TYPICAL SECTION ON SLOPE

Scale ~ ½" = 1 ft.



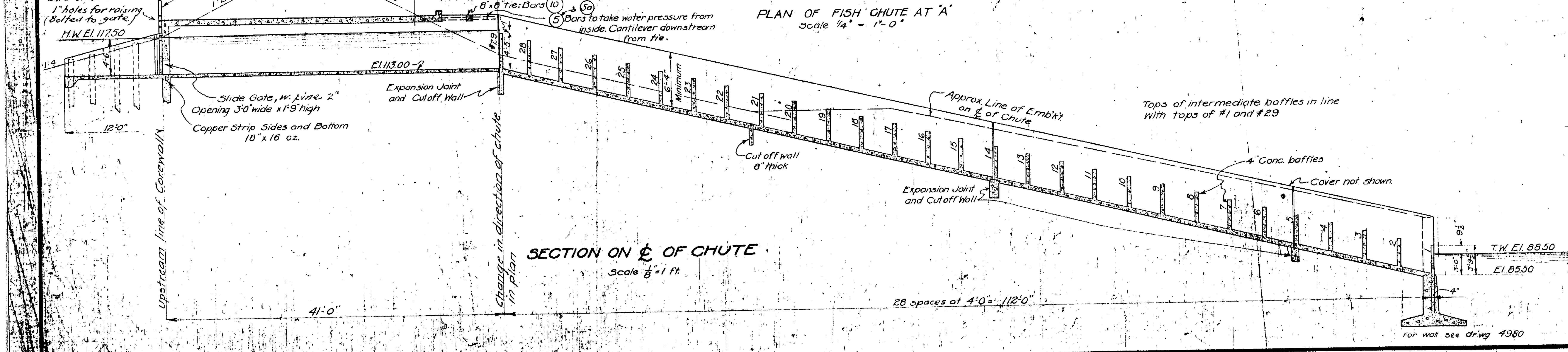
TYPICAL OUTLINE OF CUT-OFF WALLS

Scale - ¼" = 1 ft.



PLAN OF FISH CHUTE AT "A"

Scale ¼" = 1'-0"



SECTION ON ℄ OF CHUTE

Scale ⅛" = 1 ft.

Accepted July 26, 1921
John Baird, Director
per R. A. Bostwick

Approved Blueprint sent to City Clerk
July 28, 1921

FISH CHUTE

PLANS FOR
BROWN'S BRIDGE
HYDRO-ELECTRIC PLANT
ON THE BOARDMAN RIVER
FOR THE
CITY OF TRAVERSE CITY
MICHIGAN

Scales as shown

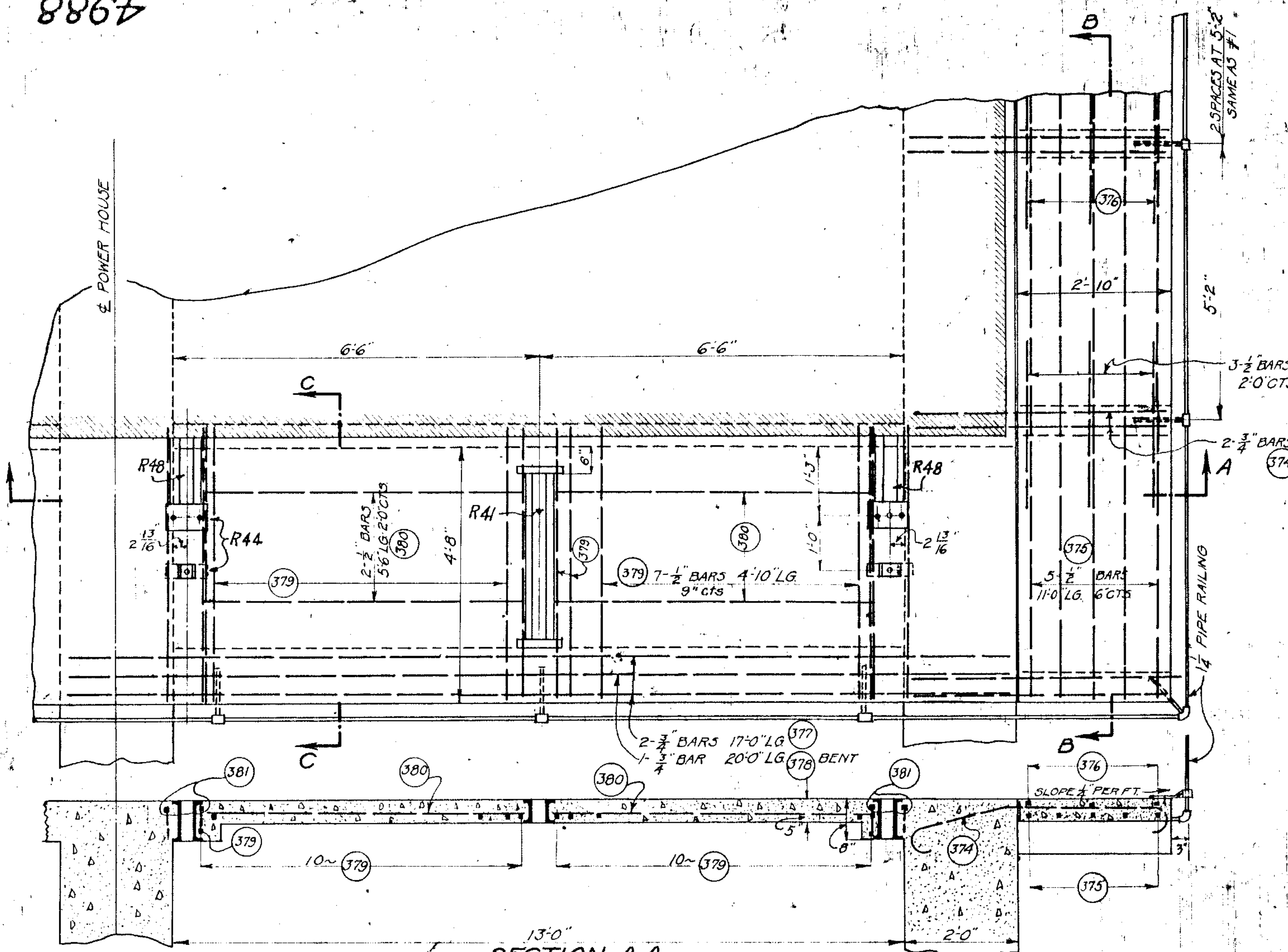
JUNE 25, 1921
JULY 11, 1921
JULY 28, 1921
AUG 11 1921
SEPT 29 1921
" 20 1922

BURD & GIFFELS,
Associate Engineers,
Grand Rapids, Mich.

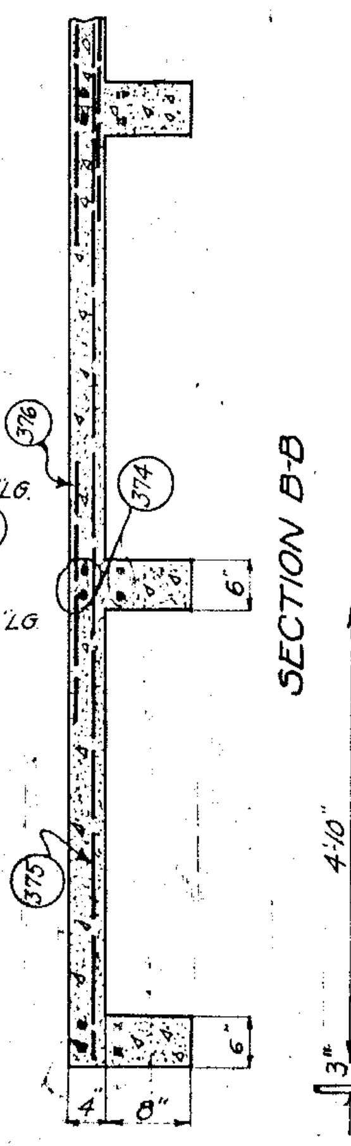
FARGO
ENGINEERING
COMPANY
Jackson, Mich.

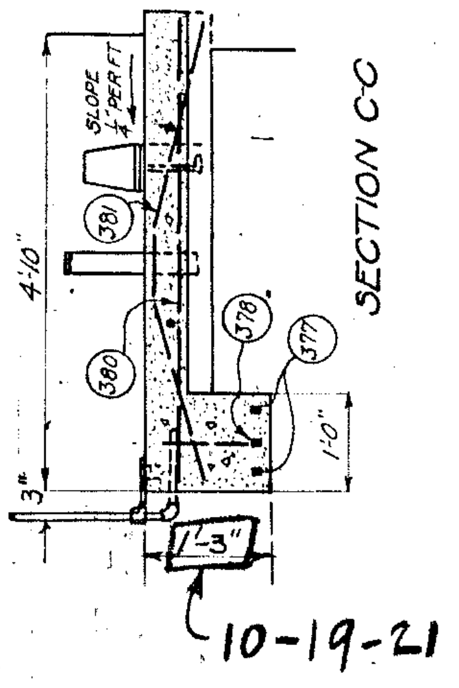
4987

4988

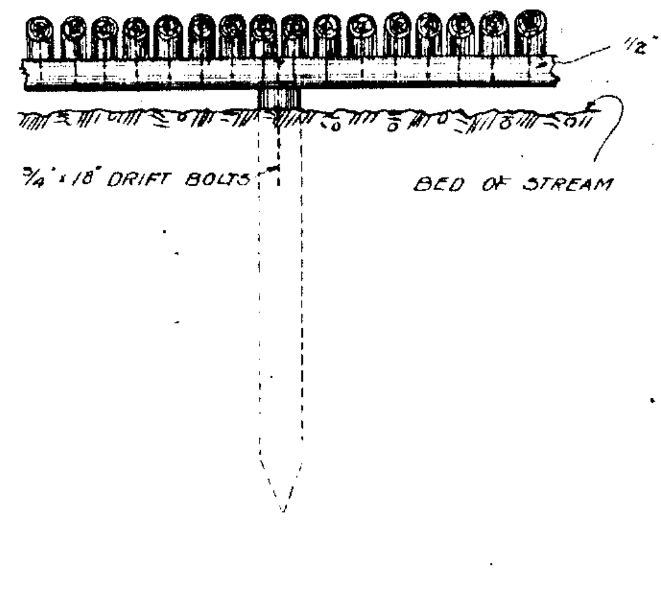


SECTION A-A
DETAIL OF DOWNSTREAM AND SOUTH RUNWAY
SCALE-½"=1 FT.

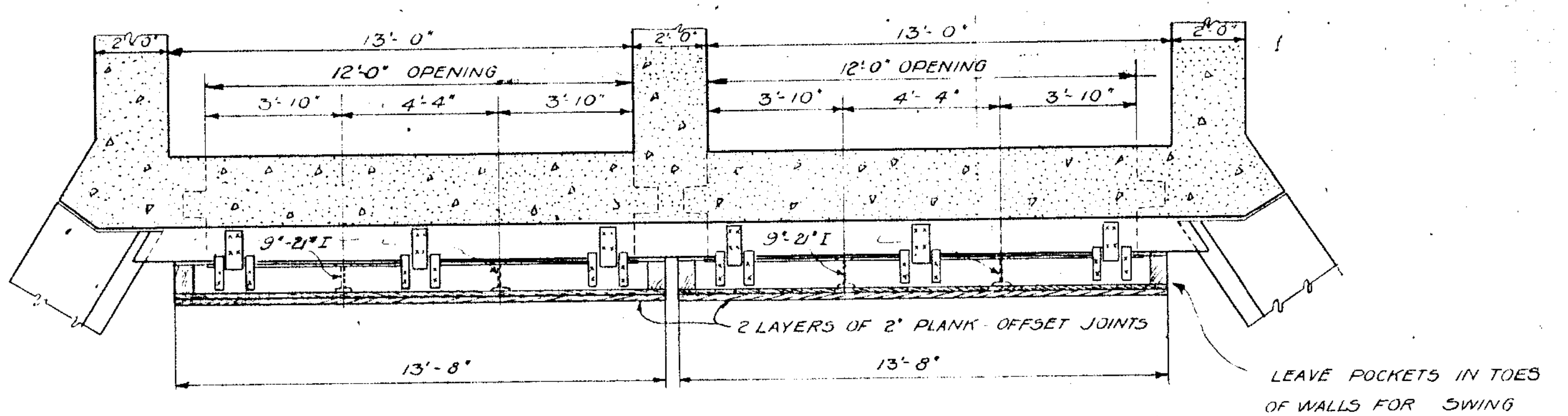




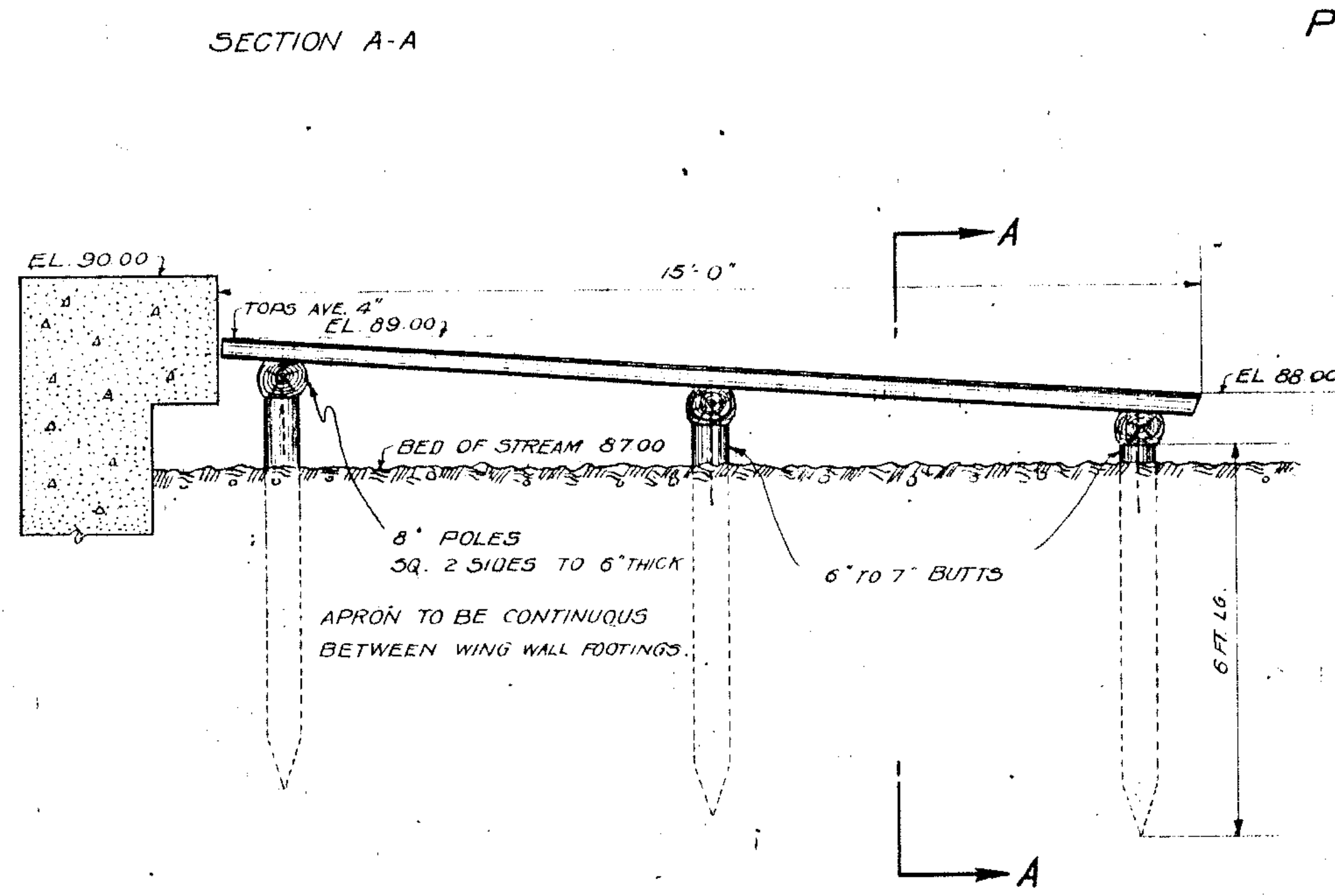
10-19-21



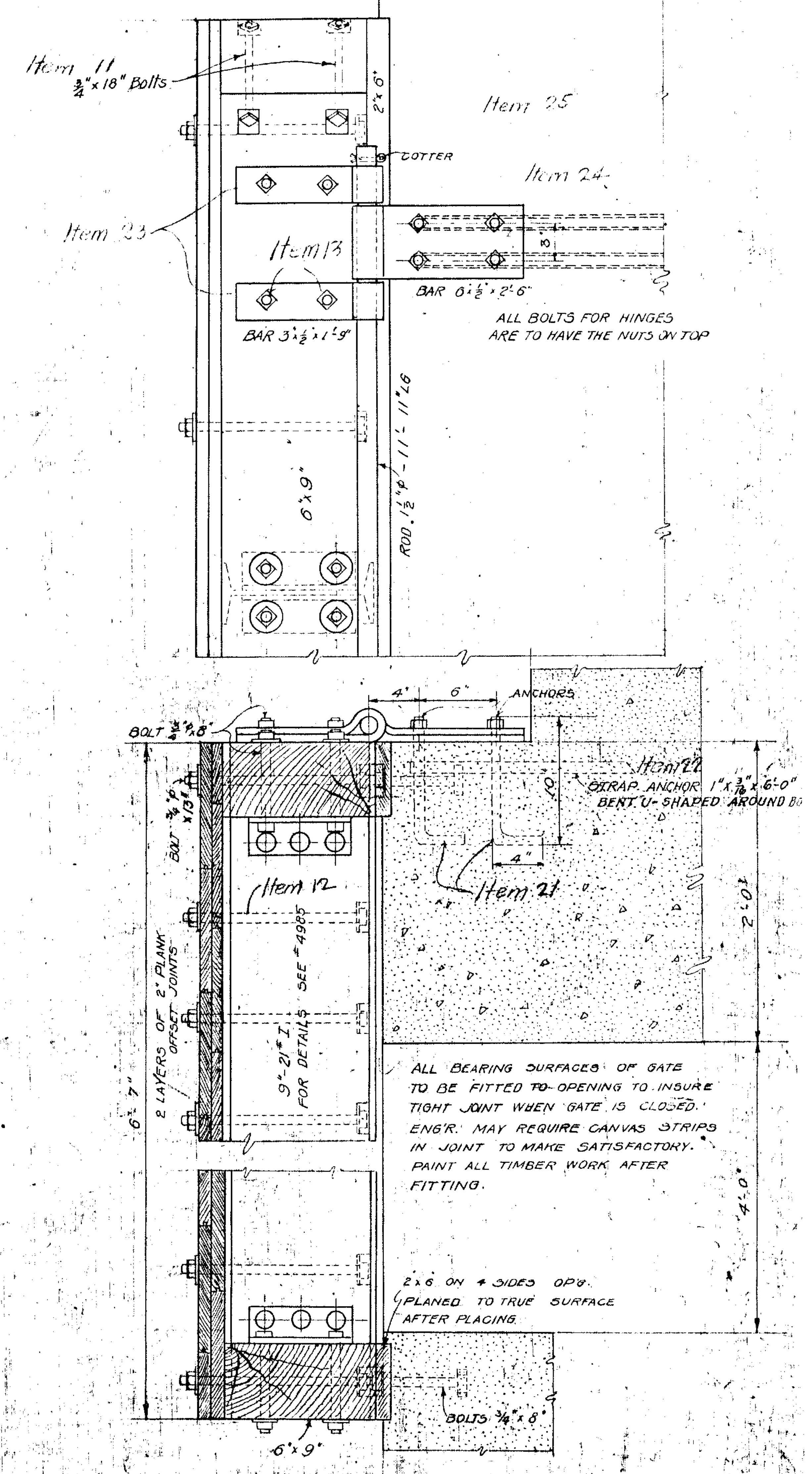
SECTION A-A



PLAN OF TEMPORARY SLUICE GATES
SEE DETAILS
SCALE ¼"=1'-0"

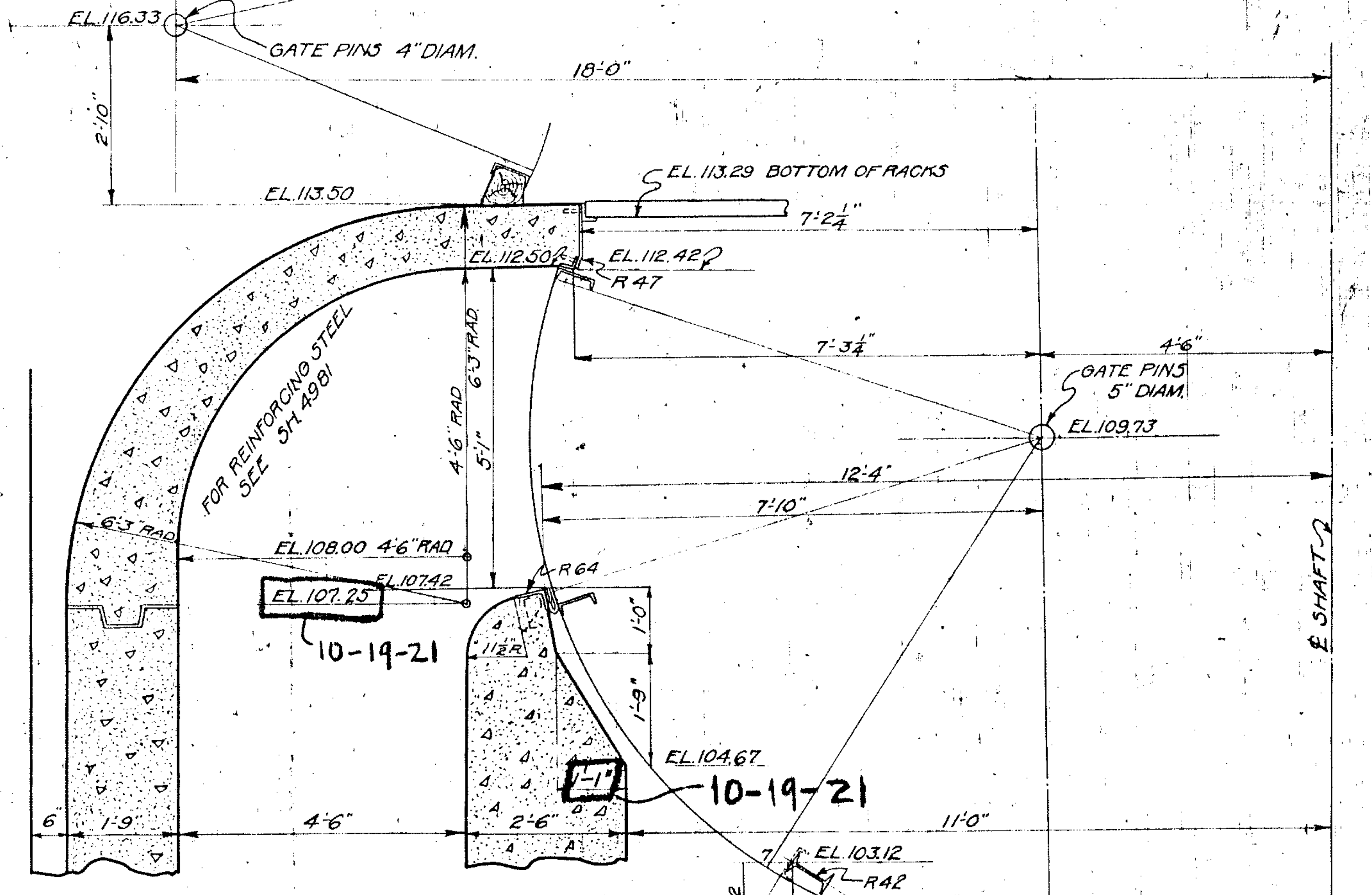


DETAIL FOR POLE APRON
UPSTR. FROM TEMP. OPENING
SCALE ⅜"=1'-0"



ALL BEARING SURFACES OF GATE TO BE FITTED ~~TO~~ OPENING TO INSURE TIGHT JOINT WHEN GATE IS CLOSED. ENG'R. MAY REQUIRE CANVAS STRIPS IN JOINT TO MAKE SATISFACTORY. PAINT ALL TIMBER WORK AFTER FITTING.

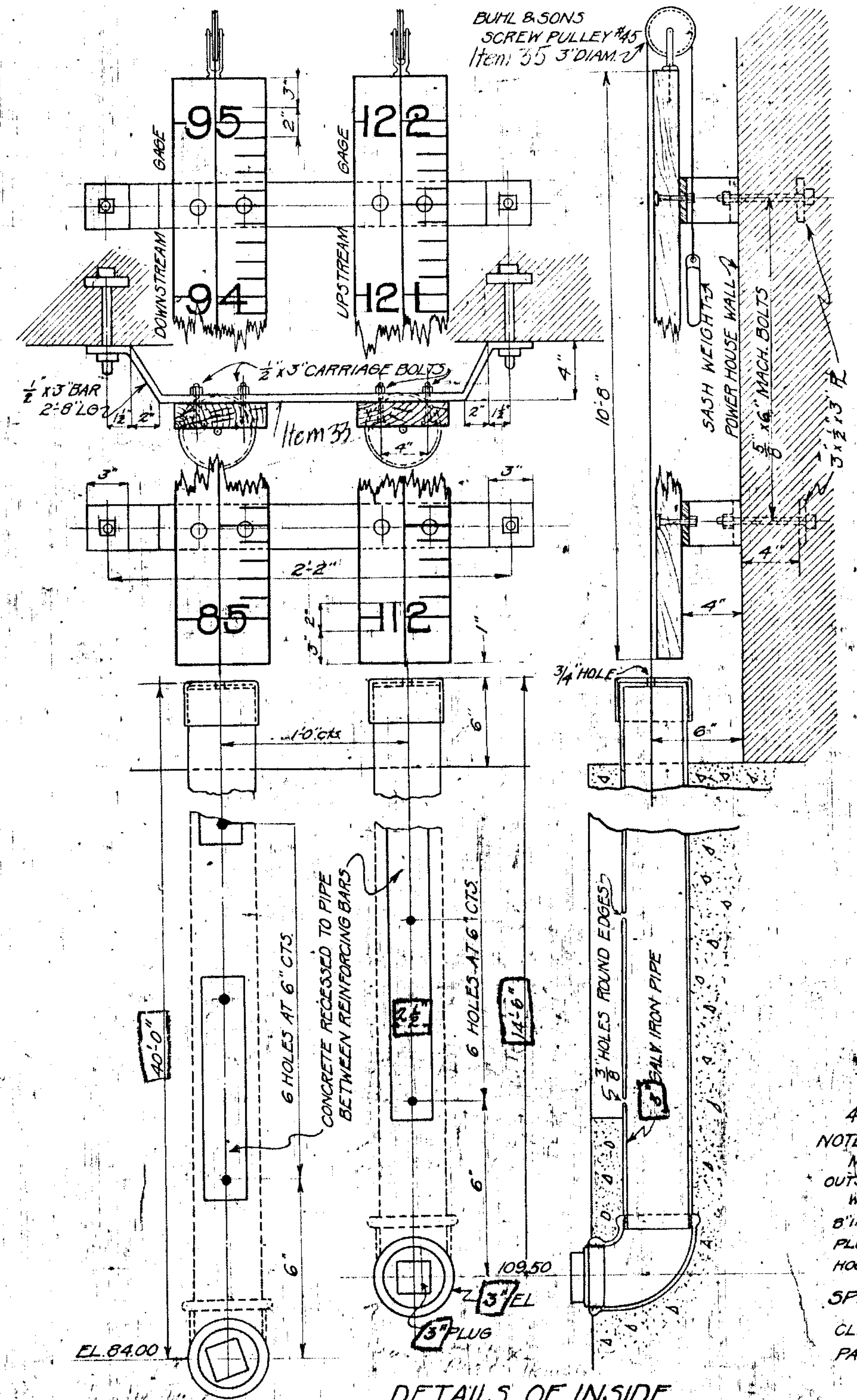
2x6 ON 4 SIDES OP'G. PLANED TO TRUE SURFACE AFTER PLACING.



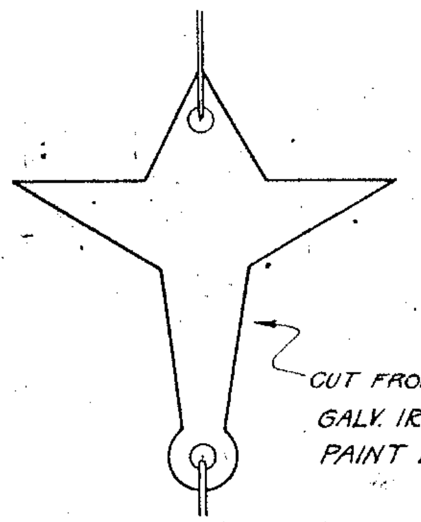
10-19-21

10-19-21

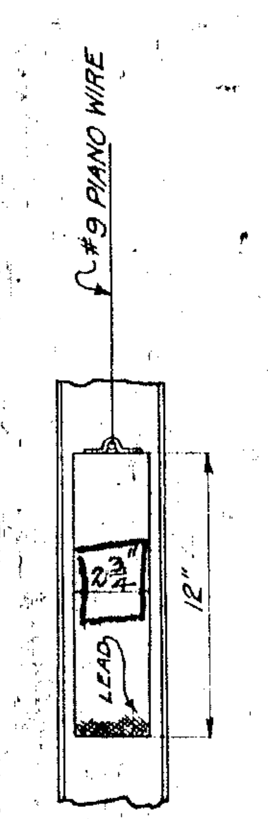
DETAIL OF
LOWER SPILLWAY
AND GATE SETTING
SCALE-½"=1 FT.



DETAILS OF INSIDE
HEAD AND TAILWATER
GAGES
2 SETS REQUIRED
SCALE 1½"=1 FT.



INDICATOR
4 REQD
SCALE-FULL SIZE



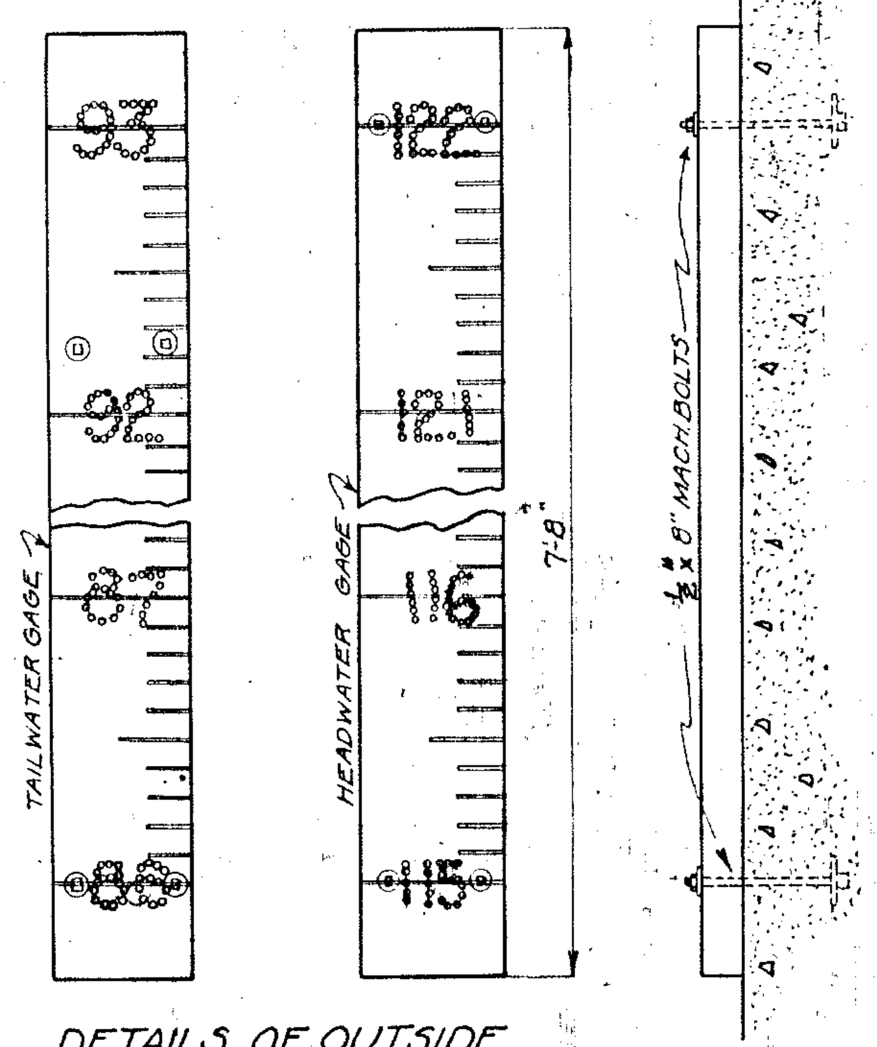
OIL FLOAT
Item 43
4 WANTED SCALE 1½"=1 FT.

NOTE:-
MAKE FLOAT OF COPPER 3" OUTSIDE DIMENSIONS, AIR TIGHT.
WEIGHT WITH LEAD UNTIL IMMERSED 8" IN WATER. TO BE MADE TO FLOAT PLUMB.
HOOK AND SOLDER #9 WIRE TO TOP.

SPECIFICATIONS

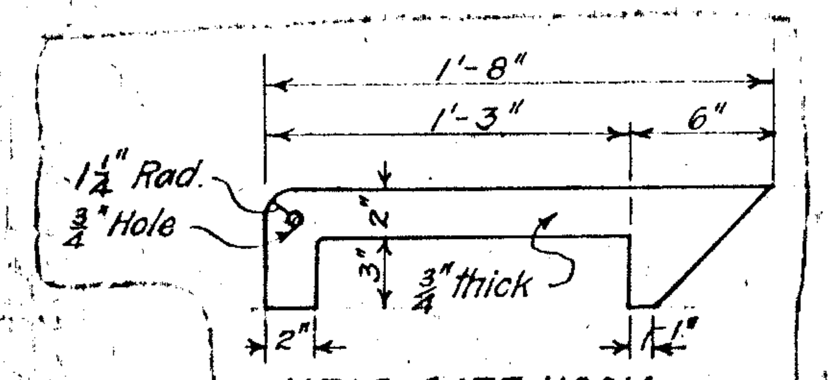
CLEAR CYPRESS 2"x 6" DRESSED-4 SIDES
PAINT 3 COATS WHITE LEAD & OIL
GRADUATIONS - BLACK
NUMERALS - VERMILLION

OWNER TO FURNISH GAGES COMPLETE

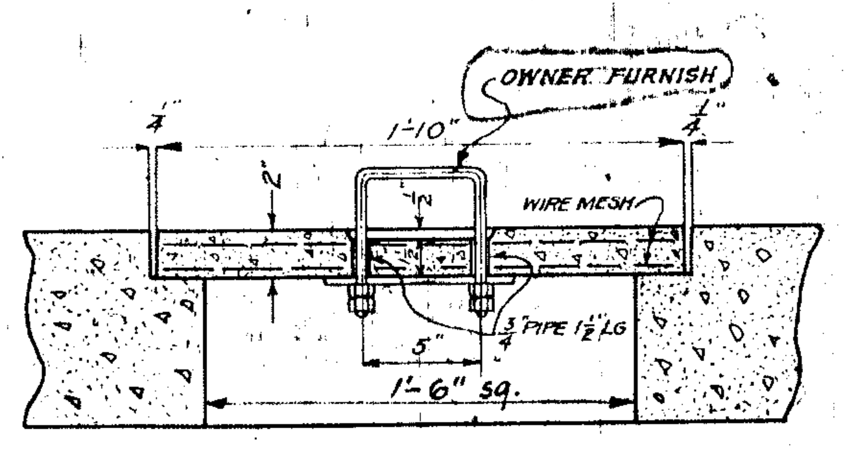


DETAILS OF OUTSIDE
HEAD AND TAILWATER GAGES
1 OF EACH REQUIRED
SCALE 1½"=1 FT.

SPECIFICATIONS
CLEAR CYPRESS-2"x6" DRESSED-4 SIDES
PAINT-OIL THOROUGHLY AND 3 COATS OF WHITE LEAD AND OIL.
GRADUATIONS - #9 GALV. STAPLES
NUMERALS - 2d GALV. NAILS



HEAD GATE HOOK
2 REQD.
SCALE 1½"=1FT.
OWNER FURNISH
Item 65



DETAIL OF MANHOLE COVER
COVER 13 SQUARE. LOCATE HOLES FOR HANDLE IN CENTER.
SCALE 1½"=1 FT.

PLANS FOR
BROWNS BRIDGE
HYDRO-ELECTRIC PLANT
ON THE BOARDMAN RIVER
FOR THE
CITY OF TRAVERSE CITY
MICHIGAN

AUGUST 15, 1921
SEPT 20, 1921
SEPT. 29, 21
OCT. 19, 21

FARGO
ENGINEERING
COMPANY
JACKSON, MICH.

SCALE AS SHOWN

BURD & GIFFELS
ASSOCIATE ENGRS
GRAND RAPIDS MICH

4988

ATTACHMENT B

HISTORIC BORING AND TEST PIT RECORDS

MEAD & HUNT, INC.
2320 University Ave. P. O. Box 5247
MADISON, WISCONSIN 53705

(608) 233-9706

22 APR 1985

LETTER OF TRANSMITTAL

DATE 4-19-85
JOB NO. T3-85A
ATTENTION Mr. Chuck Brumbaugh
RE:
Brown Bridge
Exploration

TO Gosling Czubak Associates PC
525 W 14th
Traverse City, MI 49684

WE ARE SENDING YOU ☒ Attached ☐ Under separate cover via ______ the following items:

☐ Shop drawings ☐ Prints ☐ Plans ☐ Samples ☐ Specifications
☐ Copy of letter ☐ Change order ☐ ______

COPIES	DATE	NO.	DESCRIPTION
1			SPT procedures for seismic studies
			(in addition to ASTM D 1586-67)

THESE ARE TRANSMITTED as checked below:

☐ For approval ☐ Approved as submitted ☐ Resubmit ____ copies for approval
☒ For your use ☐ Approved as noted ☐ Submit ____ copies for distribution
☐ As requested ☐ Returned for corrections ☐ Return ____ corrected prints
☐ For review and comment ☐ ______
☐ FOR BIDS DUE ______ 19____ ☐ PRINTS RETURNED AFTER LOAN TO US

REMARKS

Chuck - this should help to explain our SPT procedures. If you have any questions please call me (or Terry Hampton) by Wed. April 24 if possible.

Thank you

Tom Fontaine

COPY TO ______

SIGNED: T. Fontaine

If enclosures are not as noted, kindly notify us at once.

APPENDIX B

STANDARD PENETRATION TEST FOR SEISMIC STABILITY STUDIES

The equipment and procedures used for the standard penetration test should be in general conformance with ASTM Designation D 1586-67, "Standard Method for Penetration Test and Split-Barrel Sampling of Soils"[1]. The additional specifications below, with the exception of the method of recording penetration in gravelly materials, are in conformance with the standard as it has generally been construed. The variations in practice permitted by the standard method have been shown to lead to unacceptably large variability in the results. The procedures specified below are intended to (1) improve the repeatability and comparability of the results, and (2) provide results that are comparable to the bulk of the historical data, which are the empirical basis for evaluating liquefaction potential by the SPT. It must be emphasized that special care and attention to detail are needed to obtain results of the quality and reliability needed in seismic stability studies. All relevant details of the procedure should be clearly shown on the driller's log.

Rods. The type of rods used should be recorded on the log. Because correction to the blow count is required for short rod lengths, the length of rod should be recorded for each drive where the rod length is less than 20 feet.

Drive Weight Assembly. A rope and drum (cathead) system should be used, with two turns of the rope around the drum. The rope should be replaced before it becomes worn or polished.

Drilling Mud. Drilling mud should be used to support the hole and to prevent heave of the bottom of the hole. The mud column must be above the level needed to balance any artesian pressures that may be encountered.

Hole Diameter. To provide lateral support for the drill rods, the hole should be kept to a diameter of about 4 inches. Where casing is used, it should be of 4-inch diameter.

Interval Tested. To minimize disturbance, the hole should be cleaned out to a depth of about one foot below the previous drive. This permits one test in each two and one half foot interval.

<u>Gravelly Sands</u>. In granular soils containing occasional pieces of gravel, the method of recording should be modified. The modified procedure is as follows:

1. Measure and record, to the nearest 1/4 inch, the cumulative penetration after each blow.

2. If the penetration per blow is less than about 1/2 inch, the measurement may be made after every other blow, or less frequently, so long as at least one measurement is recorded for each inch of penetration. For each measurement, record the cumulative number of blows and the cumulative penetration.

The results should be presented on a plot of cumulative penetration versus cumulative blow count. Using the slope of this curve, an estimate can frequently be made of what the blow count would have been without the influence of gravel.

Gosling Czubak Associates

May 23, 1985

Mr. Tom Fontaine
Mead & Hunt, Inc.
2350 University Avenue
P.O. Box 5247
Madison, WI 53705

Dear Tom:

Here are the only water well logs I could find near Brown Bridge.

Sincerely,

GOSLING CZUBAK ASSOCIATES, P.C.

Charles D. Brumbaugh
Manager of Geotechnical
and Testing Services

CDB:nn

Engineers
Surveyors

Gosling Czubak Associates, P.C.
525 West Fourteenth
Traverse City, MI 49684-4093
616 946-9191

MEAD AND HUNT INC.
Consulting Engineers
Post Office Box 5247
2320 University Avenue Madison, Wisconsin 53705 608-233-9706

PLAN FOR EVALUATING THE LIQUEFACTION POTENTIAL OF THE BROWN BRIDGE HYDRO DAM EMBANKMENT AND FOUNDATION

Brown Bridge Dam is a hydraulic fill dam constructed in 1921 for the Traverse City Light and Power Department to generate hydroelectric power. The dam consists of two earth embankments separated by the powerhouse-spillway structure. The design and construction details of the earth embankments are not available to fully establish the foundation soils and the type of soils used within the earth embankment. From the available information, the soils of the embankment appear to consist mainly of sand and gravel. The foundation soils are of glacial origin and mainly outwash deposits of sand and gravel, perhaps interbedded with clays. The depth of overburden is relatively great (125 feet or more).

The major considerations involved in an analysis of threats to dam safety caused by earthquake-induced ground motions are: (1) potential for flow slides resulting from liquefaction of embankment or foundation materials and (2) permanent deformations if embankment materials do not lose appreciable strength during an earthquake, i.e., where liquefaction is not a problem. Cost of investigation can be minimized by phased investigation, and this approach is proposed in this plan. The evaluation will start with the simplified methods and progress, as necessary, to more sophisticated and expensive. The evaluation will be terminated when definitive answers are obtained. Early in the study, it will be decided whether embankment and foundation soils are of types that could be susceptible to liquefaction under earthquake loadings up to and including the maximum credible earthquake for the site of the dam. The outcome of this decision will determine not only the methods of analysis to be used but the kinds and amount of field investigation needed. With this phased approach in mind, the following investigation is planned as a minimum which will be supplanted as necessary:

1. Geological and Seismological Study. An acceleration-time history has to be developed for maximum credible earthquake and used in the analysis. This phase will run concurrently with the field exploration. The seismic

setting of the dam will be determined by relating distance from causative faults and maximum credible earthquake magnitude. The site-specific study will identify earthquake source areas and/or fault structures, maximum credible earthquakes, and estimates of the magnitude-recurrence interval relationships for them. Based on this study, appropriate earthquake accelerograms for the earthquakes provided will be selected. The accelerograms may be derived from scaling existing records or, in some cases, from synthetic records that produce a specific response spectrum. Assistance will be sought from seisemologists familiar with the geology and seismology of the region in which the dam site is located.

2. Field Investigation. The purpose of the initial field investigation is twofold: (i) to establish the dam geometry, i.e., crest alignment, concrete core wall location, location of the powerhouse and other structures, location of any drainage structures or ditches, and determination of a typical dike cross-section and (ii) to determine the nature and extent of the materials present in the embankment and the foundation to permit an assessment of the potential for liquefaction. Initially, three soil borings will be taken, one on each dike and one downstream from the embankment. Based on an understanding of the regional geology at the dam site and the conditions encountered in the borings, a subsurface model will be developed. If there are uncertainties about this model that may have an impact on the evaluation of the stability of the dam and its foundation, the exploration program will be expanded to reduce or eliminate those uncertainties.

The subsurface exploration in the bore holes will be carried using conventional methods. Standard penetration tests (SPT) will be performed at 5-foot intervals using drilling mud to support the sides of the bore hole. The tests will be performed with care and in conformity with the ASTM Standard D 1586-67. To provide results that are comparable to the bulk of the historical data, certain procedures and equipment will be specified, i.e., rod type, drive weight assembly, hole diameter, test interval, etc. The depth of exploration will extend sufficient distance into natural ground beneath the dike for the bore holes on the embankments. The third bore hole downstream from the embankment will be used primarily to explore the foundation materials. When nongranular materials are encountered, "undisturbed" 3-inch thin-wall tube samples will be taken.

The samples recovered from the bore holes will be tested in the laboratory for grain size distribution, plasticity (certain clayey materials may be vulnerable to severe loss of strength as a result of earthquake shaking), density and static strength.

Four piezometers will be installed, two in each earth dike. On each cross-section to be monitored, one piezometer shall be located at approximately mid-height of the slope with the well-point head at least 10 feet deep and at least 2 feet below the phreatic surface. The other piezometer shall be located approximately 5 feet (vertical) above the toe of the dike with the well-point head at least 7 feet deep and at least 2 feet below the phreatic surface.

If the liquefaction or excessive deformation appears to be possible and if the subsurface data appear to be inadequate, the site information will be expanded using core penetration test (CPT) to define the spatial extent of the problem.

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rength

3. Seismic Evaluations. The general procedure for evaluating liquefaction potential, in one or more of several variations, involves a comparison of the dynamic stresses and the dynamic strengths in order to predict whether the specified earthquake could cause a loss of strength that could result in excessive strains or a possible flow slide. Initially, a simplified analysis technique will be used. It involves three basic steps:

(i) Estimate the dynamic stresses in the soil resulting from motions of the postulated maximum credible earthquake as given by the geological and seismological study. A one-dimensional wave propagation analysis method will be used for this purpose along with conservative estimates of necessary input parameters such as dynamic modulus, damping ratio, Poisson's ratio, modulus reduction (due to strain level), etc.

(ii) Determine the cyclic strength of the soil. An empirical approach based on the SPT blow counts will be used. This method was described by Seed, et al (1983) and requires, in addition to SPT blow counts, soil densities, piezometric levels, gradation and plasticity, strength dependency on initial static stress, static shear modulus and Poission's ratio. These properties will be estimated from conservatively interpreted correlations based on past experience on similar soils. If CPT is used in the field explorations, proper site-specific correlations between CPT and SPT values will be developed.

(iii) Compare stresses and strengths. The factor of safety used in an evaluation of liquefaction potential is the ratio of the cyclic strength of a soil element to the cyclic stress imposed on it by the earthquake.

The result of the simplified analysis will be one of three conclusions: one, the dam is clearly safe against liquefaction; two, it is clearly unsafe; or three, the simplified analysis is inadequate to resolve the issue. If a conclusion of the first kind is reached, a permanent deformation analysis will be performed. Again a simplified procedure, the seismic coefficient analysis will be used. This is a pseudo-static analysis useful as a screening method. A seismic coefficient equal to one-half the predicted peak bedrock acceleration was found to assure, if the factor of safety is at least 1.0, that sliding deformations will be limited to 1 meter or less (Hynes-Griffin and Franklin, 1984).

If a conclusion of the second kind is reached, the consequences of the failure on downstream life and property will be evaluated. If the failure would constitute a hazard to human life or would cause extensive property damage, a plan and schedule for modifying the dam to ensure the safety of downstream life and property will be developed.

If a conclusion of the third kind is reached, then a decision must be made by Traverse City Light and Power as to whether more elaborate and rigorous dynamic analyses should be pursued and, if so, the scope of that effort. This decision involves such factors as the cost of additional studies, the cost of modifying the dam, etc.

Designation: D 1586 - 67

Standard Method for
PENETRATION TEST AND SPLIT-BARREL SAMPLING OF SOILS[1]

This Standard is issued under the fixed designation D 1586; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval.

1. Scope

1.1 This method describes a procedure for using a split-barrel sampler to obtain representative samples of soil for identification purposes and other laboratory tests, and to obtain a measure of the resistance of the soil to penetration of the sampler.

2. Apparatus

2.1 *Drilling Equipment*—Any drilling equipment shall be acceptable that provides a reasonably clean hold before insertion of the sampler to ensure that the penetration test is performed on undisturbed soil, and that will permit the driving of the sampler to obtain the sample and penetration record in accordance with the procedure described in Section 3. To avoid "whips" under the blows of the hammer, it is recommended that the drill rod have a stiffness equal to or greater than the A-rod. An "A" rod is a hollow drill rod or "steel" having an outside diameter of 1⅝ in. (41.2 mm) and an inside diameter of 1⅛ in. (28.5 mm), through which the rotary motion of drilling is transferred from the drilling motor to the cutting bit. A stiffer drill rod is suggested for holes deeper than 50 ft (15 m). The hole shall be limited in diameter to between 2¼ and 6 in. (57.2 and 152 mm).[2]

2.2 *Split-Barrel Sampler*—The sampler shall be constructed with the dimensions indicated in Fig. 1. The drive shoe shall be of hardened steel and shall be replaced or repaired when it becomes dented or distorted. The coupling head shall have four ½-in. (12.7-mm) (minimum diameter) vent ports and shall contain a ball check valve. If sizes other than the 2-in. (50.8-mm) sampler are permitted, the size shall be conspicuously noted on all penetration records.

2.3 *Drive Weight Assembly*—The assembly shall consist of a 140-lb (63.5-kg) weight, a driving head, and a guide permitting a free fall of 30 in. (0.76 m). Special precautions shall be taken to ensure that the energy of the falling weight is not reduced by friction between the drive weight and the guides.

2.4 *Accessory Equipment*—Labels, data sheets, sample jars, paraffin, and other necessary supplies should accompany the sampling equipment.

3. Procedure

3.1 Clear out the hole to sampling elevation using equipment that will ensure that the material to be sampled is not disturbed by the operation. In saturated sands and silts withdraw the drill bit slowly to prevent loosening of the soil around the hole. Maintain the water level in the hole at or above ground water level.

3.2 In no case shall a bottom-discharge bit be permitted. (Side-discharge bits are permissible.) The process of jetting through an open-tube sampler and then sampling when the desired depth is reached shall not be permitted. Where casing is used, it may not be driven below sampling elevation. Record any loss of

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[1] This method is under the jurisdiction of ASTM Committee D-18 on Soil and Rock for Engineering Purposes.
Current edition approved Oct. 20, 1967. Originally issued 1958. Replaces D 1586 - 64 T.

[2] Hvorslev, M. J., *Surface Exploration and Sampling of Soils for Civil Engineering Purposes*, The Engineering Foundation, 345 East 47th St, New York, N. Y. 10017.

circulation or excess pressure in drilling fluid during advancing of holes.

3.3 With the sampler resting on the bottom of the hole, drive the sampler with blows from the 140-lb (63.5-kg) hammer falling 30 in. (0.76 m) until either 18 in. (0.45 m) have been penetrated or 100 blows have been applied.

3.4 Repeat this operation at intervals not longer than 5 ft (1.5 m) in homogeneous strata and at every change of strata.

3.5 Record the number of blows required to effect each 6 in. (0.15 m) of penetration or fractions thereof. The first 6 in. (0.15 m) is considered to be a seating drive. The number of blows required for the second and third 6 in. (0.15 m) of penetration added is termed the penetration resistance, *N*. If the sampler is driven less than 18 in. (0.45 m), the penetration resistance is that for the last 1 ft (0.30 m) of penetration (if less than 1 ft (0.30 m) is penetrated, the logs shall state the number of blows and the fraction of 1 ft (0.30 m) penetrated).

3.6 Bring the sampler to the surface and open. Describe carefully typical samples of soils recovered as to composition, structure, consistency, color, and condition; then put into jars without ramming. Seal them with wax or hermetically seal to prevent evaporation of the soil moisture. Affix labels to the jar or make notations on the covers (or both) bearing job designation, boring number, sample number, depth penetration record, and length of recovery. Protect samples against extreme temperature changes.

4. Report

4.1 Data obtained in borings shall be recorded in the field and shall include the following:

4.1.1 Name and location of job,

4.1.2 Date of boring—start, finish,

4.1.3 Boring number and coordinate, if available,

4.1.4 Surface elevation, if available,

4.1.5 Sample number and depth,

4.1.6 Method of advancing sampler, penetration and recovery lengths,

4.1.7 Type and size of sampler,

4.1.8 Description of soil,

4.1.9 Thickness of layer,

4.1.10 Depth to water surface; to loss of water; to artesian head; time at which reading was made,

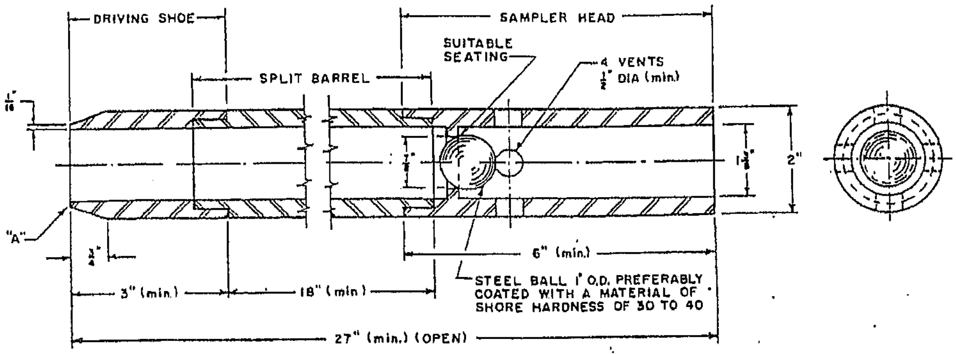
4.1.11 Type and make of machine,

4.1.12 Size of casing, depth of cased hole,

4.1.13 Number of blows per 6 in. (0.15 m),

4.1.14 Names of crewmen, and

4.1.15 Weather, remarks.



NOTE 1—Split barrel may be 1½ in. inside diameter provided it contains a liner of 16-gage wall thickness.

NOTE 2—Core retainers in the driving shoe to prevent loss of sample are permitted.

NOTE 3—The corners at *A* may be slightly rounded.

Metric Equivalents

in.	mm	in.	mm
1/16 (16 gage)	1.5	2	50.8
½	12.7	3	76.2
¾	19.0	6	152.4
⅞	22.2	18	457.2
1⅜	34.9	27	685.8
1½	38.1		

FIG. 1 Standard Split Barrel Sampler Assembly.

By publication of this standard no position is taken with respect to the validity of any patent rights in connection therewith, and the American Society for Testing and Materials does not undertake to insure anyone utilizing the standard against liability for infringement of any Letters Patent nor assume any such liability.

Gosling Czubak
Associates

Engineers
Surveyors

Gosling Czubak Associates, P.C.
525 West Fourteenth
Traverse City, MI 49684
616 946-9191

SHEET 1 OF 2

PROJECT SOIL INVESTIGATION
LOCATION BROWN BRIDGE POND
CLIENT TRAVERSE CITY LIGHT & POWER
DATE STARTED MAY 7, 1985
DATE COMPLETED MAY 7, 1985
DRILLER BRK HELPER ETM

BORING NO. ONE (SOUTH DIKE)
Ground Surface Elev.
Plugging Method EXCAVATED SOIL
Weather CLOUDY & OCC. LT. RAIN
Water Data 15'± BELOW GROUND
Job Number 85019.03

DEPTH	SAMPLE	SAMPLING METHOD	PENETRATION RESISTANCE	SOIL CLASSIFICATION
				GRAVEL FLYASH
				BROWN MEDIUM SAND
5	1	SS	3-3-7	
10	2	SS	4-3-5	
15	3	SS	8-10-9	BROWN MEDIUM
				SAND
20	4	SS	1-2-6-14	TRACE
25	5	SS	4-5-5	SILT & GRAVEL
30	6	SS	13-29-39	STARTED WATER INJECTION WHILE DRILLING
35	7	SS	19-37-50 (4")	

Gosling Czubak
Associates

Engineers
Surveyors

Gosling Czubak Associates, P.C.
525 West Fourteenth
Traverse City, MI 49684
616 946-9191

SHEET 2 OF 2

PROJECT SOIL INVESTIGATION
LOCATION BROWN BRIDGE POND
CLIENT TRAVERSE CITY LIGHT & POWER
DATE STARTED MAY 7, 1985
DATE COMPLETED MAY 7, 1985
DRILLER BRK HELPER ETM

BORING NO. ONE (SOUTH DIKE)
Ground Surface Elev.
Plugging Method EXCAVATED SOIL
Weather CLOUDY & OCC. LT. RAIN
Water Data 15'± BELOW GROUND
Job Number 85019.03

DEPTH	SAMPLE	SAMPLING METHOD	PENETRATION RESISTANCE	SOIL CLASSIFICATION
	7	SS	19-37-50 (4")	BROWN MEDIUM SAND TRACE SILT AND GRAVEL
40	8	SS	39-50 (4")	BROWN MEDIUM SAND WITH OCCASIONAL THIN LENSES OF FINE SAND & SILT AND OCCASIONAL THIN LAYER OF COARSE SAND TRACE GRAVEL
45	9	SS	28-50	
50	10	SS	(3") 45-50	
				END OF BORING @ 50½ FEET
55				
60				
65				
70				

Gosling Czubak
Associates

Engineers
Surveyors

Gosling Czubak Associates, P.C.
525 West Fourteenth
Traverse City, MI 49684
616 946-9191

SHEET 1 OF 2

PROJECT SOIL INVESTIGATION
LOCATION BROWN BRIDGE POND
CLIENT TRAVERSE CITY LIGHT & POWER
DATE STARTED MAY 8, 1985
DATE COMPLETED MAY 8 1985
DRILLER BRK HELPER ETM

BORING NO. TWO (NORTH DIKE)
Ground Surface Elev.
Plugging Method EXCAVATED SOIL
Weather CLEAR & COOL
Water Data 15'± BELOW GROUND
Job Number 85019.03

DEPTH	SAMPLE	SAMPLING METHOD	PENETRATION RESISTANCE	SOIL CLASSIFICATION
5	1	SS	2-5-7	CLEAN BROWN MEDIUM SAND SLIGHT TRACE GRAVEL
10	2	SS	3-5-9	
15	3	SS	2-2-3	
20	4	SS	6-9-13	STARTED WATER INJECTION WHILE DRILLING
25	5	SS	1-2-2-2	DARK BROWN SILT AND FINE SAND
30	6	SS	3-4-11	GRAY TO BROWN SILT AND CLAY
35	7	SS	13-26-33	LAYERS OF BROWN SILT AND CLAYEY SILT WITH SAND, TRACE GRAVEL

Gosling Czubak
Associates

Engineers
Surveyors

Gosling Czubak Associates, P.C.
525 West Fourteenth
Traverse City, MI 49684
616 946-9191

SHEET 2 OF 2

PROJECT SOIL INVESTIGATION
LOCATION BROWN BRIDGE POND
CLIENT TRAVERSE CITY LIGHT & POWER
DATE STARTED MAY 8, 1985
DATE COMPLETED MAY 8, 1985
DRILLER BRK HELPER ETM

BORING NO. TWO (NORTH DIKE)
Ground Surface Elev.
Plugging Method EXCAVATED SOIL
Weather CLEAR & COOL
Water Data 15'± BELOW GROUND
Job Number 85019.03

DEPTH	SAMPLE	SAMPLING METHOD	PENETRATION RESISTANCE	SOIL CLASSIFICATION
	7	SS	13-26-33	LAYERS OF BROWN SILT AND CLAYEY SILT WITH SAND, TRACE GRAVEL
40	8	SS	15-27-28	ALTERNATING LAYERS OF BROWN FINE SAND AND SILT, BROWN CLEAN MEDIUM SAND AND BROWN CLAYEY SILT WITH TRACE SAND
45	9	SS	22-28-46	
50	10	SS	16-26-34	
				END OF BORING @ 51½ FEET
55				
60				
65				
70				

Gosling Czubak
Associates

Engineers
Surveyors

Gosling Czubak Associates, P.C.
525 West Fourteenth
Traverse City, MI 49684
616 946-9191

SHEET 1 OF 3

PROJECT SOIL INVESTIGATION
LOCATION BROWN BRIDGE POND
CLIENT TRAVERSE CITY LIGHT & POWER
DATE STARTED MAY 9, 1985
DATE COMPLETED MAY 9, 1985
DRILLER BRK HELPER ETM

BORING NO. THREE
Ground Surface Elev.
Plugging Method EXCAVATED SOIL
Weather P.CLOUDY & WARM
Water Data SURFACE
Job Number 85019.03

DEPTH	SAMPLE	SAMPLING METHOD	PENETRATION RESISTANCE	SOIL CLASSIFICATION
				BROWN SANDY GRAVEL
5	1	SS	10-7-8	BROWN MEDIUM SAND WITH A TRACE GRAVEL
10	2	SS	33-14-15 HIT ROCK	ALTERNATING LAYERS OF BROWN MEDIUM SAND WITH LENSES OF BROWN SILT AND BROWN SANDY GRAVEL
15	3	SS	3-8-20	REDDISH CLAYEY SAND WITH TRACE GRAVEL AND WITH VEINS OF BROWN SANDY GRAVEL
20	4	SS	19-12-23	
25	5	SS	16-33-51	GRAY SANDY CLAY WITH VEINS OF BROWN SAND, TRACE SILT AND BROWN SILTY, CLAYEY SAND
30	6	SS	14-26-36	
35	7	SS	12-22-32	

Gosling Czubak
Associates

Engineers
Surveyors

Gosling Czubak Associates, P.C.
525 West Fourteenth
Traverse City, MI 49684
616 946-9191

SHEET 2 OF 3

PROJECT SOIL INVESTIGATION
LOCATION BROWN BRIDGE POND
CLIENT TRAVERSE CITY LIGHT & POWER
DATE STARTED MAY 9, 1985
DATE COMPLETED MAY 9, 1985
DRILLER BRK HELPER ETM

BORING NO. THREE
Ground Surface Elev.
Plugging Method EXCAVATED SOIL
Weather P.CLOUDY & WARM
Water Data SURFACE
Job Number 85019.03

DEPTH	SAMPLE	SAMPLING METHOD	PENETRATION RESISTANCE	SOIL CLASSIFICATION
	7	SS	12-22-32	GRAY SANDY CLAY WITH VEINS OF BROWN SAND, TRACE SILT AND BROWN SILTY, CLAYEY SAND
				BROWN MEDIUM SAND
40	8	SS	15-37-65	
45	9	SS	16-36-71	GRAY SANDY, SILTY, CLAY WITH LENSES OF FINE SAND AND SILTY SAND
50	10	SS	21-56	
55	11	SS	57-32 (1")	BROWN FINE TO MEDIUM SAND
60	12	SS	20-22-47	GRAY SILTY CLAY WITH LENSES OF GRAY FINE SAND & SILT
65	13	SS	27-58-5 (1½")	BROWN FINE TO MEDIUM SAND WITH ARTESIAN HEAD
70				

Gosling Czubak

Associates

Engineers
Surveyors

Gosling Czubak Associates, P.C.
525 West Fourteenth
Traverse City, MI 49684
616 946-9191

SHEET 3 OF 3

PROJECT SOIL INVESTIGATION

LOCATION BROWN BRIDGE POND

CLIENT TRAVERSE CITY LIGHT & POWER

DATE STARTED MAY 9, 1985

DATE COMPLETED MAY 9, 1985

DRILLER BRK HELPER ETM

BORING NO. THREE

Ground Surface Elev.

Plugging Method EXCAVATED SOIL

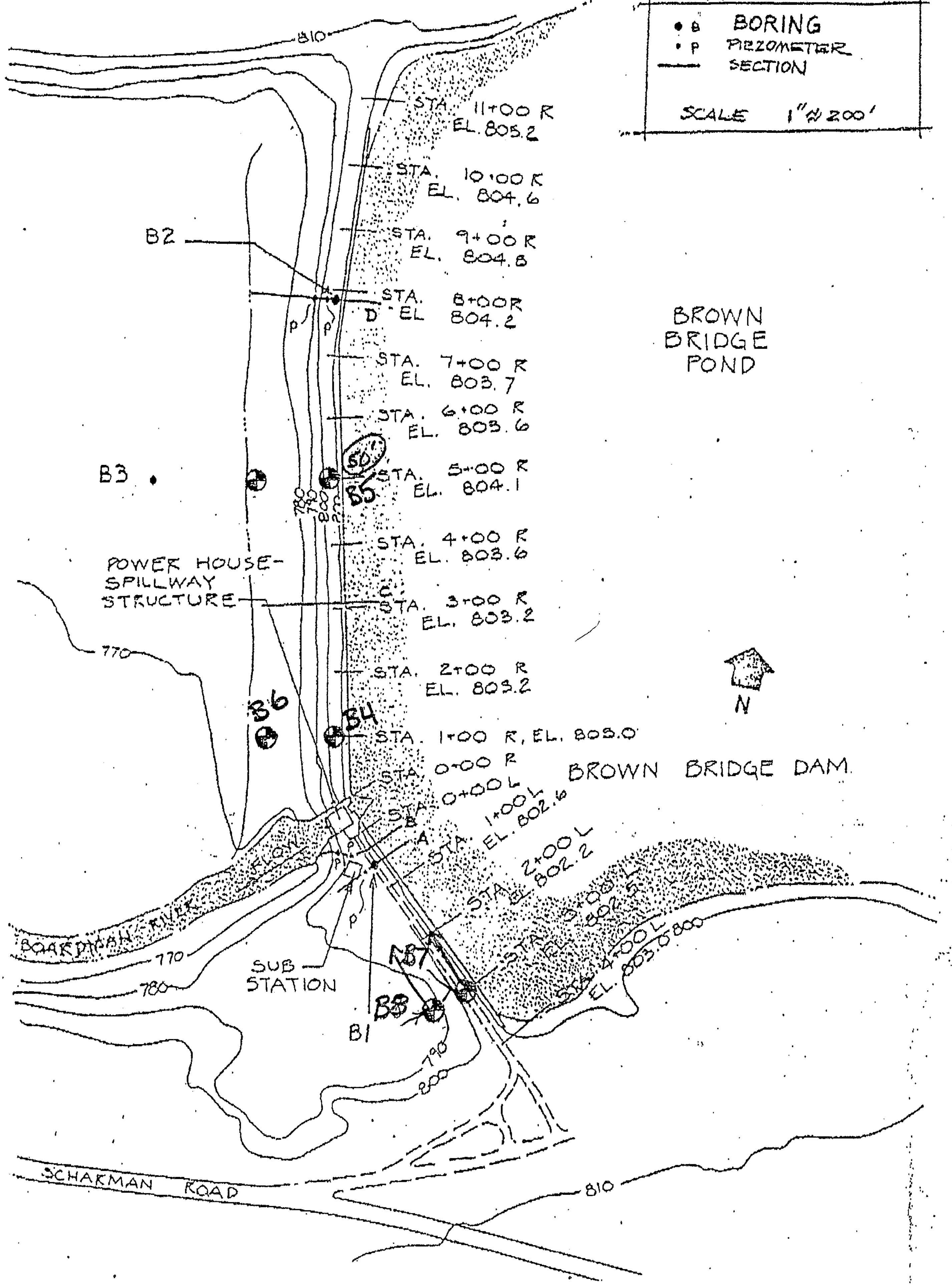
Weather P. CLOUDY & WARM

Water Data SURFACE

Job Number 85019.03

DEPTH	SAMPLE	SAMPLING METHOD	PENETRATION RESISTANCE	SOIL CLASSIFICATION
				BROWN FINE TO MED. SAND W/ ARTESIAN HEAD
				GRAY SANDY, SILTY
75				CLAY
				END OF BORING @ 77 FEET (AUGER REFUSAL ~ BOULDERS)
80				
85				
90				
95				
100				
105				

EXHIBIT 1



● B BORING
• P PIEZOMETER
SECTION
SCALE 1"≈200'
810
STA. 11+00 R EL. 805.2
STA. 10+00 R EL. 804.6
STA. 9+00 R EL. 804.8
B2
STA. 8+00R EL 804.2
D
P
P
BROWN BRIDGE POND
STA. 7+00 R EL. 803.7
STA. 6+00 R EL. 803.6
50'
B3
STA. 5+00 R EL. 804.1
B5
780
790
800
POWER HOUSE-SPILLWAY STRUCTURE
STA. 4+00 R EL. 803.6
C
STA. 3+00 R EL. 803.2
770
STA. 2+00 R EL. 803.2
N
B6
B4
STA. 1+00 R, EL. 803.0
STA. 0+00 R
STA. 0+00 L
BROWN BRIDGE DAM
B
A
STA. 1+00 L EL. 802.6
STA. 2+00 L EL 802.2
STA. 3+00 L EL 802.5
STA. 4+00 L EL. 803.0
800
FLOW
BOARDMAN RIVER
770
780
SUB STATION
B7
B8
B1
790
800
SCHAKMAN ROAD
810

Gosling Czubak

Associates

Engineers
Surveyors

Gosling Czubak Associates, P.C.
525 West Fourteenth
Traverse City, MI 49684-4093
616 946-9191
Fax 616 941-4603

PROJECT Soil Borings
LOCATION Brown Bridge Dam
CLIENT Traverse City Light & Power

DATE STARTED 10-14-92
DATE COMPLETED 10-14-92
DRILLER BRK HELPER JS

BORING NO. B4
Ground Surface Elev.
Plugging Method Excavated soils

Weather Partly cloudy, windy & cold
Water Data 19'+-
Job Number 92322.03

DEPTH	SAMPLE	SAMPLING METHOD	PENETRATION RESISTANCE	SOIL CLASSIFICATION
		SS	2-3-3-4	(4") Black sandy TOPSOIL, (3") Foundry Ash, thin layer Clay
			3-3-4-6	
5			2-3-2-3	
			2-2-3-2	
10			0-0-2-2	
		SS	1-2-2-1	Brown medium SAND with a trace Gravel
			1-1-2-4	
15			2-3-4-5	
			3-3-2-3	
			3-2-3-4	
20		SS	1-2-3-4	
			1-3-2-4	
25			2-3-4-4	
			1-1-3-2	
		SS	5-6-9-12	
30				End of Boring

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Associates

Engineers
Surveyors

Gosling Czubak Associates, P.C.
525 West Fourteenth
Traverse City, MI 49684-4093
616 946-9191
Fax 616 941-4603

PROJECT Soil Borings
LOCATION Brown Bridge Dam
CLIENT Traverse City Light & Power

DATE STARTED 10-14-92
DATE COMPLETED 10-14-92
DRILLER BRK HELPER JS

BORING NO. B-5 (Page 1 of 2)
Ground Surface Elev.
Plugging Method Excavated soils

Weather Partly cloudy, windy & cold
Water Data 18'+-
Job Number 92322.03

DEPTH	SAMPLE	SAMPLING METHOD	PENETRATION RESISTANCE	SOIL CLASSIFICATION
				TOPSOIL (4")
			1-2-2-3	Brown medium SAND with a trace Gravel
			2-3-4-4	
5			2-3-4-4	
			3-2-6-5	
			2-4-2-2	
10				
			2-5-5-7	
			1-2-4-6	
15			4-3-4-4	
			3-4-4-4	
20			1-2-3-4	
			1-1-2-3	
			3-3-3-2	
25			1-2-3-4	
			1-2-2-2	
			1-1-1-3	
30				Dark brown fine SAND with Silt and Gravel
			3-3-4-3	
				Brown SILT & CLAY, trace fine Sand
			2-1-6-7	
				Alternate layers of brown Silt & Clay, trace fine Sand and brown medium to fine Sand, trace Silt
35			6-8-12-14	

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Associates

Engineers
Surveyors

Gosling Czubak Associates, P.C.
525 West Fourteenth
Traverse City, MI 49684-4093
616 946-9191
Fax 616 941-4603

PROJECT Soil Borings
LOCATION Brown Bridge Dam
CLIENT Traverse City Light & Power

DATE STARTED 10-14-92
DATE COMPLETED 10-14-92
DRILLER BRK HELPER JS

BORING NO. B-5 (Page 2 of 2)
Ground Surface Elev.
Plugging Method Excavated soils

Weather Partly cloudy, windy & cold
Water Data 18'+-
Job Number 92322.03

DEPTH	SAMPLE	SAMPLING METHOD	PENETRATION RESISTANCE	SOIL CLASSIFICATION
				Alternate layers of brown Silt and Clay, trace fine Sand and brown medium to fine Sand, trace Silt
35				
			18-22-25-25	(Hit rock-very little recovery)
			9-14-18-23	
40			6-11-14-22	Alternate layers of brown medium SAND, trace coarse Sand and brown Silt, trace fine Sand
			10-14-19-28	
45			9-17-26-31	
			11-19-25-33	Reddish brown SILT with Sand, Clay, and Gravel
			13-13-22-37	Brown medium SAND, trace Gravel, trace Silt
50				End of Boring 50'

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Associates

Engineers
Surveyors

Gosling Czubak Associates, P.C.
525 West Fourteenth
Traverse City, MI 49684-4093
616 946-9191
Fax 616 941-4603

PROJECT Soil Borings
LOCATION Brown Bridge Dam
CLIENT Traverse City Light & Power
DATE STARTED 10-15-92
DATE COMPLETED 10-15-92
DRILLER AS HELPER MH

BORING NO. B-6
Ground Surface Elev.
Plugging Method Excavated soils
Weather Cloudy, cool
Water Data
Job Number 92322.03

DEPTH	SAMPLE	SAMPLING METHOD	PENETRATION RESISTANCE	SOIL CLASSIFICATION
				Black sandy TOPSOIL (8")
			0-2-2-1	
			3-4-5-6	Alternate layers of brown SAND, SILT, & GRAVEL
5			3-3-6-4	
			2-4-10-12	Brown fine to coarse SAND with Gravel
			8-10-14-19	Lt. brown fine to medium SAND with trace medium Gravel
10				
			10-14-18-22	
			8-10-15-16	Lt. brown fine to medium tan SAND with a trace coarse Sand
15			10-12-24-31	
			9-18-34-43	Lt. brown fine to medium tan SAND w/ occasional lenses Silt
			18-16-18-17	Brown silty, fine to medium SAND
20				
			7-11-22-36	Brown fine to coarse SAND
			5-27-47-60	
25			12-31-42-57	Brown silty CLAY with Sand & Gravel
			34-51-70-60/3	
30				End of Boring

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Associates

Engineers
Surveyors

Gosling Czubak Associates, P.C.
525 West Fourteenth
Traverse City, MI 49684-4093
616 946-9191
Fax 616 941-4603

PROJECT Soil Borings
LOCATION Brown Bridge Dam
CLIENT Traverse City Light & Power

DATE STARTED 10-15-92
DATE COMPLETED 10-15-92
DRILLER AS HELPER MH

BORING NO. B-7
Ground Surface Elev.
Plugging Method

Weather Cloudy and cool
Water Data 10'±
Job Number 92322.03

DEPTH	SAMPLE	SAMPLING METHOD	PENETRATION RESISTANCE	SOIL CLASSIFICATION
		SS	4-3-4-11	Brown medium SAND & GRAVEL
			2-3-2-2	Brown fine to medium SAND
5			2-2-2-2	
			2-3-5-5	
10		SS	2-3-2-3	
			3-3-2-4	Brown fine to coarse SAND
			2-1-2-2	
15			1-2-4-2	Brown fine to coarse SAND with a trace medium Gravel
			3-5-4-4	
		SS	1-3-3-3	
20			2-2-10-18	
			4-10-18-30	Brown fine to medium SAND
25			4-10-25-28	Brown fine to coarse SAND with a trace Gravel
			10-21-31-45	Brown medium to coarse SAND with Gravel
		SS	10-25-26-43	
30				End of Boring

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Associates

Engineers
Surveyors

Gosling Czubak Associates, P.C.
525 West Fourteenth
Traverse City, MI 49684-4093
616 946-9191
Fax 616 941-4603

PROJECT: Soil Borings
LOCATION: Brown Bridge Dam
CLIENT: Traverse City Light & Power
DATE STARTED: 10-15-92
DATE COMPLETED: 10-15-92
DRILLER: AS
HELPER: MH

BORING NO.: B-8
Ground Surface Elev.:
Plugging Method: Excavated soils
Weather: Cloudy, cool
Water Data: 2'±
Job Number: 92322.03

DEPTH	SAMPLE	SAMPLING-METHOD	PENETRATION RESISTANCE	SOIL CLASSIFICATION
				Black sandy TOPSOIL (6")
			1-2-1-2	
			2-1-2-1	Reddish brown fine to medium SAND
5			2-1-2-2	
			6-4-2-1	
10		SS	3-1-2-3	
			3-2-2-3	Brown fine to coarse SAND
			3-9-16-22	
15			6-6-24-42	
			8-17-31-38	
20		SS	6-17-31-37	Brown fine to coarse SAND & fine Gravel
			9-17-26-37	Brown fine to medium SAND
			9-18-26-34	
25			11-14-26-41	Brown fine to coarse SAND
			7-10-28-55	
		SS	14-25-50-	Brown fine to medium SAND with some Silt
30			60/4	End of Boring

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Associates

Engineers
Surveyors

Gosling Czubak Associates, P.C.
525 West Fourteenth
Traverse City, MI 49684-4093
616 946-9191
Fax 616 941-4603

PROJECT Soil Borings
LOCATION Brown Bridge Dam
CLIENT Traverse City Light & Power

DATE STARTED 10-22-92
DATE COMPLETED 10-22-92
DRILLER AS HELPER MH

BORING NO. SB-9
Ground Surface Elev.
Plugging Method Excavated soils

Weather Partly sunny 50°
Water Data 6'+-
Job Number 92322.03

DEPTH	SAMPLE	SAMPLING METHOD	PENETRATION RESISTANCE	SOIL CLASSIFICATION
				Black sandy TOPSOIL (6")
			1-1-3-6	Brown fine to coarse SAND
			3-3-3-3	
5			3-4-6-7	Brown SILT
			5-6-13-19	Brown fine to medium SAND
			7-9-15-19	
10			4-9-12-18	Brown silty CLAY with Sand & Gravel (till)
			4-9-18-26	
			5-11-16-20	
15				Brown fine SAND
			3-1/12-6	Brown coarse SAND
			2-1/9-1/3-9	
20			6-14-22-38	Brown to gray silty CLAY w/ Sand & Gravel (till)
			7-9-15-22	Gray SILT
25			7-14-21-31	
			5-12-21-33	
			11-35-35-50/5"	Gray sandy SILT
30				End of Boring

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Surveyors

Gosling Czubak Associates, P.C.
525 West Fourteenth
Traverse City, MI 49684
616 946-9191

MECHANICAL ANALYSIS

Project:	Brown Bridge Soil Borings	Test No.:	1
Client:	T.C. Light & Power	Project No.:	92322.03
Material:		Date:	11-10-92
Source:	B4 @ 10-12'	Tested By:	Carl Studzinski

SIEVE	WEIGHT	PERCENT	RETAINED	PASSING	SPECIFICATIONS
4	0.0	0.0	0.0	100	
10	6.4	1.8	1.8	98.2	
40	135.0	37.8	39.6	60.4	
100	210.2	58.7	98.3	1.7	
200	2.7	9.8	99.1	0.9	
LBW	3.0	0.8	99.9	0.1	
PAN	0.3	0.1	100.0	0	
TOTAL	357.6	100.0			

Loss By Washing:

Initial Weight of Sample 357.6 gm.
Weight After Washing 354.6 gm.
Weight of Pan ______ gm.
Passing No. 200 3.0 gm. 0.8 %

Weight of Crushed Particles ______
Total Weight of Sample ______
Crushed Particles ______ %

This material ____ meets ____ does not meet project specifications.

Sampled by ______
Tested by ______

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Engineers
Surveyors

Gosling Czubak Associates, P.C.
525 West Fourteenth
Traverse City, MI 49684
616 946-9191

MECHANICAL ANALYSIS

Project: Brown Bridge Soil Borings

Client: T.C. Light & Power

Material:

Source: B4 @ 20-22'

Test No.:

Project No.: 92322.03

Date: 11-10-92

Tested By: Carl Studzinski

SIEVE	WEIGHT	PERCENT	RETAINED	PASSING	SPECIFICATIONS
4	38.8	11.3	11.3	88.7	
10	17.7	5.1	16.4	83.6	
40	141.9	41.3	57.7	42.3	
100	142.0	41.3	99.0	1.0	
200	1.6	0.5	99.5	0.5	
LBW	1.8	0.5	100.0	0	
PAN	0.0	0.0			
TOTAL	343.8	100.0			

Loss By Washing:

Initial Weight of Sample 343.8 gm.

Weight After Washing 342.0 gm.

Weight of Pan ________ gm.

Passing No. 200 1.8 gm. 0.5 %

Weight of Crushed Particles ________

Total Weight of Sample ________

Crushed Particles ________ %

This material ____meets ____does not meet project specifications.

Sampled by ________

Tested by ________

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Engineers
Surveyors

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525 West Fourteenth
Traverse City, MI 49684
616 946-9191

MECHANICAL ANALYSIS

Project: Brown Bridge Soil Borings
Client: T.C. Light & Power
Material:
Source: B4 @ 26-28'

Test No.:
Project No.: 92322.03
Date: 11-10-92
Tested By: Ron Rushton

SIEVE	WEIGHT	PERCENT	RETAINED	PASSING	SPECIFICATIONS
3/4"	0.0	0.0	0.0	100	
3/8"	2.8	0.7	0.7	99.3	
4	9.5	2.5	3.2	96.8	
10	11.3	2.9	6.1	93.9	
40	140.0	36.3	42.4	57.6	
100	215.3	55.9	98.3	1.7	
200	4.3	1.1	99.4	0.6	
LBW	1.7	0.4	99.8		
PAN	0.8	0.2	100.0		
TOTAL	385.7	100.0	100.0		

Loss By Washing:

Initial Weight of Sample 385.7 gm.
Weight After Washing 384.0 gm.
Weight of Pan ______ gm.
Passing No. 200 1.7 gm. 0.4 %

Weight of Crushed Particles ______
Total Weight of Sample ______
Crushed Particles ______ %

This material ____meets ____does not meet project specifications.

Sampled by ______

Tested by ______

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525 West Fourteenth
Traverse City, MI 49684
616 946-9191

MECHANICAL ANALYSIS

Project: Brown Bridge Soil Borings
Client: T.C. Light & Power
Material:
Source: B5 @ 10-12'

Test No.:
Project No.: 92322.03
Date: 11-10-92
Tested By: Carl Studzinski

SIEVE	WEIGHT	PERCENT	RETAINED	PASSING	SPECIFICATIONS
4	11.4	3.1	3.1	96.9	
10	11.9	3.3	6.4	93.6	
40	149.7	41.3	47.7	52.3	
100	184.7	50.8	98.5	1.5	
200	2.4	0.7	99.2	0.8	
LBW	2.8	0.8	100.0	0	
PAN	0.0	0.0			
TOTAL	362.9	100.0			

Loss By Washing:

Initial Weight of Sample 362.9 gm.
Weight After Washing 360.1 gm.
Weight of Pan ________ gm.
Passing No. 200 2.8 gm. 0.8 %

Weight of Crushed Particles ________
Total Weight of Sample ________
Crushed Particles ________ %

This material ____ meets ____ does not meet project specifications.

Sampled by ________

Tested by ________

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525 West Fourteenth
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616 946-9191

MECHANICAL ANALYSIS

Project: Brown Bridge Soil Borings
Test No.:
Client: T.C. Light & Power
Project No.: 92322.03
Material:
Date: 11-10-92
Source: B5 @ 20-22'
Tested By: Carl Studzinski

SIEVE	WEIGHT	PERCENT	RETAINED	PASSING	SPECIFICATIONS
4	8.4	2.4	2.4	97.6	
10	6.3	1.8	4.2	95.8	
40	144.2	41.8	46.0	54.0	
100	180.6	52.3	98.3	1.7	
200	2.3	0.7	99.0	1.0	
LBW	3.0	0.9	99.9	0.1	
PAN	0.4	0.1	100.0	0	
TOTAL	345.2	100.0			

Loss By Washing:

Initial Weight of Sample 345.2 gm.
Weight After Washing 342.2 gm.
Weight of Pan ______ gm.
Passing No. 200 3.0 gm. 0.9 %

Weight of Crushed Particles ______
Total Weight of Sample ______
Crushed Particles ______ %

This material ____meets ____does not meet project specifications.

Sampled by ______

Tested by ______

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525 West Fourteenth
Traverse City, MI 49684
616 946-9191

MECHANICAL ANALYSIS

Project:	Brown Bridge Soil Borings	Test No.:	
Client:	T.C. Light & Power	Project No.:	92322.03
Material:		Date:	11-11-92
Source:	B5 @ 32-34'	Tested By:	Carl Studzinski

SIEVE	WEIGHT	PERCENT	RETAINED	PASSING	SPECIFICATIONS
4	4.0	1.4	1.4	98.6	
10	3.8	1.3	2.7	97.3	
40	40.1	14.2	16.9	83.1	
100	130.6	46.2	63.1	36.9	
200	14.1	5.0	68.1	31.9	
PAN	1.2	0.4	68.5	31.5	
LBW	89.3	31.5	100.0	0	
TOTAL	283.1	100.0			

Loss By Washing:

Initial Weight of Sample 283.1 gm.
Weight After Washing 193.8 gm.
Weight of Pan ______ gm.
Passing No. 200 89.3 gm. 31.5 %

Weight of Crushed Particles ______
Total Weight of Sample ______
Crushed Particles ______ %

This material ____meets ____does not meet project specifications.

Sampled by ______

Tested by ______

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Gosling Czubak Associates, P.C.
525 West Fourteenth
Traverse City, MI 49684
616 946-9191

MECHANICAL ANALYSIS

Project: Brown Bridge Soil Borings
Client: T.C. Light & Power
Material:
Source: B7 @ 10-12'
Test No.:
Project No.: 92322.03
Date: 11-10-92
Tested By: Carl Studzinksi

SIEVE	WEIGHT	PERCENT	RETAINED	PASSING	SPECIFICATIONS
4	2.4	0.7	0.7	99.3	
10	1.8	0.5	1.2	98.8	
40	80.0	23.3	24.5	75.5	
100	243.7	71.2	95.7	4.3	
200	8.8	2.6	98.3	1.7	
LBW	5.2	1.5	99.8	0.2	
PAN	0.8	0.2	100.0	0	
TOTAL	342.7	100.0			

Loss By Washing:

Initial Weight of Sample 342.7 gm.
Weight After Washing 337.5 gm.
Weight of Pan ______ gm.
Passing No. 200 5.2 gm. 1.5 %

Weight of Crushed Particles ______
Total Weight of Sample ______
Crushed Particles ______ %

This material ____meets ____does not meet project specifications.

Sampled by ______
Tested by ______

Gosling Czubak Associates

Engineers
Surveyors

Gosling Czubak Associates, P.C.
525 West Fourteenth
Traverse City, MI 49684
616 946-9191

MECHANICAL ANALYSIS

Project: Brown Bridge Soil Borings
Test No.:
Client: T.C. Light & Power
Project No.: 92322.03
Material:
Date: 11-10-92
Source: B7 @ 20-22'
Tested By: Carl Studzinski

SIEVE	WEIGHT	PERCENT	RETAINED	PASSING	SPECIFICATIONS
4	9.8	3.4	3.4	96.6	
10	12.3	4.3	7.7	92.3	
40	64.4	22.6	30.3	69.7	
100	171.0	60.1	90.4	1.6	
200	12.6	4.4	94.8	5.2	
LBW	11.1	3.9	98.7	1.3	
PAN	3.8	1.3	100.0	0	
TOTAL	285.0	100.0			

Loss By Washing:

Initial Weight of Sample 285.0 gm.

Weight After Washing 273.9 gm.

Weight of Pan ___ gm.

Passing No. 200 11.1 gm. 3.9 %

Weight of Crushed Particles ___

Total Weight of Sample ___

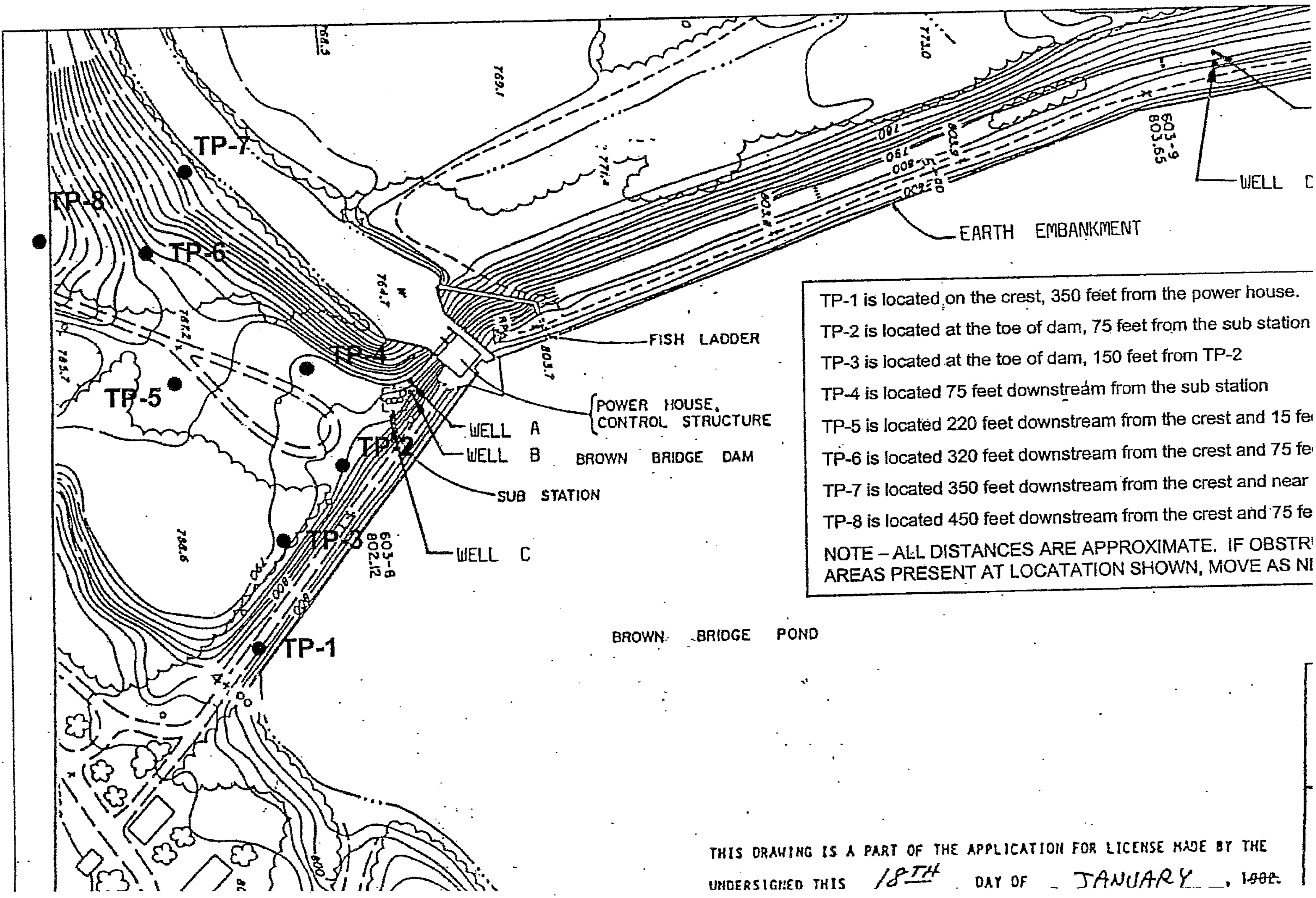
Crushed Particles ___ %

This material ___ meets ___ does not meet project specifications.

Sampled by ___

Tested by ___

Miss Dig Ticket # 30029050



TP-1 is located on the crest, 350 feet from the power house.

TP-2 is located at the toe of dam, 75 feet from the sub station

TP-3 is located at the toe of dam, 150 feet from TP-2

TP-4 is located 75 feet downstream from the sub station

TP-5 is located 220 feet downstream from the crest and 15 fe

TP-6 is located 320 feet downstream from the crest and 75 fe

TP-7 is located 350 feet downstream from the crest and near

TP-8 is located 450 feet downstream from the crest and 75 fe

NOTE – ALL DISTANCES ARE APPROXIMATE. IF OBSTR
AREAS PRESENT AT LOCATATION SHOWN, MOVE AS NI

THIS DRAWING IS A PART OF THE APPLICATION FOR LICENSE MADE BY THE
UNDERSIGNED THIS 18TH DAY OF JANUARY, ~~1982.~~

Date Started:	2/6/03	**TEST PIT LOG**	Test Pit No.:	TP-1
Date Finished:	2/6/03	**Gannett Fleming** ENGINEERS AND PLANNERS	Sheet 1 of	αα
Total Depth of Pit:	4.2 Ft.		Line & Station:	4+37
Inspector:	Matthew B. Miller, Ph.D.	Project: TCLP - Brown Bridge Spillway; Grand Traverse Co., MI	Offset:	10' DS
Photographic Log:	Yes ☒ No ☐	Excavation Contractor: Traverse City Light & Power	N Coordinate:	
Groundwater Observations		Operator: Kevin Bowden, Patrick Kendziorski	E Coordinate:	
Not Encountered		Excavation Equipment: None	Surface Elevation: 802.2 Ft.	

Depth (Ft.)	Sample No.	Legend	Description of Materials	Remarks
		░	0.0'-0.5'; Dark gray Poorly Graded SAND (sp), (Frozen A-Horizon); No reaction w/HCl	Fine to medium roots El. 801.7'
2.0 - 3.0	Bag1	░	0.5'-4.2'; Yellowish brown Poorly Graded SAND with Silt (SP-SM), moist, single-grain, loose consistency, trace gravel; No reaction w/HCl	Hand dug pit to 2.0'; bucket auger 2.0' to 4.2', possible electric utility cable at 4.2' El. 798.0'
			Bottom of Test Pit = 4.2 Ft.	

Remarks:

Hand dug pit dimensions 2'x2'x2'. Excavation halted due to possible electrical cables.

030603lmb

TEST PIT LOG

Gannett Fleming
ENGINEERS AND PLANNERS

Date Started:	2/5/03
Date Finished:	2/5/03
Total Depth of Pit:	5.2 Ft.
Inspector:	Matthew B. Miller, Ph.D.
Photographic Log:	Yes ☒ No ☐
Test Pit No.:	TP-2
Sheet	1 of αα
Line & Station:	1+79
Offset:	55' DS
N Coordinate:	
E Coordinate:	
Surface Elevation:	793.2 Ft.

Project: TCLP - Brown Bridge Spillway; Grand Traverse Co., MI

Excavation Contractor: Traverse City Light & Power

Operator: Kevin Bowden, Patrick Kendziorski

Excavation Equipment: John Deere 310 56 Backhoe; 2' bucket

Groundwater Observations

At 4.5 Ft. After 0 hours

Depth (Ft.)	Sample No.	Legend	Description of Materials	Remarks
0.0 - 2.0	Bag 1		0.0'to 2.0'; Frozen and compacted Very dark brown Silty SAND (sm) (Frozen and compacted Topsoil) Some angular gravels between 1.0' and 2.0' (fill), blocky structure; firm consistency; No reaction w/HCl	Fine roots El. 791.2'
2.5 - 3.0	Bag 2		2.0'-3.5'; Dark brown Poorly Graded SAND (SP), moist, single grain, loose; No reaction w/HCl	El. 789.7'
3.5 - 5.2	Bag 3		3.5'-5.2'; Light yellowish brown Poorly Graded SAND (SP), moist, single grain, loose; No reaction w/HCl	Wet at 4.5' El. 788.0'
			Bottom of Test Pit = 5.2 Ft.	

Remarks: Backhoe pit dimensions - 2' wide; 8' long; 3.5' deep. Depth of hand auger 3.5' to 5.2' bgs. Excavation halted due to saturated soil. 42' from center line of S. Embankment Road.

030603lmb

TEST PIT LOG

Gannett Fleming
ENGINEERS AND PLANNERS

Date Started: 2/5/03		Test Pit No.: TP-3
Date Finished: 2/5/03		Sheet 1 of αα
Total Depth of Pit: 1.4 Ft.		Line & Station: 2+50
Inspector: Matthew B. Miller, Ph.D.	Project: TCLP - Brown Bridge Spillway; Grand Traverse Co., MI	Offset: 64' DS
Photographic Log: Yes ☒ No ☐	Excavation ContractorTraverse City Light & Power	N Coordinate:
Groundwater Observations	Operator: Kevin Bowden, Patrick Kendziorski	E Coordinate:
At 1.4 Ft. After 0 hours	Excavation Equipment: John Deere 310 56 Backhoe; 2' bucket	Surface Elevation: 790.6 Ft.

Depth (Ft.)	Sample No.	Legend	Description of Materials	Remarks
0.0 - 0.9	Bag 1	⁘	0.0'-0.9'; Black, highly organic, Poorly Graded SAND (sp), moist; No reaction w/HCl Subangular blocky structure; very friable	many fine to medium roots El. 789.7'
0.9 - 1.4	Bag 2	⁞	0.9'-1.4'; Mixed sample color: Brown, Poorly Graded SAND with Silt (SP-SM), moist to wet; No reaction w/HCl Mottled strong brown on light gray	Few fine roots El. 789.2'
			Bottom of Test Pit = 1.4 Ft.	

Remarks: Backhoe Pit Dimensions 2'x6'x1.4' deep
Excavation halted due to saturated soil

030603lmb

TEST PIT LOG

Gannett Fleming
ENGINEERS AND PLANNERS

Date Started: 2/5/03
Date Finished: 2/5/03
Total Depth of Pit: 5.6 Ft.
Inspector: Matthew B. Miller, Ph.D.
Photographic Log: Yes ☒ No ☐

Test Pit No.: TP-4
Sheet 1 of αα
Line & Station: 1+18
Offset: 143' DS
N Coordinate:
E Coordinate:
Surface Elevation: 790.5 Ft.

Project: TCLP - Brown Bridge Spillway; Grand Traverse Co., MI
Excavation ContractorTraverse City Light & Power
Operator: Kevin Bowden, Patrick Kendzlorski
Excavation Equipment: John Deere 310 56 Backhoe; 2' bucket

Groundwater Observations
Not Encountered

Depth (Ft.)	Sample No.	Legend	Description of Materials	Remarks
			0.0'-0.5'; Dark brown Poorly Graded SAND (sp); No reaction w/HCl (Topsoil - A-Horizon)	Many fine roots El. 790.0'
			0.5'-1.5'; Pale brown Poorly Graded SAND (sp), moist, single-grain, loose consistency; No reaction w/HCl (Eluvial Horizon; Light gray 10YR 7/2 dry)	El. 789.0'
1.5 - 2.5	Bag 1		1.5'-3.0'; Reddish yellow Poorly Graded SAND (sp), moist, single grain, loose consistency; No reaction w/HCl (BW-Illuvial Horizon; Iron oxides) Few strong brown iron oxide clusters - "Ortstein"-like; weak cementation, 1-2" diameter	El. 787.5'
			3.0'-5.6'; Brown Poorly Graded SAND (sp), moist, single grain, loose consistency, trace gravel; No reaction w/HCl	El. 785.5'
5.5 - 5.6	Bag 2		5.0'-5.6'; Brown Poorly Graded SAND (SP), moist, single grain, loose consistency, trace gravel; strong brown lamellae (<1/2' clayey bands) illuvial clay	El. 784.9'
			Bottom of Test Pit = 5.6 Ft.	

Remarks: Backhoe Pit Dimensions 2'x8'x5.6' deep
Excavation halted due to cave in at 2.0' to 5.5'

030603imb

TEST PIT LOG

Gannett Fleming
ENGINEERS AND PLANNERS

Date Started: 2/5/03
Date Finished: 2/5/03
Total Depth of Pit: 4.5 Ft.
Inspector: Matthew B. Miller, Ph.D.
Photographic Log: Yes ☒ No ☐
Groundwater Observations
At 4.4 Ft. After 0 hrs.

Project: TCLP - Brown Bridge Spillway; Grand Traverse Co., MI
Excavation Contractor Traverse City Light & Power
Operator: Kevin Bowden, Patrick Kendziorski
Excavation Equipment: John Deere, 310 56 Backhoe; 2'bucket

Test Pit No.: TP-5
Sheet 1 of αα
Line & Station: 2+37
Offset: 196' DS
N Coordinate:
E Coordinate:
Surface Elevation: 789.2 Ft.

Depth (Ft.)	Sample No.	Legend	Description of Materials	Remarks
		░	0.0'-0.75'; Very dark brown, Poorly Graded SAND (sp); No Reaction w/ HCl (A-Horizon)	Common to many fine to coarse roots El. 788.5'
		░	0.75'-2.25'; Dark brown, Poorly Graded SAND (SP), moist, single grain; loose consistency, No reaction w/HCl (BW-Horizon)	El. 787.0'
1.0 - 4.0	Bag 1	░	2.25'-4.5'; Light yellowish brown, Poorly Graded SAND (SP), moist, single grain; loose; No Reaction w/HCl (C-Horizon)	El. 784.7 '
			Bottom of Test Pit = 4.5 Ft.	

Remarks:
Backhoe Pit Dimensions, 2'x8'x3.6'
Depth of Hand auger 3.6' to 4.5'
Excavation Halted Due to Cave In 2.3'-4.4'

030603lel

TEST PIT LOG

Gannett Fleming
ENGINEERS AND PLANNERS

Date Started: 2/5/03		Test Pit No.: TP-6
Date Finished: 2/5/03		Sheet 1 of αα
Total Depth of Pit: 5.4 Ft.		Line & Station: 1+33
Inspector: Matthew B. Miller, Ph.D.	Project: TCLP - Brown Bridge Spillway; Grand Traverse Co., MI	Offset: 281' DS
Photographic Log: Yes ☒ No ☐	Excavation ContractorTraverse City Light & Power	N Coordinate:
Groundwater Observations	Operator: Kevin Bowden, Patrick Kendziorski	E Coordinate:
Not Encountered	Excavation Equipment: John Deere, 310 56 Backhoe; 2'bucket	Surface Elevation: 788.4 Ft.

Depth (Ft.)	Sample No.	Legend	Description of Materials	Remarks
		⁘	0.0'-0.5'; Black, Poorly Graded SAND (sp); No reaction w/HCl	Many fine-medium roots El. 787.9'
		⁘	0.5'-0.75'; Strong brown Poorly Graded SAND (sp), moist (slight iron oxide accumulation); No reaction w/HCl	Common fine to coarse roots at 0.75'-1.75' El. 787.7'
1.5 - 5.4	Bag 1	⁘	0.75'-5.4'; Light yellowish brown Poorly Graded SAND (sp), moist, single grain, loose consistency; No reaction w/HCl	El. 783.0'
			Bottom of Test Pit = 5.4 Ft.	

Remarks:
030603lel
Backhoe Pit Dimensions 2'x8'x5.4'
Excavation Halted Due to Cave in 1.4'-5.4'

Date Started: 2/6/03	**TEST PIT LOG**	Test Pit No.: TP-7
Date Finished: 2/6/03	**Gannett Fleming** ENGINEERS AND PLANNERS	Sheet 1 of αα
Total Depth of Pit: 2.2 Ft.		Line & Station: 0+11
Inspector: Matthew B. Miller, Ph.D.	Project: TCLP - Brown Bridge Spillway; Grand Traverse Co., MI	Offset: 457' DS
Photographic Log: Yes ☒ No ☐	Excavation ContractorTraverse City Light & Power	N Coordinate:
Groundwater Observations	Operator: Kevin Bowden, Patrick Kendziorski	E Coordinate:
At 2.2 Ft. After 0 hrs.	Excavation Equipment: Hand Auger	Surface Elevation: 771.1 Ft.

Depth (Ft.)	Sample No.	Legend	Description of Materials	Remarks
0.0 - 1.0	Bag 1	≋	0.0'-1.0'; Black Sapric PEAT; No reaction w/HCl	Many fine and medium roots El. 770.1'
1.0 - 2.0	Bag 2	⁘	1.0'-2.2'; Light brown Poorly Graded SAND (sp); moist, mottled with black and gray, few gravel, single grain, loose consistency; No reaction w/HCl	El. 768.9'
			Bottom of Test Pit = 2.2 Ft.	

Remarks:

Depth of hand auger 0 to 2.2'
Excavation halted due to saturated soil
Water flowing on ground surface every 25 feet

TEST PIT LOG

Gannett Fleming
ENGINEERS AND PLANNERS

Date Started: 2/6/03
Date Finished: 2/6/03
Total Depth of Pit: 5.5 Ft.
Inspector: Matthew B. Miller, Ph.D.
Photographic Log: Yes ☒ No ☐

Groundwater Observations
Not Encountered

Project: TCLP - Brown Bridge Spillway; Grand Traverse Co., MI
Excavation Contractor: Traverse City Light & Power
Operator: Kevin Bowden, Patrick Kendziorski
Excavation Equipment: John Deere 310 56 Backhoe;2'bucket

Test Pit No.: TP-8
Sheet 1 of αα
Line & Station: 2+27
Offset: 503' DS
N Coordinate:
E Coordinate:
Surface Elevation: 803.7 Ft.

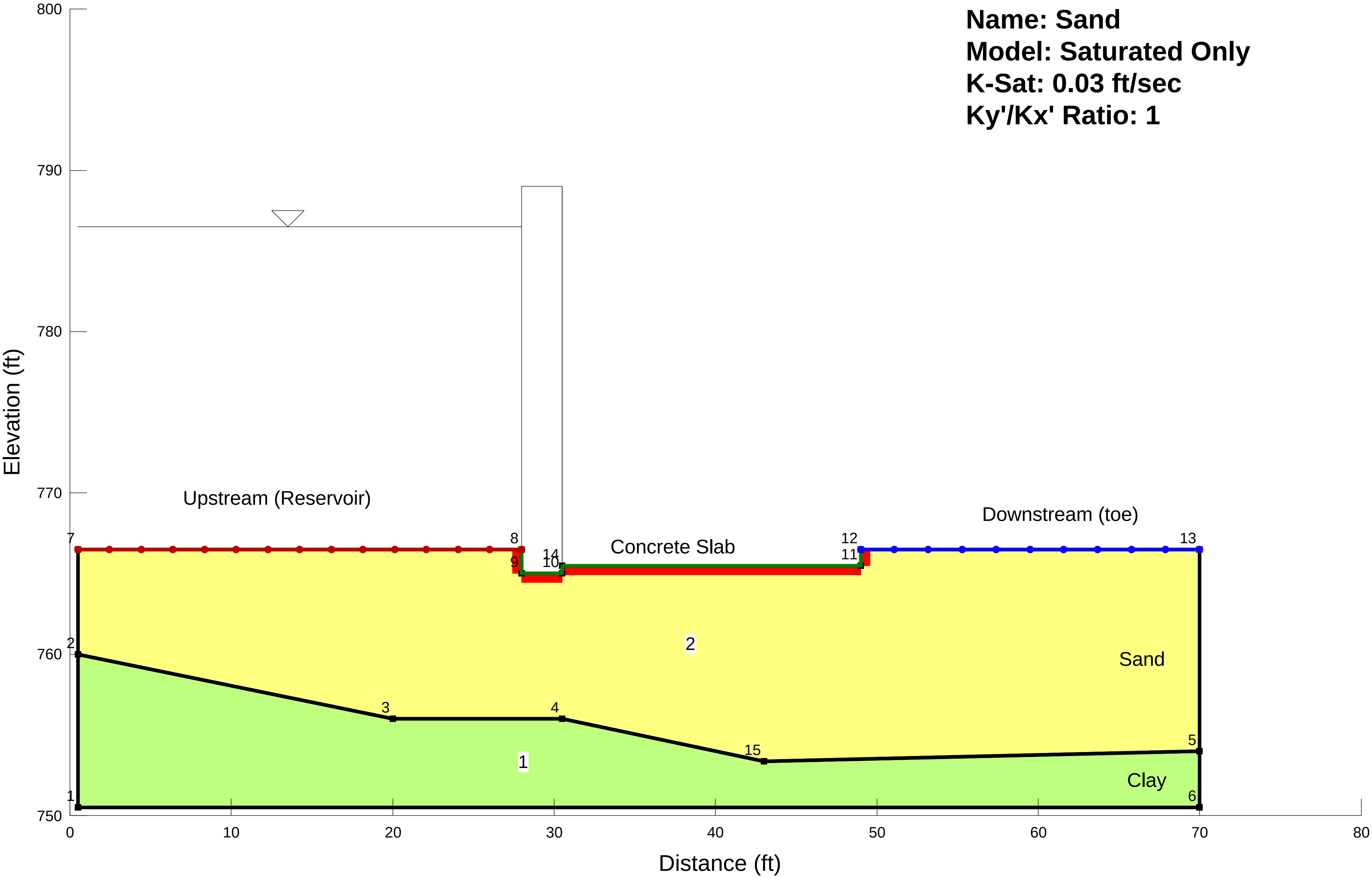
Depth (Ft.)	Sample No.	Legend	Description of Materials	Remarks
		░	0.0'-0.5'; Black Poorly Graded SAND (sp) No reaction w/HCl	Fine to coarse roots El. 803.2'
1.0 - 5.5	Bag 1	░	0.5'-5.5'; Brownish yellow Poorly Graded SAND (SP), moist single-grain; loose consistency; No reaction w/HCl	El. 798.2'
			Bottom of Test Pit = 5.5 Ft.	

Remarks: Backhoe pit dimensions 2'x6'x5.5'deep
Excavation Halted Due to cave in 1.0'-5.5'

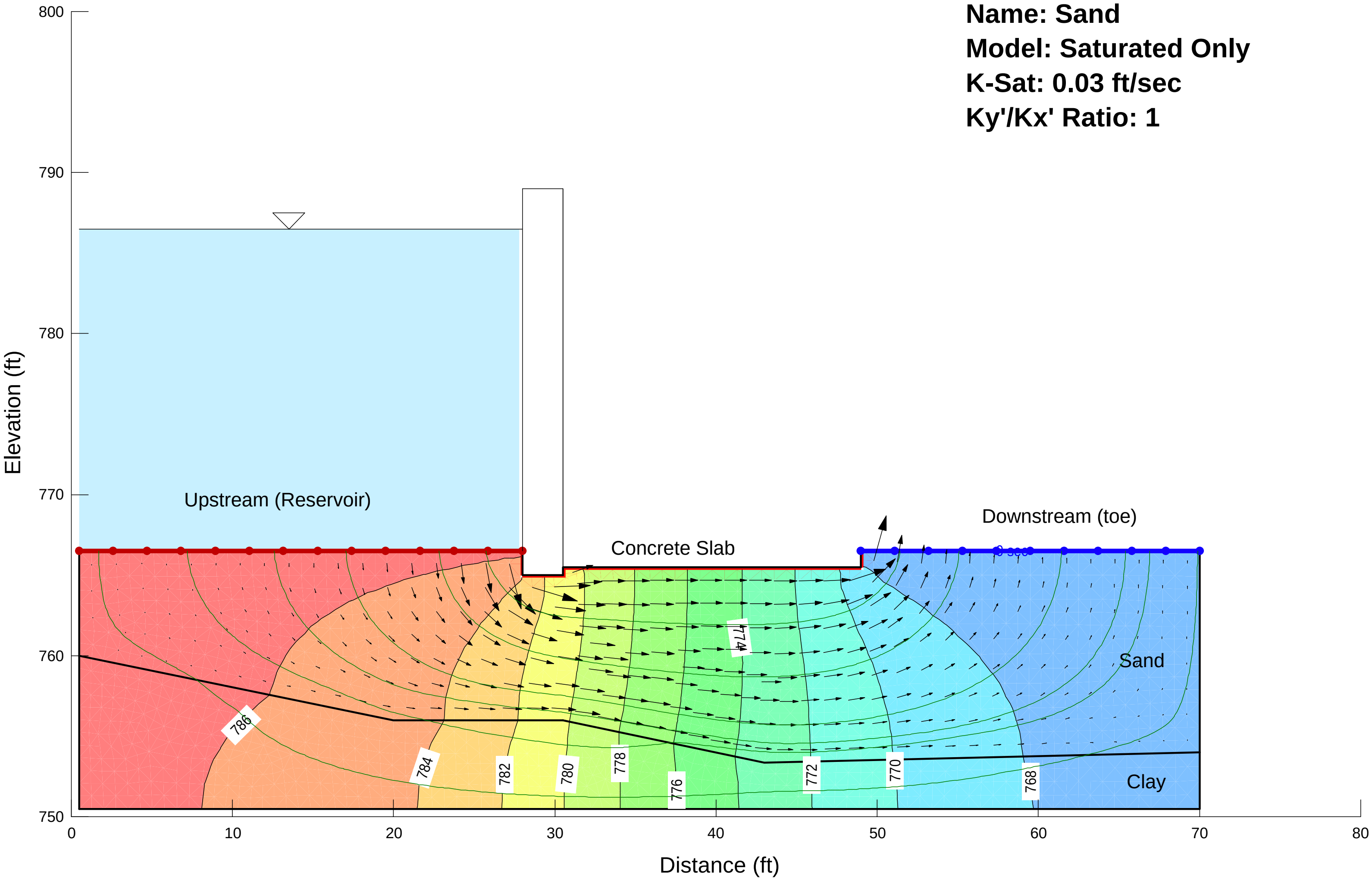
030603lel

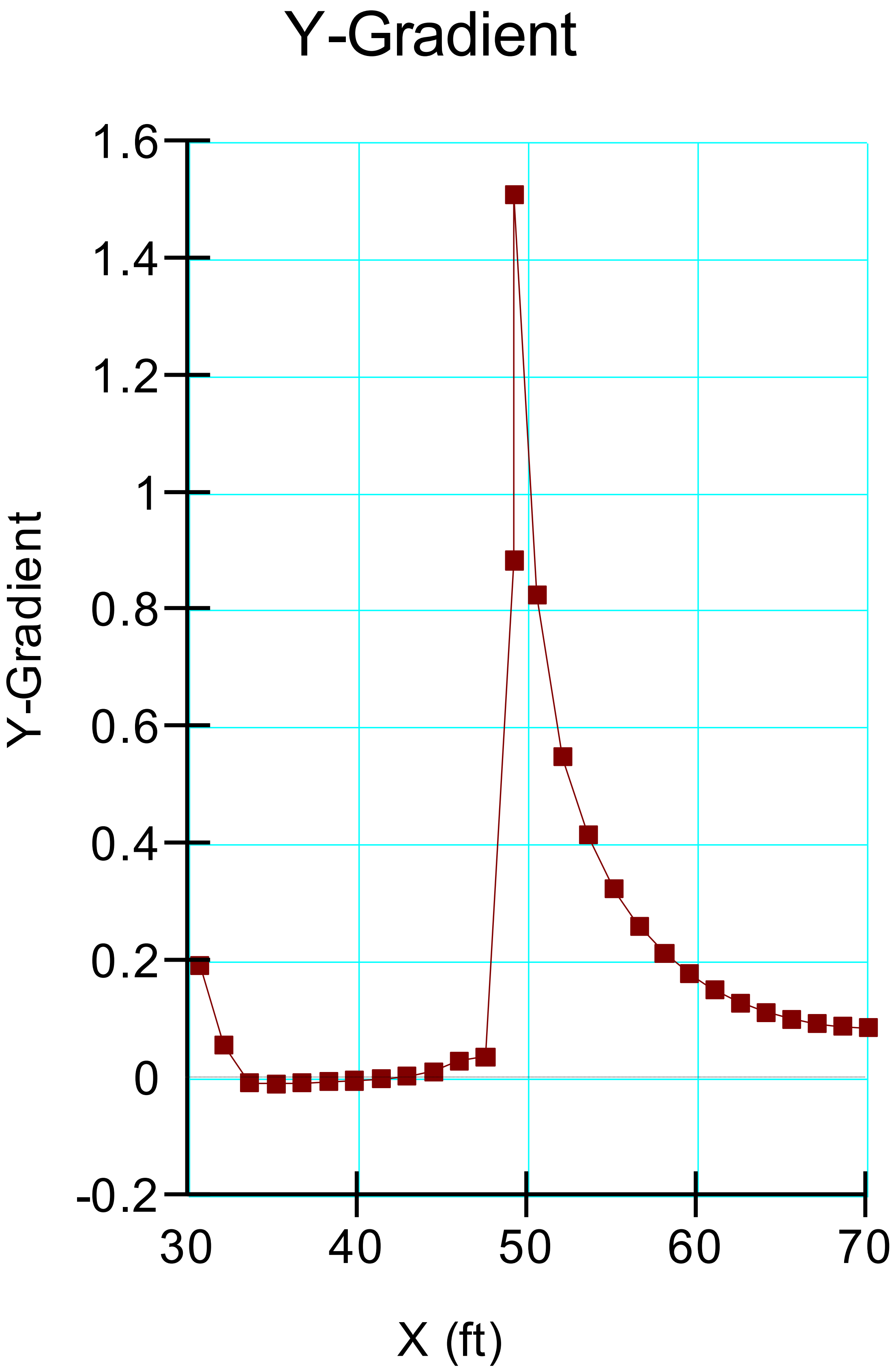
Appendix E – Detailed Seepage Analysis

BROWN BRIDGE DAM



BROWN BRIDGE DAM

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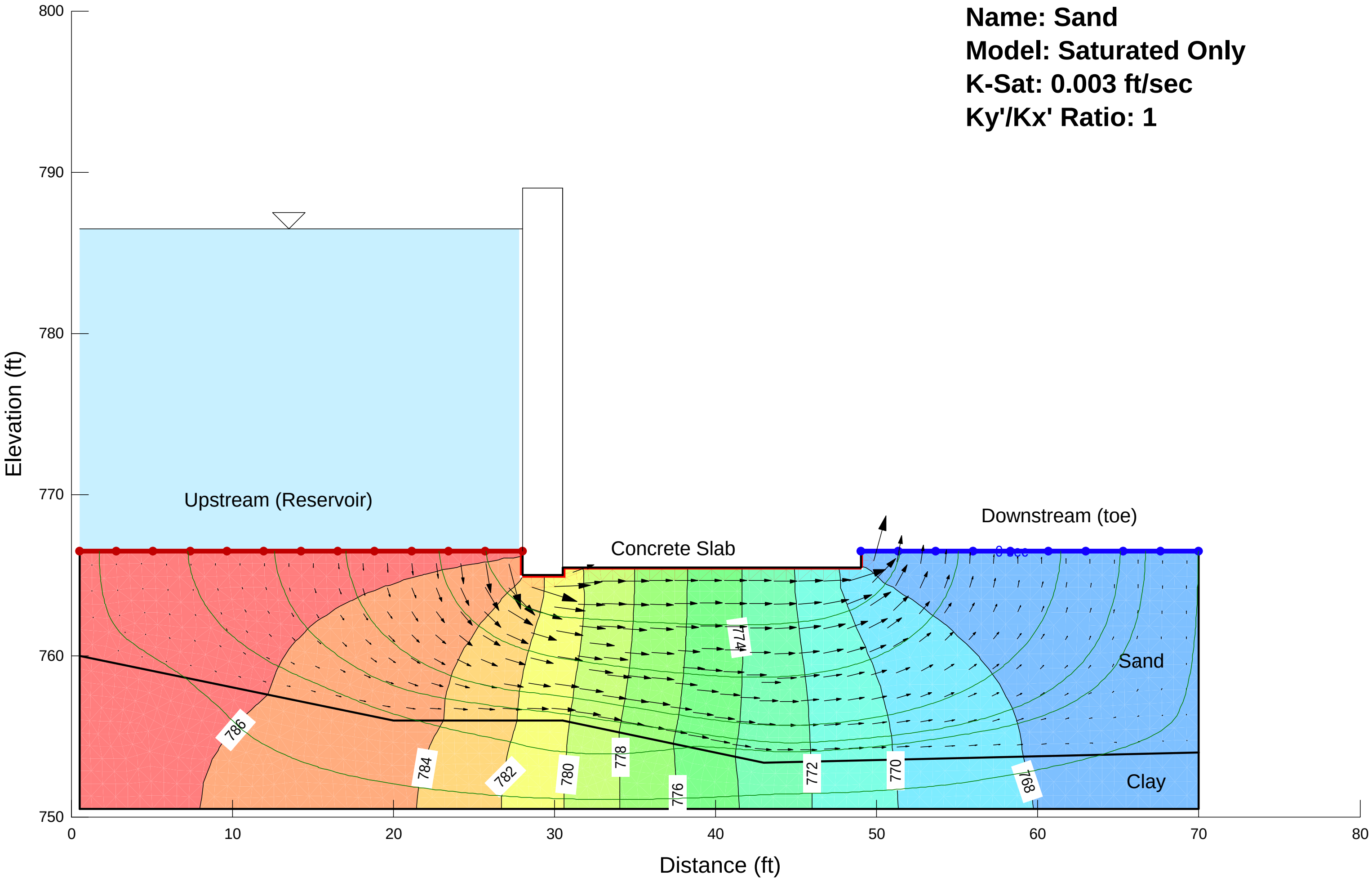
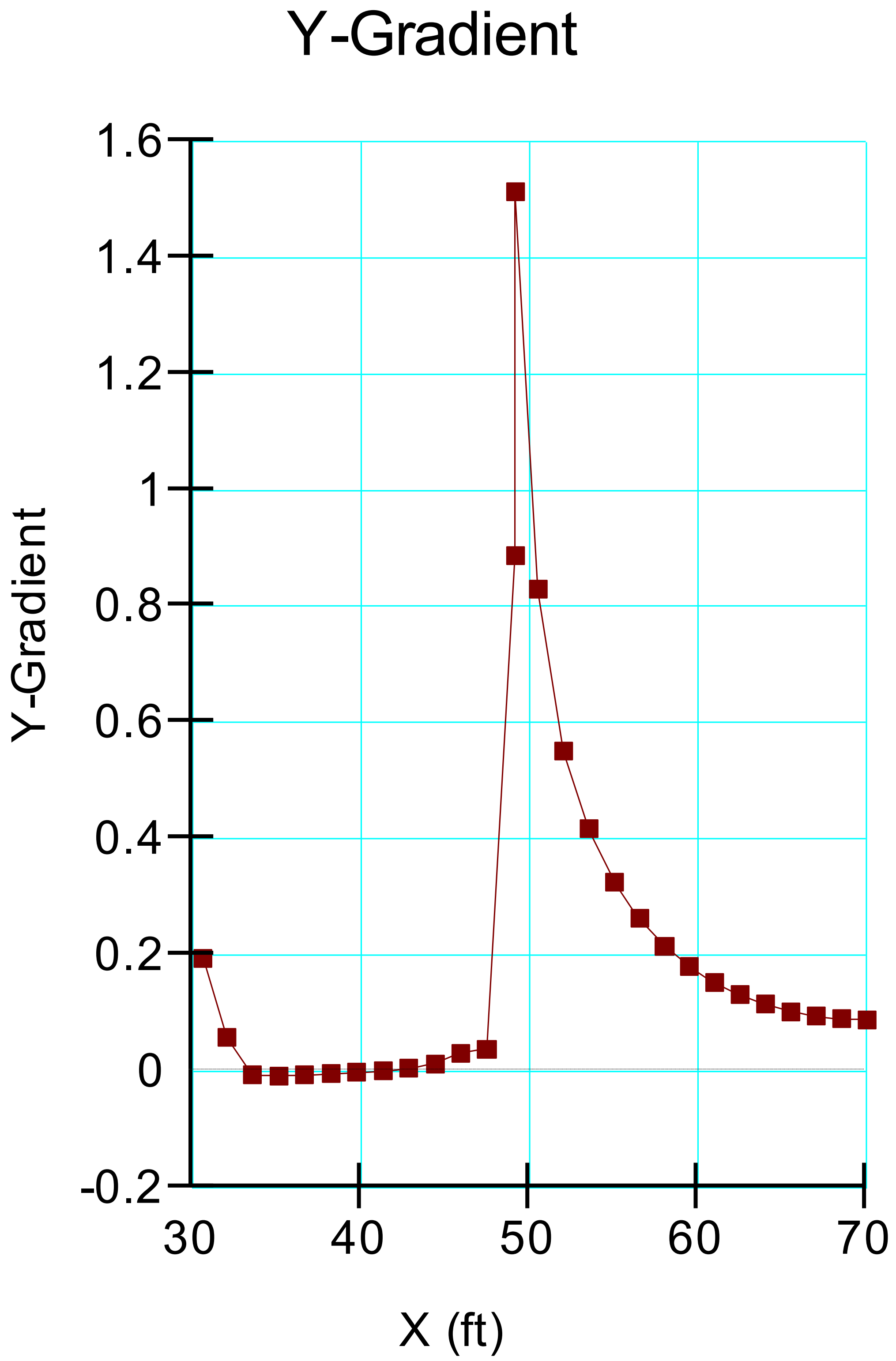
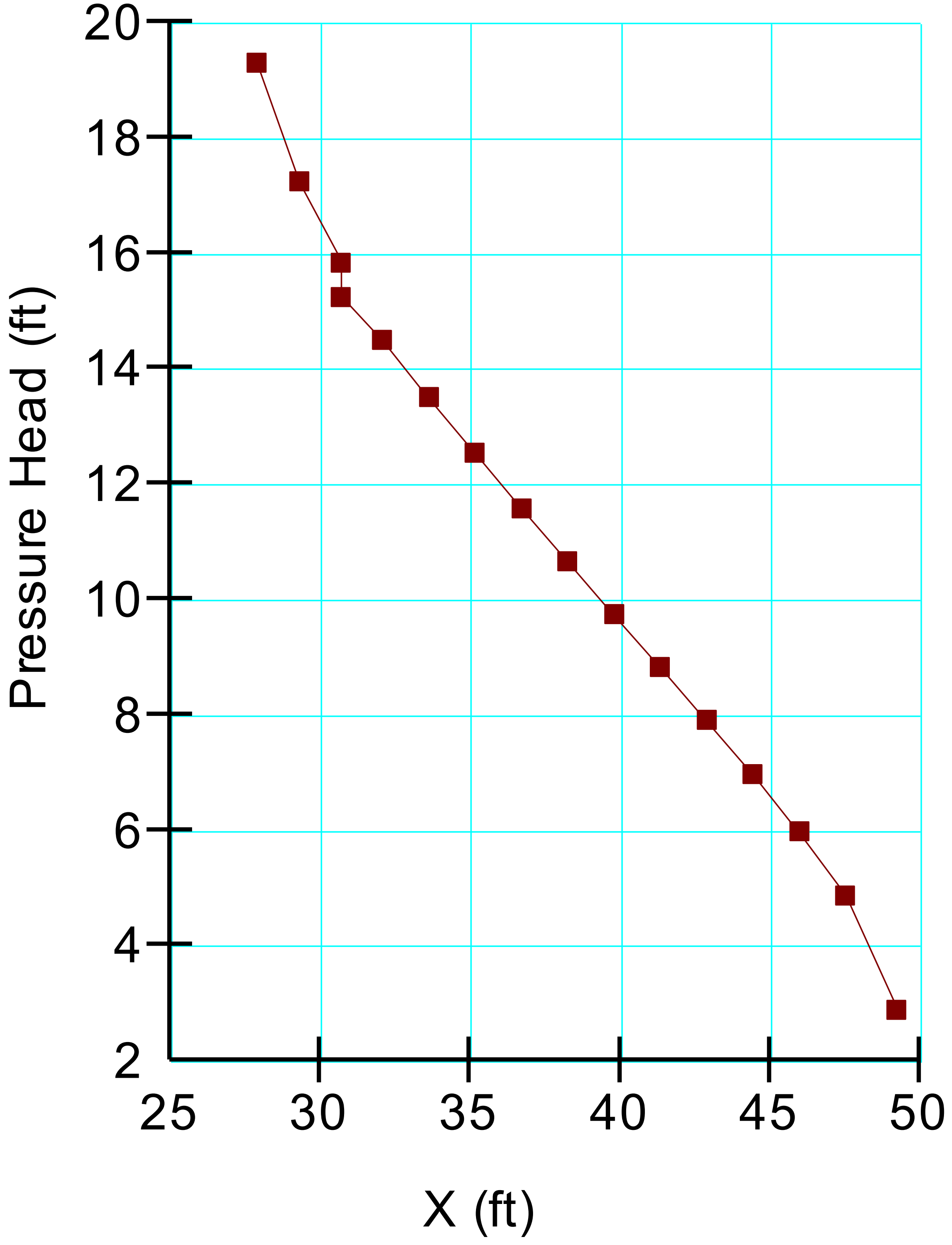
1.4
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
Y-Gradient
30
40
50
60
70
X (ft)

BROWN BRIDGE DAM




Y-Gradient
Y-Gradient
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
30
40
50
60
70
X (ft)

Pressure Head Under Concrete Slab



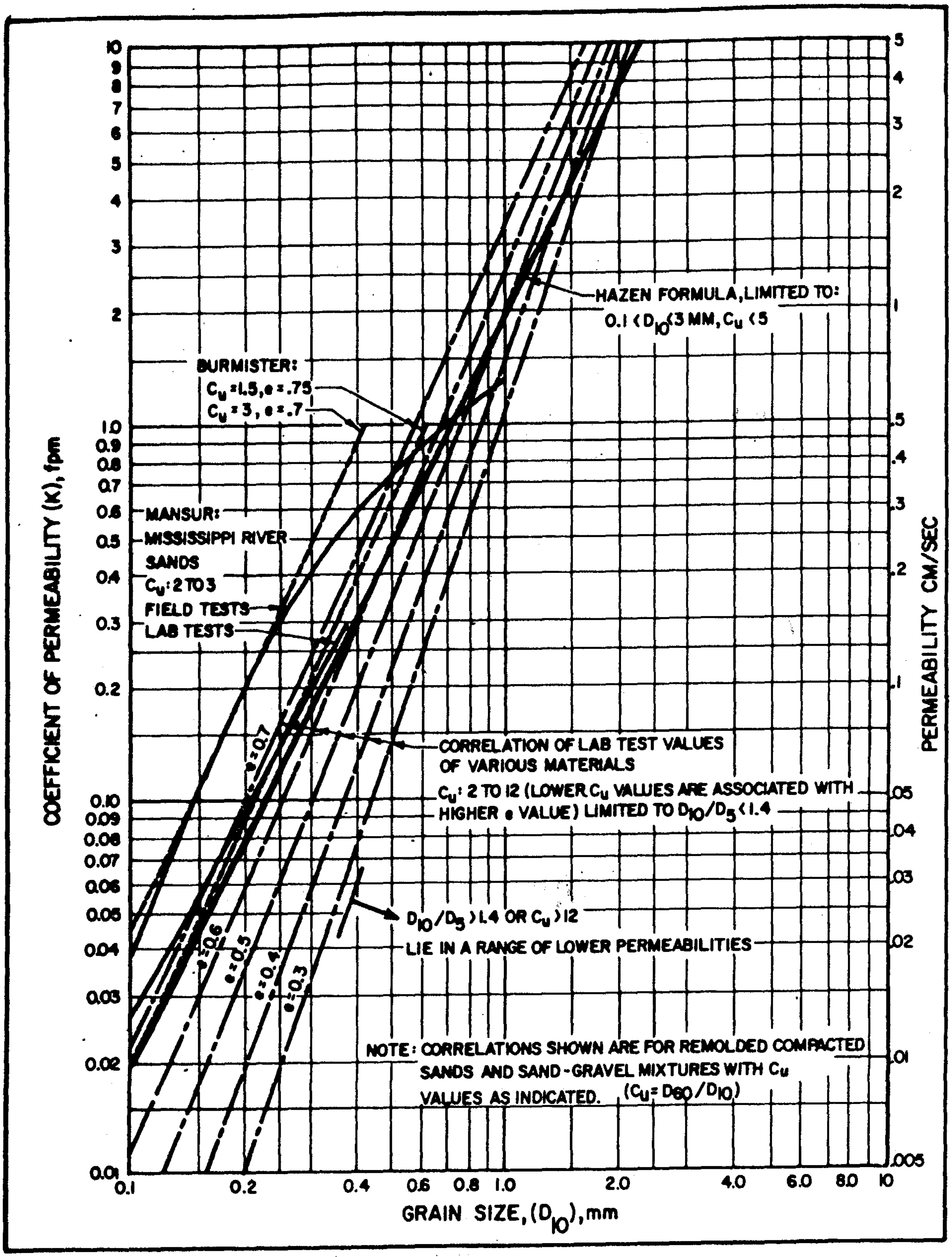


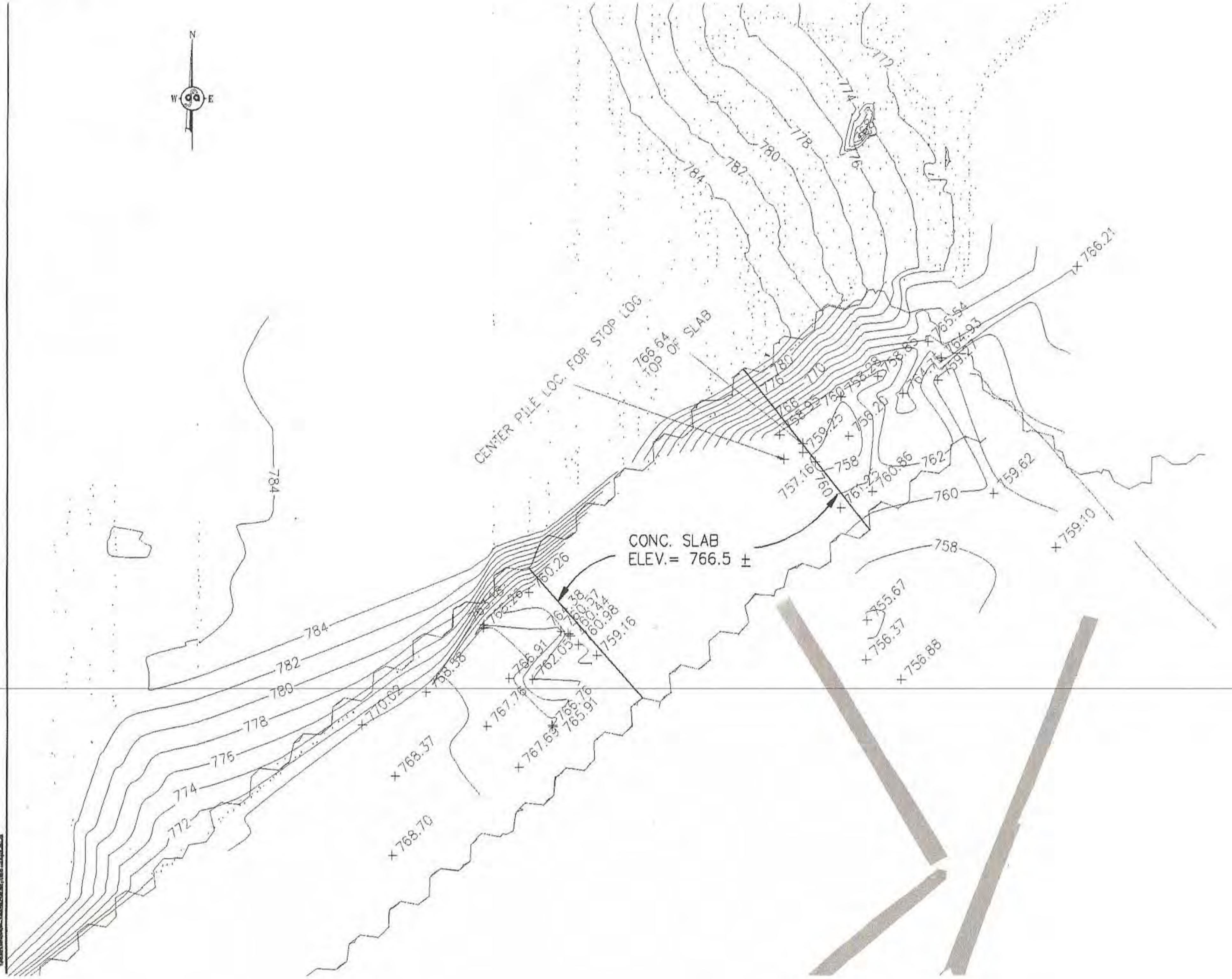
FIGURE 1
Permeability of Sands and Sand-Gravel Mixtures

1 cm/sec = 1.97 ft/min.
= $1.04 * 10^6$ ft/yr.

Boring No.	Sample No.	Depth (ft)	Gravel (%)	Sand (%)	Clay (%)	d_{10} (mm)	d_{50} (mm)	LL	PL	Estimated K (cm/sec)
GB-3	S-1	9.5-11.5	37.2	61.7	1.1	0.3064	0.9664			0.09388
	S-2A	13-13.5	0.0	42.2	57.8	NA	0.0423	19	9	NA
GB-7	S-1	12-13	10.6	87.4	2.0	0.3441	0.6977			0.11840
	S-1A	13-14	2.0	36.5	61.5	NA	0.0267			NA
GB-10	S-1	0-2	0.3	75.3	24.4	0.0161	0.1971			0.00026
	S-2	2-4	29.0	66.7	4.3	0.1950	0.5642			0.03803
	S-5	8-10	4.6	84.3	11.1	NA	0.3179			NA
	S-7	12-14	0.3	75.3	24.4	0.0160	0.1629			0.00026
	S-7A	13.5-14	0.0	41.5	58.5	NA	0.0386	18	10	NA
GB-11	S-2	12-13.5	11.2	84.8	4.0	0.2453	0.4620			0.06017
	S-2A	13.5-14	0.0	41.1	58.9	NA	0.0372	18	10	NA
GB-12	S-1A	5-6	3.5	55.5	41.0	0.0109	0.1200			0.00012
	S-3	8-10	0.2	67.9	31.9	NA	0.1604			NA
	S-4	10-10.5	0.6	78.1	21.3	0.0234	0.1330			0.00055
	S-4A	10.5-11	1.9	58.0	70.1	0.0014	0.1413	15	10	2.0E-06
	S-5	12-13	0.4	70.7	28.9	NA	0.1195			NA
	S-5A	13-14	0.4	45.9	53.7	NA	0.0520	18	10	NA
	S-6	14-15	3.9	76.2	19.9	0.0150	0.2226			0.00023
	S-6A	15-16	28.8	36.8	34.4	0.0014	0.2535	18	9	2.0E-06
	S-7	16-16.5	0.0	82.5	17.5	0.0510	0.1962			0.00260
	S-7A	16.5-17.5	3.8	42.0	84.2	NA	0.0581	18	9	NA
GB-13	S-2	6-7.2	4.3	88.1	7.6	0.1140	0.3440			0.01300
	S-3	8-9.15	1.3	88.7	10.0	0.0750	0.2893			0.00563
	S-4	10-11	4.6	76.3	19.1	0.0250	0.2503			0.00063
	S-4A	11-12	1.7	55.7	42.6	0.0033	0.0903			0.00001
	S-5A	12.2-12.8	0.7	39.9	59.4	NA	0.0337	18	9	NA
GB-14	S-2	6-8	10.2	82.9	6.9	0.1353	0.3671			0.01831
	S-3	8-9.25	1.3	80.8	17.9	0.0187	0.2360			0.00035
	S-3A	9.25-10	2.8	41.0	56.2	NA	0.0389	20	9	NA
	S-4	10-11.2	1.4	55.5	43.1	0.0014	0.1295	12	11	2.0E-06
	S-5	12-13.1	2.4	40.6	57.0	NA	0.0333	18	9	NA
GB-15	S-1A	5-6	19.9	74.3	5.8	0.1427	0.3526			0.02036

Boring No.	Sample No.	Depth (ft)	Gravel (%)	Sand (%)	Clay (%)	d_{10} (mm)	d_{50} (mm)	LL	PL	Estimated K (cm/sec)
	S-3	8-9.5	0.0	95.1	4.9	0.1538	0.3004			0.02365
	S-4	10-12	0.0	84.2	15.8	0.0502	0.1684			0.00252
	S-5	12-13	0.0	89.2	10.8	0.0718	0.2373			0.00516
	S-5A	13-13.5	5.8	73.4	20.8	0.0087	0.2563	11	11	0.00008
	S-5B	13.5-14	1.5	45.9	52.6	NA	0.0641	17	9	NA
GB-16	S-3	10-10.5	2.0	94.2	5.8	0.2213	0.3851			0.04897
	S-3A	10.5-12	5.3	75.0	19.7	0.0175	0.1630			0.00031
	S-4A	13-14	10.7	36.9	52.4	NA	0.0621	18	9	NA
GB-17	S-3	10-11.5	0.0	91.4	8.6	0.0938	0.2415			0.00880
	S-4	12-14	0.0	38.3	61.7	NA	0.0206	21	10	NA
GB-18	S-3	10-12	0.8	74.0	25.2	0.0096	0.1979			0.00009
	S-4A	12.5-14	1.4	44.1	54.5	NA	0.0471	18	9	NA

Appendix F – Post Failure Survey Data



MOLON EXCAVATING INC / AMEC ENVIORNMENT & INFASTRUCTURE INC.

DE-WATERING STRUCTURE

BROWN BRIDGE DAM, BOARDMAN RIVER

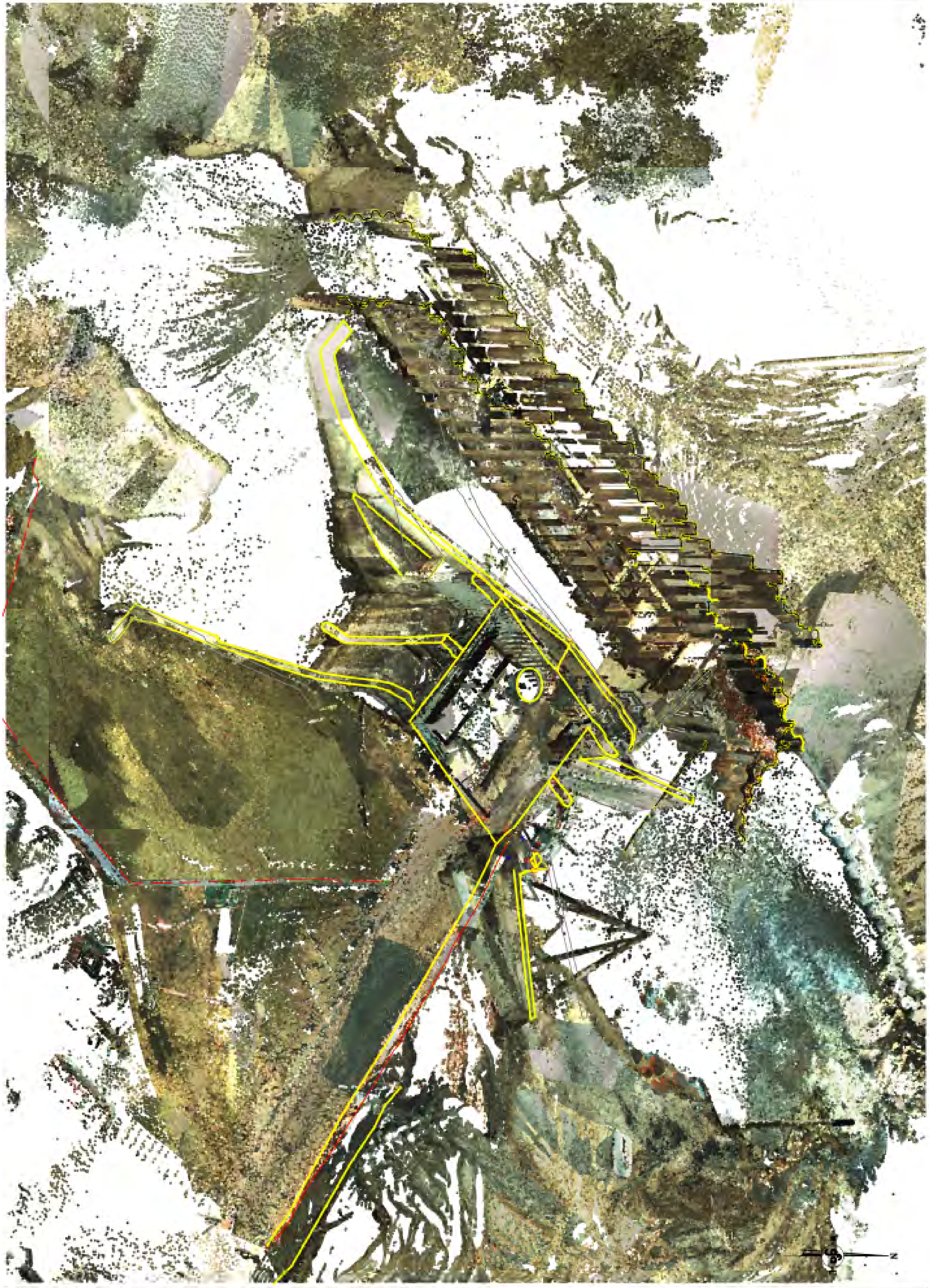
SECTION 15, TOWN 25 NORTH, RANGE 10 WEST

12278

SHT 1 OF 1

Gourdie-Fraser
Municipal | Development | Transportation

PH 231.946.5874
FAX 231.946.3703
www.gourdiefraser.com
123 W Front Street
Traverse City, MI 49684



MOLON EXCAVATING INC. / AMEC ENVOIRNMENT & INFRASTRUCTURE, INC.

BROWN BRIDGE DAM

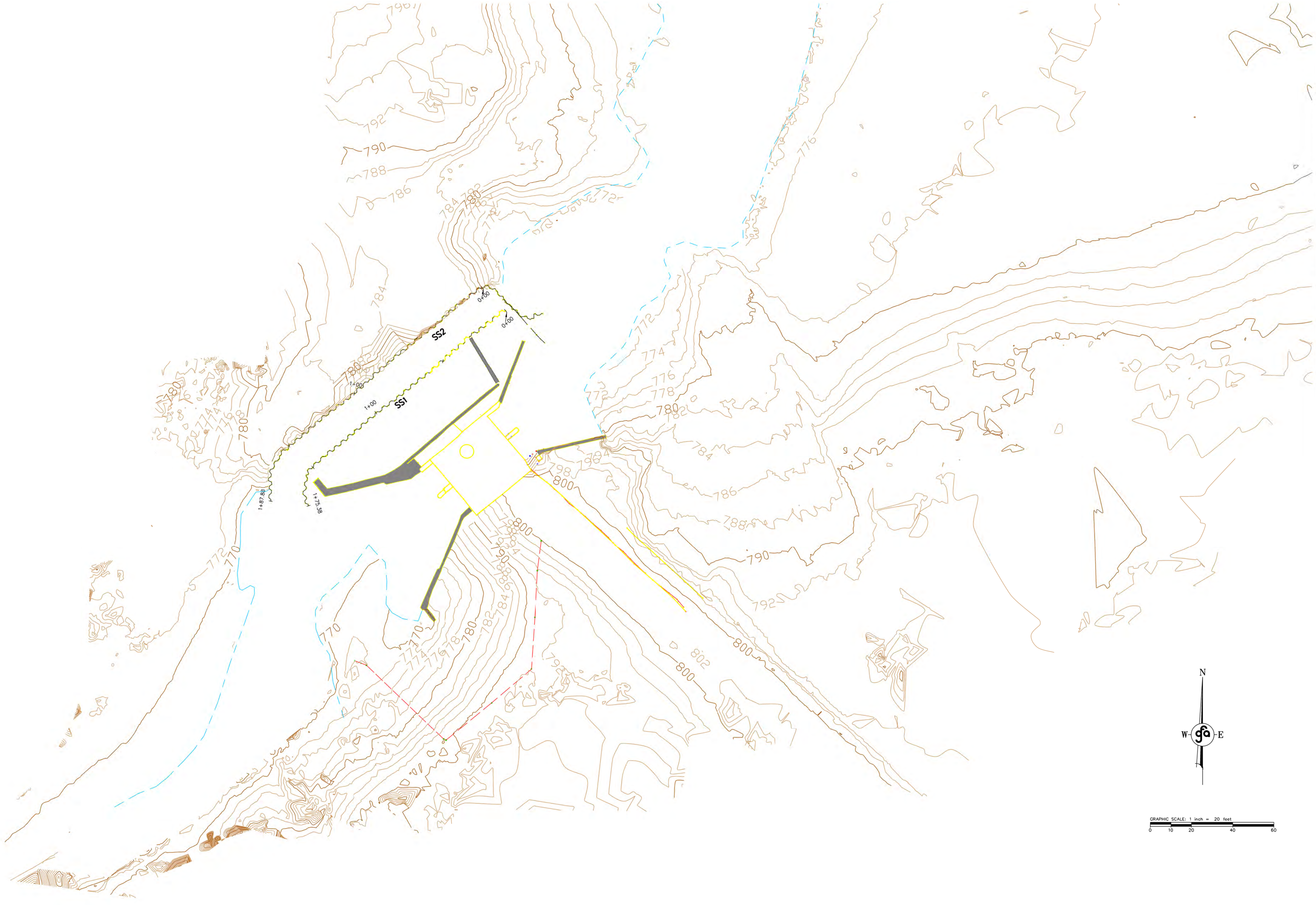
SECTION 15, TOWN 26 NORTH, RANGE 10 WEST

Gourdie-Fraser

12278A

1 of 1

These documents are prepared in accordance with the contractual terms and conditions for this project.



Gourdie-Fraser
Municipal | Development | Transportation

PH 231.946.5874
FAX 231.946.3703
WWW.gourdiefraser.com
123 W Front Street
Traverse City, MI 49684

REV#	DATE	DRN	DESC

MOLON EXCAVATING INC. / AMEC ENVIORNMENT & INFRASTRUCTURE, INC.

BOARDMAN RIVER

BROWN BRIDGE DAM

SECTION 15, TOWN 26 NORTH, RANGE 10 WEST
XX, XX, MI

P.M.: M.R.
DR.: MJF
CKD.: MR
JOB NO.: 12278A
SHT 1 OF 2

These documents are prepared in accordance with the contractual terms and conditions for this project.

Appendix G – Headwater and Tailwater Readings

Brown Bridge Dam Removal / Boardman River Restoration
MDEQ Permit: 12-28-0011-P
Project # 3310120011
Head pond measurement from gauge afixed to south gate of dam
Tailrace measurement from river gauge downstream of dam (north side of Brown Bridge Road)

Drawdown monitoring Log

Date	Head Pond Elevation	Time	Visual Observations?	Tail Race Elevation	Time	Visual Observations?	Observer	
8/27/2012	789.2	1700		765.3	1700		CB	
8/28/2012	789.2	1700		765.3	1700		CB	
8/29/2012	789.5	1830		765.3	1830		CB	
8/30/2012	789.6	845		765.3	845		CB/LM	
8/30/2012	789.6	1138		-	-		LM	
8/30/2012	789.6	1330	Clear - no silt	765.25	1341	Clear - no silt	LM	
8/30/2012	789.6	1437	Clear - no silt	-	-		LM	
8/30/2012	789.6	1602	Clear - no silt	765.25	1548	Clear - no silt	LM	
8/30/2012	789.5	1715		765.95	1820	Slightly cloudy	LM	
8/30/2012	789.3	1904		765.95	1857		LM	
8/30/2012	789.2	2050		765.9	2040		LM	
8/31/2012	789.3	720	Clear - no silt	765.2	653	Clear - no silt	LM	
8/31/2012	789.3	935	Clear - no silt	-	-		LM	
8/31/2012	789.3	1050					LM	
8/31/2012	789.3	1057					LM	Crack south gate 6.5" (msr 53" from old floor = closed; at 47")
8/31/2012	789.25	1155		765.6	1150		LM	
8/31/2012	789.2	1330		765.5	1354	Clear - no silt	LM	
8/31/2012	789.1	1551		765.45	1614		LM	
8/31/2012	789.05	1711					LM	
8/31/2012	789.1	1720					LM	Crack south gate 4.5" (msr 53" from old floor = closed; at 49.5")
8/31/2012	789.1	1827		765.25	1835		LM	
9/1/2012	789.0	837	Clear - no silt	765.25	831	Clear - no silt	LM	
9/1/2012	789.0	1105		765.25	1055		LM	
9/1/2012	789.0	1606	Slightly cloudy	765.2	1557	Clear - no silt	LM	
9/2/2012	789.0	910		765.2			SL (GTCD)	
9/2/2012	789.0	1517	Clear - no silt	765.2	1506	Very clear	LM	
9/4/2012	789.1	650		765.3	645		LM	
9/4/2012	789.05	845	Minor silt	765.4	836	Clear	LM	Crack south gate to 5.5" (msr 53" from old floor = closed; at 47.5")
9/4/2012	789.0	1205		765.4	1158	clear	LM	
9/4/2012	789.0	1450		765.4	1505	clear	LM	
9/4/2012	789.0	1720		765.4	1711		LM	Crack south gate 6.5" (msr 53" from old floor = closed; at 46.5")
9/4/2012	788.95	1914		765.4	1855		LM / FD	(FD reported tailrace measure as leaving site)
9/5/2012	788.7	800		765.3	800		CB	
9/5/2012	788.7	1220		765.3	1220		CB	Raised gate 1.5in 46.5in to 45in from old floor
9/5/2012	788.6	1820		765.6	1820		CB	
9/62012	788.3	715		765.4	715		CB	
9/6/2012	788.3	1145		765.3	1145		CB	
9/6/2012	788.3	1710		765.2	1710		**CB**	
9/7/2012	788.2	730		765.2	730		CB	
9/7/2012	788.2	1200		765.2	1200		CB	
9/7/2012	788.3	1700		765.3	1700		CB	The increase due to rainfall
9/82012	788.5	730		765.3	730		CB	
9/8/2012	788.5	1200		765.3	1200		CB	
9/8/2012	788.5	1445		765.3	1445		CB	
9/10/2012	788.5	730		765.3	730		CB	
9/10/2012	788.5	1200		765.3	1200		CB	
9/10/2012	788.5	1730		765.3	1730		CB	
9/11/2012	788.5	730		765.3	730		CB	
9/12/2012	788.5	730		765.3	730		CB	Started drawdown through powerhouse
9/12/2012	788.4	1300		765.4	1300		CB	Raised gate 1.5in 45in to 43.5 from old floor
9/12/2012	788.3	1530		765.4	1530		CB	
9/12/2012	788.3	1830		765.4	1830		CB	
9/13/2012	788	730		765.3	730		CB	Raised sou th gate 2in. 43.5in. To 41.5in. from old floor
9/13/2012	787.9	1030		765.4	1030		CB	
9/13/2012	787.8	1300		765.4	1300		CB	
9/13/2012	787.8	1630		765.4	1630		CB	
9/14/2012	787.6	715		765.3	715		CB	
9/14/2012	787.6	945		765.3	945		CB	Raised south gate 2in. 41.5in to 39.5in from old floor
9/14/2012	787.5	1400		765.4	1400		CB	
9/15/2012	787.4	700		765.4	700		CB	
9/15/2012	787.4	1200		765.4	1200		CB	
9/15/2012	787.4	1530		765.4	1530		CB	
9/17/2012	787.3	730		765.3	730		CB	
9/17/2012	787.3	1200		765.3	1200		CB	
9/17/2012	787.3	1700		765.3	1700		CB	
9/18/2012	787.7	730		765.3	730		CB	
9/18/2012	787.7	1200		765.4	1200		CB	Raised gate 2.5in 39.5in. To 37in. From old floor
9/18/2012	787.7	1730		765.4	1730		CB	
9/19/2012	787.6	730		765.5	730		CB	
9/19/2012	787.6	1100		765.6	1100		CB	Raised gate 2.5in 37in to 34.5in. From old floor
9/19/2012	787.4	1730		765.4	1730		CB	
9/20/2012	787.3	730		765.4	730		CB	
9/20/2012	787.3	830		765.4	830		CB	Raised gate 2in 34.5in to 32.5in From old floor
9/20/2012	787.3	1300		765.4	1300		CB	Raised gate 100%
9/20/2012	787.3	1530		675.9	1530		CB	Opened north wicket gate lost .10 in 2hr.
9/20/2012	787.2	1730		765.9	1730		CB	Closed wicket gate for the night.
9/21/2012	787.4	730		765.4	735		JG	
9/21/2012	787.4	935		765.8	930		JG	Opened wicket gate at 745
9/21/2012	786.9	1200		765.9	1205		JG	Closed wicket gate at 1220
9/21/2012	786.9	1720		765.5	1715		JG	
9/22/2012	786.9	900		765.5	905		JG	Opened wicket gate 25% at 910
9/22/2012	786.9	1030		765.7	1035		JG	
9/22/2012	786.8	1230		765.7	1735		JG	
9/22/2012	786.7	1745		765.7	1750		JG	
9/23/2012	786.6	1730		765.7	1725		JG	
9/24/2012	786.4	710		765.5	715		JG	Opened wicket gate to 75% at 730
9/24/2012	786.3	1135		765.6	1130		JG	
9/24/2012	786.3	1500		765.5	1455		JG	
9/25/2012	786.2	730		765.5	730		CB	No gate changes
9/25/2012	786.2	1230		765.5	1230		CB	
9/25/2012	786.1	1730		765.5	1730		CB	
9/26/2012	786.1	730		765.4	730		CB	Wicket gate is open 100%
9/26/2012	786.1	1300		765.4	1300		CB	
9/26/2012	786.1	1400		765.4	1400		CB	
9/27/2012	786.1	800		765.4	800		CB	
9/27/2012	786.1	1200		765.4	1200		CB	
9/27/2012	786.1	1700		765.3	1700		CB	
9/28/2012	786.1	730		765.3	730		CB	
9/28/2012	786.1	1345		765.3	1345		LM	

9/28/2012	786.1	1720		765.3	1720		CB	
9/29/2012	786.1	800		765.3	800		CB	
9/29/2012	786.1	1300		765.3	1300		CB	
9/29/2012	786.1	1745		765.3	1745		CB	
10/1/2012	786.4	745		765.3	745		CB	Some debris in front of trash rack causing headpond to increase.
10/1/2012	786.4	1240		765.3	1240		CB	
10/1/2012	786.4	1800		765.3	1800		CB	
10/2/2012	786.4	800		765.3	800		CB	Cleaned debris out of trash racks
10/2/2012	786.4	1300		765.3	1300		CB	
10/2/2012	786.4	1700		765.3	1700		CB	
10/3/2012	786.4	800		765.3	800		CB	
10/3/2012	786.4	1245		765.5	1245		CB	
10/3/2012	786.3	1700		765.4	1700		CB	
10/4/2012	786.3	800		765.4	800		CB	
10/4/2012	786.3	1500		765.3	1500		CB	
10/4/2012	786.3	1700		765.3	1700		CB	Cleaned debris out of trash racks
10/5/2012	786.3	800		765.3	800		CB	
10/5/2012	786.3	1230		765.3	1230		CB	
10/5/2012	786.3	1700		765.3	1700		CB	
10/6/2012	786.4	800		765.4	800		CB	Installed new staff gauge in pond reading was 8.5' 8.5=786.4
10/6/2012	-	-		764.9	1720		CB	Water very black looking
10/6/2012	-	-		765	1845		CB	
10/6/2012	-			765.1	1940		CB	
10/7/2012	772.5	0010		765.1	0024		lm/jg	
10/7/2012	772.5	0242		765.1	0245		lm/jg	
10/7/2012	772.5	0429		765.1	0436		lm/jg	
10/7/2012	772.5	0556		765.2	0550		lm/jg	
10/7/2012	772.5	900		765.2	900		CB	
10/7/2012	772.5	1200		765	1200		CB	
10/7/2012	772.5	1500		765.3	1500		CB	Water starting to clear up.
10/8/2012				765.3	900		CB	New staff gauge is out of the water.
10/8/2012				765.4	1500		CB	
10/9/2012				765.4	1700		CB	
10/10/2012				765.5	1530		CB	
10/11/2012				765.5	1300		CB	
10/12/2012				765.5	1500		CB	
10/13/2012				765.6	1200		CB	Light rain 0.86 inches of rain
10/14/2012				765.9	1300		CB	Rain continued through the night. 1.68 inches of rain
10/15/2012				766	830		CB	Rain continues through the day 0.15 inches of rain
10/15/2012			207cfs @1430	766.1	1430		CB	
10/16/2012	772	915	211cfs @ 700	766	930		CB	Upper impoundment water elevation 774.78 control point #22 elev. 778.14
10/16/2012				766	1430		CB	
10/17/2012			216cfs @700	766	900		CB	
10/17/2012			202cfs @ 1600	765.9	1600		CB	
10/18/2012			171cfs @ 845	765.9	1030		JJG	Rain continued through the day
10/18/2012			162 cfs@ 1545	765.8	1730		JJG	
10/19/2012			156 cfs @ 345	765.7	830		JJG	
10/20/2012			131 cfs @ 545	765.6	830		JJG	
10/21/2012			123 cfs @ 1200	765.6	1300		JJG	
10/22/2012			120 cfs @ 345	765.5	900		JJG	
10/24/2012			118cfs @1300	765.5	800		CB	
10/25/2012			115cfs @700	765.5	700		CB	0.52 inches of rain over rnight
10/26/2012			120cfs 900	765.5	800		CB	
10/27/2012			115cfs @ 700	765.5	800		CB	
10/29/2012			111cfs @700	765.4	900		CB	
10/30/2012			108 cfs @700	765.4	800		CB	Light rain
10/31/2012			112cfs @700	765.4	800		CB	Light rain
11/1/2012	7.5	1000	118cfs @900	765.4	900		CB	Installed new staff gauge in pond reading was 7.5'
11/2/2012	7	800	119 cfs@1200pm	765.4	800		CB	
11/3/2012	7	830	118cfs @800	765.4	830		CB	
11/5/2012	6.9	730	110 cfs @700	765.4	900		CB	
11/6/2012	6.3	700	106 cfs @730	765.4	800		CB	
11/7/2012	6	730	106 cfs @800	765.4	730		CB	
11/9/2012	5.5	1030	103 cfs @ 1030	765.5	1030		JJG	Built the weir back up to control sediment
11/9/2012	6.5	1730	103 cfs @ 1730	765.4	1730		JJG	
11/10/2012	6.8	645	103 cfs @ 645	765.3	800		JJG	
11/12/2011	6.8	830	108 cfs @ 645	765.3	835		JJG	6'8"=772.50 head pond
11/13/2012	6.8	800	106 cfs @900	765.3	800		CB	
11/14/2012	6.8	1100	105 cfs @1530	765.3	1100		CB	
11/15/2012	6.8	800	105 cfs @815	765.3	800		CB	
11/19/2012	6.8	800	102 cfs @ 1530	765.3	800		CB	
11/20/2012	6.8	830	101 cfs @1630	765.3	830		CB	
11/21/2012	6.8	830	99 cfs @830	765.3	830		CB	
11/26/2012	6.8	830	99cfs @645	765.3	930		JJG	Started dropping weir
11/27/2012	6.2	640	99 cfs @830	765.4	830		CB	
11/28/2012	5.11	730	105 cfs @730	765.4	900		CB	
11/29/2012	5.6	730	98 cfs @820	765.3	730		CB	
11/30/2012	5.6	730	99 cfs @700	765.3	800		CB	
12/1/2012	5.6	800	101 cfs @930	765.3	800		CB	
12/3/2012	4.11	900	112 cfs @630	765.3	900		CB	
12/4/2012	4.8	730	118 cfs @650	765.3	730		CB	
12/5/2012	4.8	730	119 cfs@730	765.3	730		CB	
12/6/2012	770.3	900	119 cfs @930	765.3	900		CB	
12/7/2012	770.5	900	112 cfs @800	765.3	800		CB	
12/10/2012	770	800	105 cfs @ 700	765.3	800		CB	
12/11/2012	769.5	1530	103 cfs @700	765.3	900		CB	

Appendix H – TDS Sheetpile Data

BB Dam Removal - TDS Sheet Summary
3310120011

Sheet Detail Summary 12/20/12

Sheet	Given Length	Measured Length	Top Elev	Bottom Elev	Clay Return
N 1		39		0	-
N 2		39.5		0	-
N 3		39.5		0	-
N 4		39.5		0	-
N 5		39.2		0	-
N 6		39.2		0	-
N 7		38.7		0	-
N 8		38.7		0	-
N 9		39.2		0	-
N 10		39.2		0	-
N 11		39.5		0	-
N 12		39.5		0	-
N 13		39.5	792	752.5	-
N 14		39.5	792	752.5	-
N 15		40.5	792	751.5	48"
N 16		40.3	792	751.7	36"
N 17		34.5	787	752.5	50"
N 18		35.9	787	751.1	50"
N 19		36.2	787	750.8	52"
N 20		34.8	787	752.2	52"
N 21	58.5	58.5	810	751.5	52"
N 22	58.5	58.5	811	752.5	48"
N 23	58.5	58.5	810.5	752	50"
N 24	58.5	58.1	810	751.5	84"
N 25	58.5	58.6	809	750.5	-
N 26	58.5	58.9	809	750.5	-
N 27	58	58.1	809.8	751.8	-
N 28	58	58.6	810.4	752.4	-
N 29	58.5	58.6	810.9	752.4	-
N 30	58.5	57.3	815	756.5	-
N 31	58	58.2	808.8	750.8	-
N 32	58.5	58.6	809.5	751	60"

Sheet	Given Length	Measured Length	Top Elev	Bottom Elev	Clay Return
S 1	58	58.2	809	751	-
S 2	58	58.4	809	751	-
S 3	58.5	58.4	809	750.5	36"
S 4	58.5	58.3	810.4	751.9	-
S 5	59	58.8	810.3	751.3	44"
S 6	59	58.6	810.9	751.9	48"
S 7	58.5	58.6	810.4	751.9	42"
S 8	59.5	59.5	813	753.5	-
S 9	58.5	58.1	810.5	752	40"
S 10	59	59.1	813.4	754.4	18"
S 11	59	59	813.5	754.5	24"
S 12	59	59.5	813.4	754.4	24"
S 13	59	58.8	811.6	752.6	34"
S 14	59	58.7	811.6	752.6	12"
S 15	58.5	57	816.4	757.9	-
S 16	58.5	57.2	810.7	752.2	28"
S 17	59	59.4	809.3	750.3	60"
S 18	58.5	58.3	809	750.5	12"
S 19	59	58.4	810.3	751.3	24"
S 20	59	58.7	813.7	754.7	12"
S 21	58.5	58.1	813.7	752.2	18"
S 22	59	58.8	811.4	752.4	58"
S 23	59	59.4	811.1	752.1	60"
S 24	59	59.5	818	759	-
S 25	46	45.7	798.5	752.5	60"
S 26	46	45.9	799.4	753.4	-
S 27	59	58.8	815.5	756.5	-
S 28	59	58.9	811	752	48"
S 29	58	59.1	811.3	753.3	50"
S 30	58	59	810	752	-
S 31	59	58	812.5	753.5	-
S 32	59	58	817.3	758.3	-

BB Dam Removal - TDS Sheet Summary
3310120011

N 33	44.5	44.4	800.5	756	-
N 34	44	44.2	800	756	42"
N 35	44	44.4	794.75	750.75	-
N 36	44	44.3	799	755	42"
N 37	45	45.2	795.4	750.4	60"
N 38	45	45.2	799.4	754.4	-
N 39	45	45.3	800	755	42"
N 40	44.5	44.3	800.2	755.7	24"
N 41	45	45	799.5	754.5	24"
N 42	44.5	44.4	797.4	752.9	12"
N 43	44.5	44	798	753.5	42"
N 44	45	45.1	796.8	751.8	40"
N 45	45	45.4	799.6	754.6	48"
N 46	45	45.3	797.3	752.3	72"
N 47	42	42.5	797.3	755.3	-
N 48	42	42	796.2	754.2	-
N 49	38.5	38	796	757.5	-
N 50	38.5	37.9	796	757.5	-
N 51	39	38.5	793.8	754.8	-
N 52	39	39	793.8	754.8	-
N 53	39	38.8	794.6	755.6	-
N 54	39	38.8	794.6	755.6	-
N 55	39	37.8	796.6	757.6	-
N 56	39	37.8	796.6	757.6	-
N 57	35	35.2	792.6	757.6	-
N 58	35	35	790	755	-
N 59	35	35.1	792.3	757.3	-
N 60	35	35	792.3	757.3	-
N 61	35	35.2	791.4	756.4	30"
N 62	35	35.2	791.4	756.4	30"
N 63	35	35	790.9	755.9	-
N 64	35	35.2	791.5	756.5	-
N 65	35	34.9	791.5	756.5	24"
N 66	35	34.9	791.5	756.5	24"
N 67	35	35.2	793.7	758.7	-

S 33	58.5	59	812.9	754.4	84"
S 34	58.5	59	812.9	754.4	84"
S 35	59	59	812.8	753.8	54"
S 36	59	58.9	812.8	753.8	24"
S 37	40	39.7	796.4	756.4	-
S 38	39	38.5	794.9	755.9	-
S 39	38.5	38.5	796.9	758.4	-
S 40	38.5	38.6	796.9	758.4	-
S 41	38.5	38.7	795.4	756.9	-
S 42	38.5	38.2	795.4	756.9	-
S 43	40	40.1	803.8	763.8	-
S 44	40	40.1	792.8	752.8	-
S 45	35.5	35.4	788.5	753	-
S 46	35.5	35.4	786.5	751	-
S 47	35.5	35.4	788.3	752.8	24"
S 48	35.5	35.4	788.3	752.8	24"
S 49	35	35	786.6	751.6	-
S 50	35	35.1	787.2	752.2	-
S 51	35.5	35.4	790.2	754.7	-
S 52	35.5	35.4	790.2	754.7	-
S 53	35	35	789.5	754.5	-
S 54	35	35	789.6	754.6	-
S 55		35	790.5	790.5	-
S 56		35	790.37	790.37	-
S 57		35.4	790.18	790.18	-
S 58		35.4	791.33	791.33	-
S 59		25.2	781.68	781.68	6"
S 60		25.3	781.6	781.6	-
S 61		25.5	781.67	781.67	-
S 62		25	778.04	778.04	-
S 63		25.2	778.1	778.1	-
S 64		25.3	786.68	786.68	-
S 65		25.3	785.97	785.97	-

BB Dam Removal - TDS Sheet Summary
3310120011

N	68	35	35.2	791.3	756.3	-
N	69	35	35	791.3	756.3	-
N	70	35	35.2	791.3	756.3	-
N	71	35	35.5	792	757	-
N	72	35	35.5	792	757	-
N	73	29		781.7	752.7	-
N	74	29		781.7	752.7	-
N	75	25	25	781.7	756.7	-
N	76	25	25.6	782.8	757.8	-
N	77	25	25.6	782.4	757.4	-
N	78	25	25.2	782.1	757.1	-
N	79	25	25.2	781.5	756.5	-
N	80	25	25.4	781.9	756.9	-
N	81	25	25.5	781.9	756.9	-
N	82	25	25.1	780.9	755.9	-
N	83	25	25.2	780.9	755.9	-
N	84	25	25.2	780.6	755.6	-
N	85	25	25.2	780.6	755.6	-

H	1		32.4		0	
H	2		32.4		0	
H	3		39.4		0	
H	4		39.4		0	
H	5		38.3		0	
H	6		37.5		0	
H	7		38.7		0	

C	1		35.2		0	
C	2		35.2		0	

Appendix I – TDS Failure Investigation Daily Logs

AMEC Project No. 3310120011

TDS FACT SHEET

- Time and Date:10/19/12
- What company: AMEC & Molon
- Employees: Jason Grahn, Al McDonald, Chris Kelly, Greg Needholm, Chris Holton, Brian Paroskie
- South Logs removed: 0
- North logs removed: 14
- How many sheets removed: North Wall Sheets1 through 12, Head Wall 1 through 7 and Core Wall 1 through 2
- What Sheet Numbers Were Removed: N1, N2, N3, N4, N5, N6, N7, N8, N9, N10, N11, N12, H1, H2, H3, H4, H5, H6, H7, C1, C2
- . Lengths Of Sheeting Removed: N1 39.0’, N2 39.5’, N3 39.5’, N4 39.5’, N5 39.2’, N6 39.2’, N7 38.7’, N8 38.7’, N9 39.2’, N10 39.2’, N11 39.5’, N12 39.5’, H1 32.4’, H2 32.4’, H3 39.4’, H4 39.4’, H5 38.3’, H6 37.5’, H7 38.7’ , C1 35.2’, C2 35.2’
- How deep are the scour holes in Eastside of concrete pad: Estimated at 6’ with DLR Rod
- How deep are the scour holes in Westside of concrete pad: Not Checked
- What debris has been removed: Crane Mat (2)
- TDS photos: Photos and Viedo

TDS FACT SHEET

- Time and Date:10/20/12
- What company: AMEC & Molon
- Employees: Jason Grahn, Chris Kelly, Greg Needholm, Chris Holton, Brian Paroskie
- South Logs removed: 14
- North logs removed: 0
- How many sheets removed: 0
- What Sheet Numbers Were Removed: 0
- Lengths Of Sheeting Removed: NA
- How deep are the scour holes in Eastside of concrete pad: Estimated at 6’ with DLR Rod
- How deep are the scour holes in Westside of concrete pad: Not Checked
- What debris has been removed: NA
- TDS photos: Photos
- Stop logs removed from south set, area was cleaned up and equipment moved, one sand bag was placed.

TDS FACT SHEET

- Time and Date:10/22/12
- What company: AMEC & Molon
- Employees: Jason Grahn, Mike Walton, Al McDonald, Jason Spoor
- South Logs removed: 0
- North logs removed: 0
- How many sheets removed: 0
- What Sheet Numbers Were Removed: 0
- Lengths Of Sheeting Removed: NA
- How deep are the scour holes in Eastside of concrete pad: Scour holes surveyed with instrument and DLR Rod
- How deep are the scour holes in Westside of concrete pad: Scour holes surveyed with instrument and DLR Rod
- What debris has been removed: NA
- TDS photos: Photos
- Scour holes and sheet pile toe evaluated with DLR rod and instrument. Survey completed with assistance of Gourdie Fraser. Sand bags continue to slide on North side of structure intake and will need to be maintained.

TDS FACT SHEET

- Time and Date:10/25/12
- What company: AMEC & Molon
- Employees: Jason Grahn, Chris Kelly, Greg Needholm, Chris Holton
- South Logs removed: 5
- North logs removed: 5
- How many sheets removed: 0
- What Sheet Numbers Were Removed: NA
- Lengths Of Sheeting Removed: NA
- How deep are the scour holes in Eastside of concrete pad: Placed five bulk sand bags in East scour hole.
- How deep are the scour holes in Westside of concrete pad: Placed one bulk bags in West scour hole – hole was sanded/silted in when stop logs were removed.
- What debris has been removed: Wooded debris and timbers.
- TDS photos: Photos and Video
- Started placing bulk bags on south wall of intake side of tds structure.

TDS FACT SHEET

- Time and Date:10/26/12
- What company: AMEC & Molon
- Employees: Jason Grahn, Chris Kelly, Greg Needholm, Chris Holton, Al McDonald
- South Logs removed: 0
- North logs removed: 0
- How many sheets removed: 0
- What Sheet Numbers Were Removed: NA
- Lengths Of Sheeting Removed: NA
- How deep are the scour holes in Eastside of concrete pad:
- How deep are the scour holes in Westside of concrete pad:
- What debris has been removed: Wooded debris and timbers.
- TDS photos: Photos and Video
- Placed bulk bags on south wall of intake side of tds structure. Started sheeting wing walls for intake side of tds.

TDS FACT SHEET

- Time and Date:10/27/12
- What company: AMEC & Molon
- Employees: Jason Grahn, Chris Kelly, Brian Paroskie, Chris Holton, Adam Walton
- South Logs removed: 0
- North logs removed: 0
- How many sheets removed: 2
- What Sheet Numbers Were Removed: N-13 & N-14
- Lengths Of Sheeting Removed: NA
- How deep are the scour holes in Eastside of concrete pad: Concrete slab depth below water 3.5', aggregate in east scour hole 4.5' below water level.
- How deep are the scour holes in Westside of concrete pad:
- What debris has been removed:
- TDS photos: Photos and Video
- Placed bulk bags on south wall of intake side of tds structure. Completed north wing wall to structure, pulled last remaining sheets from old wing wall. Started sheeting south wing wall.

TDS FACT SHEET

- Time and Date:12/10/12
- What company: AMEC (Jason Grahn)
- Employees: Jason Grahn, Chris Kelly, Greg Needholm, Chris Holton, Brian Paroski, Nick Walton
- How many sheets removed: 32
- What Sheet Numbers Were Removed:

Temp Sheets South Wing Wall

TS-1 25.5’	TS-2 25.5’	TS-3 29.5’
TS-4 29.5’	TS-5 28.0’	TS-6 28.0’
TS-7 25.2’	TS-8 25.2’	TS-9 25.0’
TS-10 25.0’	TS-11 25.4’	TS-12 25.4’
TS-13 25.1’	TS-14 25.1’	TS-15 25.0’
TS-16 25.2’	TS-17 29.8’	TS-18 29.8’

Temp Sheets North Wing Wall

TN-1 30.0’	TN-2 30.0’	TN-3 30.0’
TN-4 30.0’	TN-5 27.3’	TN-6 27.3’
TN-7 28.9’	TN-8 28.9’	TN-9 30.2’
TN-10 30.2’	TN-11 30.2’	TN-12 30.2’
TN-13 30.1’	TN-14 30.1’	

Removed Upper Whaler North Wall

- TDS photos: Photos and Video

TDS FACT SHEET

- Time and Date:12/11/12
- What company: AMEC (Jason Grahn)
- Employees: Jason Grahn, Chris Kelly, Greg Needholm, Chris Holton, Brian Paroski, Nick Walton
- How many sheets removed: 16
- What Sheet Numbers Were Removed:

North Wall Sheets

N-15	40.5’	Clay Return 48”	No Damage
N-16	40.3’	Clay Return 36”	No Damage
N-17	34.5’	Clay Return 50”	No Damage
N-18	35.9’	Clay Return 50”	No Damage
N-19	36.2’	Clay Return 52”	No Damage
N-20	34.8’	Clay Return 52”	Tip Deflection 1’
N-21	58.5’	Clay Return 52”	Tip Damage Interlock Rolled
N-22	58.5’	Clay Return 48”	Tip Damage Split
N-23	58.5’	Clay Return 50”	No Damage
N-24	58.1’	Clay Return 84”	No Damage
N-25	58.6’	Clay Return NA	No Damage
N-26	58.9’	Clay Return NA	No Damage
N-27	58.1’	Clay Return NA	Tip Damage
N-28	58.6’	Clay Return NA	Tip Bent
N-29	58.6’	Clay Return NA	No Damage
N-30	57.3’	Clay Return NA	No Damage

H-Pile North 29.3’ Concrete Return Tip Damage

- TDS photos: Photos and Video

TDS FACT SHEET

- Time and Date:12/12/12
- What company: AMEC (Jason Grahn)
- Employees: Jason Grahn, Chris Kelly, Greg Needholm, Chris Holton, Brian Paroski, Nick Walton
- How many sheets removed: 15
- What Sheet Numbers Were Removed:

North Wall Sheets

N-31	58.2’	Clay Return NA	No Damage
N-32	58.6’	Clay Return 60”	No Damage
N-33	44.4’	Clay Return NA	Bottom 10’ Sheet Twisted
N-34	44.2’	Clay Return 42”	No Damage
N-35	44.4’	Clay Return 52”	Bottom 5’ Twisted
N-36	44.3’	Clay Return 50”	No Damage
N-37	45.2’	Clay Return 60”	No Damage
N-38	45.2’	Clay Return NA	No Damage
N-39	45.3’	Clay Return 42”	Bottom 4’ Twisted
N-40	44.3’	Clay Return 24”	No Damage
N-41	45.0’	Clay Return 24”	No Damage
N-42	44.4’	Clay Return 12”	No Damage
N-43	44.0’	Clay Return 42”	Tip Damage
N-44	45.1’	Clay Return 40”	Bottom 3’ Twisted Decluched 18”
N-45	45.4’	Clay Return 48”	Bottom 2’ Twisted/Deflected

- TDS photos: Photos and Video
- Removed Whalers South Wall

TDS FACT SHEET

- Time and Date:12/14/12
- What company: AMEC (Jason Grahn)
- Employees: Jason Grahn, Chris Kelly, Greg Needholm, Chris Holton, Brian Paroski, Nick Walton
- How many sheets removed: 42
- What Sheet Numbers Were Removed:

S-65	25.3’	Clay Return NA	No Damage
S-64	25.3’	Clay Return NA	No Damage
S-63	25.2’	Clay Return NA	No Damage
S-62	25.0’	Clay Return NA	No Damage
S-61	25.5’	Clay Return NA	No Damage
S-60	25.3’	Clay Return NA	No Damage
S-59	25.2’	Clay Return NA	No Damage
N-85	25.2’	Clay Return NA	No Damage
N-84	25.2’	Clay Return NA	No Damage
N-83	25.2’	Clay Return NA	No Damage
N-82	25.1’	Clay Return NA	No Damage
N-81	25.5’	Clay Return NA	No Damage
N-80	25.4’	Clay Return NA	No Damage
N-79	25.2’	Clay Return NA	No Damage
N-78	25.2’	Clay Return NA	No Damage
N-77	25.6’	Clay Return NA	No Damage
N-76	25.6’	Clay Return NA	No Damage
N-75	25.0’	Clay Return NA	No Damage
N-72	35.5’	Clay Return NA	No Damage
N-71	35.5’	Clay Return NA	No Damage
S-58	35.4’	Clay Return NA	No Damage
S-57	35.4’	Clay Return NA	No Damage
S-56	35.0’	Clay Return NA	No Damage
S-55	35.0’	Clay Return NA	No Damage
S-54	35.0’	Clay Return NA	No Damage
S-53	35.0’	Clay Return NA	No Damage
S-52	35.4’	Clay Return NA	No Damage

S-51	35.4’	Clay Return NA	No Damage
S-50	35.1’	Clay Return NA	No Damage
S-49	35.0’	Clay Return NA	No Damage
S-48	35.4’	Clay Return 24”	No Damage
S-47	35.4’	Clay Return 24”	No Damage
N-70	35.2’	Clay Return NA	No Damage
N-69	35.0’	Clay Return NA	No Damage
N-68	35.2’	Clay Return NA	No Damage
N-67	35.2’	Clay Return NA	No Damage
N-66	34.9’	Clay Return 24”	No Damage
N-65	34.9’	Clay Return 24”	No Damage
N-64	35.2’	Clay Return NA	No Damage
N-63	35.0’	Clay Return NA	No Damage
N-62	35.2’	Clay Return 30”	No Damage
N-65	35.2’	Clay Return 30”	No Damage

- TDS photos: Photos and Video

- Sheets N-74 and N-73 left in place as they could not be removed at this time.

TDS FACT SHEET

- Time and Date:12/17/12
- What company: AMEC (Jason Grahn)
- Employees: Jason Grahn, Chris Kelly, Greg Needholm, Chris Holton, Brian Paroski, Nick Walton
- How many sheets removed: 32
- What Sheet Numbers Were Removed:

S-1	58.2’	Clay Return NA	No Damage
S-2	58.4’	Clay Return NA	No Damage
S-3	58.4’	Clay Return 36”	No Damage
S-4	58.3’	Clay Return NA	No Damage
S-5	58.8’	Clay Return 44”	No Damage
S-6	58.6’	Clay Return 48”	No Damage
S-7	58.6’	Clay Return 42”	No Damage
S-8	59.5’	Clay Return NA	No Damage
S-9	58.1’	Clay Return 40”	No Damage
S-10	59.1’	Clay Return 18”	No Damage
S-11	59.0’	Clay Return 24”	Bottom 2’ Bent – Interlock Torn
S-12	59.5’	Clay Return 24”	No Damage
S-13	58.8’	Clay Return 34”	No Damage
S-14	58.7’	Clay Return 12”	No Damage
S-15	57.0’	Clay Return NA	No Damage
S-16	57.2’	Clay Return 28”	No Damage
S-17	59.4’	Clay Return 60”	No Damage
S-18	58.3’	Clay Return 12”	No Damage
S-19	58.4’	Clay Return 24”	Bottom 1’ Bent
S-20	58.7’	Clay Return 12”	No Damage
S-21	58.1’	Clay Return 18”	No Damage
S-22	58.8’	Clay Return 58”	Bottom 1.5’ Bent
S-23	59.4’	Clay Return 60”	Bottom 1’ Bent
S-24	59.5’	Clay Return NA	Bottom 3’ Bent/Torn/Declutched
S-25	45.7’	Clay Return 60”	Sheered Interlock 10’ Up From Tip
S-26	45.9’	Clay Return NA	No Damage
S-27	58.8’	Clay Return NA	No Damage

S-28	58.9’	Clay Return 48”	No Damage
S-29	59.1’	Clay Return 50”	No Damage
S-30	59.0’	Clay Return NA	No Damage
S-31	58.0’	Clay Return NA	Bottom 3’ Curled/Split/Declutched
S-32	58.0’	Clay Return NA	No Damage
H-Pile South	28.7’	No Return	No Damage

- TDS photos: Photos and Video

TDS FACT SHEET

- Time and Date:12/18/12
- What company: AMEC (Clayton Boyinton)
- Employees: Clayton Boyinton, Chris Kelly, Greg Needholm, Chris Holton, Brian Paroski, Nick Walton
- How many sheets removed: 29
- What Sheet Numbers Were Removed:

S-33	59.0’	Clay Return 84”	No Damage
S-34	59.0’	Clay Return 84”	No Damage
S-35	59.0’	Clay Return 54”	No Damage
S-36	58.9’	Clay Return 24”	No Damage
S-37	39.7’	Clay Return NA	No Damage
S-38	38.5’	Clay Return NA	No Damage
S-39	38.5’	Clay Return NA	No Damage
S-40	38.6’	Clay Return NA	No Damage
S-41	38.7’	Clay Return NA	No Damage
S-42	38.2’	Clay Return NA	No Damage
S-43	40.1’	Clay Return NA	No Damage
S-44	40.1’	Clay Return NA	No Damage
S-45	35.4’	Clay Return NA	No Damage
S-46	35.4’	Clay Return NA	No Damage

N-46	45.3’	Clay Return 72”	No Damage
N-47	42.5’	Clay Return NA	Declutched 13’ From Bottom
N-48	42.0’	Clay Return NA	Declutched 12’ & 13’ From Bottom
N-49	38.0’	Clay Return NA	Declutched 13’ From Bottom
N-50	37.9’	Clay Return NA	No Damage
N-51	38.5’	Clay Return NA	No Damage
N-52	39.0’	Clay Return NA	No Damage
N-53	38.8’	Clay Return NA	No Damage
N-54	38.8’	Clay Return NA	No Damage
N-55	37.8’	Clay Return NA	No Damage
N-56	37.8’	Clay Return NA	No Damage
N-57	35.2’	Clay Return NA	No Damage

N-58	35.0’	Clay Return	NA	No Damage
N-59	35.1’	Clay Return	NA	No Damage
N-50	35.0’	Clay Return	NA	No Damage

- Sheets N-73 and N-74 Cut Off 3’ Below Ground Level
- TDS photos: Photos and Video

TDS FACT SHEET

- Time and Date:12/3/12
- What company: AMEC, Molon & Oversight Group
- Employees: Jason Grahn, Chris Kelly, Greg Needholm, Chris Holton
- South Logs removed: 0
- North logs removed: 0
- How many sheets removed: 0
- What Sheet Numbers Were Removed: NA
- Lengths Of Sheeting Removed: NA
- Removed cat-walk, lower struts and H-pile support from TDS.
- Cored nine holes through concrete slab in TDS structure.
    - Core #1 slab 14”, void 34”, DLR refusal 9’6”
    - Core #2 slab 13”, void 33.5”, DLR refusal 8’8”
    - Core #3 slab 11”, void 34”, DLR refusal 9’8”
    - Core #4 slab 12”, void 33”, DLR refusal 9’11”
    - Core #5 slab 12.25”, void 36”, DLR refusal 9’4”
    - Core #6 slab 20”, void 38.5”, DLR refusal 11’10”
    - Core #7 slab 18”, void 39”, DLR refusal 11’ (slab was cracked throughout core)
    - Core #8 slab 19”, void 45”, DLR refusal 10’
    - Core #9 slab 11”, void 39”, DLR refusal 11’
- DLR readings along West side of slab 9’3” through 9’.
- GFA on-site to survey core hole locations and proposed soil boring locations. Also surveyed top of sheet elevation of South wall sheets S-55 through S-65.
- TDS photos: Photos and Video

TDS FACT SHEET

- Time and Date:12/4/12
- What company: AMEC, Molon & Oversight Group
- Employees: Jason Grahn, Chris Kelly, Greg Needholm, Chris Holton
- South Logs removed: 0
- North logs removed: 0
- How many sheets removed: 0
- What Sheet Numbers Were Removed: NA
- Lengths Of Sheeting Removed: NA
- Removed H-pile support from TDS for center of stop logs.
  H-pile was 12’ in length and when removed there was 6” of clay embedded on end.
- Soil borings through TDS concrete slab.
    - Boring S-3 at Core #3 location hard clay at 12.5’
      Elevation of clay at 754.00
- Removed slab from TDS and inspected bottom of slab once removed.
- TDS photos: Photos and Video

TDS FACT SHEET

- Time and Date:12/5/12
- What company: AMEC, Molon & Oversight Group
- Employees: Jason Grahn, Chris Kelly, Greg Needholm, Chris Holton
- Subcontracted driller RAU
- South Logs removed: 0
- North logs removed: 0
- How many sheets removed: 0
- What Sheet Numbers Were Removed: NA
- Lengths Of Sheeting Removed: NA
- Removed upper strut from fore-bay TDS
- Soil Borings four were completed.
    - GB-10 hard clay at 13.5’ at elevation 755.69
    - GB-12 hard clay at 13’ at elevation 756.16
    - GB-11 hard clay at 13.2’ at elevation 755.69
    - GB-7 hard clay at 13.25’ at elevation 755.64

- TDS photos: Photos and Video

TDS FACT SHEET

- Time and Date:12/6/12
- What company: AMEC, Molon & Oversight Group
- Employees: Jason Grahn, Chris Kelly, Greg Needholm, Chris Holton
- Subcontracted driller RAU
- South Logs removed: 0
- North logs removed: 0
- How many sheets removed: 0
- What Sheet Numbers Were Removed: NA
- Lengths Of Sheeting Removed: NA
- Soil Borings six were completed.
    - GB-13 hard clay at 12.2’ at elevation 755.78
    - GB-14 hard clay at 9.25’ at elevation 758.38
    - GB-15 hard clay at 13.5’ at elevation 756.25
    - GB-16 hard clay at 12.8’ at elevation 755.70
    - GB-17 hard clay at 11.8’ at elevation 756.80
    - GB-18 hard clay at 12.5’ at elevation 755.69

- Test pit scour hole through fore-bay for relic sheeting. Excavated down to elevation 760 from know sheeting to the West to the relic sheets to the East. No other sheets were located
- TDS photos: Photos and Video