DWG. NO.	TITLE
	SPILLWAY
M-6-1 SHT 1	SPILLWAY DAM-SHOWING SCOUR AS OF JAN. 1939
2	SPILLWAY DAM-BAY 9 - SHOWING SCOUR AS OF JAN. 1939
3	SPILLWAY DAM-BAY 15- SHWOING SCOUR AS OF JAN. 1939
4	SPILLWAY DAM-SHOWING SCOUR AS OF NOV. 1939
5	SPILLWAY DAM-SHOWING SCOUR AS OF NOV. 1939
M-6-1 SHT 6	SPILLWAY DAM SHOWING SCOUR AS OF NOV. 1939
7	BOTTOM CONTOURS-D/S OF APRON - PIERS 1-5
8	BOTTOM CONTOURS-D/S OF APRON - PIERS 5-9
9	BOTTOM CONTOURS-D/S OF APRON - PIERS 9-13
10	BOTTOM CONTOURS-D/S OF APRON - PIERS 13-7
M-6-1 SHT 11	SPILLWAY DAM-BAY 5 - SHOWING SCOUR AS OF NOV. 1941
12	SPILLWAY DAM-BAY 9 - SHOWING SCOUR AS OF NOV. 1941
13	SPILLWAY DAM-BAY 13 - SHOWING SCOUR AS OF NOV. 1941
14	SPILLWAY DAM-BAY 15 - SHOWING SCOUR AS OF NOV. 1941
15	DOWNSTREAM APRON - SURVEY OF OCTOBER 1943
M-6-1 SHT 16A	DOWNSTREAM APRON SOUNDING PROFILES STA. 14+70 TO STA. 11+80
16B	DOWNSTREAM APRON SOUNDING PROFILES STA. 11+50 TO STA. 8+50
16C	DOWNSTREAM APPON SOUNDING PROFILES STA. 8+20 TO STA. 5+30
17	SKETCH SHOWING CONDITION OF BAFFLE DECK RESTORED IN DEC. 1940 AS OF SEPT. 1943
18	SPILLWAY DAM-BAY 5 - SHWOING SCOUR AS OF NOV 41 & 46
M-6-1 SHT 19	SPILLWAY DAM-BAY 9 - SHOWING SCOUR AS OF NOV 41 & 46
20	SPILLWAY DAM-BAY 13- SHOWING SCOUR AS OF NOV 41 & 46
21	SPILLWAY DAM-BAY 15- SHOWING SCOUR AS OF NOV 41 & 46
22	SPILLWAY DAM-BAY 16- SHOWING SCOUR AS OF NOV 41 & 46
23	SPILLWAY DAM-BAY 17- SHOWING SCOUR AS OF NOV 41 & 46
M-6-1 SHT 24	SPILLWAY DAM-DIVING SURVEY-BAFFLE DECK BAYS 5, 9 & 13 - NOV. 1948
25	SPLWY DAM-DIVING SUPVEY-BAFFLE DECK BAYS 15, 16 & 17 - NOV. 1948
26	SPILLWAY DAM-DIVING SURVEY-BAFFLE DECK BAYS 5, 9 & 13 - OCT. 1949
27	SPILLWAY DAM-DIVING SUPVEY-BAYS 15, 16 & 17- OCT 49
28A	SPILLWAY DAM- BAY 5 - NOV 1950
M-6-1 SHT 28B	SPILLWAY DAM-BAFFLE DECK CHANGES IN BAY 9-DEC. 1950
29	SPILLWAY DAM-BAY 16 - SHOWING SCOUR AS OF NOV. 1951
30	SPILLWAY DAM-BAY 13 - SHOWING SCOUR AS OF NOV. 1951
31	SPILLWAY DAM-BAY 9 - SHOWING SCOUR AS OF NOV. 1951
32	SPILLWAY DAM-BAY 5 - SHOWING SCOUR AS OF NOV. 1951
M-6-1 SHT 33	SPILLWAY DAM-BAY 16- SHOWING SCOUR AS OF NOV. 1952
34	SPILLWAY DAM-BAY 13- SHOWING SCOUR AS OF NOV. 1952
35	SPILLWAY DAM-BAY 9 - SHOWING SCOUR AS OF NOV. 1952
36	SPILLWAY DAM-BAY 5 - SHOWING SCOUR AS OF NOV. 1952
37	SPILLWAY DAM-BAY 16- SHOWING SCOUR AS OF NOV. 1954
M-6-1 SHT 38	SPILLWAY DAM-BAY 8 - SHOWING SCOUR AS OF JAN. 1955
39	SPILLWAY DAM-BAY 7 - SHOWING SCOUR AS OF JAN. 1955
40	SPILLWAY DAM-BAY 6 - SHOWING SCOUR AS OF JAN. 1955
41	SPILLWAY DAM-BAY 5 - SHOWING SCOUR AS OF JAN. 1955
42	SPILLWAY DAM-BAY 4 - SHOWING SCOUR AS OF JAN. 1955
M-6-1 SHT 43	SPILLWAY DAM-BAY 3 - SHOWING SCOUR AS OF JAN. 1955
44	SPILLWAY DAM-BAY 2 - SHOWING SCOUR AS OF JAN. 1955
45	SPILLWAY DAM-BAY 16- SHOWING SCOUR AS OF OCT. 1958
46	SPILLWAY DAM-BAY 15- SHOWING SCOUR AS OF OCT. 1958
47	SPILLWAY DAM-BAY 14- SHOWING SCOUR AS OF OCT. 1958
M-6-1 SHT 48	SPILLWAY DAM-BAY 13- SHOWING SCOUR AS OF OCT. 1958
49	SPILLWAY DAM-BAY 12- SHOWING SCOUR AS OF OCT. 1958
50	SPILLWAY DAM-BAY 11- SHOWING SCOUR AS OF OCT. 1958
51	SPILLWAY DAM-BAY 10- SHOWING SCOUR AS OF OCT. 1958
52	SPILLWAY DAM-BAY 9 - SHOWING SCOUR AS OF OCT. 1958
M-6-1 SHT 53	SPILLWAY DAM-BAY 8 SHOWING SCOUR AS OF OCT. 1958
54	SPILLWAY DAM-BAY 7 SHOWING SCOUR AS OF OCT. 1958
55	SPILLWAY DAM-BAY 6 SHOWING SCOUR AS OF OCT. 1958
56	SPILLWAY DAM-BAY 5 SHOWING SCOUR AS OF OCT. 1958
57	SPILLWAY DAM-BAY 4 SHOWING SCOUR AS OF OCT. 1958
M-6-2 SHT 1	REPAIR METHODS FOR SPILLWAY BAFFLES
2	REMOVABLE STEEL FORMS FOR BAFFLE REPAIR
3	PIER AND OGEE REPAIR PLATES
4	PIER AND OGEE SECTION ARMOR PLATE REPAIR
5	STEEL FORM FOR SPILLWAY DAM
	SPILLWAY DAM APRON & BAFFLE DAMAGE
3/1	SITE MAP
2	LOCATION MAP
3	BAY 10 SHOWING SCOUR AS OF NOV. 1954
4	BAY 11 SHOWING SCOUR AS OF NOV. 1954
5	BAY 12 SHOWING SCOUR AS OF NOV. 1954
6	BAY 13 SHOWING SCOUR AS OF NOV. 1954
	BAY 14 SHOWING SCOUR AS OF NOV. 1954
	BAY 15 SHOWING SCOUR AS OF NOV. 1954
	BAY 16 SHOWING SCOUR AS OF NOV. 1954
	BAY 17 SHOWING SCOUR AS OF NOV. 1954
MC-5-20-1	NORTH APPROACH TO DAM - POUR LINE DRAWINGS
2	NORTH APPROACH TO DAM - POUR LINE DRAWINGS
3	NORTH APPROACH TO DAM - POUR LINE DRAWINGS
4	NORTH APPROACH TO DAM - POUR LINE DRAWINGS
5	NORTH APPROACH TO DAM - POUR LINE DRAWINGS
MC-5-20-6	NORTH APPROACH TO DAM - POUR LINE DRAWINGS
7	NORTH APPROACH TO DAM - POUR LINE DRAWINGS
8	NORTH APPROACH TO DAM - POUR LINE DRAWINGS
9	NORTH APPROACH TO DAM - POUR LINE DRAWINGS
10	NORTH APPROACH TO DAM - POUR LINE DRAWINGS

DWG. NO.	TITLE
	SPILLWAY DAM APRON & BAFFLE DAMAGE
MC-5-23-1	WASH. ENTRANCE BAY CONSTR DET & JOINTS COUNTER. 1 & 2
2	CONSTR. JOINTS COUNTERFORT #3 & RETAINING WALL
3	CONSTR. JOINTS - CENTER WALL
4	CONSTR. JOINTS - A-1 TRAINING WALL
5	CONSTR. JOINTS - PIERS A-4 TO A-11 INCL.
MC-5-23-6	CONSTR. JOINTS - POURS NOS. 5, 6, 7 & 8
7	CONSTR. JOINTS - POURS NOS. 9, 10, 11 & 12
8	CONSTR. JOINTS - POURS NOS. 13 TO 18 INCL.
8	ABUTMENT NO. 1 & FISH LOCKS ERECTION DETS.-POUR 11
9	ABUT. NO. 1 & FISH LOCKS ERECTION DETS. POURS 12 & 13
MC-5-23-10	ABUT. NO. 1 & FISH LOCKS ERECTION DETS.-POUR 14
11	ABUT. NO. 1 & FISH LOCKS ERECTION DETS.-POUR 15
12	ABUT. NO. 1 & FISH LOCKS ERECTION DETS.-POUR 16
13	ABUT. NO. 1 & FISH LOCKS ERECTION DETS.-POUR 17
14	ABUT. NO. 1 & FISH LOCKS ERECTION DETS.-POUR 18
MC-5-23-15	ABUT. NO. 1 & FISH LOCKS ERECTION DETS.-POUR 19
16	ABUT. NO. 1 & FISH LOCKS ERECTION DETS.-POUR 20
17	ABUT. NO. 1 & FISH LOCKS ERECTION DETS.-POUR 21
	WASHINGTON SHORE FISH LADDER SEC. 15
MC-5-24 SHT 1	CONSTRUCTION DETAILS GENERAL PLAN AND INDEX
2	NORTH AND SOUTH WALLS
3	COUNTERFORTS NO 4 TO NO 10, INCL.
4	WATER SLOTS & KEYWAYS
5	CONSTRUCTION DETAILS DIFFUSION CHAMBER
MC-5-24 SHT 6	TYPICAL FORMING SECTIONS.
	ABUTMENT NO. 1 & FISH LOCK ERECTION DETAILS
MC-5-25 SHT 1	KEY TO POURS
2	POURS 1 - 4
3	POUR 5
4	POUR 6
5	POUR 7
MC-5-25 SHT 6	POUR 8 & 9
7	POUR 10
8	POUR 11
9	POUR 12 & 13
10	POUR 14
MC-5-25 SHT 11	POUR 15
12	POUR 16
13	POUR 17
14	POUR 18
15	POUR 19
MC-5-25 SHT 16	POUR 20
17	POUR 21
	SPILLWAY DAM
MD-2-46	CRIB STABILITY ANALYSIS SECOND STEP COFFERDAM
MD-3-5 SHT 1	STABILITY ANALYSIS SPILLWAY DAM FIRST STEP CONSTRUCTION
2	STABILITY ANALYSIS SPILLWAY DAM SECOND STEP CONSTRUCTION
MD-3-46	SPILLWAY GATES ASSEMBLY OF LIFTING AND LATCHING MECHANISM
MD-3-57	LINNTON HYDRAULIC LABORATORY BACKWATER EXPERIMENTS 1:100 RIVER MODEL COMPARISON OF ADJUSTED WATER SURFACE ELEVATIONS AT THE HEAD OF CASCADE RAPIDS
57B	SPILLWAY DAM LOCATION ORIGINAL RIVER CHANNEL AND COMPARATIVE SPILLWAY CRESTS
MD-3-58-B	HYDRAULIC LABORATORY BACKWATER EXPERIMENTS OF CHANNEL IMPROVEMENTS AT SHERIDAN POINT
MD-3-59-A	BONNEVILLE HYDRAULIC LABORATORY BACKWATER EXPERIMENTS AND NAVIGATION RUNS SHOWING CHANNEL IMPROVEMENTS AT CASCADE LOCKS CANAL FOR EXP. B39
60-A	BONNEVILLE HYDRAULIC LABORATORY BACKWATER EXPERIMENTS OF CHANNEL IMPROVEMENTS AT LOWER CASCADE RAPIDS
61-A	BONNEVILLE HYDRAULIC LABORATORY BACKWATER EXPERIMENTS SUMMARY OF BENEFITS DUE TO CHANNEL IMPROVEMENTS
62-A	BONNEVILLE HYDRAULIC LABORATORY BACKWATER EXPERIMENTS COMPARISON OF RIVER PROFILES FOR EXPERIMENTS B2 & B39
	BRADFORD ISLAND FISH LADDER SECTION 27
MC-5-8 SHT 1	DESIGN ASSUMPTIONS
MD-5-9 SHT 1	BRADFORD ISLAND WINGWALL COUNTERFORTS NO 2-5 INCL. DESIGN ASSUMPTIONS
MD-5-12 SHT 1	PIERS DESIGN DATA
2	CRANE RUNWAY GIRDERS-DESIGN DATA
3	CRANE DECK CENTER GIRDERS DESIGN
4	ORIGINAL DESIGN LAYOUT WITH TWO PIERS RIGID WITH OPERATING BRIDGE DESIGN DATA
MD-5-16 SHT 1	ABUTMENT NO 2 & FISH LOCKS ASSUMED LOADINGS FOR DESIGN
MD-5-24 SHT 1	WASHINGTON SHORE FISH LADDER-SECTION 15 DESIGN ASSUMPTIONS
	SPILLWAY - DOWNSTREAM
MP-1-59/1	REVETMENT RESTORATION - PLAN (21 FEB 47)
2	REVETMENT RESTORATION - SECTION

DWG. NO.	TITLE
	CONCRETE POWERHOUSE SUBSTRUCTURE & NAVIGATION LOCK
	CONTRACT W694 ENG. 45TH SPILLWAY DAM GANTRY CRANES
MISC. NOS.	
472371	STRESS ANALYSIS
472381	STRESS ANALYSIS
472391	STRESS ANALYSIS
472401	STRESS ANALYSIS
472621	BRIDGE ERECTION DIAGRAM 350 TON GANTRY CRANE-15 TON AUX. HOIST
472671	FRAME FOR 15 TON GRAPPLE TROLLEY 34'0" SPAN
472681	CANTILEVER FOR 15 TON GRAPPLE TROLLEY
473241	TROLLEY FRAME 15 TON BUCKET
473251	TROLLEY FRAME 15 TON BUCKET
487271	GENERAL DRAWING OF 350 TON GANTRY CRANE
N-1-3	LOCK EXCAVATION-5TH CONTRACT
	SUPSD BY
N-1-4 SHT 1	GENERAL DRAWING N-1-11 SERIES
2	LOCK DESIGN DATA N-1-11 SERIES
3	LOCK MASONRY PLAN & CROSS SECTIONS N-1-11 SERIES
4	LOCK WALLS LONGITUDINAL ELEVATIONS N-1-11 SERIES
5	CULVERT DETAILS N-1-11 SERIES
N-1-4 SHT 6	LOCK GUIDE WALLS & BRIDGE PIERS N-1-11 SERIES
7	LOCK EMBEDDED STEEL EMERGENCY DAM, FISHWAY GATES & MISC. N-1-11 SERIES
8	LOCK TAINTER VALVE PIT N-1-11 SERIES
9	LOCK MITER GATE ANCHOR FRAMES N-1-11 SERIES
10	LOCK MANHOLES & MISC. EMBEDDED STEEL N-1-11 SERIES
N-1-10	PRELIMINARY PLAN FOR CONVERSION OF SINGLE-LIFT BARGE LOCK INTO DOUBLE-LIFT SHIP LOCK 76 FT. x 500 FT. x 26 FT. DRAFT
N-1-11 SHT 1	GENERAL DRAWING
2	DESIGN DATA
3	MASONRY PLAN & CROSS SECTIONS
4	WALLS & LONGITUDINAL ELEVATIONS
5	CULVERT DETAILS
N-1-11 SHT 6	LOWER GUIDE WALL DETAILS GENERAL PLAN & RETAINING WALL
7	UPPER GUIDE WALL DETAILS
8	SWING BRIDGE - PIER DETAILS
9	DETAILS OF MONOLITHS 18-19-20
10	TAINTER VALVE PIT
N-1-11 SHT 11	TAINTER VALVE PIT
12	LOWER MITER GATE ANCHOR FRAMES
13	UPPER MITER GATE ANCHOR FRAMES
14	CURBING & MISC. EMBEDDED STEEL
15	CONTROL STATIONS & MANHOLE DETL'S MANHOLES 1, 10, 11, 12, 13, 14.
N-1-13	EXCAVATION FOR SWING BRIDGE PIERS NO's 1 & 2
N-1-14 SHT 1	EXCAVATION DETAILS
2	EXCAVATION DETAILS
3	EXCAVATION DETAILS
4	UPSTREAM GUIDE WALL EXCAVATION
N-1-16 SHT 1	MASONRY DETAILS MONOLITHS NOS. 11 THRU 17
2	MASONRY DETAILS MONOLITHS NOS. 11 THRU 17
3	MASONRY DETAILS MONOLITHS NOS. 11 THRU 17
4	MASONRY DETAILS MONOLITHS NOS. 11 THRU 17
5	MASONRY DETAILS MONOLITHS NOS. 11 THRU 17
N-1-16 SHT 6	MASONRY DETAILS MONOLITHS NOS. 11 THRU 17
N-1-17 SHT 1	ELECTRICAL DETAILS CONDUIT & PIPING PLAN
2	ELECTRICAL DETAILS- MANHOLES 2 TO 9 INCL.
3	ELECTRICAL DETAILS LOWER GUIDE WALL & BRIDGE PIERS NOS. 1, 2, & 3
4	ELECTRICAL DETAILS WALL LIGHTING & MACH'Y PITS MONOLITHS 11, 12, 16 & 17
5	ELECTRICAL DETAILS COND'T ENTRANCES, CABLE SUPPORTS & LTG. STD. DTL'S
N-1-17 SHT 6	ELECTRICAL DETAILS MACHINERY PITS IN MONOLITHS 26 & 27
7	ELECTRICAL DETAILS STOP LOG PLATFORM, UPPER GUIDE WALL & MISC. DET'LS
8	ELECTRICAL DETAILS LIGHTING & RECEPTABLE OUTLETS, & LIGHT ST'D DET'L MONOLITHS 19 TO 25 INCL.
9	WATER MAIN LAYOUT
N-1-17 SHT 11	ELECTRICAL DETAILS CONTROL STATIONS
12	ELECTRICAL DETAILS MONOLITHS 1 & 2 SOUTH LOCK WALL LIGHT STANDARDS
13	DRAINAGE SYSTEM FOR MANHOLES & PITS
N-1-18 SHT 1	LOWER GUIDE WALL DETAILS
2	LOWER GUIDE WALL DETAILS
N-1-19	LOWER EMERGENCY DAM RECESS-EMBEDDED STEEL
N-1-22 SHT 1	MASONRY DETAILS MONOLITH NO. 27
2	MASONRY DETAILS MONOLITH NO. 27
3	MASONRY DETAILS MONOLITH NO. 27
4	MASONRY DETAILS MONOLITH NO. 27

DWG. NO.	TITLE
	CONCRETE POWERHOUSE SUBSTRUCTURE & NAVIGATION LOCK
	CONTRACT W694 ENG. 45TH SPILLWAY DAM GANTRY CRANES
N-1-23	BORROW PIT AREA "A" 21ST CONTRACT
N-1-24 SHT 1	DETAILS OF MONOLITH NO. 26 INTAKE OF NORTH WALL
2	DETAILS OF MONOLITH NO. 26 INTAKE OF NORTH WALL
3	DETAILS OF MONOLITH NO. 26 INTAKE OF NORTH WALL
N-1-25	WALL DRAINAGE SYSTEM
26	PLAN FOR TEMPORARY 150 FOOT TRUSS FOR O.W.R. & N. COMPANY AT EAST END OF SHIP LOCK
N-1-28 SHT 1	CULVERT DETAILS
2	CULVERT DETAILS
3	CULVERT DETAILS
4	CULVERT DETAILS
5	CULVERT DETAILS
N-1-28 SHT 6	CULVERT DETAILS
N-1-29	EMBEDDED STEEL FOR MACHINERY PITS, ECT.
30	MASONRY DETAILS-MITER GATE PINTLE BASES
N-1-32 SHT 1	EMBEDDED BOLTS PIER NO. 2
2	EMBEDDED BOLTS PIER NO. 1 & 3
3	EMBEDDED BOLTS PIER NO. 4 & 5
N-1-33 SHT 1	DETAILS OF MONLITHS 18-19-20
N-1-34 SHT 1	MASONRY DETAILS MONOLITHS NOS. 21 THRU 25
2	MASONRY DETAILS MONOLITHS NOS. 21 THRU 25
3	MASONRY DETAILS MONOLITHS NOS. 21 THRU 25
4	MASONRY DETAILS MONOLITHS NOS. 21 THRU 25
5	MASONRY DETAILS MONOLITHS NOS. 21 THRU 25
N-1-35 SHT 1	MASONRY DETAIL - MONOLITHS NOS 1 TO 10 INC. & NO 28
2	MASONRY DETAILS- MONOLITHS NOS 1 TO 10 INC. & NO 28
3	MASONRY DETAILS- MONOLITHS NOS 1 TO 10 INC. & NO 28
N-1-37	TAINTER VALVE TRASH RACKS & QUOIN POST ADJUSTMENT BEAMS
N-1-38 SHT 1	UPPER GUIDE WALL DETAILS
2	UPPER GUIDE WALL DETAILS
3	UPPER GUIDE WALL DETAILS
4	UPPER GUIDE WALL DETAILS
5	UPPER GUIDE WALL DETAILS
N-1-38 SHT 6	UPPER GUIDE WALL DETAILS
N-1-39	BACK FILL FOR SHIP LOCK DEC 4, 1934
N-1-40 SHT 1	CONTROL HOUSES ARCHITECTURAL DETAILS
2	CONTROL HOUSES ARCHITECTURAL DETAILS
3	CONTROL HOUSES ARCHITECTURAL DETAILS
N-1-42	MONOLITH NO. 26 CONSTRUCTION JOINTS
N-1-45	FLOATING MOORING BIT RECESSES CONCRETE OUTLINE & EMBEDDED STEEL
46	LOWER ANCHOR FRAME EXCAVATION NORTH WALL
47	RECESS FOR R.R. TRACK
N-1-48 SHT 1	HAND RAILING PLAN & ELEVATIONS
2	HAND RAILING ELEVATIONS & WALKWAYS
3	MISCELLANEOUS DETAILS
4	PLAN & ELEVATIONS
	SHIP LOCK SWING BRIDGE
N-1-49	CORRECTIONS TO PIER NO 3
50	ALTERATIONS TO PIER NO 1
51	PIER DETAILS WING-WALL ADDITION TO PIER NO. 1
N-1-52 SHT 1	GENERAL SITE MAP
2	EQUIPMENT LOCATION AND GEOMETRY OF MITER GATES
N-1-56	TIMBER BUMPER MONLITH 16
57	EXCAVATION REQUIRED FOR WALL DRAINS (SOUTH WALL ONLY)
N-1-59 SHT 1	DETAILS OF CORNER PROTECTION ANGLES
2	DETAILS OF CORNER PROTECTION ANGLES
3	DETAILS OF CORNER PROTECTION ANGLES
4	DETAILS OF CORNER PROTECTION ANGLES
	CONTROL HOUSES
N-1-60 SHT 1	PLANS, ELEVATIONS AND GENERAL SECTIONS
2	DOOR & PROJECTED WINDOW DETAILS
3	CIRCULAR WINDOW, WALL SECTION & CONDUIT LAYOUT
4	MOUNTING BLOCKS AND CEILING LIGHT DETAILS

REVISION	DATE	DESCRIPTION	BY
	4/18/80	INDEX UPDATED	VLS

U. S. ARMY ENGINEER DISTRICT, PORTLAND
CORPS OF ENGINEERS

DESIGNED BY
DRAWN BY
TRACED BY
CHECKED BY
REVIEWED:

BONNEVILLE DAM
COLUMBIA RIVER OREGO
NAVIGATION LO

SUPERVISED: MKV
NAME AND TITLE CHIEF O & M MANUAL WRITING SECTI
SUBMITTED:
RECOMMENDED:

THIS PRINT REDUCED
ONE-HALF SCALE

CORPS OF ENGINEERS — U. S. ARMY

DWG. NO.	TITLE
	SHIP LOCK - EMERGENCY DAM BULKHEAD
N-1-62	BRIDGE PIERS, ANCHOR BOLT PLAN, GENERAL LAYOUT & DETAILS
N-1-64	CHANGES IN MONOLITH NO. 17 & ROCK BACKING
N-1-68	VALVE CHAMBER GATES EMBEDDED STEEL
N-1-70	DRAINAGE PIPES FOR NON'LTH. 25
71	COUNTERWEIGHT PROPOSED ARRANGEMENT
N-1-73	EMBEDDED STEEL-MACHINERY PITS
N-1-75	RELOCATION OF QUOIN POST ADJUSTMENT BEAM
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2	LOWER GUIDE WALL - NORTH SIDE
	BRIDGE ACROSS NAVIGATION CHANNEL
N-1-77	BRIDGE & PIER PROTECTION-NORTH SIDE-
77A	SWING BRIDGE REST & FENDER DETAILS
77B	SWING BRIDGE FENDER CELL
77C	RECONSTRUCTION OF SWING BRIDGE FENDER CELL
	SHIP LOCK HAND RAILING DETAILS
N-1-79 SHT 1	SOUTH-WEST END OF LOCK
2	
3	NORTH WALL OF LOCKS
4	NORTH WALL OF LOCKS
5	FOR WALKWAYS AT EL. +25 & +65 IN MONOLITHS 20 TO 25 INCL.
	SHIP LOCK
N-1-80 SHT 1	CONDUIT SYSTEM BETWEEN SHIP LOCK & BRIDGE
2	ELECTRICAL DETAILS PULL BOX AT SWING BRIDGE PIER NO. 1
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83	CONDUIT & PIPING CONNECTIONS SOUTH OF MONOLITH 11
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85	EXTENSION OF 14" TYPE "C" LADDER
86	LOWER CONTROL HOUS ADDITION PLUMBING
N-1-88	TAINTER VALVE PIT ALTERATIONS
N-1-90 SHT 1	TAINTER VALVES MACHINERY PIT ALTERATIONS
2	TAINTER VALVES MACHINERY PIT ALTERATIONS
N-1-91	RAILINGS ADDITIONAL PLAN
92	HAND RAILING DETAILS
	COFFERDAMS, EXCAVATION AND ROADWAY FOR POWERHOUSE & LOCK
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2	POWER HOUSE EXCAVATION - 5TH CONTRACT
3	LOCK EXCAVATION COFFERDAM & ROADWAY DETAILS - 5TH CONTRACT
N-2-26	GENERAL PLAN OF NAVIGATION
29	TAINTER VALVES - GENERAL ARRANGEMENT
N-2-31	TAINTER VALVES - TRUNNION BEARING ANCHORAGE
32	TAINTER VALVES - GENERAL ARRANGEMENT & WATER SEALS
33	TAINTER VALVES - SCOUPING PLATE & WATER SEALS
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42	CONCRETE RECESS FOR MITER GATE ANCHOR LINKAGE
	BRIDGE ACROSS NAVIGATION CANAL — 28TH CONTRACT
N-2-43 SHT 1	GENERAL SITE MAP
2	GENERAL LAYOUT
3	GENERAL ARRANGEMENT OF MACHINERY
4	ELECTRICAL DETAILS AND CONDUIT DIAGRAMS
	SWING BRIDGE
N-2-43A SHT 1	GENERAL PLAN
2	SWING SPAN (SPAN NO. 1)
N-2-43A SHT 3	FIXED SPANS (SPANS 2, 3,& 4)

DWG. NO.	TITLE
N-2-43A SHT 4	RECONSTRUCTION ABUTMENT, PIER ALTERATION & SECTIONS
5	RECONSTRUCTION BEAM SEATS
6	RECONSTRUCTION MISCELLANEOUS DETAILS
N-2-43A1	RECONSTRUCTION GRATING REPAIR
B	MODIFICATION TO FIXED SPAN BEARING AT PIER 3
	SHIP LOCK
N-2-44 SHT 1	UPPER ADJUSTING BEAMS FOR SETTING WALL QUOINS
2	UPPER ADJUSTING BEAMS FOR SETTING WALL QUOINS
	SHIP LOCK — EMERGENCY DAM
N-2-48 SHT 1	VALVE CHAMBER GATES ASSEMBLY & STRUCTURAL DETAILS
2	VALVE CHAMBER GATES SEAL DETAILS
3	VALVE CHAMBER GATES SKIN PLATE & GUIDE ROLLERS
4	VALVE CHAMBER GATES HOIST, LATCH PAWL & MISCL.
N-2-48 SHT 6	VALVE CHAMBER GATE ALTERATIONS FOR NEW TOP HORIZONTAL SEAL
7	EMERGENCY VALVE CHAMBERS - STOPLOG DETAILS
8	EMERGENCY VALVE CHAMBERS - STOPLOG DETAILS
9	EMERGENCY VALVE CHAMBERS - STOPLOG ROLLER GUIDE DETAILS
	NAVIGATION LOCK VALVE CHAMBER STOPLOG
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11	DETAILS II
12	DETAILS III
	SHIP LOCK EMERGENCY DAM
N-2-60 SHT 1	GENERAL SITE PLAN
2	BULKHEADS GENERAL PLAN AND STRESS SHEET
3	BULKHEADS NO 1 TO 3 INCL. PLAN & ELEVATIONS
4	BULKHEADS NO 1 TO 3 INCL. SECTIONS & END DETAILS
5	BULKHEADS NO 1 TO 3-END SHOES & MISCELLANEOUS DETAILS
N-2-60 SHT 6	BULKHEADS NO 1 TO 13 INCL. PICK-UP DETAILS
7	BULKHEADS NO 4 TO 13 INCL. PLAN AND ELEVATIONS
8	BULKHEADS NO 4 TO 13 INCL.-SE_TIONS & END DETAILS
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10	BULKHEADS NO 4 TO 13 INCL. END ROLLERS-DETAILS
11	LIFTING BEAM PLAN AND ELEVATION
12	LIFTING BEAM ROLLERS AND DETAILS
13	LIFTING BEAM HOOK ASSEMBLY AND DETAILS
N-2-60 SHT 14	LIFTING BEAM HOOK - DETAILS
15	DERRICKS GENERAL ARRANGEMENT & DATA
	BRIDGE ACROSS NAVIGATION CANAL
N-2-61 SHT 1	SWING SPAN COUNTERWEIGHT END
2	SWING SPAN SWING END
3	SWING SPAN DETAILS
4	SWING SPAN DETAILS
5	FIXED SPANS DETAILS
N-2-61 SHT 6	TIE PLAN AND DETAILS
7	SWING SPAN TURNING MACHINERY
8	SWING SPAN CENTER WEDGE MACHINERY
9	SWING SPAN END JACKS MECHANISM
10	SWING SPAN LATCH MECHANISM
N-2-61 SHT 10A	SWING SPAN CENTERING LATCH MECHANISM REVISIONS TO SHEET 10 - N-2-61
11	BRIDGE PIERS ANCHOR BOLTS PLAN
12	ELECTRICAL DETAILS SWING SPAN
13	ELECTRICAL DETAILS FIXED SPAN
	SHIP LOCK
N-2-62	TIMBER MITER SILLS - EMERGENCY DAM
N-2-63 SHT 4	TIMBER MITER GATES PINTLE CASTINGS & MISCL. DETAILS
N-2-63 SHT 6	TIMBER MITER GATES WICKET GATES-ASSEMBLY AND DETAILS
7	TIMBER MITER GATES GEOMETRY AND PLAN
	BRIDGE ACROSS NAVIGATION CANAL
N-2-69	COUNTERWEIGHT PROPOSED ARRANGEMENT
70	SWING SPAN HAND OPERATING MECHANISM PROPOSED CHANGE IN BRACKET S-4789
71	COUNTERWEIGHT PROPOSED ARRANGEMENT

DWG. NO.	TITLE
	TIMBER MITER GATES
N-2-72 SHT 1	DESIGN DATA
2	GENERAL ASSEMBLY & POST DETAILS
3	WALL ANCHORAGE & QUOIN POST CASTINGS
4	PINTLE CASTINGS & MISCEL. DETAILS
5	TEMPORARY MITER GATES OPERATING MACHINERY
N-2-72 SHT 6	TEMPORARY MITER GATES OPERATING SPAR
7	GEOMETRY AND PLAN
	BRIDGE ACROSS NAVIGATION CANAL
N-2-73	SWING SPAN ALTERATIONS FOR CENTERING LATCH CLEARANCE
74 SHT 1	TEMPORARY TRESTLE TO MONOLITH NO. 12
75	CONDUIT DETAILS PIER NO. 3
N-2-77	SWING SPAN CORRECTIONS TO TURNING MACHINERY CLUTCH YOKE MOUNTING
78	FIXED SPAN NO 2 CORRECTIONS TO NORTH ENDS OF GIRDERS
79	ARRANGEMENT SKETCH TO SHOW LOCATION OF SPEED REDUCER
	SWING SPAN END JACKS MECHANISM
80	SWING SPAN ALTERATIONS CHANGE IN BRACKET TO CLEAR S-4684
	36TH CONTRACT LOCK OPERATING EQUIPMENT LOWER MITER GATE
N-2-81 SHT 1	DESIGN DATA — SUPSD BY N-2-114
2	GENERAL ASSEMBLY — SUPSD BY N-2-114
3	QUOIN & MITER CASTINGS — SUPSD BY N-2-114
4	EMBEDDED QUOIN POST ELEVATIONS — SUPSD BY N-2-114
5	EMBEDDED QUOIN POST, SECTIONS AND DETAILS — SUPSD BY N-2-114
N-2-81 SHT 6	PINTLE CASTINGS ASSEMBLY & DETAILS — SUPSD BY N-2-114
7	LOWER SEALS ARRANGEMENT AND DETAILS — SUPSD BY N-2-114
8	AIR CHAMBER GIRDERS, 15 TO 20, AND CONNECTIONS — SUPSD BY N-2-114
9	TOP GIRDER, ANCHORAGE AND STRUT CONNECTIONS — SUPSD BY N-2-114
N-2-81 SHT 10	ADJUSTMENT FACILITIES FOR EMBEDDED QUOIN POSTS — SUPSD BY N-2-114
	LOCK OPERATING EQUIPMENT - UPPER MITER GATE
N-2-82 SHT 1	DESIGN DATA — SUPSD BY N-2-115
2	GENERAL ASSEMBLY — SUPSD BY N-2-115
3	QUOIN & MITER CASTINGS — SUPSD BY N-2-115
4	EMBEDDED QUOIN POST, ELEVATIONS — SUPSD BY N-2-115
5	WATER CHAMBER GIRDERS 2 TO 6, AND CONNECTIONS — SUPSD BY N-2-115
	LOCK OPERATING EQUIPMENT - MITER GATE MACHINERY
N-2-83 SHT 1	DESIGN DATA — SUPSD BY N-2-116
1A	COMPUTATION CURVES FOR MITER GATES OPERATING MACHINERY — SUPSD BY N-2-116
2	GENERAL ASSEMBLY — SUPSD BY N-2-116
3	OPERATING STRUT ARRANGEMENT DETAILS OF SECTOR AND ARM — SUPSD BY N-2-116
	LOCK OPERATING EQUIPMENT - TAINTER VALVES
N-2-84 SHT 1	DESIGN DATA
2	GENERAL ASSEMBLY
3	SEALS & SEAL CASTINNGS
4	TUNNION & GUIDE ROLLER DETAILS
	LOCK OPERATING EQUIPMENT - TAINTER VALVE MACHINERY
N-2-85 SHT 1	GENERAL ASSEMBLY
2	HOIST ASSEMBLY
3	GEARS PINIONS AND SHEAVES
4	BEARING DETAILS
5	SHAFTS, BUSHINGS, SPROCKET, ETC.
N-2-85 SHT 6	HOIST & COUNTERWEIGHT SHEAVE FRAMES
7	CHAIN SHEAVE DETAILS
8	RADIUS FRAME, STRUT'S & YOKES
9	COUNTERWEIGHT AND DETAILS
10	HOIST FRAME GRATINGS & LOWER PLATFORM
N-2-85 SHT 11	DETAILS OF CHAIN, UPPER STRUT, AND CABLE CONNECTIONS

DWG. NO.	TITLE
N-2-85 SHT 12	GEAR GUARDS
13	OVERLOAD CLUTCH DETAILS.
14	COVERS FOR PITS AND FLOATING MOORING BITT RECESSES
15	GREASING LAYOUT & PARTS LIST
16	ELECTRICAL DETAILS
	LOCK OPERATING EQUIPMENT - FLOATING MOORING BITT
N-2-86 SHT 1	GENERAL ARRANGEMENT AND DETAILS SUPSD BY N-2-102
2	PONTOON DETAILS
3	DETAILS OF YOKE, BITT STOCK SPINDLE & ROLLER SUPSD BY N-2-102
	33RD CONTRACT
N-2-87	LIFTING BAR FOR VALVE GATES
	BRIDGE ACROSS NAVIGATION CANAL
N-2-89	SWING SPAN CHANGES
90	SWING BRIDGE CHANGES IN LOWER FLANGE GIRDER
91	SWING SPAN INDICATOR SUPPORT
92	SWING SPAN COUNTERWEIGHT
93	SWING SPAN - SOUTH END LUBRICATION PLATFORM
	SHIP LOCK — EMERGENCY DAM
N-2-94	DERRICK OPERATOR'S CAB
95 SHT 1	33RD CONTRACT PROPOSED CHANGES IN BULKHEADS ETC.
N-2-97	LIFTING BEAM CENTER OF GRAVITY ADJUSTMENT
98	CENTER OF GRAVITY ADJUSTMENT FOR LIFTING BEAM
99 SHT 1	PROVISIONS FOR TEMPORARY LIFT GATES
100 SHT 1	PROVISIONS FOR TEMPORARY LIFT GATES BULKHEADS NO. 4 TO 8 INCLUSIVE PLAN & ELEVATIONS
2	PROVISIONS FOR TEMPORARY LIFT GATES BULKHEADS NO. 4 TO 8 INCLUSIVE SECTIONS & END DETAILS
	BRIDGE ACROSS NAVIGATION CANAL LOCK
N-2-101	COUNTERWEIGHT FOR CENTERING LATCH MECHANISM
N-2-102 SHT 1	FLOATING MOORING BITT GENERAL ARRANGEMENT
2	FLOATING MOORING BITT DETAILS OF PONTOON & BITT STOCK
3	DETAILS OF YOKE
4	FLOATING MOORING BITT BEARING DETAILS
N-2-104	SHIP LOCK EMERGENCY DAM SUGGESTED CORRECTIONS TO ROLLER HOUSING ER-1-ER
105	SHIP LOCK EMERGENCY DAM ARRANGEMENT OF LIFTING BEAM SHEAVES
106	BRIDGE ACROSS NAVIGATION CANAL SWING SPAN MAIN PINION BRACKET (CHANGES)
107	BRIDGE ACROSS NAVIGATION CANAL SWING SPAN PINION SHAFT BEARING (CHANGES)
108	BRIDGE ACROSS NAVIGATION CANAL SWING SPAN INDICATOR BRACKET CHANGES
N-2-109/1	TAINTER VALVE OPERATOR PLANS, SECTIONS AND HYDRAULIC SYSTEM
2	TAINTER VALVE OPERATOR DETAILS
N-2-111 SHT 1	TAINTER VALVES - COUNTERWEIGHT PIT INSPECTION DOOR
2	TAINTER VALVES - COUNTERWEIGHT PIT INSPECTION DOOR
N-2-112	DERRICK BOOM POINT STUDY
113	FLOATING MOORING BITT RECESS MEASURING TEMPLATE

THIS PRINT REDUCED TO ONE-HALF SCALE

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LOCK OPERATING EQUIPMENT

N-2-114 SHT 1	LOWER MITER GATE DESIGN DATA
2	LOWER MITER GATE MATERIALS AND DESIGN SPECIFICATIONS
3	LOWER MITER GATE GENERAL ARRANGEMENT
4	LOWER MITER GATE GIRDERS 2 TO 6 AND CONNECTIONS
5	LOWER MITER GATE GIRDERS 7 & 8 AND CONNECTIONS
N-2-114 SHT 6	LOWER MITER GATE GIRDER 9-10 & 11 AND CONNECTIONS
7	LOWER MITER GATE GIRDERS 12 TO 14 INCLUSIVE
8	LOWER MITER GATE AIR CHAMBER GIRDERS 15 TO 19, AND CONNECTIONS
9	LOWER MITER GATE GIRDERS 20 TO 22 INCLUSIVE AND CONNECTIONS
10	LOWER MITER GATE END REACTION DIAPHRAGM AND END VERTICAL FRAME
N-2-114 SHT 11	LOWER MITER GATE DIAGONAL BRACING
12	LOWER MITER GATE QUOIN & MITER POST PLATES
13	LOWER MITER GATE QUOIN AND MITER CASTINGS
14	LOWER MITER GATE EMBEDDED QUOIN POST
15	LOWER MITER GATE GATE FENDERS AND RECESS BUMPERS
N-2-114 SHT 16	LOWER MITER GATES ROLLING PLAN & JACKING DATA
N-2-115 SHT 1	UPPER MITER GATE DESIGN DATA
2	UPPER MITER GATE MATERIALS AND DESIGN SPECIFICATIONS
3	UPPER MITER GATE GENERAL ARRANGEMENT
4	UPPER MITER GATE GIRDER NO 1
5	UPPER MITER GATE ANCHOR STRUT AND GUARD BRACKETS ON GIRDER NO 1
N-2-115 SHT 6	UPPER MITER GATE GIRDERS 2 TO 7 AND CONNECTIONS
7	UPPER MITER GATE GIRDERS-8 TO 10 AND CONNECTIONS
8	UPPER MITER GATE DIAGONAL BRACING-END VERTICAL FRAME AND END REACTION DIAPHRAGM
9	UPPER MITER GATE QUOIN & MITER POST PLATES
10	MITER GATES-TOP WATER SEAL
N-2-115 SHT 11	UPPER MITER GATE WALKWAY AND HAND RAIL
12	UPPER MITER GATE QUOIN & MITER CASTINGS
13	UPPER MITER GATE SPECIAL QUOIN AND MITER END CASTINGS
14	UPPER MITER GATE PINTLE CASTINGS ASSEMBLY & DETAILS
15	UPPER MITER GATE MITER GUARD, ASSEMBLY AND DETAILS
N-2-115 SHT 16	UPPER MITER GATE LOWER SEALS & SILLS ARRANGEMENT AND DETAILS
17	UPPER MITER GATE GATE FENDERS AND RECESS BUMPERS
18	UPPER MITER GATE EMBEDDED QUOIN POST, ELEVATIONS
19	UPPER MITER GATE ADJUSTMENT FACILITIES FOR EMBEDDED QUOIN POSTS
20	UPPER MITER GATE ANCHOR ADJUSTMENT SYSTEM
N-2-115 SHT 21	UPPER MITER GATE LUBRICATION DETAILS
22	LOWER MITER GATES - SEAL ALTERATIONS
N-2-116 SHT 1	MITER GATE MACHINERY DESIGN DATA
2	MITER GATE MACHINERY GENERAL ASSEMBLY
3	MITER GATE MACHINERY-ANCHOR BOLT SETTING ANCHOR BOLTS, SLEEVES & MISC. PARTS
4	MITER GATE MACHINERY OPERATING STRUT ARRANGEMENT DETAILS OF SECTOR AND ARM
4A	REPAIRS TO SECTOR ARM - MECHANICAL DETAILS
N-2-116 SHT 4B	SPARE SECTOR ARM - FABRICATION
5	MITER GATE MACHINERY OPERATING STRUT DETAILS
6	MITER GATE MACHINERY OPERATING STRUT DETAILS
7	MITER GATE MACHINERY GEARS, SHAFTS, KEYS AND WASHERS
8	MITER GATE MACHINERY BEARINGS & CAPS
N-2-116 SHT 9	MITER GATE MACHINERY MACHINERY BASE, STUFFING BOX DETAILS AND LIMIT SWITCH GEARS
10	MITER GATE MACHERY PIT AND RECESS COVERS
11	MITER GATE MACHINERY AUTOMATIC AUXILIARY BRAKE
12	MITER GATE MACHINERY ELECTRICAL DETAILS
N-2-118	BRIDGE SPAN - RELATION BETWEEN SWING SPAN ROLLERS & END ROLLER TRACK
N-2-119	TAINTER VALVE - SECTION THRU SIDE SEAL

PROVISIONS FOR TEMPERARY LIFT GATE

N-2-121 SHT 1	BULKHEAD STORAGE
2	CULVERT DISCHARGE BOX
3	BULKHEADS NO 7 AND 8 TIMBER ATTACHMENTS
4	MISC.-ADJUSTMENTS & SEALS

POWERHOUSE & SUBSTRUCTURE (MISC.)

N-2-122	TEMPORARY MITER GATES OPERATING SCHEME
123	NAVIGATION LOCKS CHAIN FENDERS PROPOSED PLAN
124	TAINTER VALVE PITS - GUIDE ROLLER TRACK ALIGNMENT
125	TAINTER VALVE MACHINERY
126	SHIP LOCK EMERGENCY DAM-DERRICK STRESS DIAGRAM
N-2-127	TAINTER VALVE-PROFILES OF SPROCKET TOOTH FORMS
128	EMERGENCY UNWATERING GATES - TESTING FACILITIES
129	TAINTER VALVE MACHINERY ARRANGEMENT OF RAILS & BARS IN COUNTERWEIGHT POCKETS
130	EMERGENCY DAMS AND DERRICKS BALLAST FOR VALVE CHAMBER GATES
N-2-131 SHT 1	EMERGENCY UNWATERING GATES - ALIGNMENT PROFILES OF EMBEDDED STEEL
N-2-134 SHT 1	TRASH RACKS-CULVERTS INTAKE-MON. #26
2	TRASH RACKS DETAILS FOR LIFTING BEAM
N-2-136	VALVE CHAMBER GATES-SEAL ALTERATION TO TOP SEAL CASTING

SHIP LOCK EQUIPMENT VALVE CHAMBER GATES

N-2-137 SHT 1	LOCK OPERATING EQUIPMENT LOWER MITER GATE STUDY OF SPLICES END POST & DOUBLING PLATES
N-2-138 SHT 1	GUIDE ROLLERS & LIFTING BAR
2	STRUCTURAL DETAILS
3	SEAL DETAILS
4	HAND HOIST - ASSEMBLY
N-2-138 SHT 6	HAND HOIST - SHEAVES
7	HAND HOIST - DRUM & BRAKE
8	HAND HOIST REVISED AUTOMATIC BRAKE ASSEMBLY

EMERGENCY DAM & DERRICKS

N-2-139	MAST AND BOOM LINE HANGERS
N-2-142 SHT 1	MAST REINFORCEMENTS
2	ALTERATIONS TO BOOM & BULL GEAR
3	LOAD HANGER & BLOCKS AND DETAILS
4	STRESS DIAGRAM
N-2-142 SHT 5	GENERAL ARRANGEMENT SHOWING ALTERATIONS

LOCK OPERATING EQUIPMENT

N-2-143	MITER GATE PINTLE BASE FOUNDATION
143A	PUMP SHAFT EXTENSION - MECHANICAL DETAILS

LOCK OPERATING EQUIPMENT AND MISC.

N-2-145	TAINTER VALVE MACHY.-PLATFORMS AT ELE +64 & ELE +23 -HINGED GRATINGS AND LADDER EXTENSIONS
N-2-147	UNWATERING PUMP FOR ELECTRICAL MANHOLES
N-2-149 SHT 1	SWING BRIDGE TURNING MACHINERY ALTERATIONS
2	SWING BRIDGE TURNING MACHINERY ALTERATIONS
N-2-150 SHT 1	ELECTRICAL SYSTEM-CONDUIT LOCATION DIAGRAM FOR SHIP LOCK
2	ELECTRICAL SYSTEM-CONDUIT LOCATION DIAGRAMS FOR SHIP LOCK & GUIDE WALLS

SHIP LOCK EMERGENCY DAM - VALVE GATE CHAMBERS

N-2-151 SHT 1	HAND HOIST ALTERATIONS
2	HAND HOIST ALTERATIONS
N-2-151 SHT 5	MOTOR DRIVE ASSEMBLY
6	MOTOR DRIVE DETAILS

NAVIGATION LOCKS

N-2-152	UPSTREAM GUIDE WALL EXTENSION GENERAL LAYOUT
153	UPSTREAM GUIDE WALL EXTENSION DETAILS
N-2-156	UPSTREAM GUIDE WALL EXTENSION LIGHTING SYSTEM
157	UPSTREAM NORTH GUARD WALL PROPOSED CONC. WALL ON TIMBER PILES PLAN AND DETAILS
158	UPSTREAM NORTH GUARD WALL PROPOSED FLOATING CONCRETE WALL LAYOUT & DESIGN DETAILS
159	UPSTREAM NORTH GUARD WALL ROCK FILL CRIBS LAYOUT & STABILITY ANALYSIS
160	SOUNDINGS AT PROPOSED GUIDE WALL
N-2-161	DOWNSTREAM MOORING FACILITIES FLOATING TYPE
162	DOWNSTREAM MOORING FACILITIES CONCRETE WALL ON PILES
163	DOWNSTREAM MOORING FACILITIES TIMBER WALL
164	UPSTREAM SOUTH GUIDE WALL CONCRETE WALL ON PILES
165	UPSTREAM NORTH GUARD WALL PROPOSED FLOATING STEEL WALL TYPICAL DETAILS
N-2-166	UPSTREAM GUIDE WALL EXTENSION GENERAL PLAN
167	UPSTREAM GUIDE WALL EXTENSION STRUCTURAL DETAILS
N-2-169	UPSTREAM NAVIGATION LOCK GUIDE WALL FENDER DOLPHIN

SHIP LOCK AND SWING BRIDGE EQUIPMENT

N-2-400 SHT 2	ELECTRICAL SYSTEM INDEX OF EQUIPMENT
3	ELECTRICAL SYSTEM SINGLE LINE DIAGRAMS (SUPSD BY BDM-9-6-0B19/1)
4	ELECTRICAL SYSTEM ELEMENTARY WIRING DIAGRAM 120-240 V. SYSTEM & 480 V. LIGHT CONTROL
5	ELECTRICAL SYSTEM ELEMENTARY WIRING DIAGRAM DIAGRAM SWING BRIDGE (SUPSD BY BDM-9-61B19/B1)
6	ELECTRICAL SYSTEM ELEMENTARY WIRING DIAGRAM MITER GATES 1, 2, 3 & 4
N-2-400 SHT 7	ELECTRICAL SYSTEM ELEMENTARY WIRING DIAGRAM TAINTER VALVES 1, 2, 3 & 4
8	ELECTRICAL SYSTEM ELEMENTARY WIRING DIAGRAM CHAIN FENDERS 1 & 2

TEMPORARY LOCK OPERATING EQUIPMENT

N-2-401 SHT 1	ELECTRICAL DETAILS ONE LINE WIRING DIAGRAM
2	ELECTRICAL DETAILS ELEMENTARY WIRING DIAGRAM
3	ELECTRICAL DETAILS CONTROL AND CONTACTOR PANEL DETAILS
4	ELECTRICAL DETAILS BRIDGE CONTROL HOUSE LAYOUT
5	ELECTRICAL DETAILS BRIDGE WIRING DIAGRAM
N-2-401 SHT 6	ELECTRICAL DETAILS VALVE WIRING DIAGRAM
N-2-401 SHT 7	ELECTRICAL DETAILS WIRING DEVICES AND LOCATIONS
8	ELECTRICAL DETAILS DETAILS OF NAVIGATION LIGHTS
9	ELECTRICAL DETAILS AIR WHISTLE AND TRAFFIC STOP SIGNS
10	TAINTER VALVE MACHINERY ELECTRICAL TESTING EQUIPMENT
11	ELECTRICAL DETAILS PULL BOX & MANHOLE COVER GASKETS & MISCELLANEOUS DETAILS
N-2-401 SHT 12	TEMPORARY NAVIGATION TOPOGRAPHY & CANAL LOCATION
13	LOCK OPERATION AND SEQUENCE TABLE
N-2-402 SHT 2	ELECTRICAL DETAILS - BRIDGE ACROSS NAV. CANANL - BRIDGE CABLE LOOP

SHIP LOCK & SWING BRIDGE EQUIPMENT

N-2-403 SHT 1	ELECTRICAL SYSTEM CONTROL EQUIPMENT CONTROL DESKS IN LOCK CONTROL HOUSES
2	ELECTRICAL SYSTEM CONTROL EQUIPMENT CUBICLES IN CONTROL HOUSES 1 & 2
3	ELECTRICAL SYSTEM CONTROL EQUIPMENT CUBICLES IN CONTROL HOUSE 3
4	ELECTRICAL SYSTEM CONTROL EQUIPMENT CONTROL SWITCH DETAILS
5	ELECTRICAL SYSTEM CONTROL EQUIPMENT CONTROL DESK IN BRIDGE CONTROL HOUSE

SHIP LOCK AND SWING BRIDGE EQUIPMENT

N-2-404 SHT 1	ELECTRICAL SYSTEM WIRING DIAGRAMS FOR CH-1 & CH-3 CONTROL DESKS FOR GATES 1 & 2, ALL VALVES & BRIDGE (SUPSD BY BDM-9-6-0B9/OD1, OD2, & BDM-9-6-1B/19, BDM-9-6-G1-4, V1-V4,)
2	ELECTRICAL SYSTEM WIRING DIAGRAM OF CH-2 CONTROL DESK FOR GATES 3, 4 VALVES AND FENDERS (SUPSD BY BDM-9-6 -0B9/ OD3 & OD 4)
3	ELECTRICAL SYSTEM WIRING DIAGRAM FOR GATE 1, VALVE 1 AND LIGHTING PANELS IN CH-1
4	ELECTRICAL SYSTEM WIRING DIAGRAM FOR GATE 3, VALVE 3, VALVE 4, & LIGHTING PANELS IN CH-2
5	ELECTRICAL SYSTEM WIRING DIAGRAM FOR GATE 2 AND VALVE 2 PANELS AND GATES 1 & 2 MACHINERY
N-2-404 SHT 6	ELECTRICAL SYSTEM WIRING DIAGRAM FOR GATE 4 PANEL, GATE 3 & 4, AND VALVE 3 AND 4 MACHINERY
N-2-404 SHT 7	ELECTRICAL SYSTEM WIRING DIAGRAM FOR BRIDGE PANELS, BRIDGE MACHINERY AND GUARD GATES
8	ELECTRICAL SYSTEM WIRING DIAGRAM FOR LOCK LIGHTING AND RECEPTACLES
N-2-405 SHT 3	ELECTRICAL DETAILS 3 WIRE, 3 POLE, 30A, 440 V, PLUG RECEPTACLE DETAILS
N-2-406 SHT 1	CONTROL HOUSES HEATING AND VENTILATING SYSTEM
N-2-407 SHT 1	ELECTRICAL SYSTEM CABLE LOCATIONS ARRANGEMENT FOR TEMPORARY CONNECTIONS
2	ELECTRICAL SYSTEM CABLE LOCATIONS LOCATION OF CABLES FOR TEMPORARY CONNECTIONS
N-2-408 SHT 1	ELECTRICAL SYSTEM CABLE LOCATION DIAGRAM LOWER LOCK AND BRIDGE
2	ELECTRICAL SYSTEM CABLE LOCATION DIAGRAM UPPER LOCK AND FENDER

DERRICK

N-2-409 SHT 1	MAST STEP & COLLECTOR ASSEMBLY
2	STEP BEARING DETAILS
3	NAVIGATION LOCK-EMERGENCY DAM-TRANSFER CAR

OPERATING EQUIPMENT

N-2-410 SHT 1	ELECTRICAL SYSTEM CABLE ROUTING IN MANHOLE 7
2	ELECTRICAL SYSTEM CABLE ROUTING IN MANHOLE NO. 5
3	ELECTRICAL SYSTEM CABLE ROUTING IN MANHOLES NO 5, NO 15 AND NO 19
4	ELECTRICAL SYSTEM CABLE ROUTING IN MACHINERY PITS AND MISCELLANEOUS DETAILS
5	ELECTRICAL SYSTEM CABLE ROUTING IN MANHOLE 3
N-2-410 SHT 6	ELECTRICAL SYSTEM CABLE ROUTING IN MANHOLES 2 AND 4
7	ELECTRICAL SYSTEM CABLE ROUTING IN MANHOLES NOS 8 AND 9
8	ELECTRICAL SYSTEM CABLE ROUTING IN MANHOLE 10-11
9	ELECTRICAL SYSTEM CABLE ROUTING IN MANHOLE NO. 12
10	ELECTRICAL SYSTEM CABLE ROUTING IN MANHOLES 1, 17 & 18
N-2-410 SHT 11	ELECTRICAL SYSTEM CABLE ROUTING IN MH-14 & PULL BOXES

OPERATING EQUIPMENT

N-2-411 SHT 1	CABLE SCHEDULE - POWER CIRCUITS
2	CABLE SCHEDULE - POWER, CONTROL AND MISCELLANEOUS
3	CABLE SCHEDULE - LIGHTING CIRCUITS
4	CABLE SCHEDULE - LIGHTING CIRCUITS
5	CABLE SCHEDULE - GROUNDING SYSTEM
N-2-412 SHT 1	ELECTRICAL SYSTEM CABLE INSTALLATION DETAILS CONDUIT DETAILS FOR CH-1, GQ-2, G0-4, VQ-2
2	ELECTRICAL SYSTEM CABLE INSTALLATION DETAILS CONDUIT DETAILS FOR CH-2, F0-1 & FQ-2
3	ELECTRICAL DETAILS CABLE INSTALLATION DETAILS INSULATOR SUPPLIES
4	ELECTRICAL DETAILS CABLE INSTALLATION DETAILS INSULATOR SUPPORTS
5	ELECTRICAL DETAILS CABLE-INSTALLATION DETAILS - INSULATOR SUPPORTS
N-2-412 SHT 6	ELECTRICAL DETAILS CABLE INSTALLATION DETAILS - SHELF SUPPORTS
7	ELECTRICAL DETAILS CABLE INSTALLATION DETAILS BILL OF MATERIAL FOR SHTS. 3, 4, 5, 6
N-2-413	ELECTRICAL DETAILS CABLE BOXES
N-2-414/1	NAVIGATION SIGNAL - LOCK AND DETAILS
2	NAVIGATION SIGNAL - WIRING & SCHEMATIC DIAGRAM
N-2-417 SHT 1	ELECTRICAL SYSTEM-SWING BRIDGE CONTROL HOUSE (CH 3) DETAILS
2	ELECTRICAL SYSTEM SWING BRIDGE CONTROL HOUSE (CH 3) DETAILS

NAVIGATION LOCK - ELECTRICAL & MECHANICAL

N-2-418/1	50 TON POST DERRICK CONTROL MODIFICATIONS PLAN AND SECTIONS
2	50 TON POST DERRICK CONTROL MODIFICATIONS RISER DIAGRAM & PAWL POSITION INDICATORS
3	50 TON POST DERRICK CONTROL MODIFICATIONS HYDRAULIC CONTROLS GENERAL ARRANGEMENT
4	50 TON POST DERRICK CONTROL MODIFICATIONS HYDRAULIC CONTROLS DETAILS
5	50 TON POST DERRICK CONTROL MODIFICATIONS CONTROL STAND

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LOCK AND OPERATING EQUIPMENT INDEX

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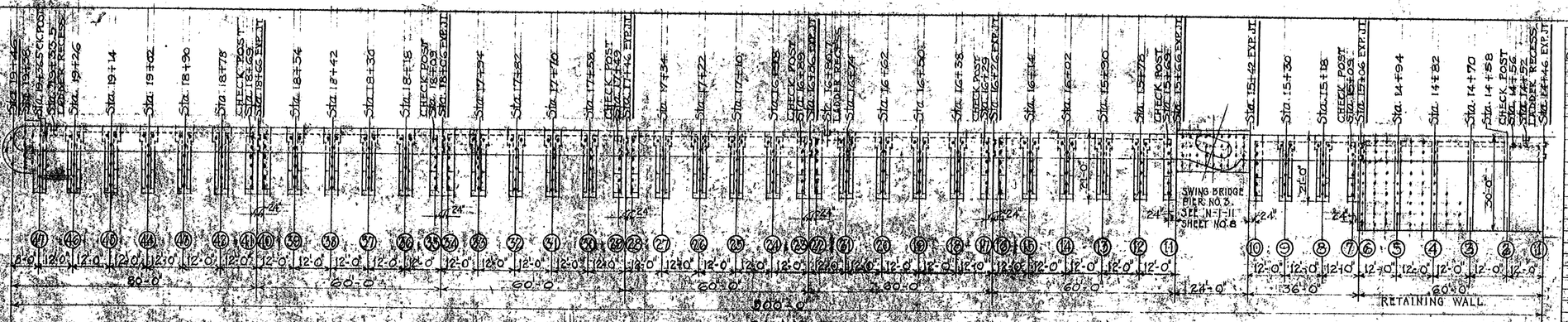

LOCATION	NO.	SIZE	LENGTH	MARK	REMARKS
COUNTERFORTS	2	5/8ϕ	7'-1"	A.868 b	
	2	"	7'-7"	A.869 b	
	2	"	7'-11"	A.870 b	
	2	"	8'-3"	A.871 b	
	2	"	8'-7"	A.872 b	
	2	"	8'-11"	A.873 b	
	2	"	9'-3"	A.874 b	
	2	"	9'-7"	A.875 b	
	2	"	9'-11"	A.876 b	
	2	"	10'-3"	A.877 b	
	2	"	10'-7"	A.878 b	
	2	"	10'-10"	A.879 b	
	2	"	11'-3"	A.880 b	
	2	"	11'-7"	A.881 b	
	2	"	11'-11"	A.882 b	
	2	"	12'-3"	A.883 b	
	2	"	12'-7"	A.884 b	
	2	"	12'-10"	A.885 b	
	2	"	13'-2"	A.886 b	
	2	"	13'-6"	A.887 b	
	2	"	13'-10"	A.888 b	
	2	"	14'-2"	A.889 b	
	2	"	14'-6"	A.890 b	
	2	"	14'-10"	A.891 b	
	2	"	15'-2"	A.892 b	
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	2	"	15'-10"	A.894 b	
	2	"	16'-2"	A.895 b	
	2	"	16'-6"	A.896 b	
	2	"	16'-10"	A.897 b	
	2	"	17'-2"	A.898 b	
	2	"	17'-6"	A.899 b	
	2	"	17'-10"	A.900 b	
	2	"	18'-2"	A.901 b	
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	2	"	18'-10"	A.903 b	
	2	"	19'-2"	A.904 b	
	2	"	19'-6"	A.905 b	
	2	"	19'-10"	A.906 b	
	2	"	20'-2"	A.907 b	
	2	"	20'-6"	A.908 b	
	2	"	20'-10"	A.909 b	
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	2	"	21'-6"	A.911 b	
	2	"	21'-10"	A.912 b	
	2	"	22'-2"	A.913 b	
	2	"	22'-6"	A.914 b	
	2	"	22'-10"	A.915 b	
	2	"	23'-2"	A.916 b	
	2	"	23'-6"	A.917 b	
	2	"	23'-10"	A.918 b	
	2	"	24'-2"	A.919 b	
	2	"	24'-6"	A.920 b	
	2	"	24'-10"	A.921 b	
	2	"	25'-2"	A.922 b	
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	2	"	26'-2"	A.925 b	
	2	"	26'-6"	A.926 b	
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	2	"	27'-2"	A.928 b	
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	2	"	32'-6"	A.944 b	
	2	"	32'-10"	A.945 b	
	2	"	33'-2"	A.946 b	
	2	"	33'-6"	A.947 b	
	2	"	33'-10"	A.948 b	
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	2	"	81'-10"	A.1092 b	
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	2	"	91'-10"	A.1122 b	
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	2	"	92'-6"	A.1124 b	
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	2	"	97'-2"	A.1138 b	
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	2	"	97'-10"	A.1140 b	
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	2	"	99'-6"	A.1145 b	
	2	"	99'-10"	A.1146 b	
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	2	"	101'-10"	A.1152 b	
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	2	"	105'-10"	A.1164 b	
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	2	"	107'-10"	A.1170 b	
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	2	"	161'-6"	A.1331 b	
	2	"	161'-10"	A.1332 b	
	2	"	162'-2"	A.1333 b	
	2	"	162'-6"	A.1334 b	
	2	"	162'-10"	A.1335 b	
	2	"	163'-2"	A.1336 b	
	2	"	163'-6"	A.1337 b	
	2	"	163'-10"	A.1338 b	
	2	"	164'-2"	A.1339 b	
	2	"	164'-6"	A.1340 b	
	2	"	164'-10"	A.1341 b	
	2	"	165'-2"	A.1342 b	
	2	"	165'-6"	A.1343 b	
	2	"	165'-10"	A.1344 b	
	2	"	166'-2"	A.1345 b	
	2	"	166'-6"	A.1346 b	
	2	"	166'-10"	A.1347 b	
	2	"	167'-2"	A.1348 b	
	2	"	167'-6"	A.1349 b	
	2	"	167'-10"	A.1350 b	
	2	"	168'-2"	A.1351 b	
	2	"	168'-6"	A.1352 b	
	2	"	168'-10"	A.1353 b	
	2	"	169'-2"	A.1354 b	
	2	"	169'-6"	A.1355 b	
	2	"	169'-10"	A.1356 b	
	2	"	170'-2"	A.1357 b	
	2	"	170'-6"	A.1358 b	
	2	"	170'-10"	A.1359 b	
	2	"	171'-2"	A.1360 b	
	2	"	171'-6"	A.1361 b	
	2	"	171'-10"	A.1362 b	
	2	"	172'-2"	A.1363 b	
	2	"	172'-6"	A.1364 b	
	2	"	172'-10"	A.1365 b	
	2	"	173'-2"	A.1366 b	
	2	"	173'-6"	A.1367 b	
	2	"	173'-10"	A.1368 b	
	2	"	174'-2"	A.1369 b	
	2	"	174'-6"	A.1370 b	
	2	"	174'-10"	A.1371 b	
	2	"	175'-2"	A.1372 b	
	2	"	175'-6"	A.1373 b	
	2	"	175'-10"	A.1374 b	
	2	"	176'-2"	A.1375 b	
	2	"	176'-6"	A.1376 b	
	2	"	176'-10"	A.1377 b	
	2	"	177'-2"	A.1378 b	
	2	"	177'-6"	A.1379 b	
	2	"	177'-10"	A.1380 b	
	2	"	178'-2"	A.1381 b	
	2	"	178'-6"	A.1382 b	
	2	"	178'-10"	A.1383 b	
	2	"	179'-2"	A.1384 b	
	2	"	179'-6"	A.1385 b	
	2	"	179'-10"	A.1386 b	
	2	"	180'-2"	A.1387 b	
	2	"	180'-6"	A.1388 b	
	2	"	180'-10"	A.1389 b	
	2	"	181'-2"	A.1390 b	
	2	"	181'-6"	A.1391 b	
	2	"	181'-10"	A.1392 b	
	2	"	182'-2"	A.1393 b	
	2	"	182'-6"	A.1394 b	
	2	"	182'-10"	A.1395 b	
	2	"	183'-2"	A.1396 b	
	2	"	183'-6"	A.1397 b	
	2	"	183'-10"	A.1398 b	
	2	"	184'-2"	A.1399 b	
	2	"	184'-6"	A.1400 b	
	2	"	184'-10"	A.1401 b	
	2	"	185'-2"	A.1402 b	
	2	"	185'-6"	A.1403 b	
	2	"	185'-10"	A.1404 b	
	2	"	186'-2"	A.1405 b	
	2	"	186'-6"	A.1406 b	
	2	"	186'-10"	A.1407 b	
	2	"	187'-2"	A.1408 b	
	2	"	187'-6"	A.1409 b	
	2	"	187'-10"	A.1410 b	
	2	"	188'-2"	A.1411 b	
	2	"	188'-6"	A.1412 b	
	2	"	188'-10"	A.1413 b	
	2	"	189'-2"	A.1414 b	
	2	"	189'-6"	A.1415 b	
	2	"	189'-10"	A.1416 b	
	2	"	190'-2"	A.1417 b	
	2	"	190'-6"	A.1418 b	
	2	"	190'-10"	A.1419 b	
	2	"	191'-2"	A.1420 b	
	2	"	191'-6"	A.1421 b	
	2	"	191'-10"	A.1422 b	
	2	"	192'-2"	A.1423 b	
	2	"	192'-6"	A.1424 b	
	2	"	192'-10"	A.1425 b	
	2	"	193'-2"	A.1426 b	
	2	"	193'-6"	A.1427 b	
	2	"	193'-10"	A.1428 b	
	2	"	194'-2"	A.1429 b	
	2	"	194'-6"	A.1430 b	
	2	"	194'-10"	A.1431 b	
	2	"	195'-2"	A.1432 b	
	2	"	195'-6"	A.1433 b	
	2	"	195'-10"	A.1434 b	
	2	"	196'-2"	A.1435 b	
	2	"	196'-6"	A.1436 b	
	2	"	196'-10"	A.1437 b	
	2	"	197'-2"	A.1438 b	
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	2	"	198'-6"	A.1442 b	
	2	"	198'-10"	A.1443 b	
	2	"	199'-2"	A.1444 b	
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	2	"	203'-10"	A.1458 b	
	2	"	204'-2"	A.1459 b	
	2	"	204'-6"	A.1460 b	
	2	"	204'-10"	A.1461 b	
	2	"	205'-2"	A.1462 b	
	2	"	205'-6"	A.1463 b	
	2	"	205'-10"	A.1464 b	
	2	"	206'-2"	A.1465 b	
	2	"	206'-6"	A.1466 b	
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	2	"	214'-6"	A.1490 b	
	2	"	214'-10"	A.1491 b	
	2	"	215'-2"	A.1492 b	
	2	"	215'-6"	A.1493 b	
	2	"	215'-10"	A.1494 b	
	2	"	216'-2"	A.1495 b	
	2	"	216'-6"	A.1496 b	
	2	"	216'-10"	A.1497 b	
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	2	"	217'-6"	A.1499 b	
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	2	"	219'-2"	A.1504 b	
	2	"	219'-6"	A.1505 b	
	2	"	219'-10"	A.1506 b	
	2	"	220'-2"	A.1507 b	
	2	"	220'-6"	A.1508 b	
	2	"	220'-10"	A.1509 b	
	2	"	221'-2"	A.1510 b	
	2	"	221'-6"	A.1511 b	
	2

WAR DEPARTMENT

CORPS OF ENGINEERS U.S. ARMY.

PLAN

PLAN OF PIER No1

SECTION D-D.

ELEVATION F-F.

PLAN OF ANCHORS.

ELEVATION E-E.

PLAN PIER No3

ELEVATION PIER No3

SECTION H-H

SECTION C-C.

PIER No 5

SECTION A-A

PIER No 4.

TOP PLAN PIER No 3.

SCHEDULE OF REINFORCING STEEL

LOCATION	No	SIZE	LENGTH	MARK	BENDING
Pier No1	32	1"ϕ	20'-3"	C810b	
" "	12	½"ϕ	15'-6"	A425	Straight.
" "	16	½"ϕ	16'-0"	A426	"
" "	16	½"ϕ	15'-0"	C427	"
" "	16	½"ϕ	4'-10"	D428b	
Pier No 5	400	⅜"ϕ	Random	613	
"	25	1"ϕ	20'-0"	C812	
"	11	½"ϕ	16'-0"	A426	
Pier No3	20	1" □	8'-6"	C813	Dowels
"	20	1" □	57'-0"	C814	Shaft Steel.
"	13	½"□	23'-0"	A429	Footing.
"	24	½"□	12'-0"	B430	"
"	2600	⅜"ϕ	Random	310	Hooping.
"	170	¾"ϕ	"	610	Under Brngs.
"	24	¾"ϕ	12'-0"	C611	
"	22	¾"ϕ	8'-6"	C612	
"	18	⅜"ϕ	14'-8"	C510b	See detail
Slab&Wall	31	¾"ϕ	23'-6"	A511	
" Wall	74	¾"ϕ	28'-0"	C433	Spacers
" "	16	½"ϕ	5'-0"	C434	Curtain
" "	42	½"ϕ	7'-6"	B433	Spacers

NOTE: Reinforcing Schedule is for the Convenience of Contractor. Lengths & Bending diagrams shall be Checked by the Contractor See Electrical Details for Conduits Sheet 1-N-1-11

② 6" From Face of Concrete unless Shown Otherwise.

DETAILS COMPLETED.	DATE	BY	APVD.

BONNEVILLE POWER NAVIGATION PROJECT

13TH. CONTRACT - CONCRETE

POWER HOUSE SUBSTRUCTURE & NAVIGATION LOCK

SHIP LOCK

SWING BRIDGE-PIER DETAILS.

SCALES AS SHOWN.

U. S. ENGINEER OFFICE. PORTLAND, OREGON DISTRICT

SUBMITTED: R.H.Mackenzie ENGINEER — APPROVED: [illegible] MAJOR, CORPS OF ENGINEERS

RECOMMENDED: [illegible] HEAD ENGINEER — DRAWN BY M.R.L. DATE 9-28-34 — TRACED BY M.R.L. CHECKED BY [illegible]

NO	REVISION.	DATE	BY	APVD
(5)	Pier No. 5 - Footing Revised	11-19-34	J.R.R.	RMM
(4)	Pier Coordinates shown	10/16/34	R.S.D.	RMM
(3)	Pier No 2 - General	10/15/34	M.R.L.	RMM
(2)	Bars Spliced Pier No. 5 Notes & Quantities added.	10/2/34	M.R.L.	RMM
(1)	Manhole Size Changed Pier No 2	10/1/34	M.R.L.	RMM

WAR DEPARTMENT

CORPS OF ENGINEERS U.S.ARMY

PLAN

REAR ELEVATION

SECTION A-A THRU DECK SLAB
TYPICAL FOR ALL PANELS-18" SLAB EXCEPT BETWEEN BENTS 7&10

SECTION B-B THRU WALL SLAB
TYPICAL FOR ALL PANELS

SECTION H-H

TYPICAL BENT
SHOWING PILE CUT-OFF & EXCAVATION

LADDER RECESS
TYPE 'A' LADDER

TYPICAL EXPANSION JOINT

ELEVATION M-M

ELEVATION N-N

SECTION O-O

ELEVATION F-F

SECTION E-E

Note: Piling plan under Retaining Wall subject to possible revision to suit excavation conditions

NO.	DETAILS COMPLETED	DATE	BY	APV'D
1	3"X10" SWAY BRACING LOWERED	10-1-34	A.E.J.C.	Kow

BONNEVILLE POWER NAVAGATION PROJECT
13 TH. CONTRACT- CONCRETE
POWER HOUSE SUBSTRUCTURE & NAVIGATION LOCK
SHIP LOCK
LOWER GUIDE WALL DETAILS
SCALE 6 AS SHOWN

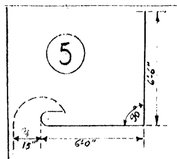
U. S. ENGINEER OFFICE. PORTLAND. OREGON DISTRICT

SUBMITTED: R.D. Mackenzie, ENGINEER
APPROVED: H.J. Harris, MAJOR, CORPS OF ENGINEERS
RECOMMENDED: CHIEF ENGINEER
DRAWN BY P.R. CASTRO DATE 9-28-34
TRACED BY P.R. CASTRO CHECKED BY M.K.S.

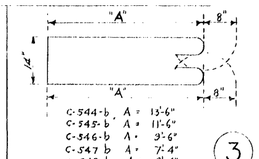
SHEET 1 OF 2 N-1-18

WAR DEPARTMENT

CORPS OF ENGINEERS U.S. ARMY



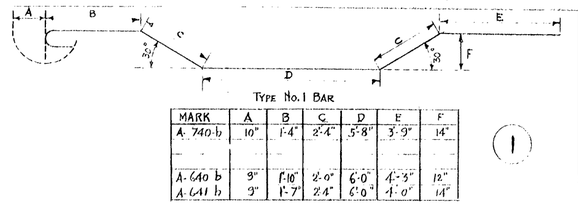
C-1040-b



C-544-b A = 13'-6"
C-545-b A = 11'-6"
C-546-b A = 9'-6"
C-547-b A = 7'-4"
C-548-b A = 5'-4"
C-549-b A = 3'-4"

C-544-b To C-549-b

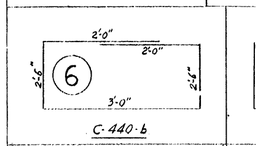
3



TYPE No. 1 BAR

MARK	A	B	C	D	E	F
A-740-b	10"	1'-4"	2'-4"	5'-8"	3'-9"	14"
A-640 b	9"	1'-10"	2'-0"	6'-0"	4'-3"	12"
A-641 b	9"	1'-7"	2'-4"	6'-0"	4'-0"	14"

1



C-440-b

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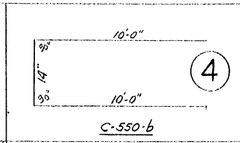

C-550-b

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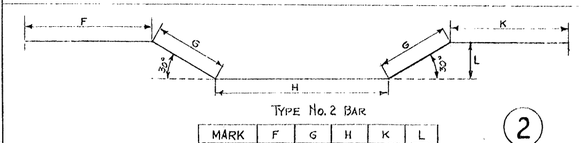
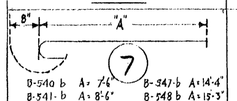


TYPE No. 2 BAR

MARK	F	G	H	K	L
A-741-b	4'-0"	2'-4"	6'-0"	4'-0"	14"
A-642-b	4'-3"	2'-0"	6'-0"	4'-3"	12"
A-643 b	4'-0"	2'-4"	6'-0"	4'-0"	14"

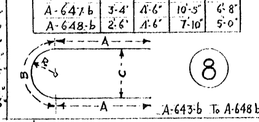
2



B-540-b	A= 7'-6"	B-547-b	A=14'-4"
B-541-b	A= 8'-6"	B-548-b	A=15'-3"
B-542-b	A= 9'-6"	B-549-b	A=16'-2"
B-543-b	A=10'-6"	B-550-b	A=17'-1"
B-544-b	A=11'-6"	B-551-b	A=18'-0"
B-545-b	A=12'-6"	B-552-b	A=19'-0"
B-546-b	A=13'-5"	B-553-b	A=19'-5"
C-540-b	A= 5'-1"	C-542-b	A=17'-6"
C-541-b	A=20'-0"	C-543-b	A=12'-6"

7

MARK	R	A	B	C
A-643-b	6'-8"	4'-6"	20-11"	13'-4"
A-644-b	5'-10"	4'-6"	18'-3"	11'-8"
A-645-b	5'-0"	4'-6"	15'-9"	10'-0"
A-646-b	4'-2"	4'-6"	13'-1"	8'-4"
A-647-b	3'-4"	4'-6"	10'-5"	6'-8"
A-648-b	2'-6"	4'-6"	7'-10"	5'-0"



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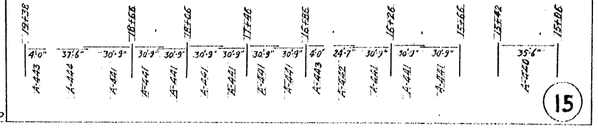
A-643-b To A-648-b

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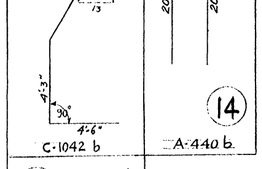
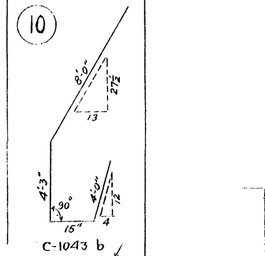
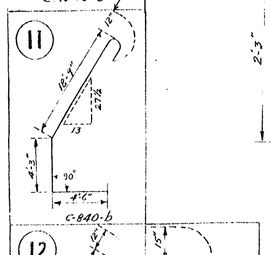


C-1042 b

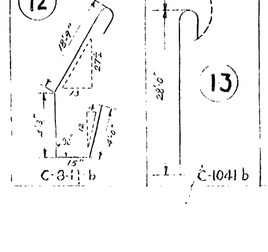
A-440 b



C-1043 b

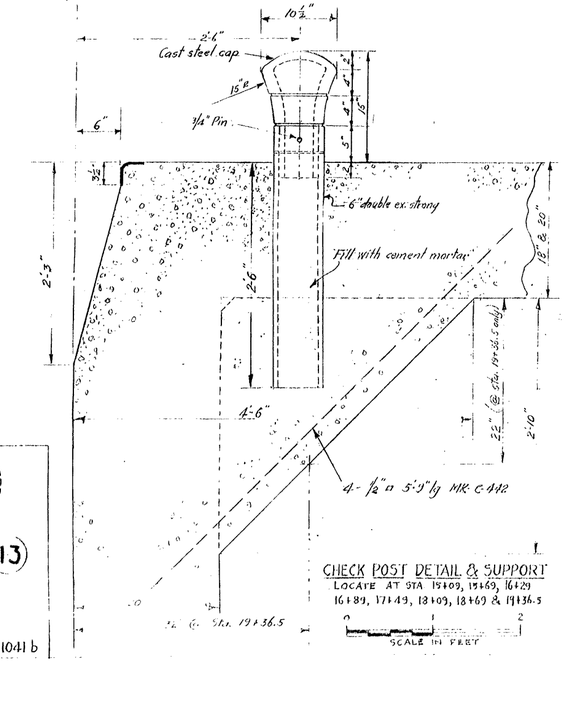


C-840-b



C-841-b

C-1041 b

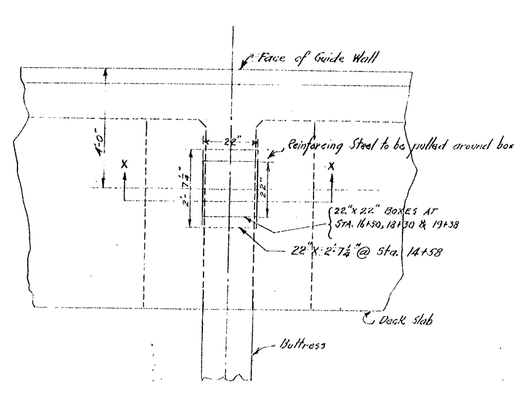


CHECK POST DETAIL & SUPPORT

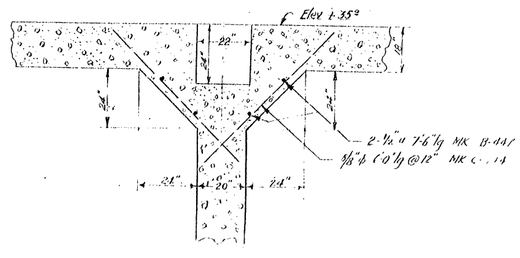
LOCATE AT STA 15+09, 15+69, 16+29
16+89, 17+49, 18+09, 18+69 & 19+36.5

SCALE IN FEET

NOTE —
For details of check post at Sta. 14+58 see Dwg. No. N-1-18 Sheet 6



PLAN



SECTION X-X
DETAIL OF CONSTRUCTION JOINT
AT
PULL BOXES
(SEE DETAIL DRAWING FOR DETAILS)

SCALE IN FEET

SCHEDULE OF REINFORCING STEEL
(CONTINUED)

	LOCATION	NO	SIZE	LENGTH UNBENT	MARK	BENDING
	COUNTERFORTS	164	⅝"ø	21'-2"	C-550-b	See Detail No. 4 ★
	"	164	½"□	19'-6"	B-441	★
	"	779	½"□	12'-0"	C-440 b	See Detail No. 6 ★
ADDITIONAL SLABS SEC. BENTS 46 & 47	Top of Slab - El 117.5 Between Bents 46 & 47	10	½"□	15'-0"	B-442	
		13	½"□	13'-2"	A-449	
	Bottom of Slab - El 117.5 Between Bents 46 & 47	28	¾"ø	13'-2"	A-643	
		10	½"□	15'-8"	B-443	
	Top of Slab - El 115 Between Bents 46 & 47	11	½"□	19'-6"	B-444	★
		21	½"□	14'-0"	A-450	★
	Bottom of Slab El 115 Between Bents 46 & 47	21	¾"ø	10'-6"	A-644	★
		11	½"□	19'-6"	B-445	★
MONOLITH STA 19+49 TO STA 19+38	OVER PILES	1	¾"ø	29'-11"	A-643 b	See Detail No. 8 ★
	" "	1	¾"ø	27'-3"	A-644 b	" " No. 8 ★
	" "	1	¾"ø	24'-9"	A-645 b	" " No. 8 ★
	" "	1	¾"ø	22'-1"	A-646 b	" " No. 8 ★
	" "	1	¾"ø	19'-5"	A-647 b	" " No. 8 ★
	" "	1	¾"ø	16'-10"	A-648 b	" " No. 8 ★
	" "	17	¾"ø	6'-0"	B-641	★
	" "	5	¾"ø	6'-0"	A-646	★
	" "	4	¾"ø	14'-6"	B-642	★
	IN FACE	BOTTOM LAYERS	½"□	915 LINEAL FEET	A-451	(PORTION = ★)
	" "	REMAINING LAYERS	½"□	836 LINEAL FEET	C-441	(PORTION = ★)
	CHECK POST SUPPORTS	32	½"□	5'-9"	C-442	
	EXPANSION JOINTS	24	⅞"ø	33'-0"	C-543	
	EXPANSION JOINTS	408	½"□	3'-10"	A-440-b	See Detail No. 14
	PULL BOX SUPPORTS	12	⅝"□	7'-6"	B-447	
	" " "	36	⅝"ø	6'-0"	C-544	

SCHEDULE OF REINFORCING STEEL
STA. 15+06 TO STA 19+49 (EXCLUSIVE OF BRIDGE PIER BAY)

	LOCATION	NO.	SIZE	LENGTH UNBENT	MARK	BENDING
SLAB	End Panels	351	⅞"ø	16'-3"	A-740-b	See Detail No. 1
	Interior Panels	567	⅞"ø	18'-8"	A-741 b	" " No. 2
WALL SLAB	End Panel-Bents 16 to 17	54	⅞"ø	13'-2"	A-742	
	End Panel-Bents 21 to 22	54	⅞"ø	12'-4"	A-743	
	Remaining End Panels	324	⅞"ø	11'-9"	A-740	
	Interior Panels	540	⅞"ø	12'-0"	A-741	
WALL SLAB OUTSIDE	End of each buttress	123	1¼"ø	26'-9"	C-1040	
		123	1¼"ø	15'-9"	C-1040-b	See Detail No. 5
	Sta. 15+06 To Sta. 15+42	27	¼"□	35'-6"	A-440	
	Typical Sections Sta. 15+66 to Sta 16+26 Sta 16+86 to Sta 18+66	216	½"□	30'-9"	A-441	
		27	½"□	30'-9"	A 441	
	STA 16+26 To Sta 16+86	27	¼"□	24'-7"	A-442	For location see Detail No. 15
		27	½"□	4'-0"	A-443	
		27	½"□	30'-9"	A-441	
	STA. 18+66 To Sta 19+38	27	½"□	37'-6"	A-444	
		27	½"□	4'-0"	A-443	
	Wall Slab - Both faces	759	½"□	28'-6"	C-440	
BOTTOM SLAB	Sta. 15+06 To Sta. 15+42	3	⅞"ø	35'-6"	A-744	
	Sta. 15+66 To Sta. 18+66	15	⅞"ø	37'-3"	A-745	
		15	⅞"ø	25'-3"	A-746	
	Sta. 18+66 To Sta. 19+38	6	⅞"ø	37'-3"	A-745	
SLAB DECK	Interior Panels - Between Bents 9 & 7	6	¾"ø	18'-8"	A-643 b	See Detail No. 2
	End Panels - Bottom Except End Bents 7 & 10	66	¾"ø	16'-10"	A-640 b	See Detail No. 1
	End Panels - Bottom Between Bents 7 & 10	12	¾"ø	17'-0"	A-641 b	" " No. 1
	End Panels - Bottom Except End Bents 45-47	72	¾"ø	11'-9"	A-640	
	End Panels - Bottom Between Bents 46 & 47	6	¾"ø	12'-7"	A-641	
	Interior Panels - Bottom	120	¾"ø	18'-6"	A-642-b	See Detail No. 2
	" " "	126	¾"ø	12'-0"	A-642	
	Interior & End Panels Top & Bottom	108	½"□	7'-3"	B-446	
		4108	½"□	15'-9"	C-1040	
	Sta. 15+06 To Sta. 15+42	8	¼"□	35'-6"	A-446	
	Sta. 15+66 To Sta. 18+66	80	¼"□	31'-3"	A-447	Top of SLAB
	Sta. 18+66 To Sta 19+38	16	¼"□	37'-9"	A-448	
COUNTERFORTS	COUNTERFORTS	125	1¼"□	29'-5"	C-1041 b	See Detail No. 13
	"	82	1¼"□	16'-9"	C-1042 b	" " No. 9 ★
	"	41	1¼"□	17'-6"	C-1043 b	" " No. 10 ★
	"	82	1"□	28'-6"	C-840 b	" " No. 11 ★
	"	41	1"□	29'-3"	C-841 b	" " No. 12 ★
	"	110	⅝"ø	3'-9"	C-540 b	" " No. 7 ★
	"	246	⅞"ø	28'-8"	C-540	
	"	82	⅝"ø	26'-0"	C-541	
	"	82	⅝"ø	21'-6"	C-542	
	"	82	⅝"ø	20'-8"	C-541-b	See Detail No. 7 ★
	"	82	⅝"ø	18'-2"	C-542-b	" " No. 7 ★
	"	82	⅝"ø	13'-2"	C-543 b	" " No. 7 ★
	"	82	⅝"ø	8'-2"	B-540-b	" " No. 7
	"	82	⅝"ø	9'-2"	B-541-b	" " No. 7
	"	82	⅝"ø	10'-2"	B-542-b	" " No. 7
	"	82	⅝"ø	11'-2"	B-543-b	" " No. 7
	"	82	⅝"ø	12'-2"	B-544-b	" " No. 7
	"	82	⅝"ø	13'-2"	B-545-b	" " No. 7
	"	82	⅝"ø	14'-1"	B-546-b	" " No. 7
	"	82	⅝"ø	15'-0"	B-547-b	" " No. 7
	"	82	⅝"ø	15'-11"	B-548-b	" " No. 7
	"	82	⅝"ø	16'-8"	B-549 b	" " No. 7
	"	82	⅝"ø	17'-9"	B-550 b	" " No. 7
	"	82	⅝"ø	18'-8"	B-551-b	" " No. 7
	"	82	⅝"ø	19'-8"	B-552 b	" " No. 7 ★
	"	82	⅝"ø	20'-8"	B-553 b	" " No. 7 ★
	STIRRUPS	41	⅝"ø	29'-6"	C-514-b	" " No. 3 ★
	"	41	⅝"ø	25'-6"	C-515 b	" " No 3 ★
	"	41	⅝"ø	21'-6"	C-516 b	" " No 3 ★
	"	41	⅝"ø	17'-2"	C-517 b	" " No 3 ★
	"	41	⅝"ø	13'-2"	C-518 b	" " No 3 ★
	"	41	⅝"ø	9'-2"	C-519 b	" " No 3 ★

Reinforcing Steel Notes —
"A" Horiz bars placed East & West MARK "A"
"B" Horiz bars placed North & South MARK "B"
"C" Vertical bars Mark "C"
Suffix "b" indicates bent bars, thus A-621-b

Bars to be installed before pouring base marked ★

NOTE —
Steel List is for convenience of Contractor All bending diagrams and dimensions should be checked by Contractor

NO	DETAILS COMPLETED	DATE	BY	APVD

BONNEVILLE POWER NAVIGATION PROJECT
13TH CONTRACT — CONCRETE
POWER HOUSE SUBSTRUCTURE & NAVIGATION LOCK
SHIP LOCK

LOWER GUIDE WALL DETAILS

SCALES AS SHOWN

U S ENGINEER OFFICE PORTLAND, OREGON DISTRICT

SUBMITTED R.F. Mackenzie ENGINEER — APPROVED: MAJOR, CORPS OF ENGINEERS

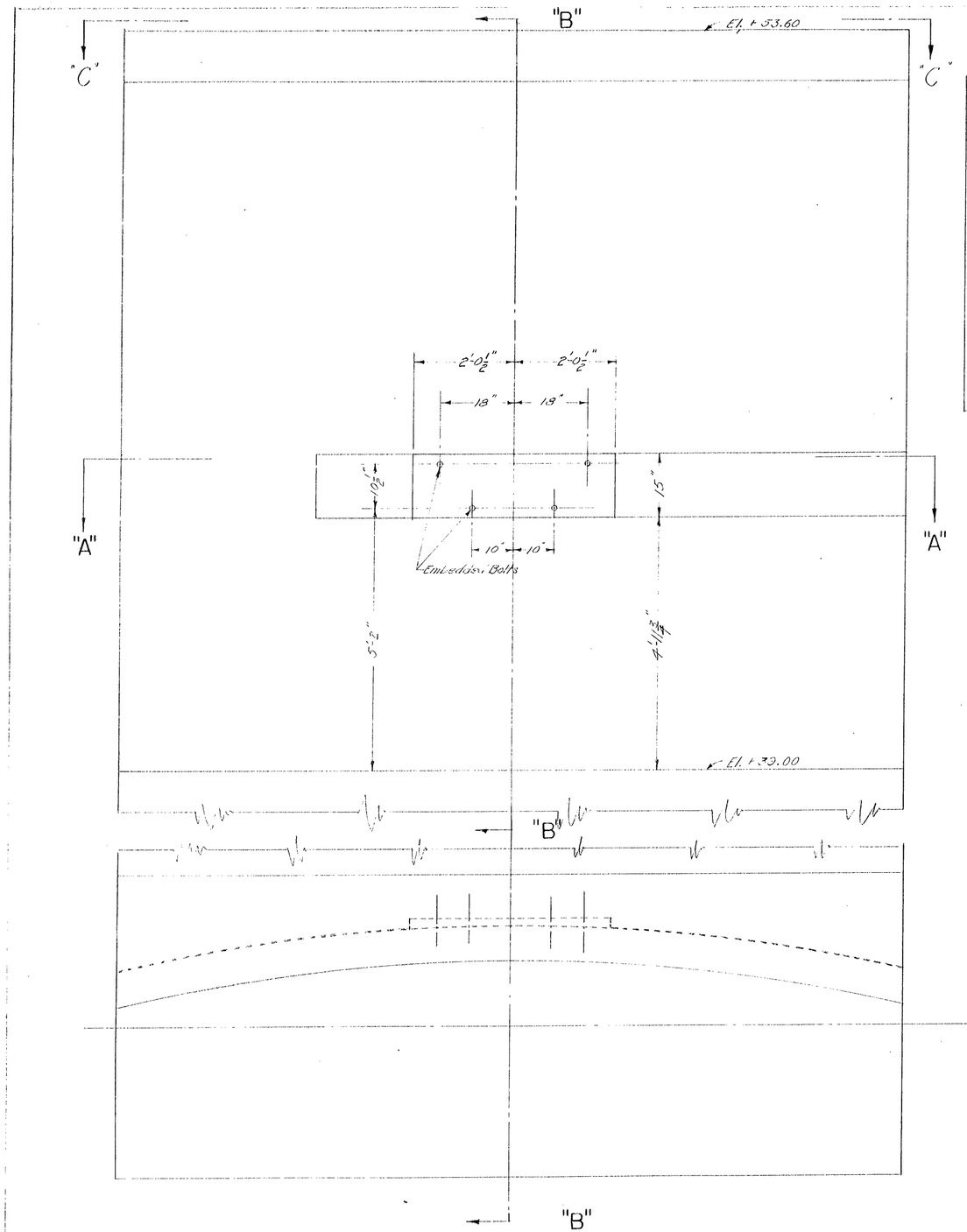
RECOMMENDED HEAD ENGINEER — DRAWN BY PF CASTRO DATE 9-28-34 — TRACED BY PF CASTRO CHECKED BY M.K.C.

NO	REVISION	DATE	BY	APVD

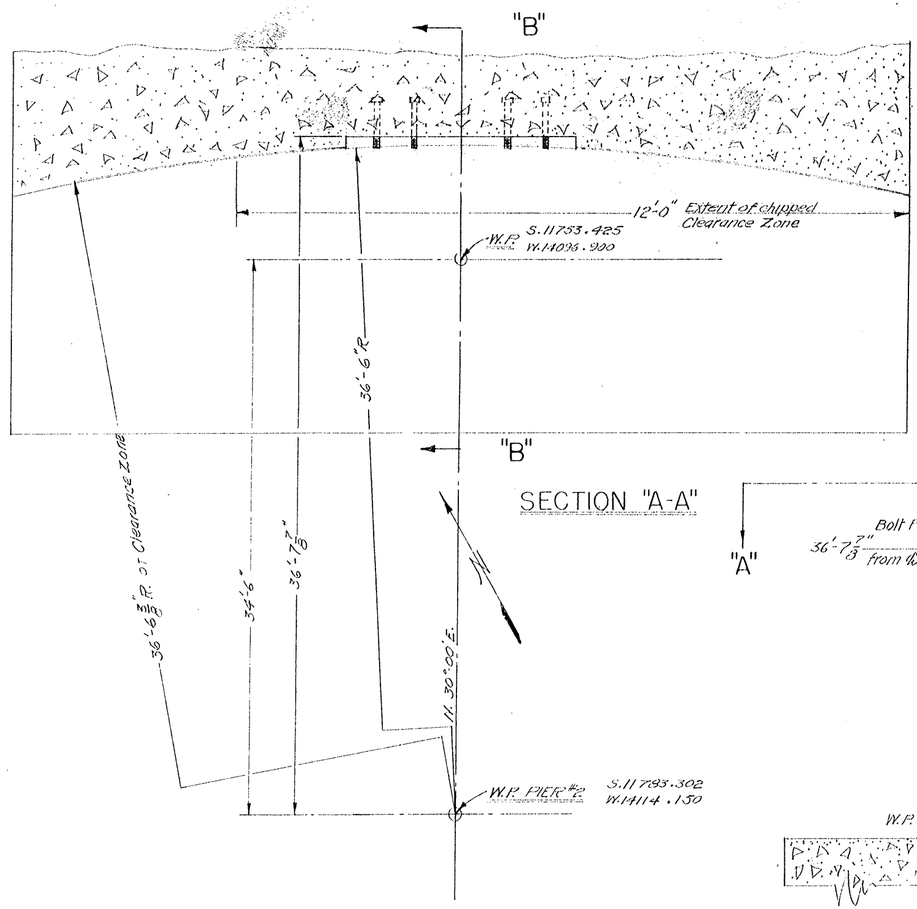
SHEET 2 OF 2 N-1-18

WAR DEPARTMENT

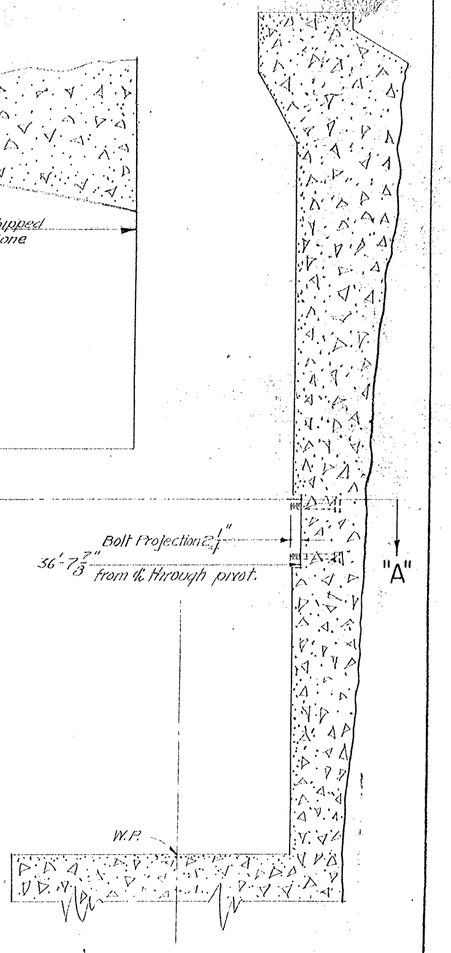
CORPS OF ENGINEERS U.S. ARMY



PLAN VIEW "C-C"



SECTION "A-A"



SECTION "B-B"

General Notes:

To accommodate changes that have been made in the swing span structure of the bridge across the navigation channel, it is required that the latch casting saddle, to be attached to the concave southerly face of Pier #1, be set into a pocket provided in the pier face by chipping, as indicated.

A clearance zone 15" wide, and having a radius of 36'-6⅜" about the axis of rotation of the swing span, is required as shown. Any concrete encroaching upon this zone is to be removed by chipping.

Chipped surfaces are to be grouted for finish.

The embedded bolts affected are to be shortened to the dimensions given herewith, and the fully threaded portion of each of the altered bolts is to be at least 1½" long.

References:

For basic dimensions and co-ordinates of Working Points, see Dwgs. N-1-11 Sheet 8, and N-2-51 Sheet 11.

BONNEVILLE POWER NAVIGATION PROJECT

13TH CONTRACT – CONCRETE

POWER HOUSE SUBSTRUCTURE & NAVIGATION LOCK

SHIP LOCK – SWING BRIDGE

ALTERATIONS TO PIER No. 1

SCALE ¾" = 1'-0"

U. S. ENGINEER OFFICE, PORTLAND, OREGON DISTRICT

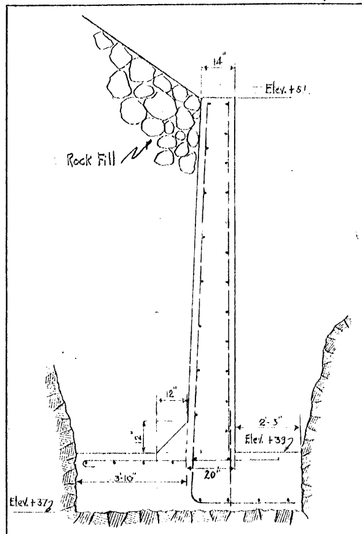
SUBMITTED: R.R. Clarke ENGINEER — APPROVED: Thos. M. Robbins MAJOR, CORPS OF ENGINEERS

RECOMMENDED: [illegible] HEAD ENGINEER — DRAWN BY: H.G.L. DATE 4-3-35 — TRACED BY ..... CHECKED BY .....

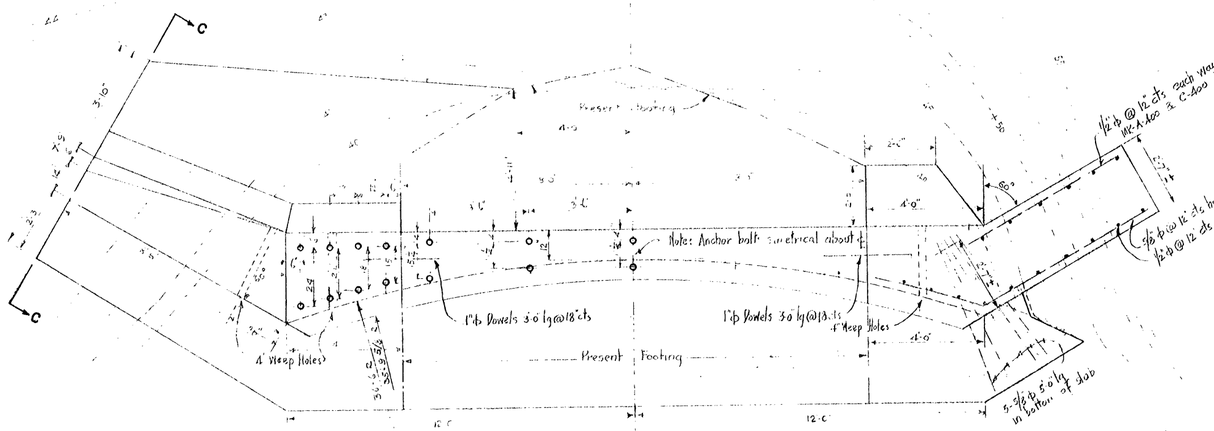
N-1-50

WAR DEPARTMENT

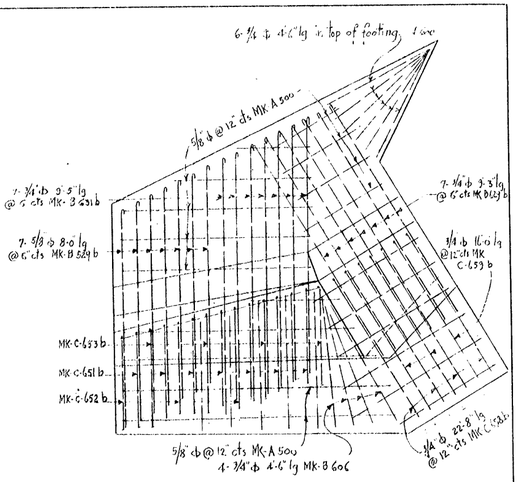
CORPS OF ENGINEERS U. S. ARMY



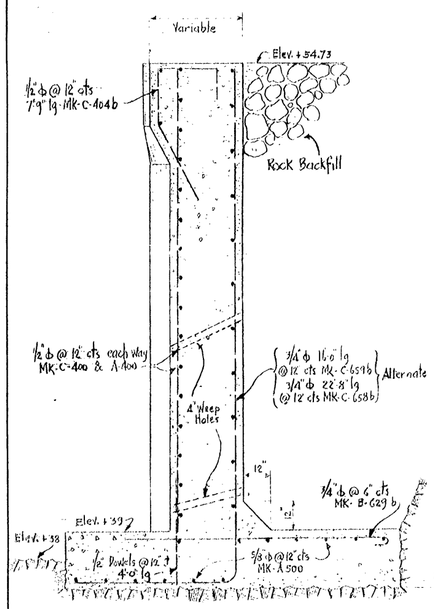
ELEVATION C-C



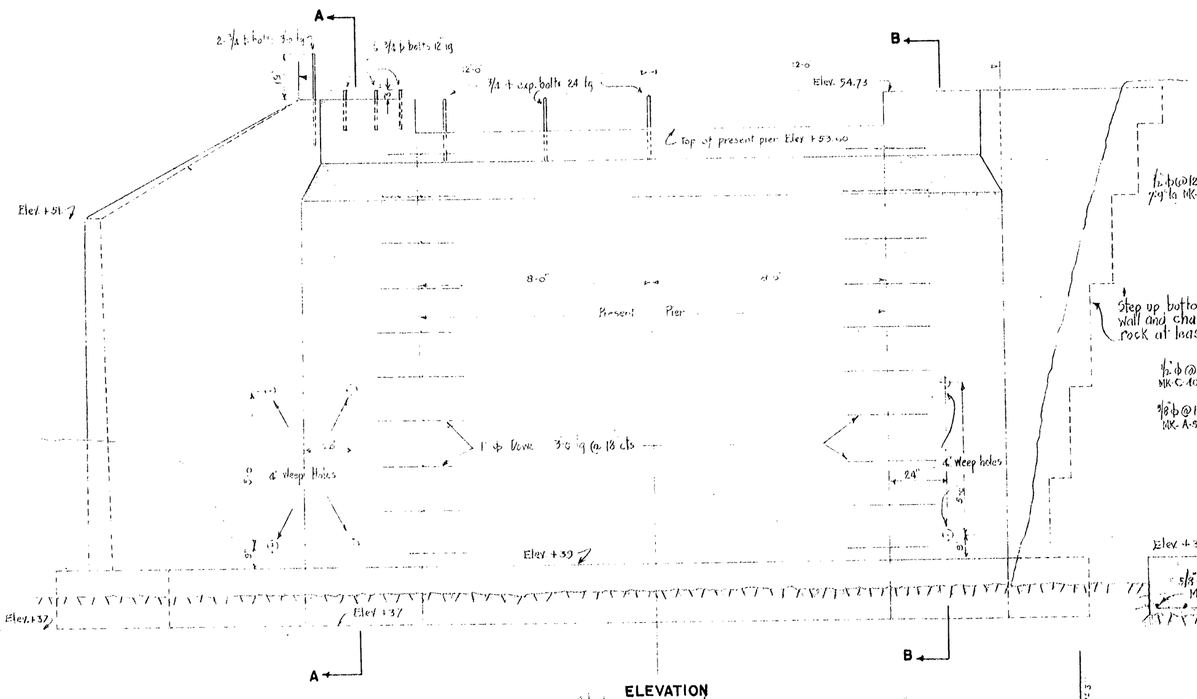
PLAN

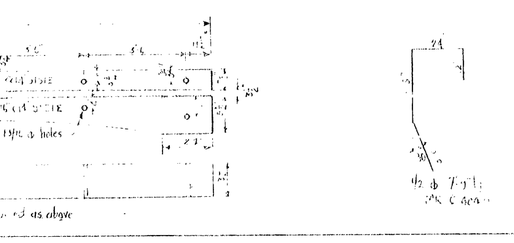


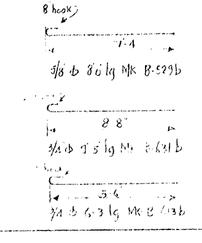
REINFORCING DETAILS-WEST WING WALL

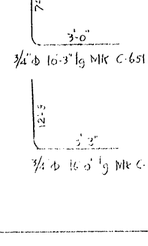


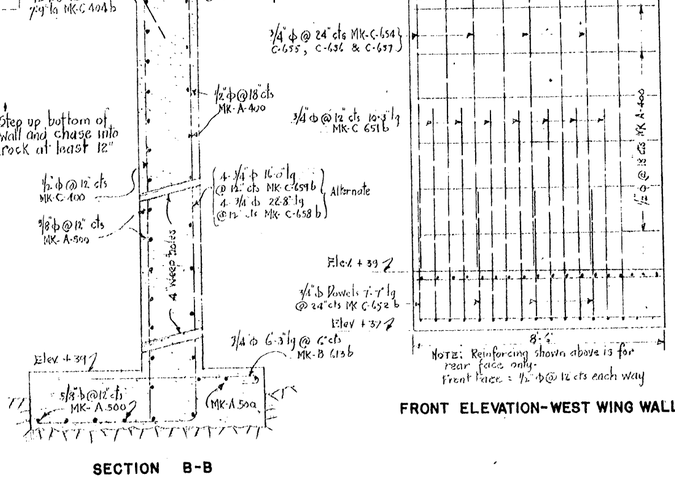
SECTION A-A



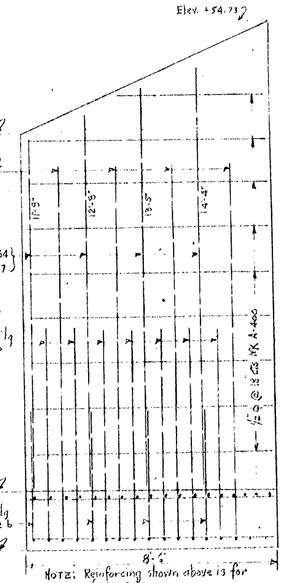








SECTION B-B



FRONT ELEVATION-WEST WING WALL

NOTE: Reinforcing shown above is for rear face only. Front face = 1/2"ϕ @ 12" cts each way

NOTE: ALL CONCRETE TO BE CLASS "A"

BONNEVILLE POWER NAVIGATION PROJECT

13 TH CONTRACT – CONCRETE

POWER HOUSE SUBSTRUCTURE & NAVIGATION LOCK

SHIP LOCK

SWING BRIDGE PIER DETAILS

WING WALL ADDITION TO PIER NO. 1

SCALE: 0 1 2 3 4 FT.

U. S. ENGINEER OFFICE, PORTLAND, OREGON DISTRICT

NO.	REVISION	DATE	BY	APV'D

SUBMITTED R.P. Mackenzie ENGINEER — APPROVED — MAJOR, CORPS OF ENGINEERS

RECOMMENDED — HEAD ENGINEER — DESIGNED BY M.K.C. DATE 4-8-33

DR. BY A.F.&S. TR. BY A.F.&S. CHECKED BY

N-1-51

WAR DEPARTMENT

CORPS OF ENGINEERS U.S. ARMY

KEY MAP

SCALE 0 5 10 MILES

WASHINGTON

OREGON

COLUMBIA RIVER

ASTORIA

LONGVIEW

COWLITZ

SKAMANIA

CLATSOP

COLUMBIA

CLARK

BONNEVILLE DAM

VANCOUVER

CASCADE LOCKS

PORTLAND

MULTNOMAH

FOOD

RIVER

CLACKAMAS

TILLAMOOK

WASHINGTON

SALEM

EAST LINE B.B. BISHOP D.L.C. #39

WEST LINE F.A. SCHAMPEN D.L.C. #108

PRESENT LOCATION SPOKANE PORTLAND & SEATTLE R.R. MAIN LINE

EVERGREEN HIGHWAY

NORTH BONNEVILLE

FORMERLY CASCADE

YARD AND DISPOSAL AREA "B"

RESERVED FOR GATE CONTRACTOR AFTER JULY 1, 1936 AREA "C"

PROPOSED RELOCATION OF SPOKANE PORTLAND & SEATTLE R.R.

TOP OF DIKE EL. +32

SPILLWAY DAM

COLUMBIA RIVER

BOAT ROCK

FRL NORTH

BRADFORD ISLAND

RECEIVING AREA "A"

PRESENT ACCESS ROAD

YARD AND DISPOSAL AREA "A"

LEVEE

Future extension of Power House

Rock Rip Rap
Pervious Material from Cofferdam "A"
Impervious Material from Cofferdam A
(For Section See Sheet 7; P-5-1)

15000 C.Y. Impervious Backfill

15000 C.Y. Rock Rip Rap for Embankment in Stock Pile

COFFERDAM "A"

POWER HOUSE

Bridge in this contract

YARD AREA

LOCK

Intake Valves

SLOUGH

Union Pacific System

BONNEVILLE RESIDENCES UNDER CONSTRUCTION

Permanent Buildings

ENTRANCE ROAD

100' to Columbia River Highway

MATCH LINE FOR INSET

TO PORTLAND

Eagle Creek

PROPOSED UNION PACIFIC RELOCATION

FLOW

BONNEVILLE CAMP AREA No 1

CAPACITY 450 MEN

CAMP AREA 110 3

CAPACITY 650 MEN

CAMP AREA 110 2

CAPACITY 450 MEN

NOTCHLINE

STATE FISH HATCHERY

NO.	REVISION	DATE	BY	APV'D

BONNEVILLE POWER NAVIGATION PROJECT

28TH CONTRACT

BRIDGE ACROSS NAVIGATION CANAL

GENERAL SITE MAP

SCALE IN FEET

0 50 100 200 300 400 500 600

U.S. ENGINEER OFFICE PORTLAND, OREGON

SUBMITTED R.P. Mackenzie

APPROVED

SHEET 1 OF 4 N-2-43

WAR DEPARTMENT

CORPS OF ENGINEERS U.S. ARMY

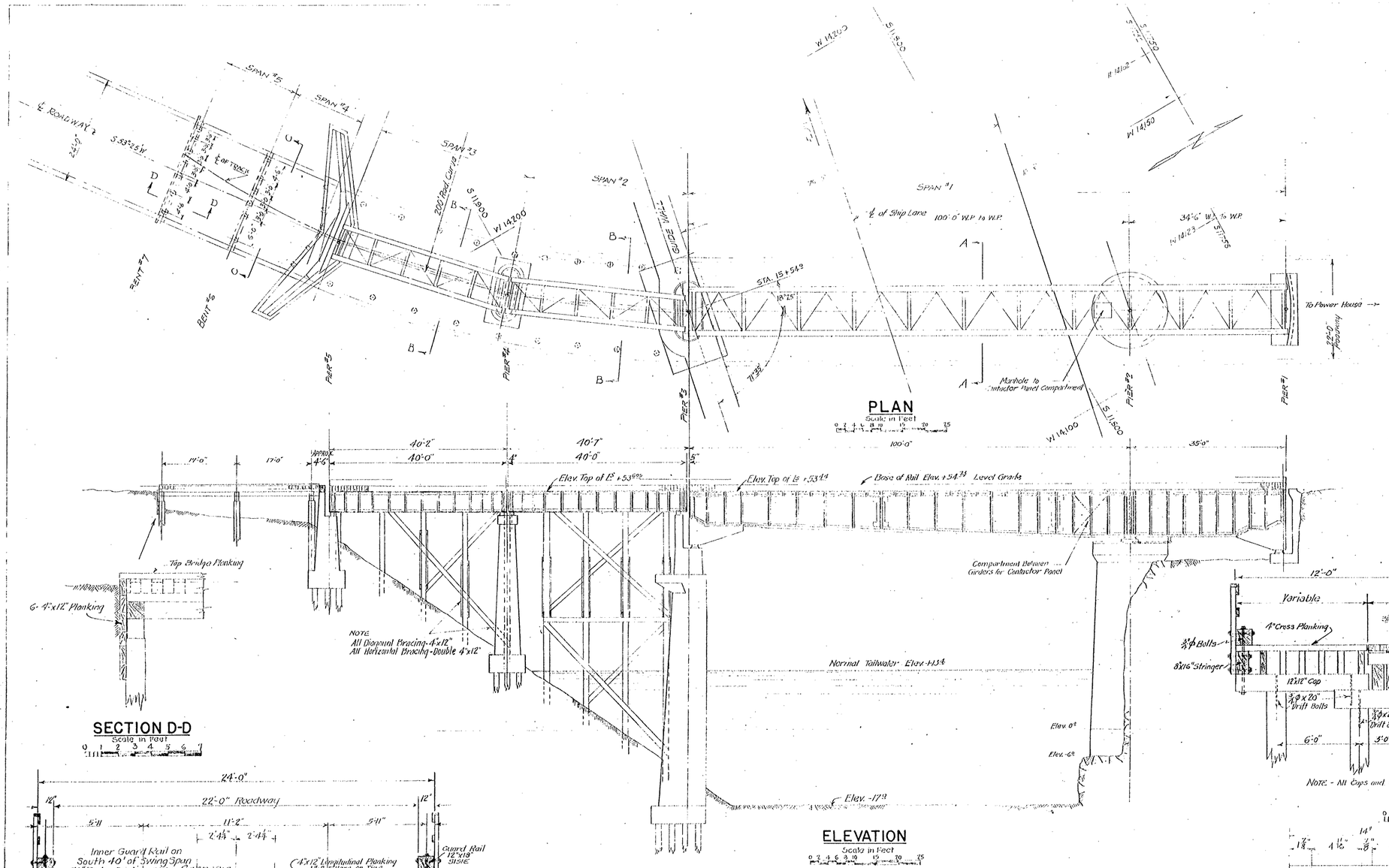
GENERAL NOTES

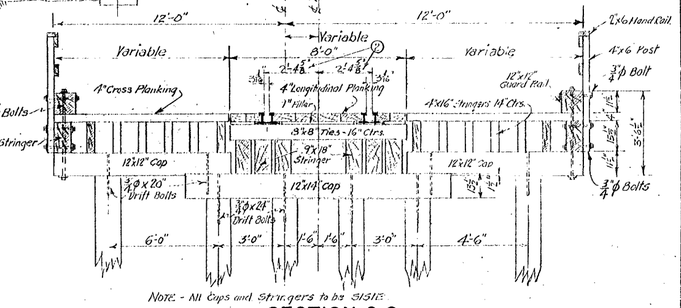
LOADING - 3000# per foot of girder plus 40% Impact

RIVETING - Rivets ⅞" dia. except in Cross Frames and Laterals where ¾" dia. are to be used. All rivet holes for field rivets to be sub-punched and reamed while assembled in shop. All other holes may be punched or drilled full size.

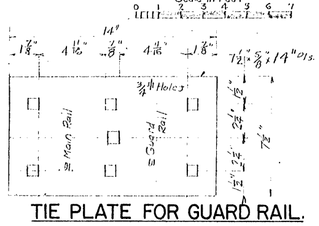
DRIFT BOLTS - Drift bolts for timber not to have heads or points. Holes for drift bolts to be bored ⅛" less in diameter than nominal diameter of bolts.

TIMBER WORK - 3"x18" Stringers to be drift bolted at each end with one ⅝ ϕ x 28" long drift bolt. 4"x16" Stringers to be toe nailed each side at each cap with 60d nails. 2" fills on track ties to be spiked with 20d nails. 4" deck planking to be spiked with one ¼" ϕ x 8" long wire spike at each intermediate stringer and 2 spikes at the ends. Spikes in intermediate stringers to be staggered opposite sides of planks. All bracing to be fastened at ends with ¾" ϕ machine bolts and at intermediate piles with 3 - ¾" ϕ x 8" long square head boat spikes. 2"x6" Rails to be securely fastened with 30d nails.

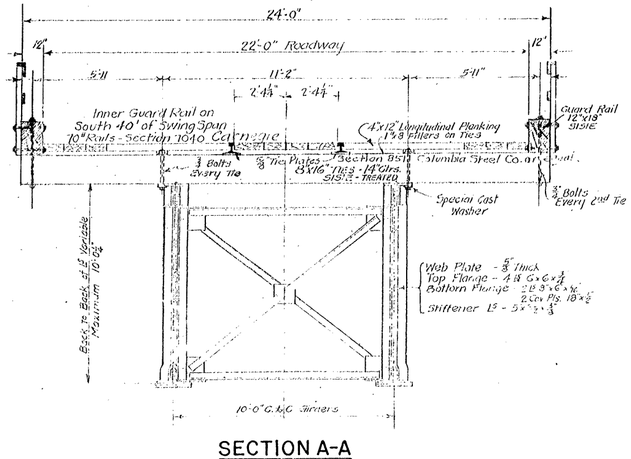




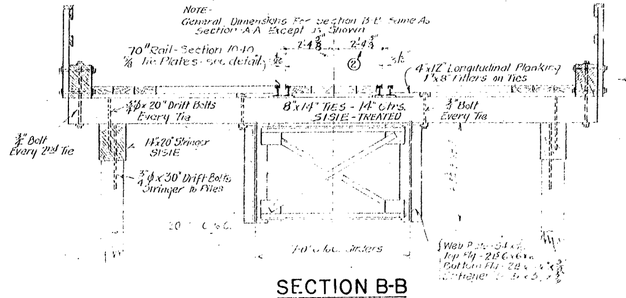
SECTION C-C
Scale in Feet
0 1 2 3 4 5 6



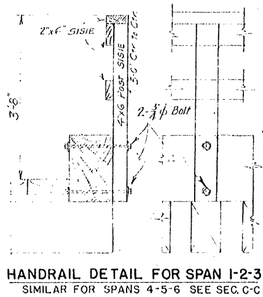
TIE PLATE FOR GUARD RAIL.



SECTION A-A
Scale in Feet
0 1 2 3 4 5 6 7



SECTION B-B
Scale in Feet
0 1 2 3 4 5 6 7



HANDRAIL DETAIL FOR SPAN 1-2-3
SIMILAR FOR SPANS 4-5-6 SEE SEC. C-C

NO.	REVISION	DATE	BY	APV'D
2	Change Radius of Curve	1-16-35	J.M.G.	RCM
1	Spacing of Girders, Width and Thickness of Floor, Section of Girder at Pier #2, Section of Girder at Pier #3, Roadway Width	12-28-34	J.M.G.	RCM

BONNEVILLE POWER NAVIGATION PROJECT
28TH CONTRACT
BRIDGE ACROSS NAVIGATION CANAL

GENERAL LAYOUT

SCALES AS SHOWN

U. S. ENGINEER OFFICE, PORTLAND, OREGON DISTR.

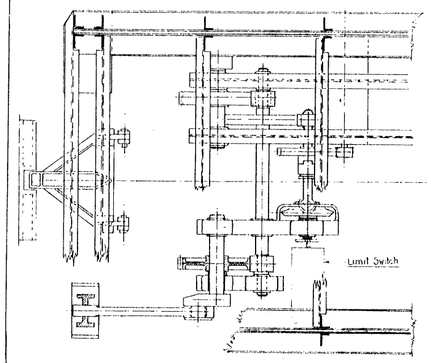
SUBMITTED: R.H. Mackenzie, ENGINEER — APPROVED: Chas. H. Williams, MAJOR, CORPS OF ENGINEERS

RECOMMENDED: [illegible], HEAD ENGINEER

DRAWN BY: R.D. Palmer DATE 12-16-34

TRACED BY: M.V.P. CHECKED BY: [illegible]

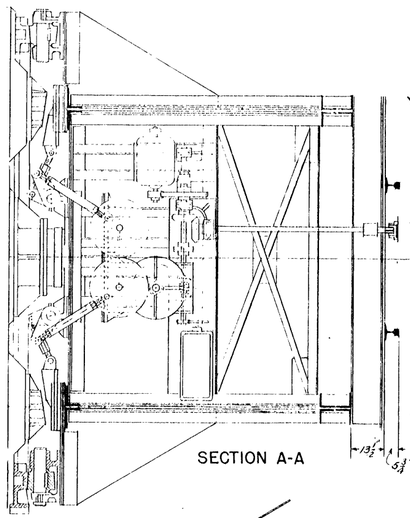
SHEET 2 OF 4 N-2-43



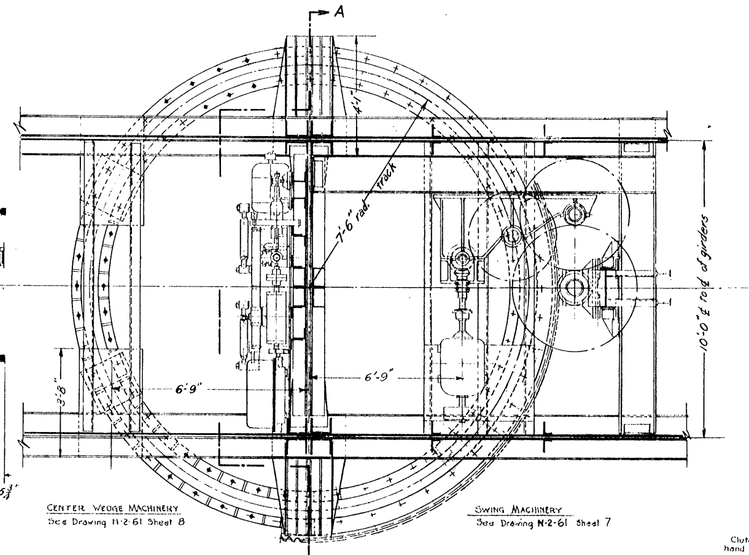
SECTIONAL PLAN

END JACK MACHINERY
See Drawing N-2-61 Sheet 9

CENTERING LATCH
See Drawing N-2-61 Sheet 10



SECTION A-A

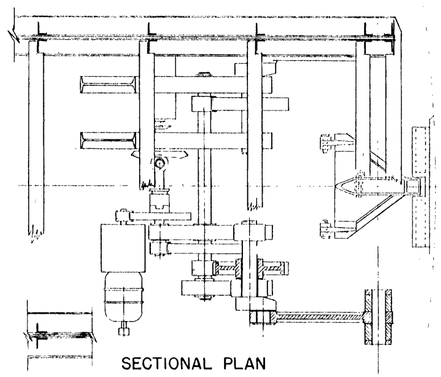


CENTER WEDGE MACHINERY
See Drawing N-2-61 Sheet 8

SWING MACHINERY
See Drawing N-2-61 Sheet 7

PLAN
Scale: ½"=1'-0"

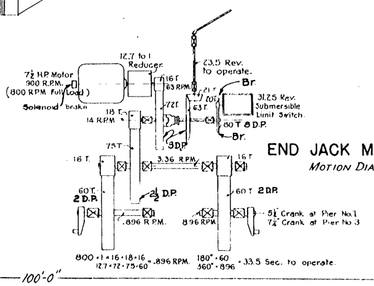
0 1 2 3 4 5 6
Scale in feet



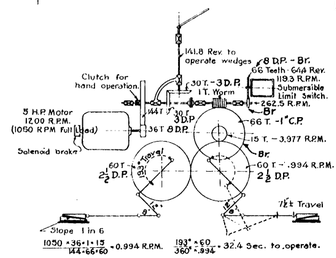
SECTIONAL PLAN

END JACK MACHINERY
See Drawing N-2-61 Sheet 9

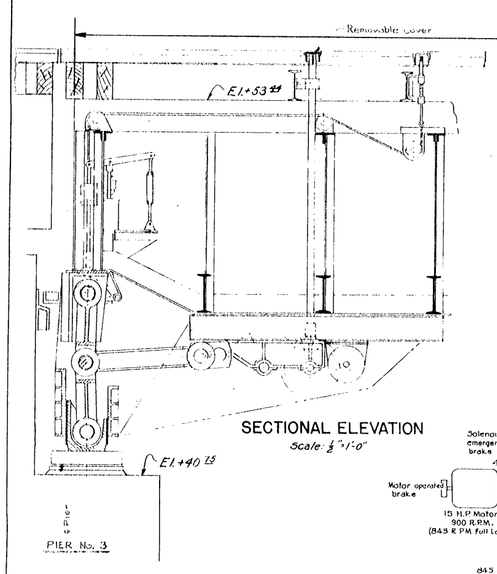
CENTERING LATCH
See Drawing N-2-61 Sheet 10



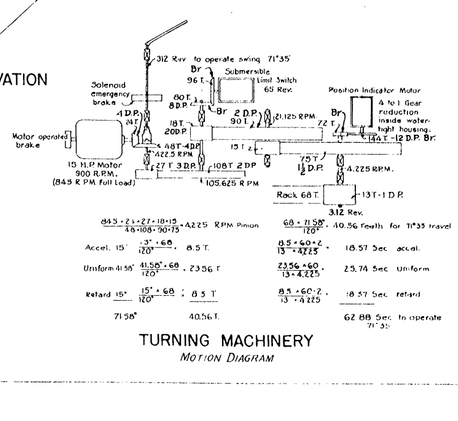
END JACK MACHINERY
MOTION DIAGRAM



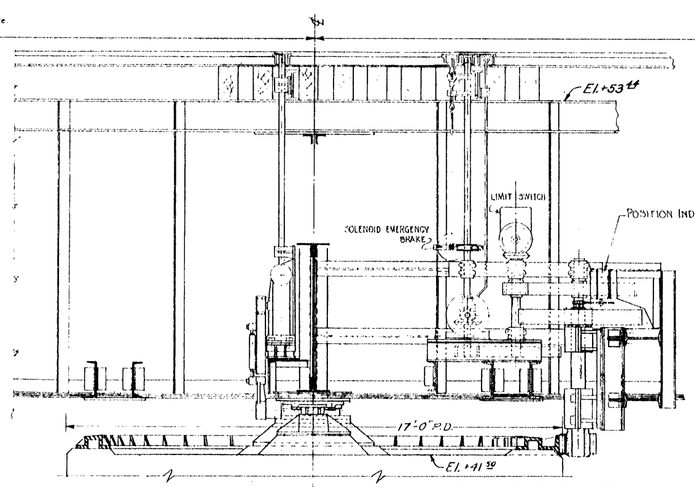
CENTER WEDGE MACHINERY
MOTION DIAGRAM



SECTIONAL ELEVATION
Scale: ½"=1'-0"

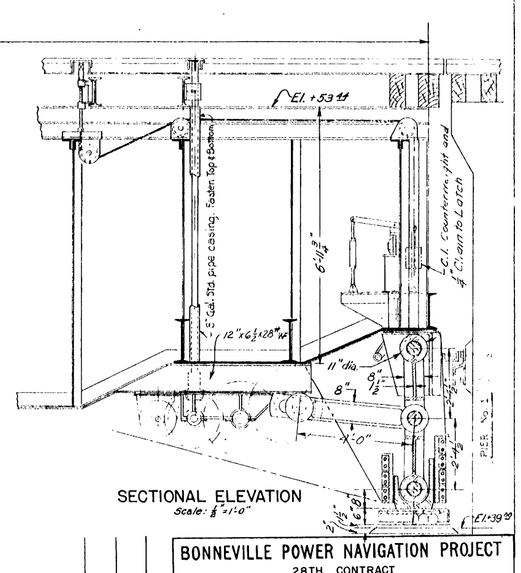


TURNING MACHINERY
MOTION DIAGRAM



SECTIONAL ELEVATION
Scale: ½"=1'-0"

SECTION THRU ℄ OF CENTER BEARING
Scale: ¾"=1'-0"



SECTIONAL ELEVATION
Scale: ½"=1'-0"

NO	REVISION	DATE	BY	APP'D

BONNEVILLE POWER NAVIGATION PROJECT
28TH CONTRACT
BRIDGE ACROSS NAVIGATION CANAL
GENERAL ARRANGEMENT OF MACHINERY
SCALE ½" = 1 FOOT
U. S. ENGINEER OFFICE PORTLAND, OREGON DISTRICT

SUBMITTED: R. R. Mackenzie, ENGINEER
APPROVED: [illegible], MAJOR, CORPS OF ENGINEERS
RECOMMENDED: [illegible], HEAD ENGINEER
DRAWN BY: Dikarp Leonard — DATE: 15/10-36
TRACED BY: DJDL — CHECKED BY: [illegible]

Note: These conduits terminate at end of Pier No. 3 & shall be capped

2-1½" Conduits to Guard Gate
1-1" Conduit to Sign
1-1" Conduit to Lighting
Terminal Box
5-3" Conduits reduced to 2"
1-2" Conduit
from Pier No. 3
30A 250V Plug Receptal

DIAGRAM OF CONDUITS FROM PIER No. 3

NO SCALE

Crouse-Hinds Sondulet Type ? or equal
Mating Boxes or equal
3" Conduits

5-3 Conduits from Pier No. 2

COMPARTMENT FOR CONTACTOR PANELS

SWING MOTOR EQUIPMENT
1½" RES.
2" LIMIT SW.
¾" SOL. BRK.
1" POS. IND.
1½" MOT. ROT.
1½" MOT. STAT.
¾" MOT. OP. BRK.

Spares: Cap ends of conduits 1½"

To End-Lock Equipment 2" 1½" ¾"

To End-Latch Equipment ¾" 1"

JACK
2" LIMIT SW.
1½" MOTOR
¾" BRK.

LATCH
¾" MOTOR
1" AUX. SW.

WEDGE
¾" BRK.
1" MOTOR
2" LIMIT SW.

30A 250V Plug Receptle. 1"
1" 30A 250V Plug Receptle.
1" 30A 440V Plug Receptle.

5-3" Conduits from Pier No. 2

1½" Spares Cap ends of conduits

Note: Contractor to check size of all conduits against size of fittings supplied by Intrs.

Note: All conduits to motor on gate shall be furnished with Crouse-Hinds ? Fig or equal seals ? each.

DIAGRAM OF CONDUITS FROM PIER No. 2

NO SCALE

ESTIMATED CONDUIT QUANTITIES	
SIZE	TOTAL LENGTH
½"	400'
1"	600'
1½"	200'
2"	200'
3"	120'

N

Crouse-Hinds Sondulet FSX3 or equal
Terminal Box
Navigation Light
Navigation Light
Pier No. 5
Pier No. 4
Crouse-Hinds Sondulet FSX3 or equal
Pier No. 3
Crouse-Hinds Sondulet FSX3 or equal
Pier No. 2
FST3 or equal
Contactor panels

BRIDGE LIGHTING CONDUIT DIAGRAM

NO SCALE

Note: All Light Standards & Luminaires will be furnished by U.S. Government & installed by Contractor.

24" Terminal Blocks
18"
(2) (4) (6) (7)
(1) (3) (5)
Spare To be capped

VIEW A-A OF TERMINAL BOX

24"x18"x10" Watertight Terminal Box of #14 ga. Sheet Steel mounted on side of bridge girder

Swing span
Fixed Span
℄ Bridge Pier #2
5-3" Conduits in top of Pier No. 3 reduced to 2"
1-2" Conduit in top of Pier No. 3
1-1" Conduit in top of Pier No. 3
1" Conduit to Guard Gate
1" Conduit to Sign and Lighting

DIAGRAM OF CONDUIT IN PIER No. 3 ENTERING TERMINAL BOX ON BRIDGE

NO SCALE

Conduit to Sign near Pier No. 5 shall be buried 2' in ground

2" Pipe
Sta. flange steel (companion) flange not drilled

DRAIN DETAIL

NO SCALE

℄ Bridge
Conduits to Panels
1" well Pipe
4'-0" 4'-0" 4'-6"
12'-8 3/16"

SECTION B-B

Deck of Span
℄ Bridge Pier #2
Lift Cover
Removable Section
Ties
℄ Bridge
A
A

PLAN OF MANHOLE

Removable Section
This section shall be constructed of [illegible] steel
3'-0" Square Removable block (Cover) Lift Cover
Ladder
24" Sq.
Ceiling Plate
Filler blocks for bearing for removable section
3'-0" Removable Section bolted to ceiling plate
Wall plate
Wall plate
Ladder
Weld
Drain plug
Floor Plate
Field weld
Shop weld
6'-9"
A
B
B

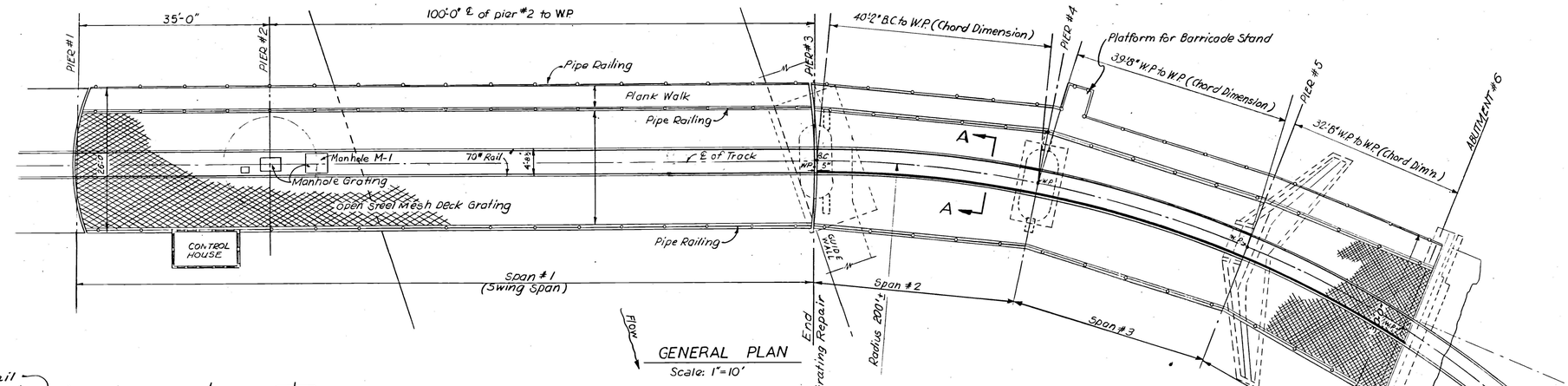
SECTION A-A

COMPARTMENT FOR CONTACTOR PANELS

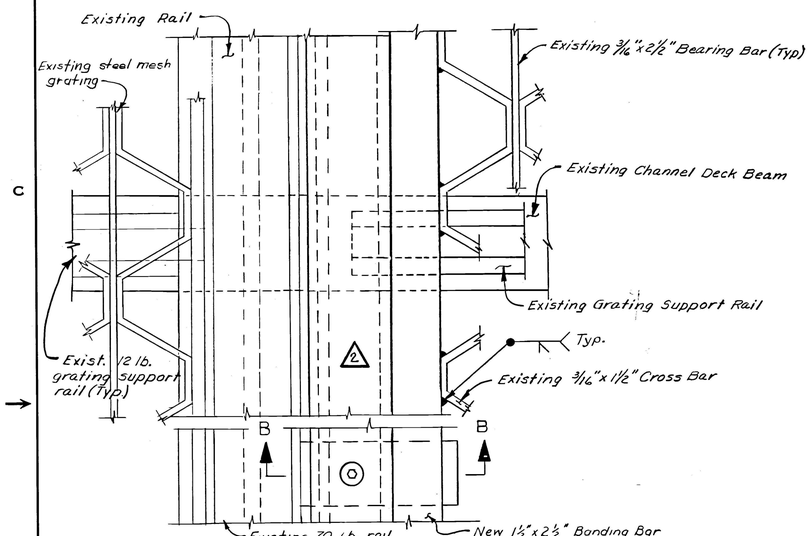
SCALE IN FEET

NO.	REVISION	DATE	BY	APV'D

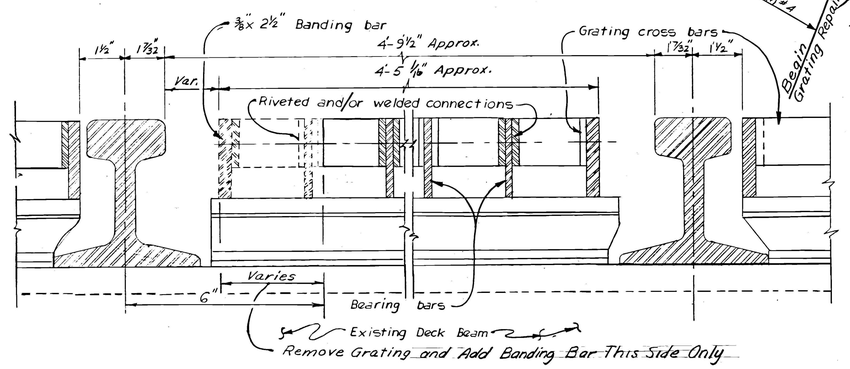
BONNEVILLE POWER NAVIGATION PROJECT
28TH CONTRACT
BRIDGE ACROSS NAVIGATION CANAL
ELECTRICAL DETAILS & CONDUIT DIAGRAMS
SCALES AS SHOWN
U.S. ENGINEER OFFICE, PORTLAND, OREGON DISTRICT
SUBMITTED: R.L. Mackenzie ENGINEER
APPROVED: [illegible] MAJOR, CORPS OF ENGINEERS
RECOMMENDED: [illegible] HEAD ENGINEER
DRAWN BY: [illegible] DATE [illegible]
TRACED BY JMG CHECKED BY [illegible]



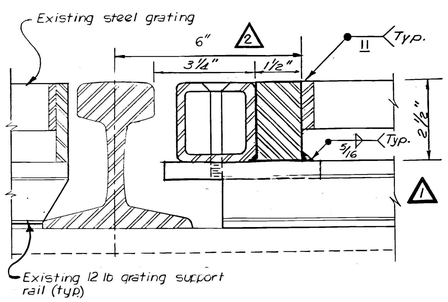
GENERAL PLAN
Scale: 1"=10'



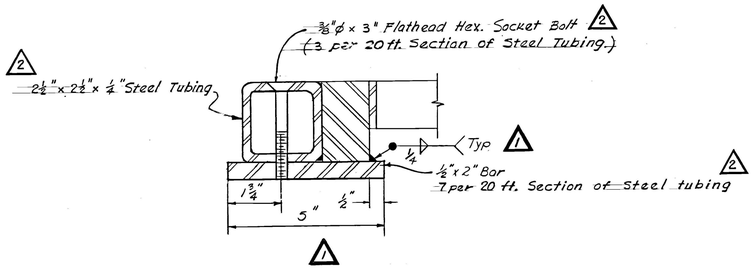
PLAN
Scale 6"=1'-0"



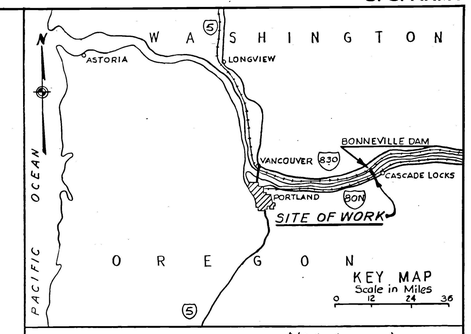
SECTION A-A
EXISTING STEEL GRATING & RAILS
Scale: 6"=1'-0"

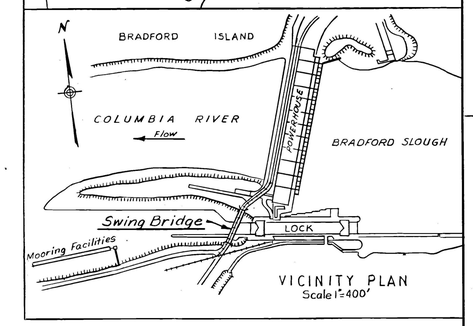


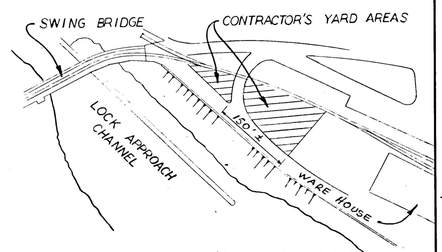
TYPICAL SECTION
Scale 6"=1'-0"



SECTION B-B
Scale: 6"=1'-0"







CONTRACTOR'S YARD AREAS
NOT TO SCALE

NOTES:

1. Open joints in new bonding bar shall be ⅜-inch at piers #4 and #5. Butt joints near mid-span shall be seal welded.
2. Steel Tubing in flangeway shall be installed and removed for each use of railroad track.

AS CONSTRUCTED
~~CONTRACT No.~~ HIRED LABOR
~~CONTRACTOR~~
~~DATE OF RECEIPT OF NOTICE TO PROCEED~~
~~DATE OF COMPLETION OF CONTRACT~~
~~DATE OF ACCEPTANCE~~

REVISION	DATE	DESCRIPTION	BY
2		As Constructed	
1	70 Oct 12	Revised weld size, corrected dimension.	Neal

U. S. ARMY ENGINEER DISTRICT, PORTLAND

DESIGNED: S.V.H
DRAWN: WPP-DAC
CHECKED: WRG
PREPARED: W.R. Graybill

BONNEVILLE DAM PROJECT
COLUMBIA RIVER OREGON-WASHINGTON

SWING BRIDGE RECONSTRUCTION

GRATING REPAIR

SUPERVISED: Ralph T. Millican, CHIEF, STRUCTURES SECTION
SUBMITTED: Harold A. Kirby, CHIEF, DESIGN BRANCH
RECOMMENDED: CHIEF, ENGINEERING DIVISION

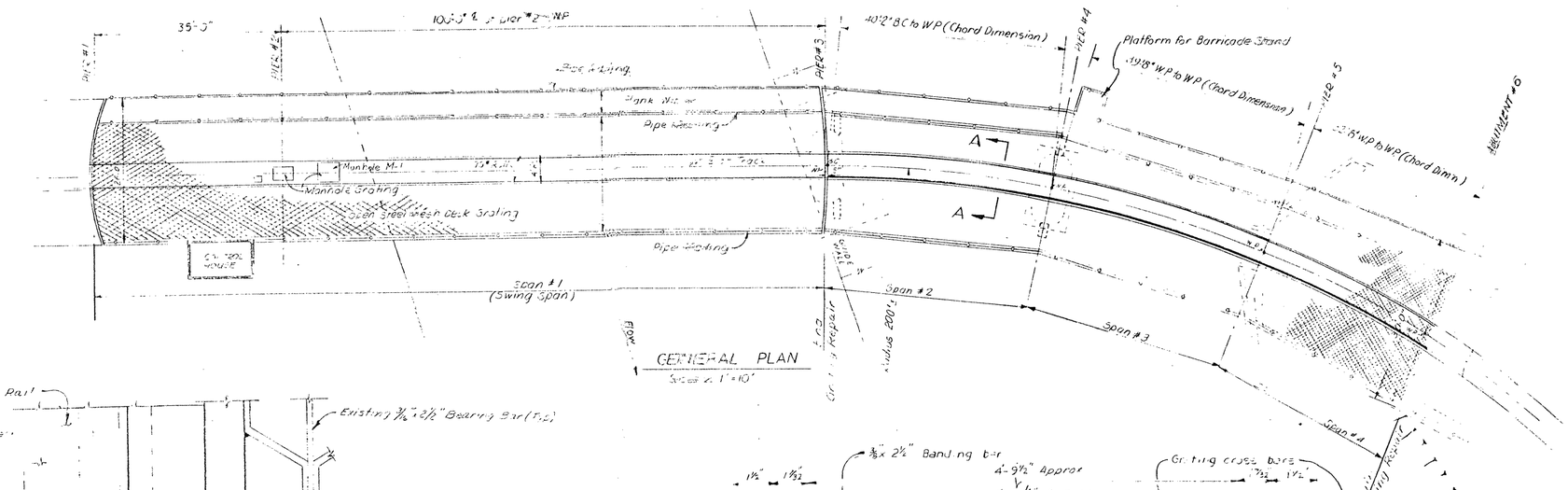
APPROVED: DATE 20 OCT 70
Paul D. Trimble, COLONEL, C. E., DISTRICT ENGINEER

SCALE AS SHOWN SPEC. NO.

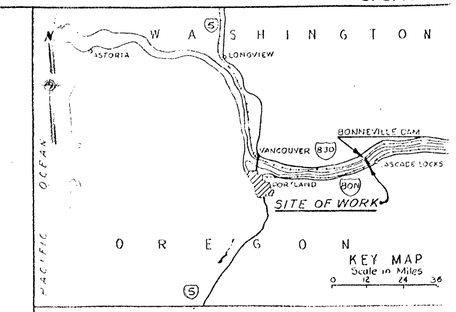
SHEET 1 OF 1 N-2-43A1

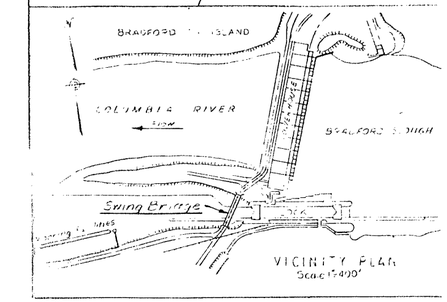
ARMY – 9-8-68 STATIONERY & PRINTING DIV., PORTLAND, ORE.

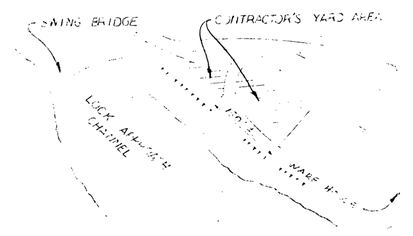
CORPS OF ENGINEERS 4 VALUE ENGINEERING WILL INCREASE YOUR PROFITS 1 U. S. ARMY



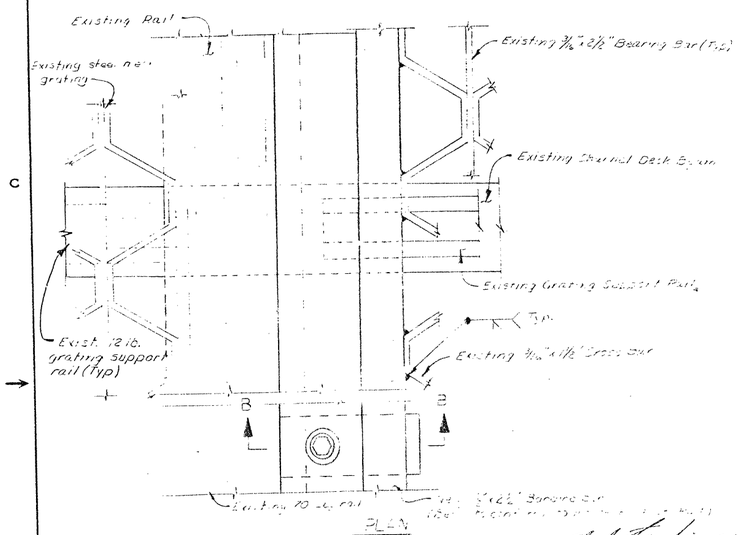
GENERAL PLAN
Scale: 1" = 10'



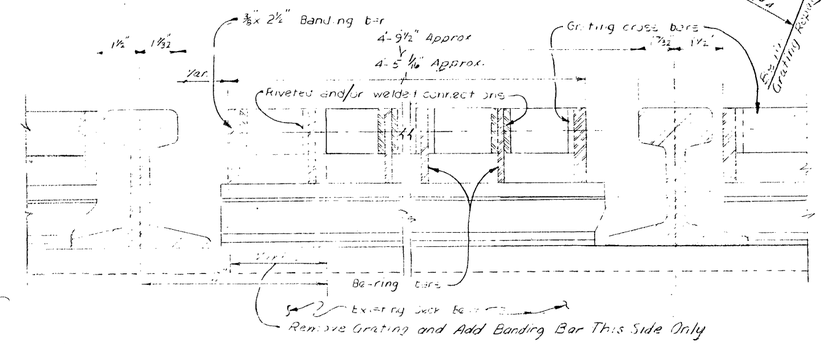




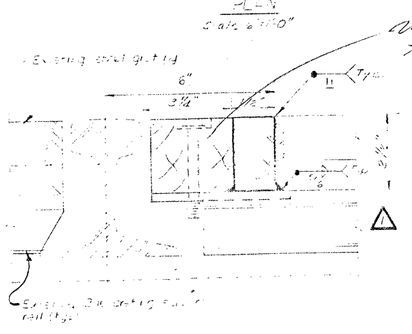
CONTRACTOR'S YARD AREA
NOT TO SCALE



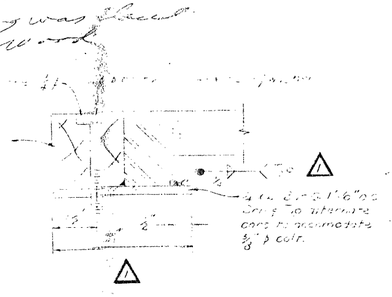
PLAN
Scale: 3/4" = 1'-0"



SECTION A-A
EXISTING STEEL GRATING & RAILS
Scale: 3"=1'-0"



TYPICAL SECTION
Scale: 6"=1'-0"



SECTION B-B
Scale 6"=1'-0"

REVISION	DATE	DESCRIPTION	BY

U. S. ARMY ENGINEER DISTRICT, PORTLAND

DESIGNED: [illegible]
DRAWN: [illegible]
CHECKED:
PREPARED: W. R. Grayvil
SUPERVISED: Ralph K. McKinnon, CHIEF STRUCTURES SECTION
SUBMITTED: Harold A. Kirby, CHIEF DESIGN BRANCH
RECOMMENDED: CHIEF ENGINEERING DIVISION

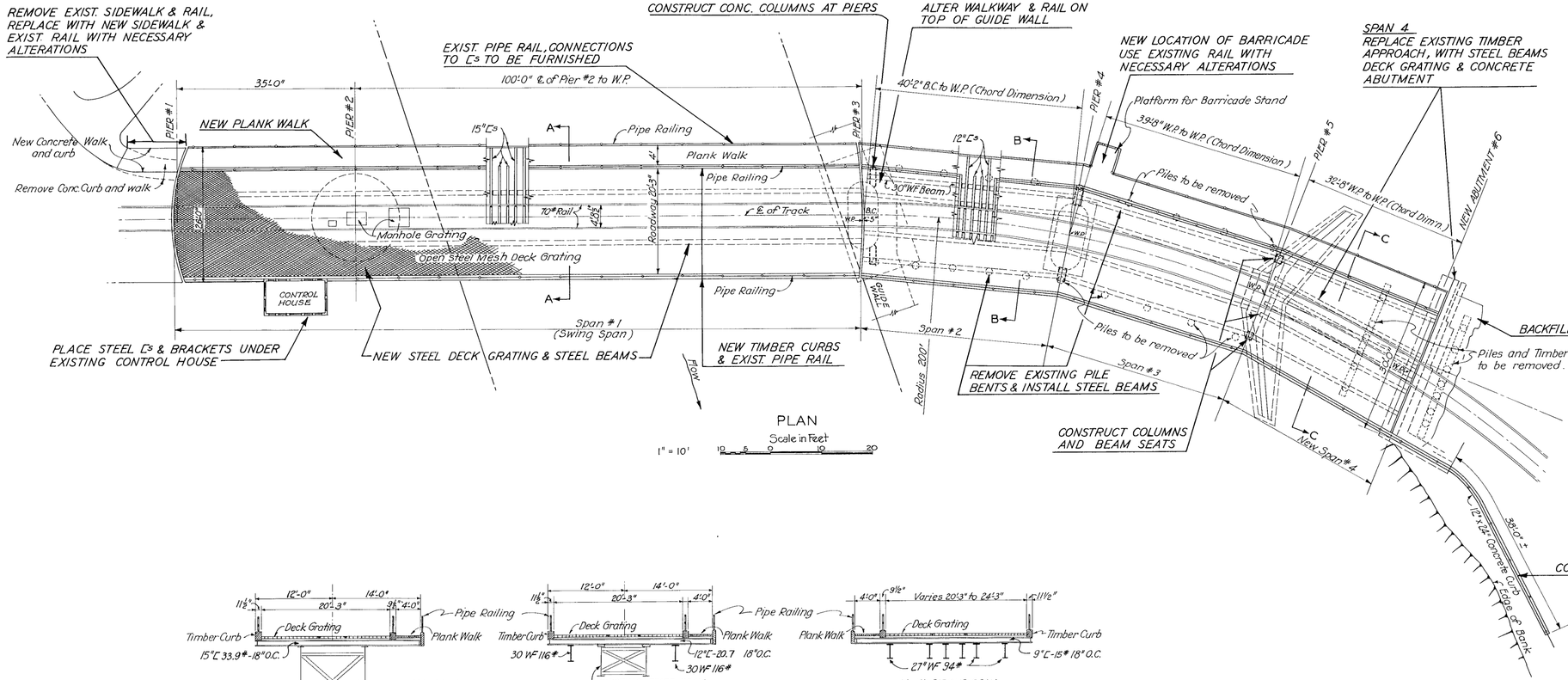
BONNEVILLE DAM PROJECT
COLUMBIA RIVER OREGON - WASHINGTON
SWING BRIDGE RECONSTRUCTION
GRATING REPAIR

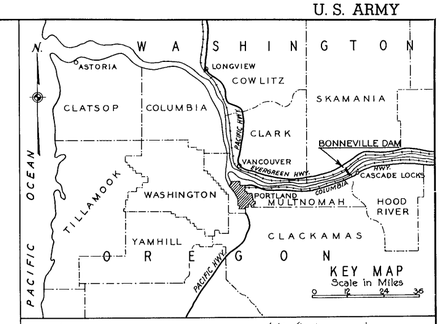
APPROVED: Earl D. Price, COLONEL, C. E., DISTRICT ENGINEER
DATE: 29 OCT 57
SCALE AS SHOWN SPEC. NO.
SHEET 1 OF 1
N-2-43A1

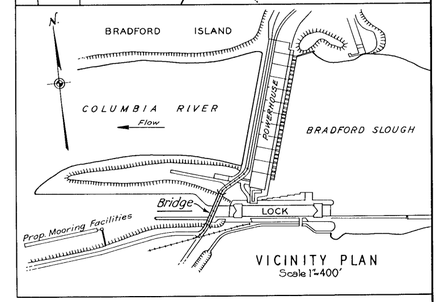
ARMY - KILGUS BLUEPRINT & DRAFTING SUPPLIES, PORTLAND, ORE.

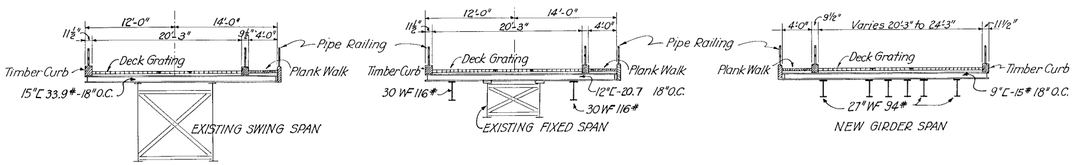
CORPS OF ENGINEERS

U. S. ARMY



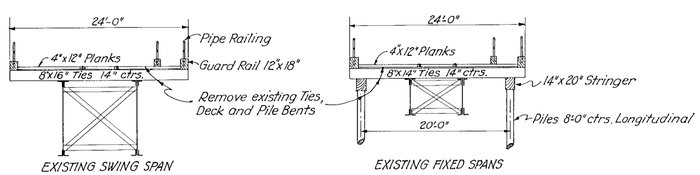






SECTION A-A SECTION B-B SECTION C-C

TYPICAL SECTIONS OF PROPOSED CONSTRUCTION



TYPICAL SECTIONS OF BRIDGE DECK ORIGINAL CONSTRUCTION

Scale in Feet

1/8" = 1'-0"

NOTE:
For original construction refer to reference Dwgs. Sheet 2 of N-B-43 and Sheet 8 of N-1-11. Since construction, minor changes have been made during maintenance. The extent of these changes are to be determined in the field by the contractor.

FOR INFORMATION ONLY

THIS PRINT REDUCED TO ONE-HALF SCALE

REVISION	DATE	DESCRIPTION	BY

CORPS OF ENGINEERS, U. S. ARMY
OFFICE OF THE DISTRICT ENGINEER, PORTLAND, OREGON

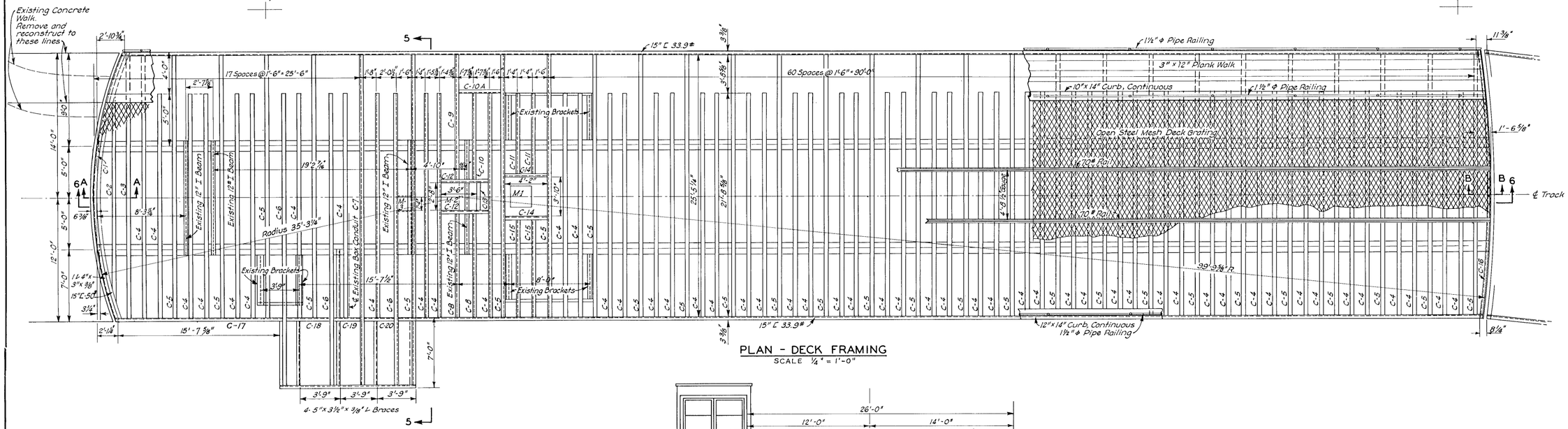
BONNEVILLE DAM PROJECT
COLUMBIA RIVER OREGON-WASHINGTON

SWING BRIDGE

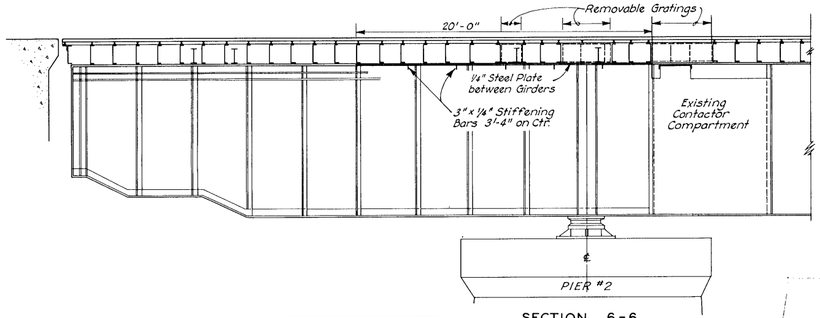
GENERAL PLAN

DRAWN BY R.M.H.
TRACED BY C.A.S.
CHECKED BY D.W.S.
PREPARED: Index Surveyance Design Section
SUBMITTED: Head, Design Branch
RECOMMENDED: Chief, Engineering Division — For H.E. Hickerson
REVIEWED BY Head, Safety Branch — For
APPROVED: Colonel, C.E. District Engineer
DATE 1-26-72
SCALE AS SHOWN
SPEC. NO.
SHEET 1 OF 6 N-2-43A

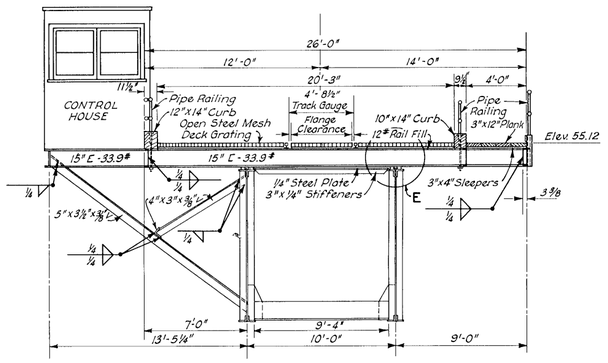
Paint New Lock Swing Bridge Bid No. 76-B-0031
C-5966



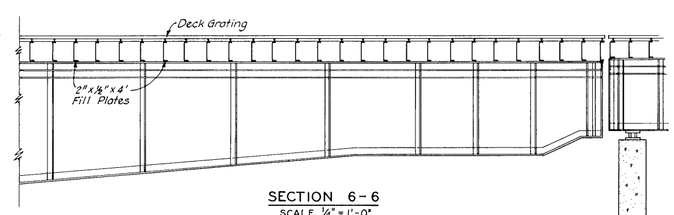
PLAN - DECK FRAMING
SCALE ¼" = 1'-0"



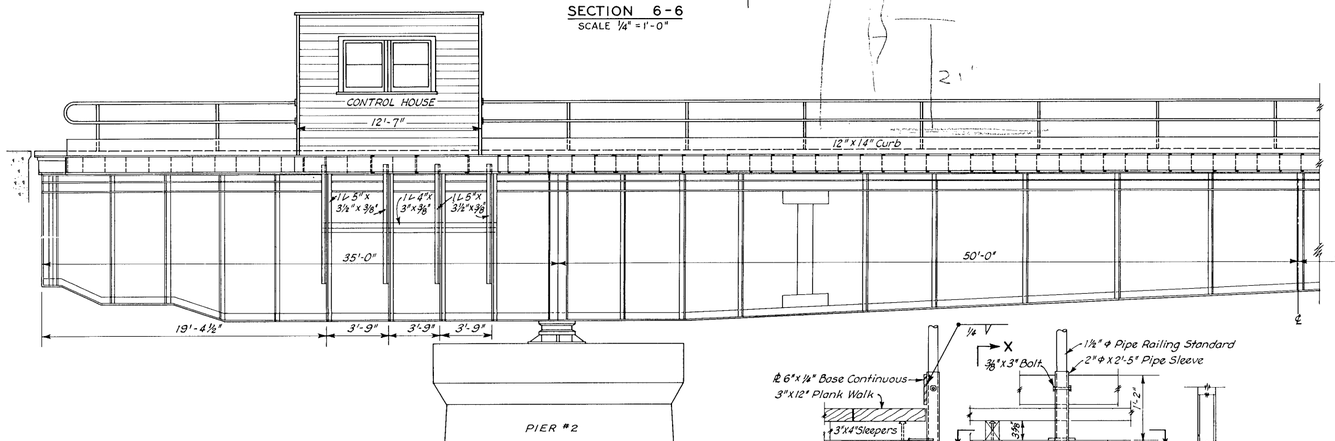
SECTION 6-6
SCALE ¼" = 1'-0"



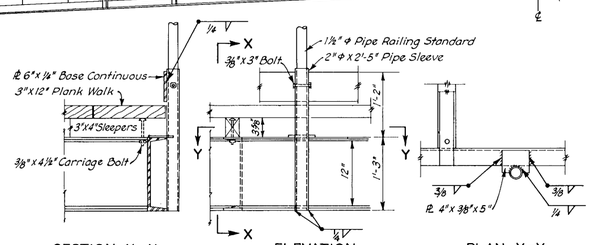
SECTION 5-5
SCALE ¼" = 1'-0"



SECTION 6-6
SCALE ¼" = 1'-0"

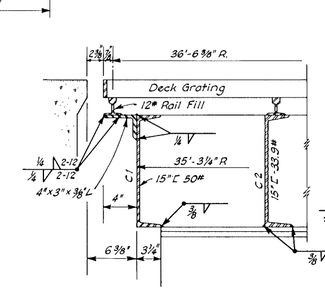


ELEVATION (WEST SIDE)
SCALE ¼" = 1'-0"

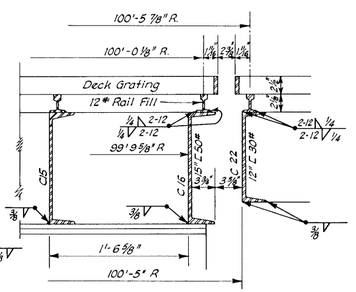


SECTION X-X | ELEVATION | PLAN Y-Y

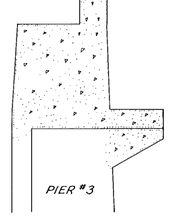
DETAIL OF RAILING SUPPORT ON OUTSIDE OF WALK
SCALE 1" = 1'-0"

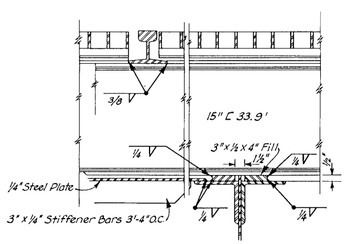


DETAIL SECTION A-A
SCALE 1½" = 1'-0"



DETAIL SECTION B-B
SCALE 1½" = 1'-0"





DETAIL E
SCALE 1½" = 1'-0"

GRAPHIC SCALES
¼" = 1'-0"
1" = 1'-0"
1½" = 1'-0"

THIS PRINT REDUCED TO ONE-HALF SCALE.

FOR INFORMATION ONLY

REVISION	DATE	DESCRIPTION	BY

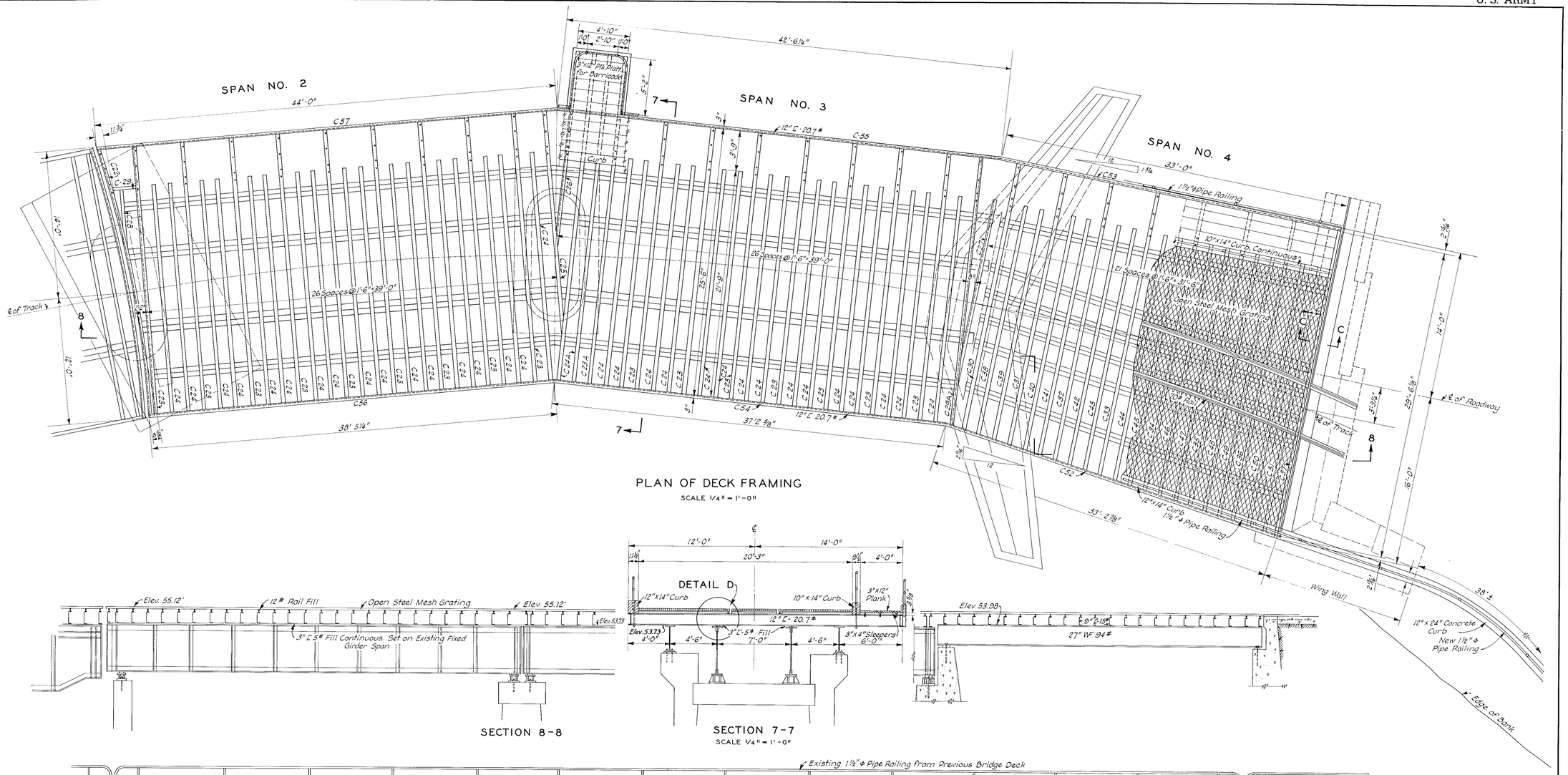
CORPS OF ENGINEERS, U. S. ARMY
OFFICE OF THE DISTRICT ENGINEER, PORTLAND, OREGON

BONNEVILLE DAM PROJECT
COLUMBIA RIVER OREGON-WASHINGTON

SWING BRIDGE

SWING SPAN (Span No. 1)

DRAWN BY R.M.H.
TRACED BY M.F.B.
CHECKED BY D.W.S.
PREPARED: H.W. Lundak, HEAD, STRUCTURES DESIGN SECTION
SUBMITTED: P.B. Lent, HEAD, DESIGN BRANCH
RECOMMENDED: Francis S. Munro, For: R.H. Heaston, CHIEF, ENGINEERING DIVISION
REVIEWED BY: For: C.A. Stanton, HEAD, SAFETY BRANCH
APPROVED: W.A. Ellerget, COLONEL, C.E. DISTRICT ENGINEER
DATE: 1-20-50
SCALE AS SHOWN
SPEC. NO.
SHEET 2 OF 6 N-2-43A



THIS PRINT REDUCED TO ONE-HALF SCALE

GRAPHIC SCALES
1/4" = 1'-0" 5 0 5 10 15 FT.
1 1/2" = 1'-0" 1 0 1 2 FT.

FOR INFORMATION ONLY

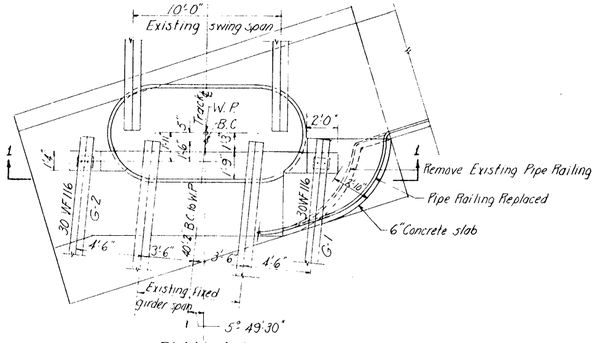
REVISION	DATE	DESCRIPTION	BY

CORPS OF ENGINEERS, U. S. ARMY
OFFICE OF THE DISTRICT ENGINEER, PORTLAND, OREGON

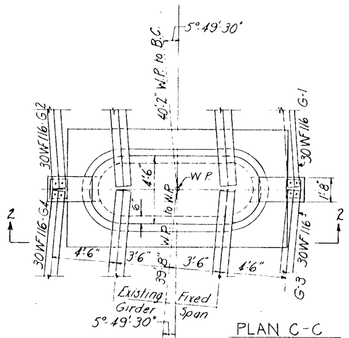
DRAWN BY A.M.H.
TRACED BY M.F.B.
CHECKED BY D.W.S.
PREPARED: A. M. Hunt, Jr.
HEAD, STRUCTURES DESIGN SECTION
SUBMITTED: R. Holmes
HEAD, OREGON BRANCH
RECOMMENDED: Samuel Mann For R.E. Hanson
CHIEF, ENGINEERING DIVISION
REVIEWED BY: For E. A. Starcevich
HEAD, SAFETY BRANCH
APPROVED: O.A. Seaberg DATE:
COLONEL, C. E. DISTRICT ENGINEER

BONNEVILLE DAM PROJECT
COLUMBIA RIVER OREGON - WASHINGTON
SWING BRIDGE
FIXED SPANS (Spans 2, 3 & 4)

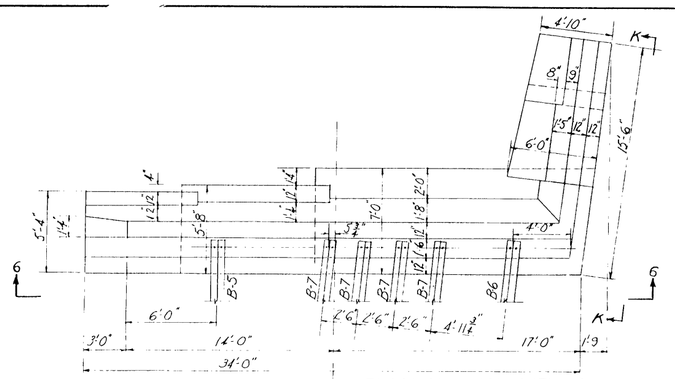
SCALE AS SHOWN SPEC. NO.
SHEET 3 OF 6 N-2-43A



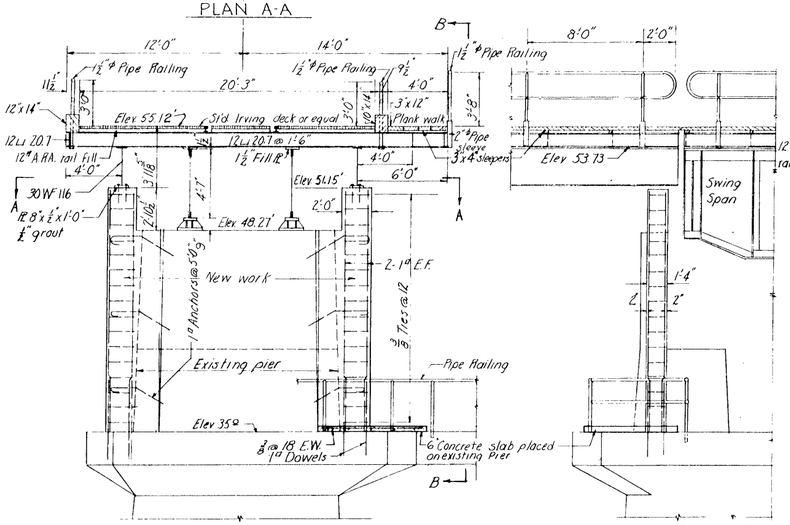
PLAN A-A



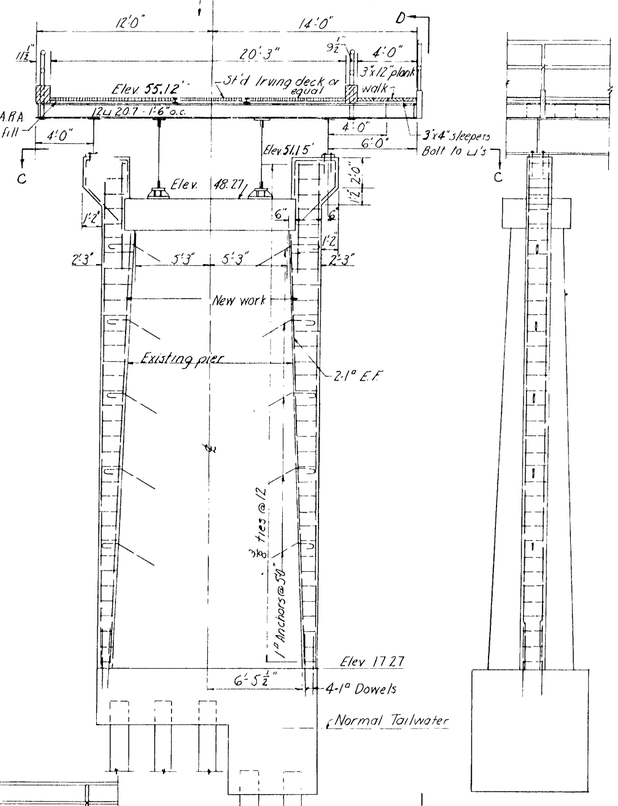
PLAN C-C



PLAN H-H ABUTMENT #6

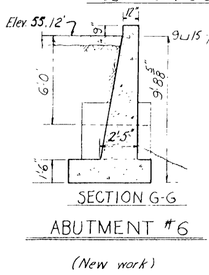


SECTION 1-1 ELEVATION B-B



SECTION 2-2

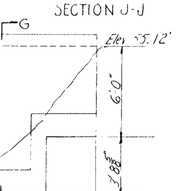
ELEVATION D-D



SECTION G-G ELEVATION F-F

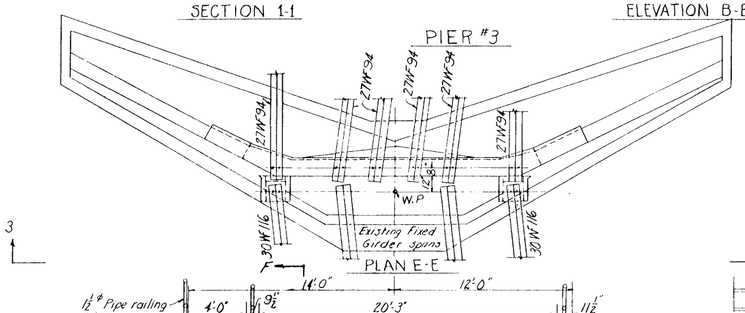
ABUTMENT #6

(New work)

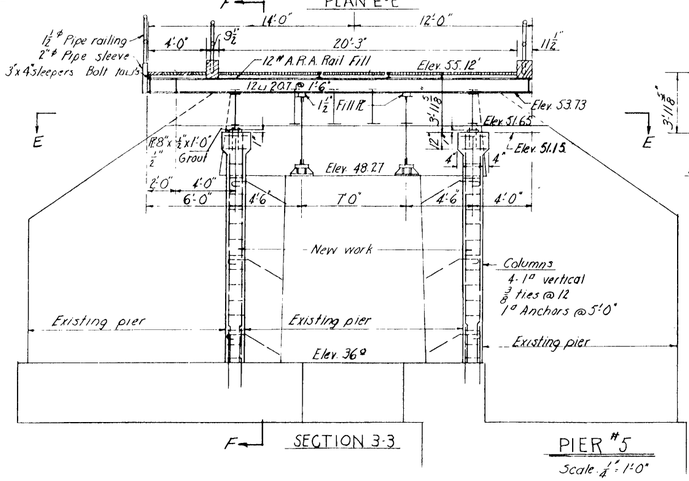


SECTION J-J

Existing bulkhead to be removed

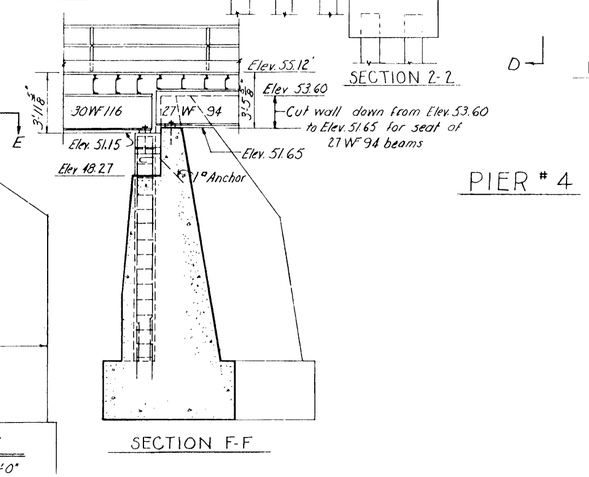


PLAN E-E



SECTION 3-3 PIER #5

Scale 1/4" = 1'-0"



SECTION F-F PIER # 4

Scale 1/4" = 1'-0"

Note:
1. New work consists of
   (a) Entire Abutment #6
   (b) Columns indicated as "New work"
2. For existing concrete piers refer to Sheet 8 of Dwg. N-1-11

REVISION	DATE	DESCRIPTION	BY

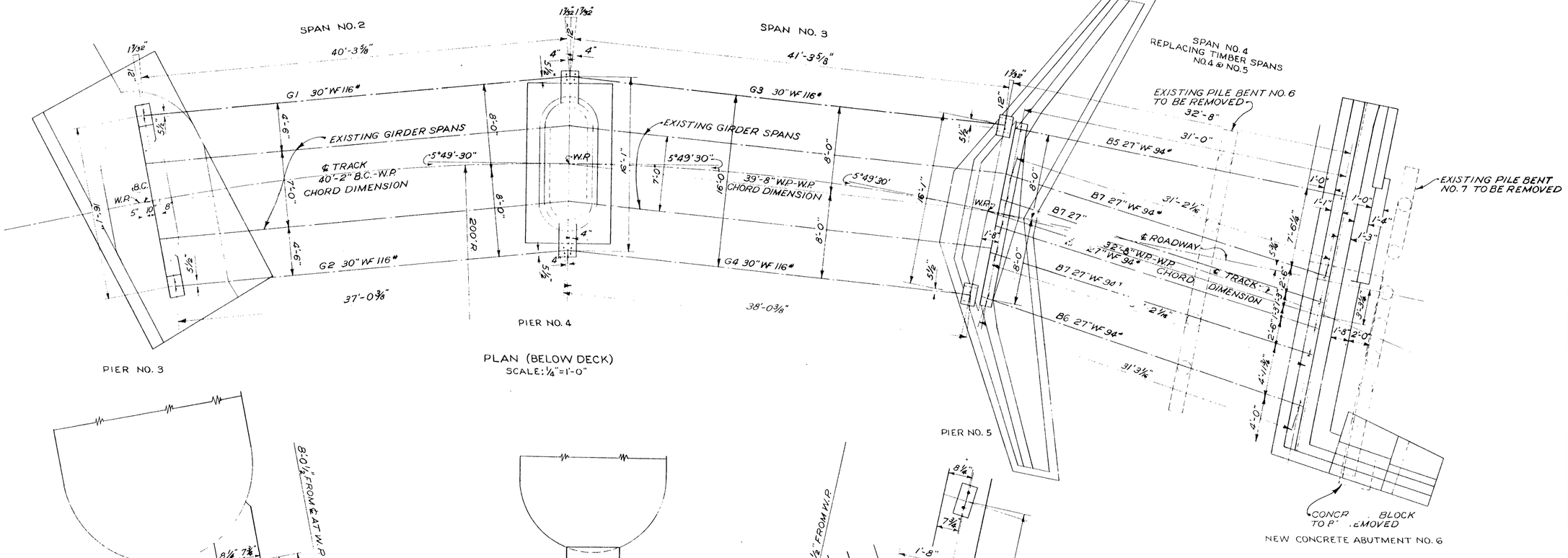
CORPS OF ENGINEERS, U. S. ARMY
OFFICE OF THE DISTRICT ENGINEER, PORTLAND, OREGON

DESIGNED BY R.M.H.
DRAWN BY E.J.K.
CHECKED BY D.W.S.
PREPARED: H.D. Walker, BRIDGE STRUCTURES DESIGN SECTION
REVIEWED BY: for C.A. Stainton, HEAD, SAFETY BRANCH
SUBMITTED: R.D. Reed, HEAD, DESIGN BRANCH
RECOMMENDED: Thomas E. Hamm for R.E. Hewston, CHIEF, ENGINEERING DIVISION

BONNEVILLE DAM PROJECT
COLUMBIA RIVER OREGON-WASHINGTON

SWING BRIDGE RECONSTRUCTION
ABUTMENT, PIER ALTERATION & SECTIONS

APPROVED: W.A. Greene, COLONEL, C. E. DISTRICT ENGINEER
DATE 1-20-50.
SCALE AS SHOWN | SPEC. NO.
SHEET 4 OF N-2-43A

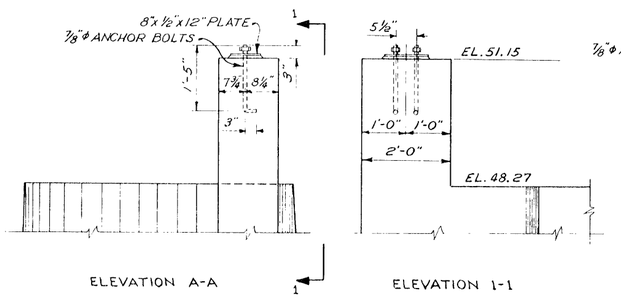


PLAN (BELOW DECK)
SCALE: 1/4"=1'-0"

PLAN - BEAM SEAT
PIER NO. 3

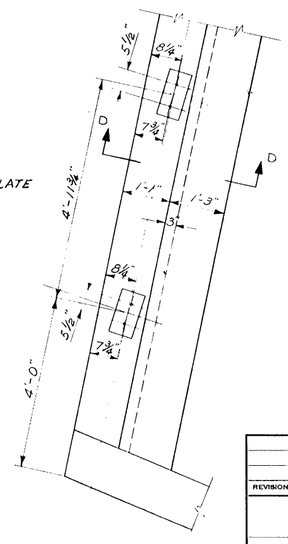
PLAN - BEAM SEAT
PIER NO. 4

PLAN - BEAM SEAT
PIER NO. 5

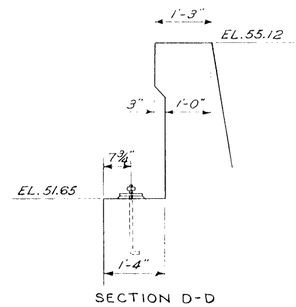


ELEVATION A-A
ELEVATION 1-1
ELEVATION B-B
ELEVATION 2-2
ELEVATION 3-3
ELEVATION C-C

DETAILS - TOP OF P: :
SCALE: 3/4" = 1'-0"



PLAN - BEAM SEATS
ABUTMENT NO. 6



SECTION D-D

GRAPHIC SCALES
1/4" = 1'-0"
3/4" = 1'-0"

REVISION	DATE	DESCRIPTION	BY

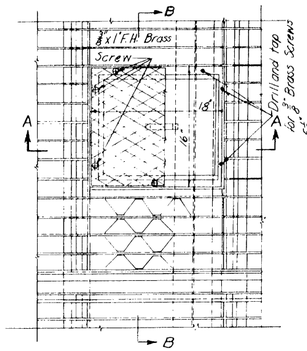
CORPS OF ENGINEERS, U. S. ARMY
OFFICE OF THE DISTRICT ENGINEER, PORTLAND, OREGON

BONNEVILLE DAM PROJECT
COLUMBIA RIVER OREGON-WASHINGTON

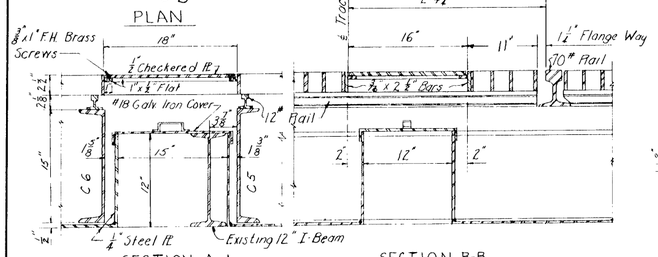
SWING BRIDGE RECONSTRUCTION

BEAM SEATS

DESIGNED BY R.M.H.
DRAWN BY H.E.B.
CHECKED BY D.W.S.
PREPARED: A. Lowaikus, HEAD, STRUCTURES DESIGN SECTION
SUBMITTED: Portland, HEAD, DESIGN BRANCH
RECOMMENDED: Samuel Wilson Jr., CHIEF, ENGINEERING DIVISION
REVIEWED BY: [illegible], HEAD, SAFETY BRANCH
APPROVED: Wm. E. Bright, COLONEL, C.E., DISTRICT ENGINEER
DATE: 1-20-50
SCALE AS SHOWN
SPEC. NO.
SHEET 5
N-2-43A



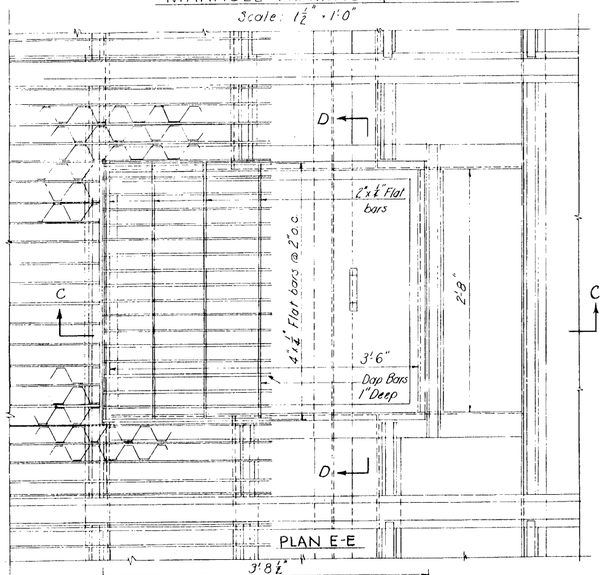
PLAN



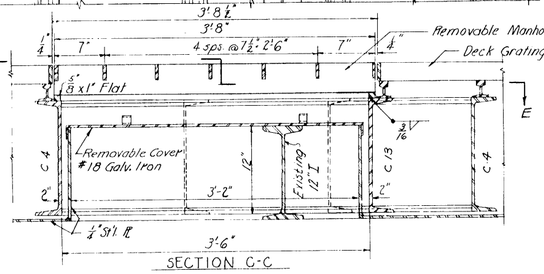
SECTION A-A SECTION B-B

MANHOLE FRAMING & COVERS-M-3

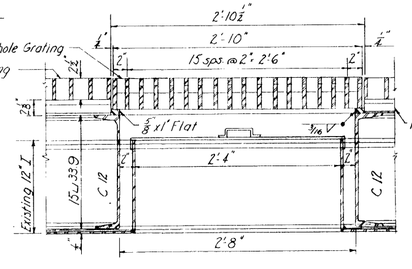
Scale: 1½" = 1'-0"



PLAN E-E



SECTION C-C

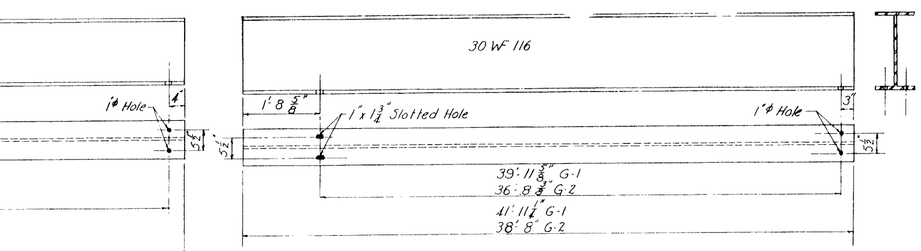


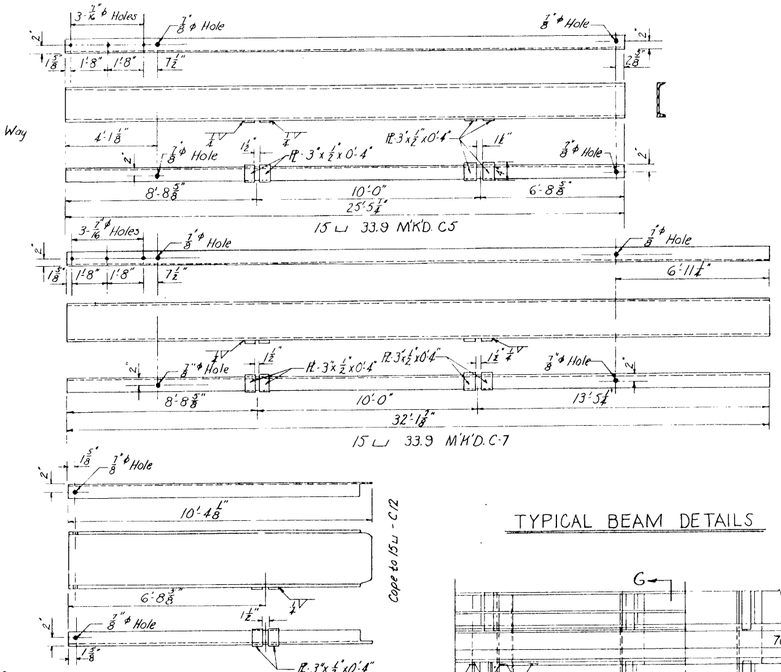
SECTION D-D

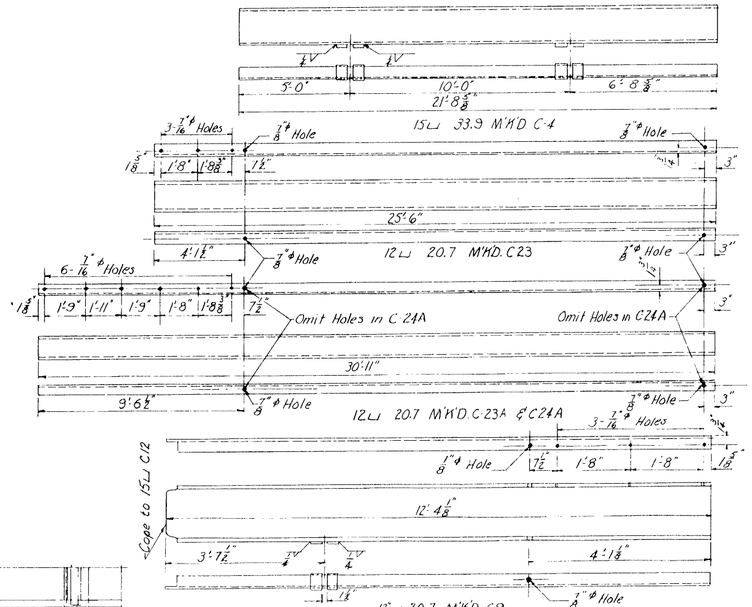
MANHOLE, DECK FRAMING, GRATING, & COVER M-2

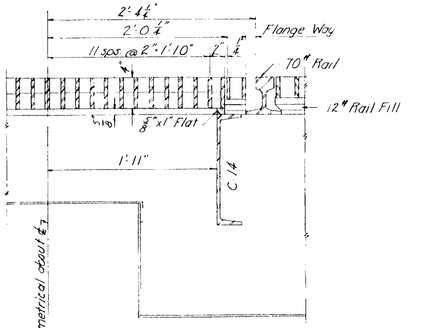
Scale: 1½" = 1'-0"

TYPICAL BEAM DETAILS

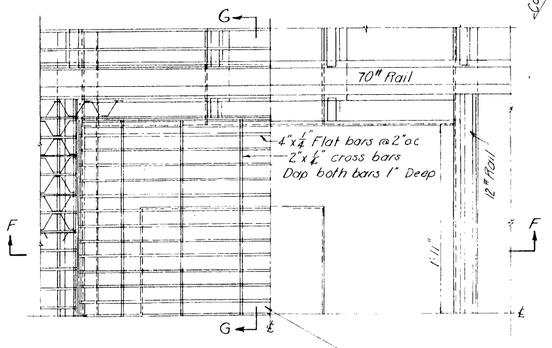




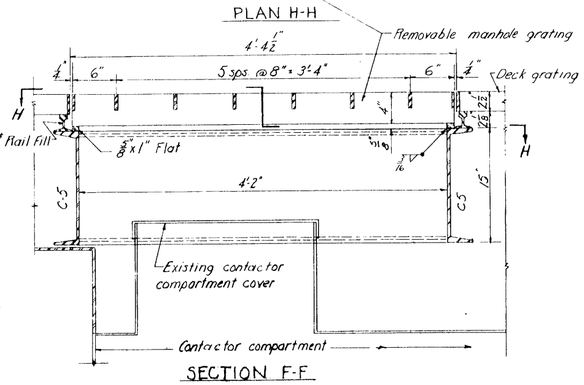




SECTION G-G



PLAN H-H



SECTION F-F

MANHOLE, DECK FRAMING, & GRATING - M1

Scale: 1½" = 1'-0"

REVISION	DATE	DESCRIPTION	BY

CORPS OF ENGINEERS, U. S. ARMY
OFFICE OF THE DISTRICT ENGINEER, PORTLAND, OREGON

BONNEVILLE DAM PROJECT
COLUMBIA RIVER OREGON—WASHINGTON

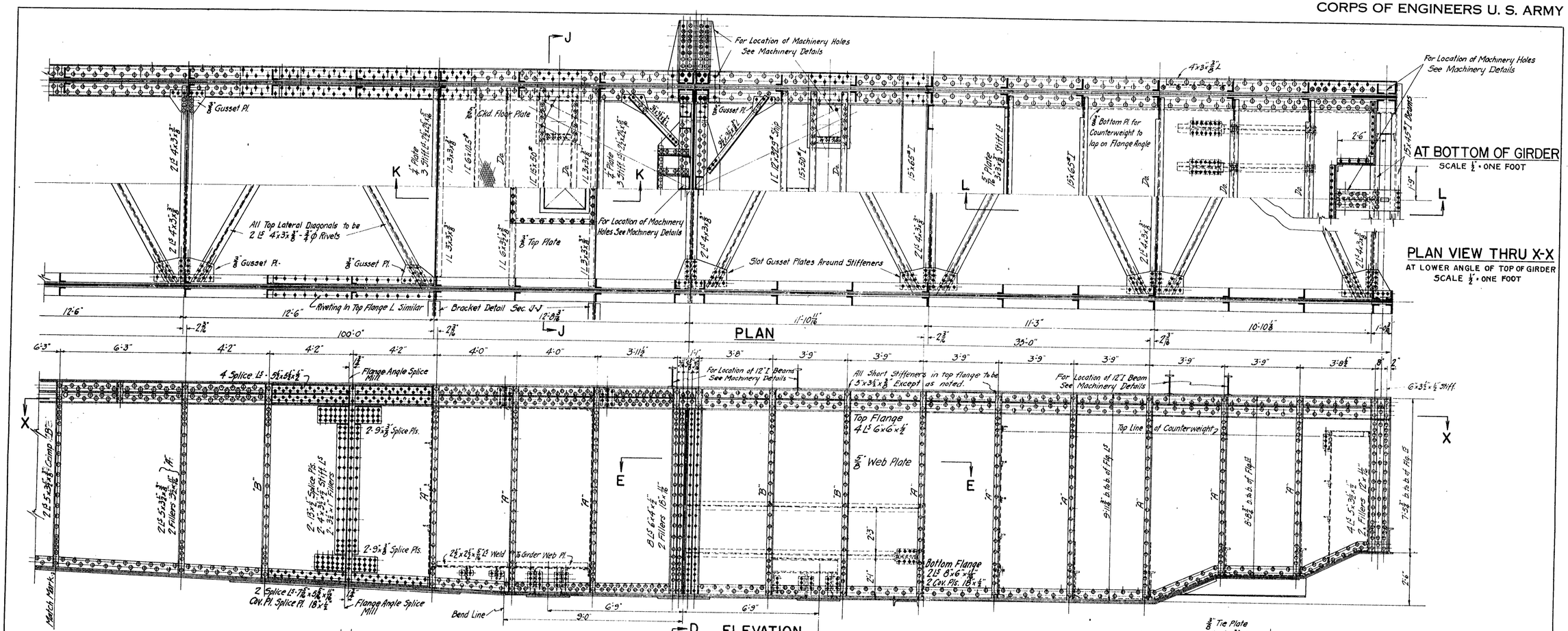
SWING BRIDGE RECONSTRUCTION

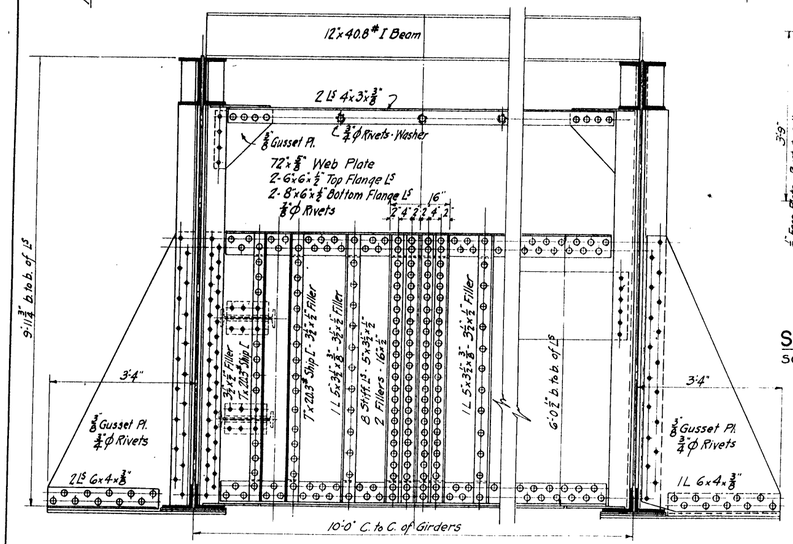
MISCELLANEOUS DETAILS

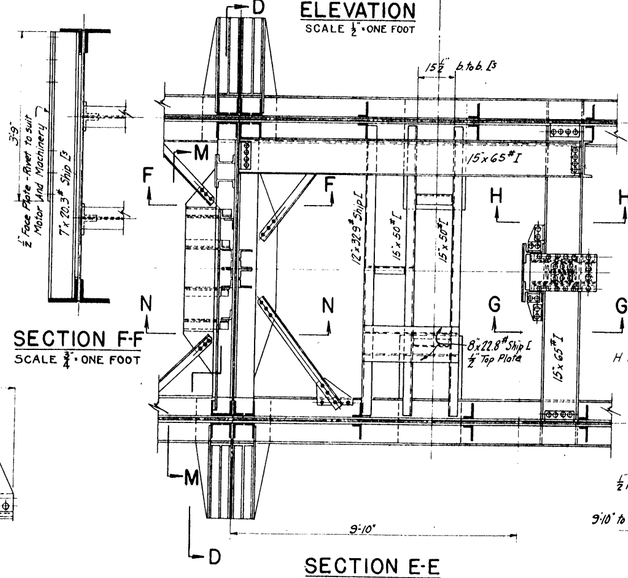
DESIGNED BY R.M.H.
DRAWN BY E.J.K.
CHECKED BY O.W.S.
PREPARED: H.L.Walker
REVIEWED BY: for
HEAD, SAFETY BRANCH
SUBMITTED:
CHIEF, MECH. & ELEC. BRANCH
RECOMMENDED: For A.R. Higdon
CHIEF, ENGINEERING DIVISION
APPROVED: Oscar Edwards
COLONEL, C. E. DISTRICT ENGINEER
DATE: 7-20-40
SCALE AS SHOWN
SPEC. NO.
SHEET 6 OF
N-2-43A

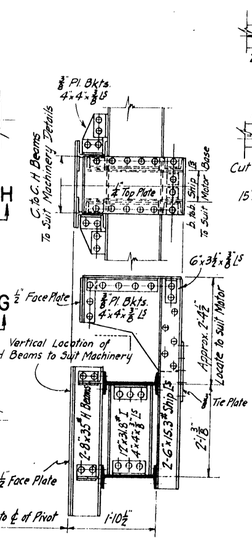
WAR DEPARTMENT

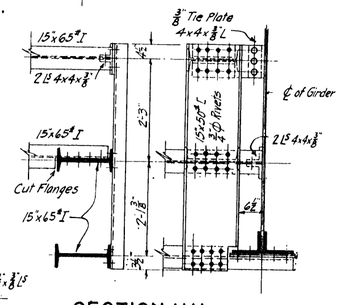
CORPS OF ENGINEERS U. S. ARMY











GENERAL NOTES

RIVETING - All rivets to be 7/8" dia. except as noted. All rivet holes for field rivets to be sub-punched and reamed while assembled in shop. All other holes may be punched or drilled full size.

PAINTING - All structural steel to be painted as specified.

REFERENCES

For Swing End of Swing Span See SHEET 2 DRAWING N-2-61.
For Sections J-J K-K L-L M-M and N-N See SHEET 3 DRAWING N-2-61
For Machinery Details See SHEETS 7-8-9 and 10 DRAWING N-2-61.
For Anchor Bolt Plan See SHEET 11 DRAWING N-2-61.

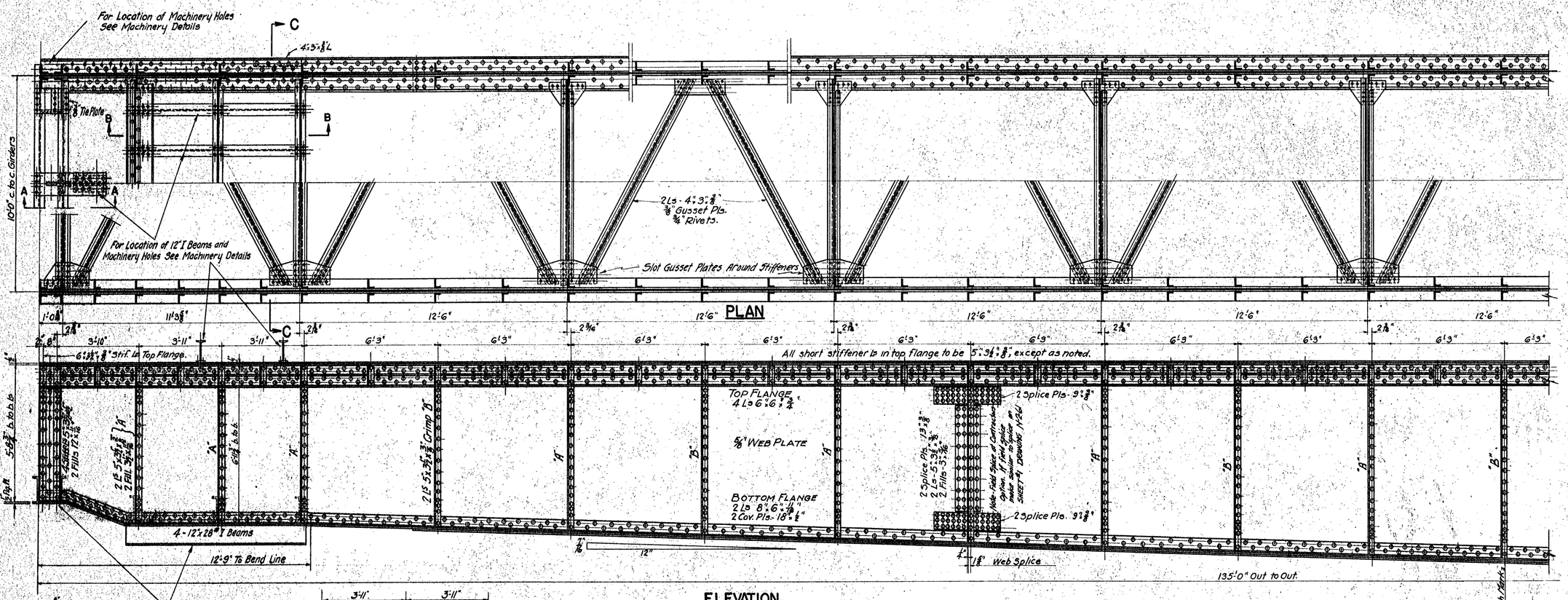
NO.	REVISION	DATE	BY	APV'D

BONNEVILLE POWER NAVIGATION PROJECT
28TH CONTRACT
BRIDGE ACROSS NAVIGATION CANAL
SWING SPAN
COUNTERWEIGHT END
SCALE AS SHOWN
U. S. ENGINEER OFFICE, PORTLAND, OREGON DISTRICT

SUBMITTED R. M. Mackenzie ENGINEER
APPROVED Gen. Williams MAJOR, CORPS OF ENGINEERS
RECOMMENDED S. D. Greene HEAD ENGINEER
DESIGNED BY W.P.S. DATE 1/6/36
DR. BY R.O.P. TR. BY R.O.P. CHECKED BY W.P.S.

WAR DEPARTMENT

CORPS OF ENGINEERS U.S. ARMY



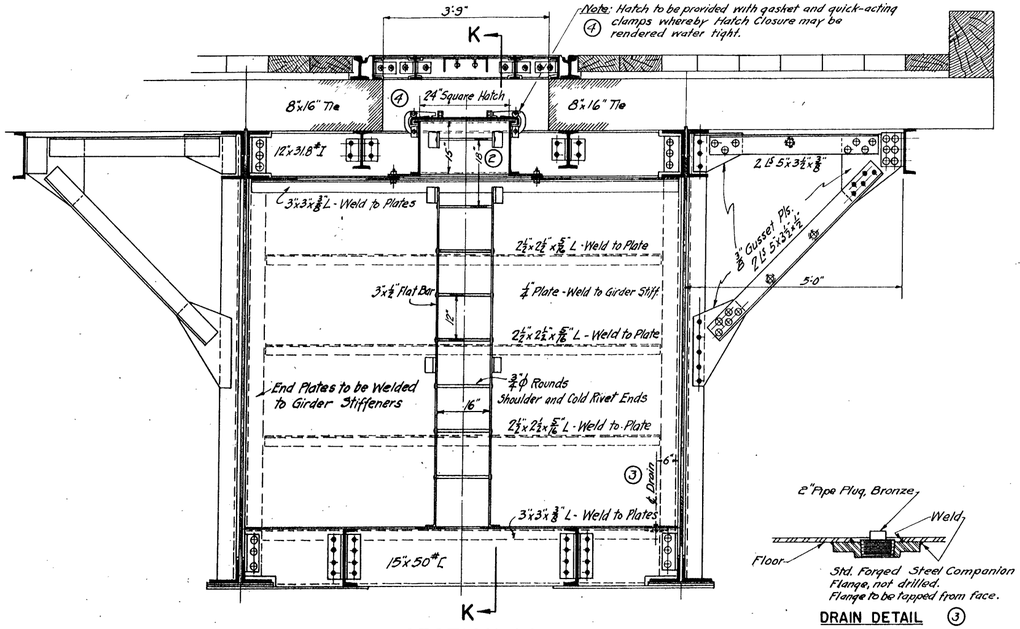
REFERENCES

For General Notes See SHEET #1 DRAWING N-2-61.
For Counterweight End See SHEET #1 DRAWING N-2-61.
For Machinery Details See SHEETS 7, 8, 9 and 10 DRAWING N-2-61.
For Anchor Bolt Plan See SHEET #11 DRAWING N-2-61

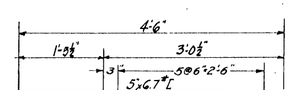
NO.	REVISION	DATE	BY	APV'D

BONNEVILLE POWER NAVIGATION PROJECT
28TH CONTRACT
BRIDGE ACROSS NAVIGATION CANAL
SWING SPAN
SWING END
SCALE AS SHOWN
U. S. ENGINEER OFFICE, PORTLAND, OREGON DISTRICT

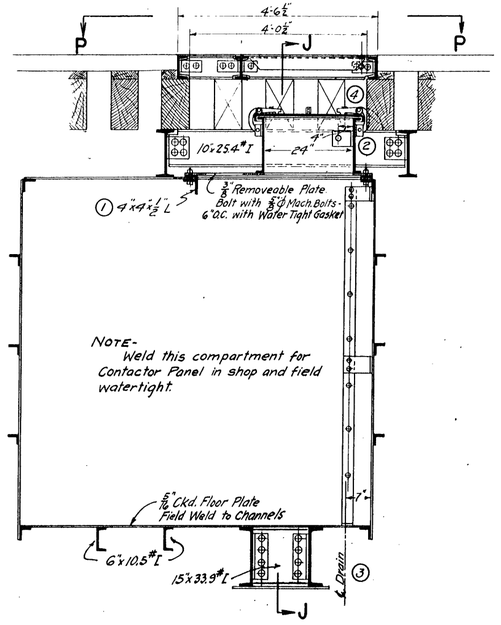
SUBMITTED: R. A. Mackenzie, ENGINEER
APPROVED: D. D. Evans, MAJOR, CORPS OF ENGINEERS
RECOMMENDED: [illegible], HEAD ENGINEER
DRAWN BY: W.D.F. R.D.P. DATE 6-16-'35.
TRACED BY R.D.P. CHECKED BY W.D.F.



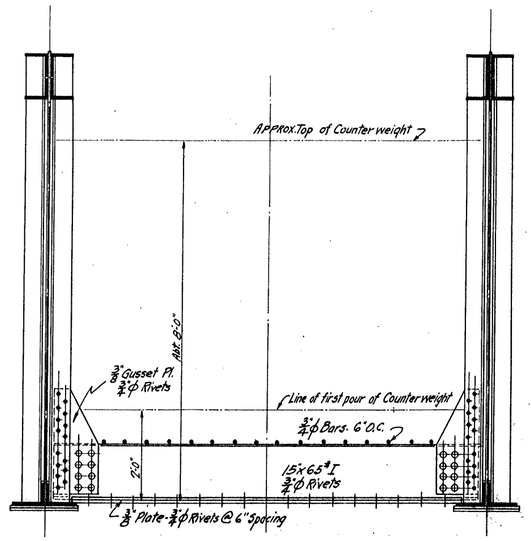
SECTION J-J
SCALE ¾" ONE FOOT



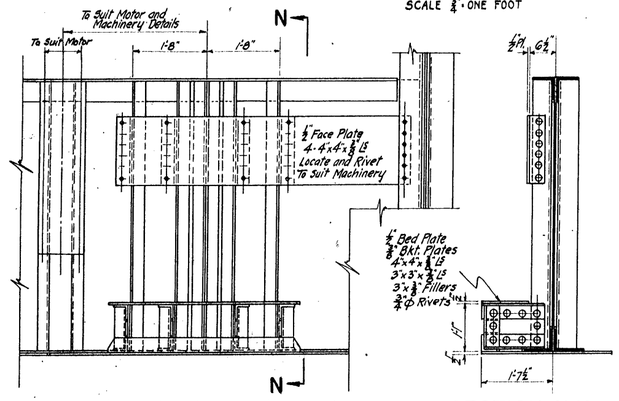
DRAIN DETAIL ③
No Scale



SECTION K-K
SCALE ¾" ONE FOOT

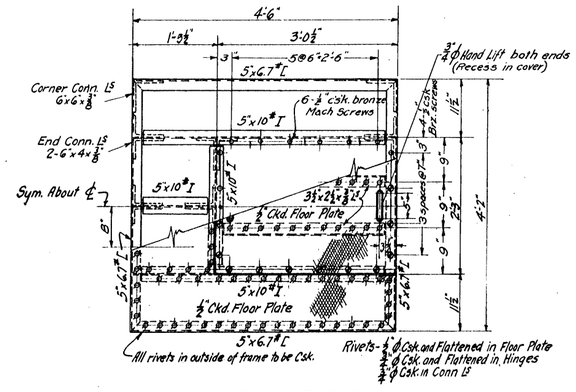


TYPICAL SECTION THRU COUNTERWEIGHT
SCALE ¾" ONE FOOT

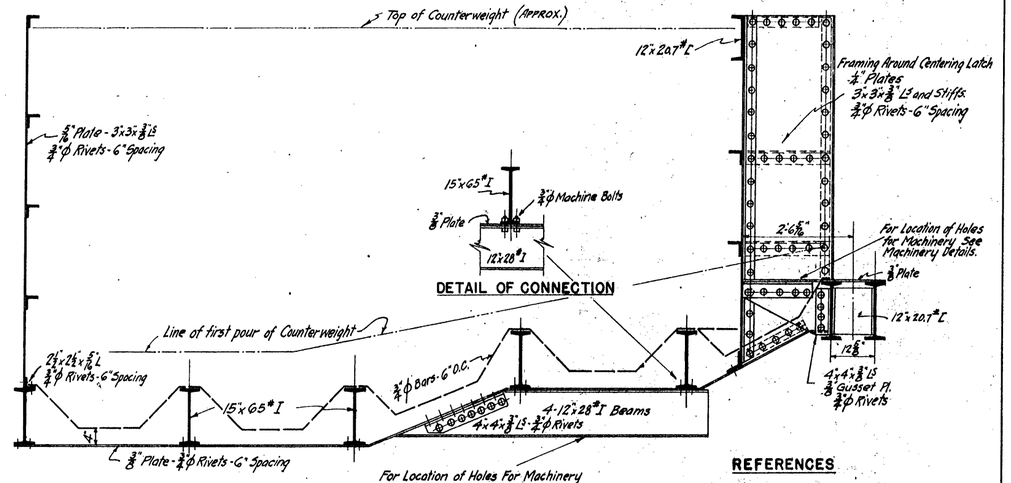


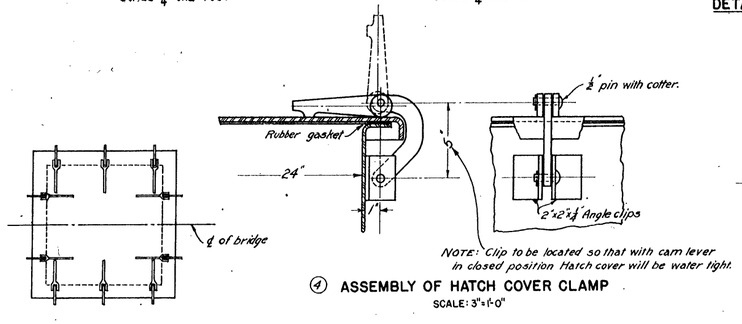
SECTION M-M
SCALE ¾" ONE FOOT

SECTION N-N
SCALE ¾" ONE FOOT



PLAN VIEW AT P-P
DETAIL CONTACTOR COMPARTMENT COVER
SCALE - 1" = ONE FOOT

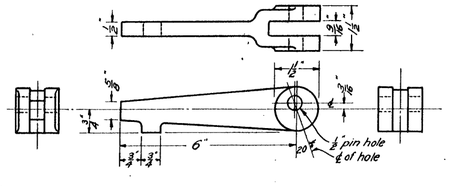




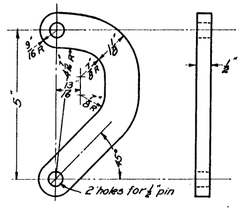
④ ASSEMBLY OF HATCH COVER CLAMP
SCALE: 3"=1'-0"

NOTE: Clip to be located so that with cam lever in closed position Hatch cover will be water tight.

④ LAYOUT OF HATCH CLAMPS PLAN
SCALE: 1"=1'-0"



④ HATCH CLAMP LEVER
STEEL CASTING MAKE IO
SCALE HALF SIZE



④ HATCH CLAMP HOOK
STEEL FORGING MAKE IO
SCALE HALF SIZE

SECTION L-L
SCALE ¾" ONE FOOT

REFERENCES

For General Notes See SHEET 1 DRAWING N-2-61
For Counterweight End of Swing Span See SHEET 1 DRAWING N-2-61
For Swing End of Swing Span See SHEET 2 DRAWING N-2-61
For Machinery Details See SHEETS 7-8-9 and 10 DRAWING N-2-61
For Anchor Bolt Plan See SHEET 11 DRAWING N-2-61

NO.	REVISION	DATE	BY	AP'V'D
4	Hatch cover tightening details added.	12/3/35	H&L	
3	Drain added.	12/3/35	H&L	
2	Ladder Rung added.	12/3/35	H&L	
1	Angle was 5"x3½"x⅜".	12/3/35	H&L	

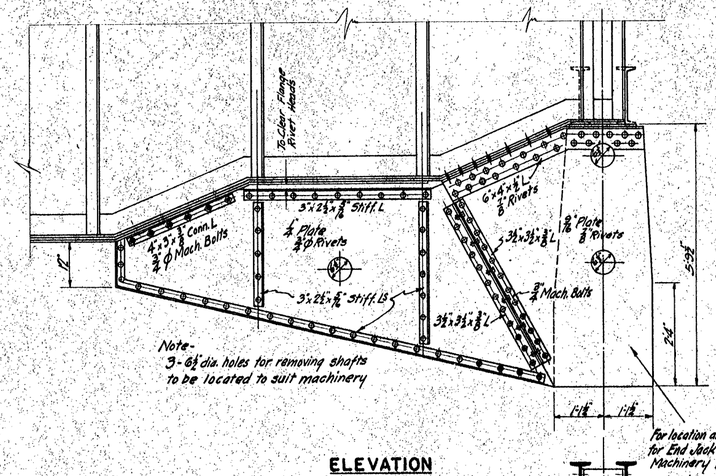
BONNEVILLE POWER NAVIGATION PROJECT
28TH CONTRACT
BRIDGE ACROSS NAVIGATION CANAL
SWING SPAN
DETAILS
SCALE AS SHOWN

U. S. ENGINEER OFFICE, PORTLAND, OREGON DISTRICT

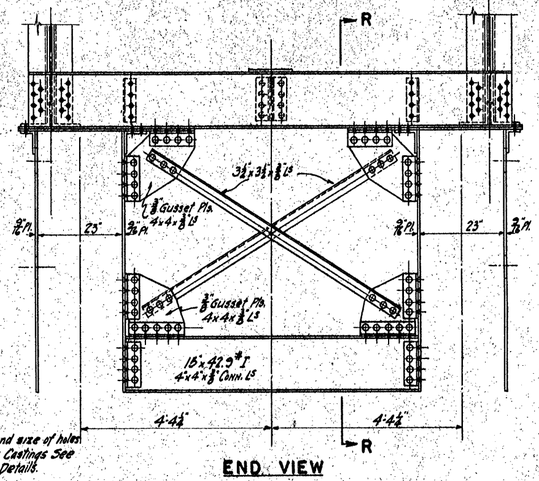
SUBMITTED R. D. Mackenzie ENGINEER — APPROVED C. E. Williams MAJOR, CORPS OF ENGINEERS

RECOMMENDED HEAD ENGINEER — DESIGNED BY W.D.E. DATE 1/16/36

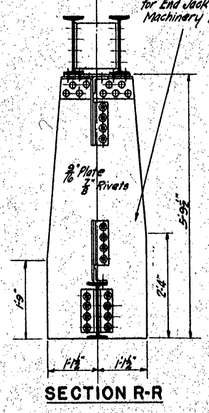
DR. BY R.D.P. TR. BY R.D.P. CHECKED BY W.D.S.



ELEVATION



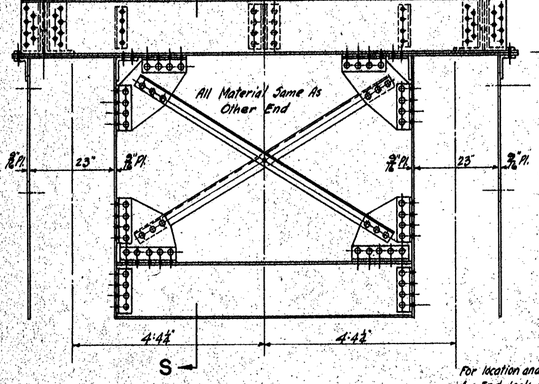
END VIEW



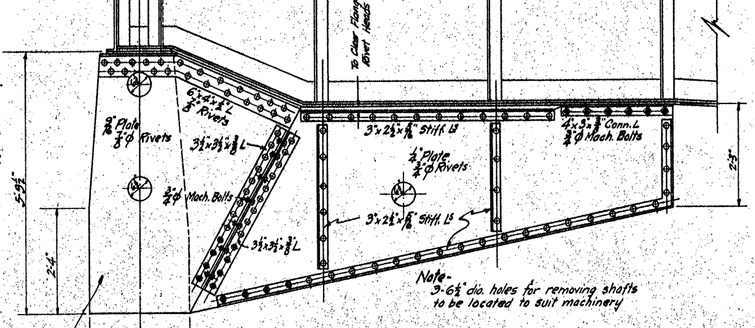
SECTION R-R

END JACK PLATES- COUNTER WEIGHT END

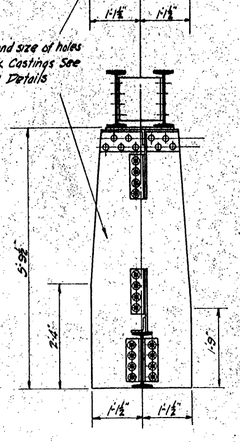
SCALE- ¾" = ONE FOOT



END VIEW



ELEVATION



SECTION S-S

END JACK PLATES- SWING END

SCALE ¾" = ONE FOOT

0 1 2 3

REFERENCES

For General Notes See SHEET 1 DRAWING N-2-61
For Counterweight End See SHEET 1 DRAWING N-2-61
For Swing End See SHEET 2 DRAWING N-2-61
For Machinery Details See SHEET 7-8-9 and 10 DRAWING N-2-61

NO.	REVISION	DATE	BY	APV'D

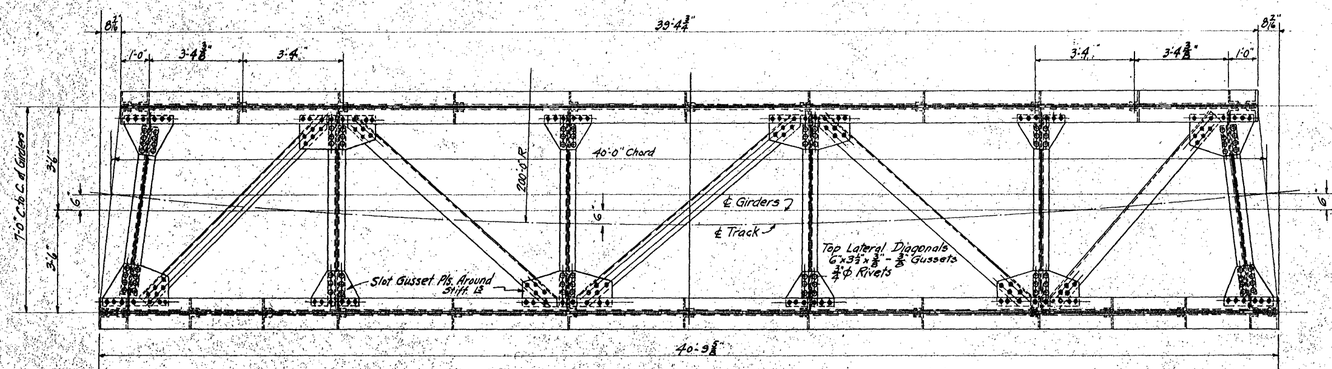
BONNEVILLE POWER NAVIGATION PROJECT
28TH CONTRACT

BRIDGE ACROSS NAVIGATION CANAL
SWING SPAN
DETAILS

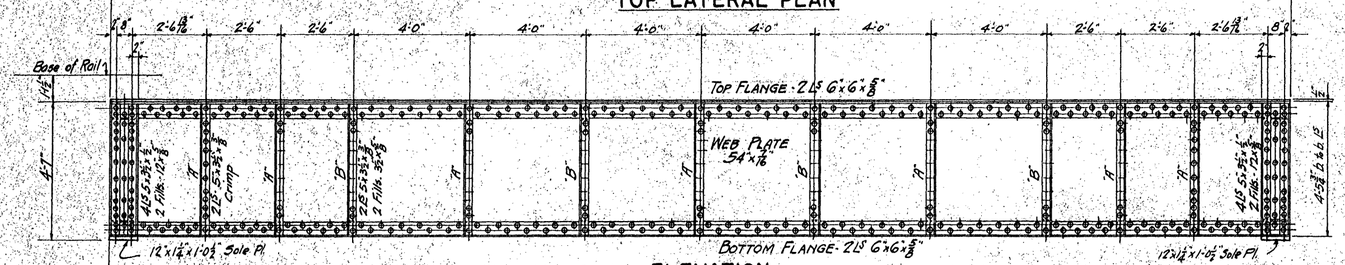
SCALE AS SHOWN

U. S. ENGINEER OFFICE, PORTLAND, OREGON DISTRICT

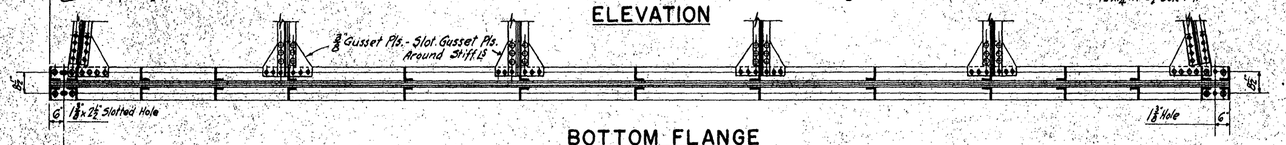
SUBMITTED R.F. Mackenzie ENGINEER
APPROVED E. Williams MAJOR, CORPS OF ENGINEERS
RECOMMENDED HEAD ENGINEER
DESIGNED BY H.D. SHONE DATE 1-16-35
DR. BY Palmer TR. BY R.D.P. CHECKED BY [illegible]



TOP LATERAL PLAN



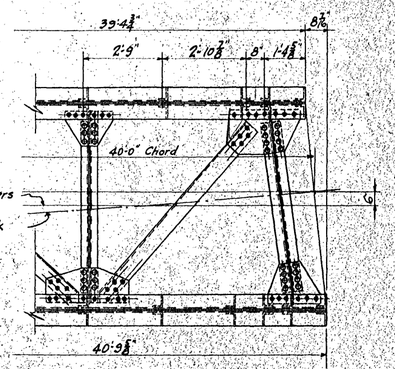
ELEVATION



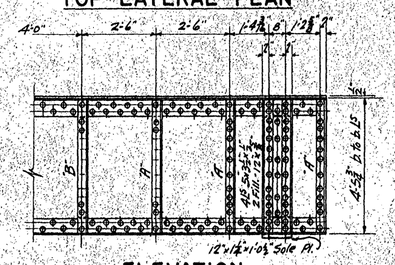
BOTTOM FLANGE

MAKE 1 SPAN AS SHOWN FOR SPAN #3

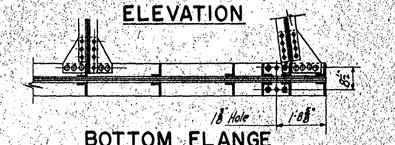
SCALE 1/2" = ONE FOOT



TOP LATERAL PLAN



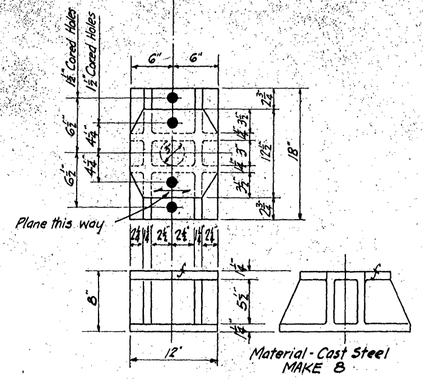
ELEVATION



BOTTOM FLANGE

MAKE 1 SPAN SIMILAR TO SPAN #3 EXCEPT AS SHOWN FOR SPAN #2

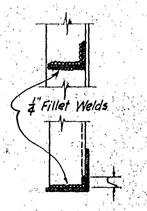
SCALE 1/2" = ONE FOOT



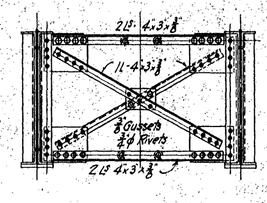
BASE PLATE

SCALE 1 1/2" = ONE FOOT

SCALE IN INCHES

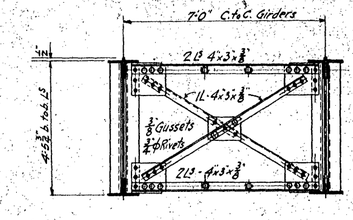


DETAIL OF STIFFENER WELDS



END CROSS FRAME

SCALE 1/2" = ONE FOOT



INTERMEDIATE CROSS FRAME

SCALE 1/2" = ONE FOOT

REFERENCES

For General Notes See SHEET 1 DRAWING N-2-61
For Anchor Bolt Plan See SHEET 11 DRAWING N-2-61

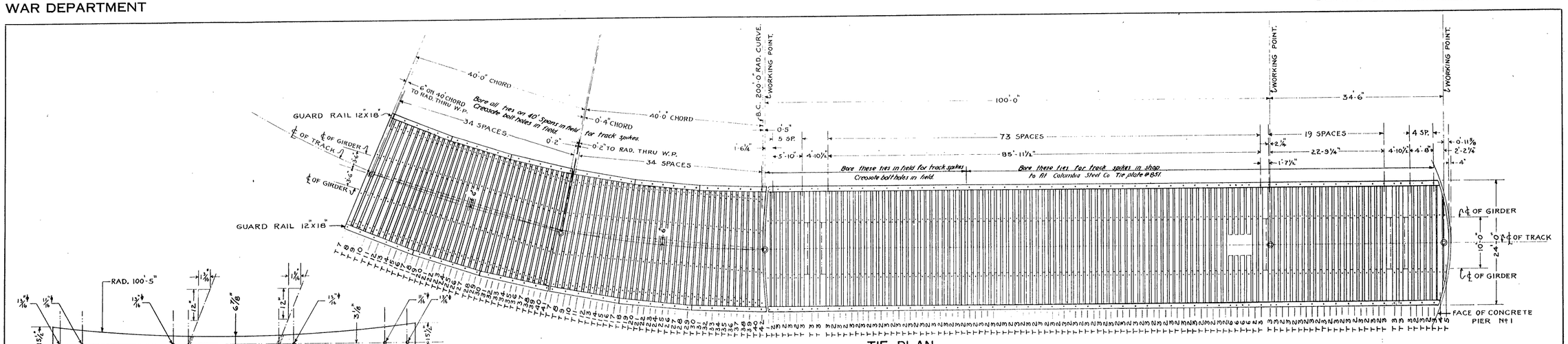
Note:-
FIELD RIVETING OF CROSS FRAMES & DIAGONALS OPTIONAL.

NO.	REVISION	DATE	BY	APV'D

BONNEVILLE POWER NAVIGATION PROJECT
28TH CONTRACT
BRIDGE ACROSS NAVIGATION CANAL
FIXED SPANS
DETAILS
SCALE AS SHOWN

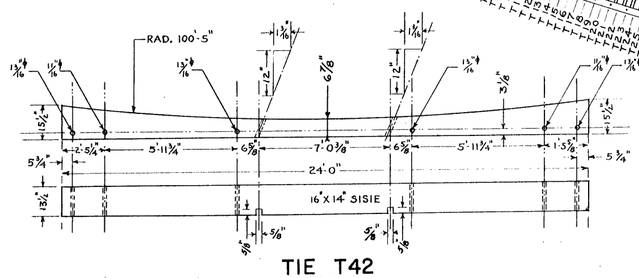
U. S. ENGINEER OFFICE, PORTLAND, OREGON DISTRICT

SUBMITTED R.M. Mackenzie ENGINEER
APPROVED E. H. Williams MAJOR, CORPS OF ENGINEERS
RECOMMENDED HEAD ENGINEER
DESIGNED BY W.D.S. DATE 1-16-35
DR. BY R.D.P. TR. BY R.D.P. CHECKED BY

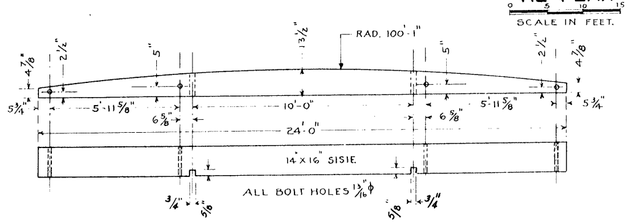


TIE PLAN

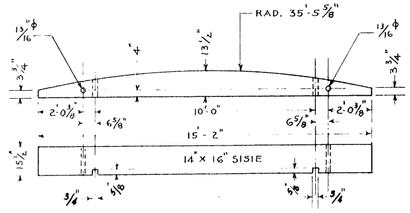
SCALE IN FEET. 0 5 10 15



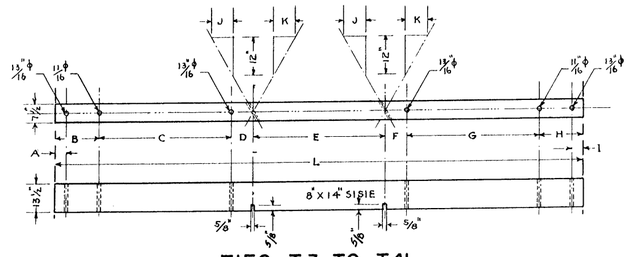
TIE T42
1-REQ.



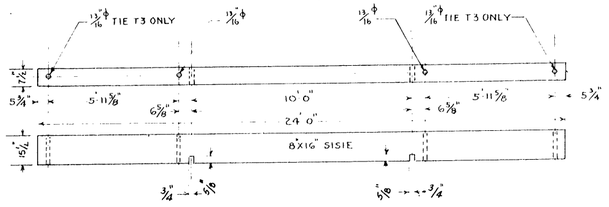
TIE TI
1 REQ.



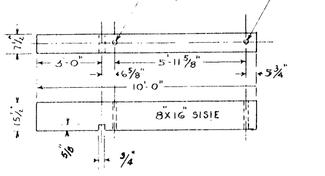
TIE T5
1 REQ.



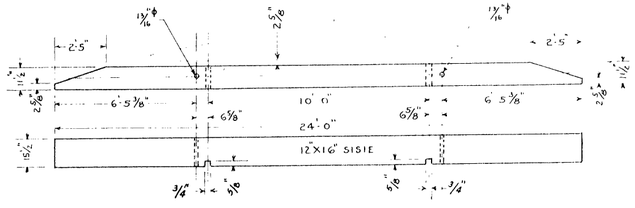
TIES T7 TO T41



TIE T2 & T3
49 - T2 REQ. 56 - T3 REQ.



TIE T6
8 REQ.



TIE T4
1 REQ.

SCALE IN FEET. 0 1 5 10

SCHEDULE OF TIE MEASUREMENTS

Nº	Nº REQ	L	A	B	C	D	E	F	G	H	I	J	K
T 7	2	24'-0"	5¾"	2'-5¼"	5'-11¾"	6⅝"	7'-0⅜"	6⅝"	5'-11¾"	1'-5⅝"	5¾"	1 3/16	
T 8	2	24'-0"		2'-4½"	5'-11⅞"	6⅝"	7'-0⅜"	6⅝"	5'-11⅝"	1'-6⅝"		1 1/16	
T 9	2	24'-0"	5¾"	2'-3½"	5'-11⅝"	6⅝"	7'-0¼"	6⅝"	5'-11⅝"	1'-7¾"	5¾"	1 1/16	
T 10	2	24'-0"		2'-2⅝"	5'-11⅝"	6⅝"	7'-0¼"	6⅝"	5'-11⅝"	1'-8⅝"		1"	
T 11	2	24'-0"	5¾"	2'-1⅝"	5'-11⅝"	6⅝"	7'-0¼"	6⅝"	5'-11⅝"	1'-9⅝"	5¾"	0 15/16	
T 12	2	24'-0"		2'-0⅞"	5'-11½"	6⅝"	7'-0¼"	6⅝"	5'-11½"	1'-10⅝"		0 15/16	
T 13	2	24'-0"	5¾"	2'-0"	5'-11½"	6⅝"	7'-0¼"	6⅝"	5'-11½"	1'-11⅝"	5¾"	0 3/4	
T 14	2	24'-0"		1'-11"	5'-11½"	6⅝"	7'-0¼"	6⅝"	5'-11½"	2'-0½"		0 11/16	
T 15	2	24'-0"	5¾"	1'-10¼"	5'-11½"	6⅝"	7'-0⅛"	6⅝"	5'-11½"	2'-1⅝"	5¾"	0 3/8	
T 16	2	24'-0"		1'-9¼"	5'-11½"	6⅝"	7'-0"	6⅝"	5'-11½"	2'-2½"		0 3/16	
T 17	2	24'-0"	5¾"	1'-8⅜"	5'-11⅜"	6⅝"	7'-0"	6⅝"	5'-11⅜"	2'-3⅜"	5¾"	0 1/16	
T 18	2	24'-0"		1'-7¼"	5'-11⅜"	6⅝"	7'-0"	6⅝"	5'-11⅜"	2'-4½"		0 1/16	
T 19	2	24'-0"	5¾"	1'-7⅜"	5'-11⅜"	6⅝"	7'-0"	6⅝"	5'-11⅜"	2'-4⅝"	5¾"	0 1/4	
T 20	2	24'-0"		1'-7⅜"	5'-11⅜"	6⅝"	7'-0"	6⅝"	5'-11⅜"	2'-4⅝"		0 1/4	
T 21	2	24'-0"	5¾"	1'-7⅜"	5'-11⅜"	6⅝"	7'-0"	6⅝"	5'-11⅜"	2'-4⅝"	5¾"	0 1/16	
T 22	2	24'-0"		1'-7⅜"	5'-11⅜"	6⅝"	7'-0"	6⅝"	5'-11⅜"	2'-4⅝"		0 1/16	
T 23	2	24'-0"	5¾"	1'-7⅜"	5'-11⅜"	6⅝"	7'-0"	6⅝"	5'-11⅜"	2'-4⅝"	5¾"	0 1/16	
T 24	2	24'-0"		1'-7⅜"	5'-11⅜"	6⅝"	7'-0"	6⅝"	5'-11⅜"	2'-4⅝"		0	0
T 25	2	24'-0"	5¾"	1'-7⅜"	5'-11⅜"	6⅝"	7'-0"	6⅝"	5'-11⅜"	2'-4⅝"	5¾"		0 1/16"
T 26	2	24'-0"		1'-7⅜"	5'-11⅜"	6⅝"	7'-0"	6⅝"	5'-11⅜"	2'-4⅝"			0 1/8"
T 27	2	24'-0"	5¾"	1'-7⅜"	5'-11⅜"	6⅝"	7'-0"	6⅝"	5'-11⅜"	2'-4⅝"	5¾"		0 3/16"
T 28	2	24'-0"		1'-7⅜"	5'-11⅜"	6⅝"	7'-0"	6⅝"	5'-11⅜"	2'-4⅝"			0 1/4"
T 29	2	24'-0"	5¾"	1'-7⅜"	5'-11⅜"	6⅝"	7'-0"	6⅝"	5'-11⅜"	2'-4⅝"	5¾"		0 5/16"
T 30	2	24'-0"		1'-7½"	5'-11⅜"	6⅝"	7'-0"	6⅝"	5'-11⅜"	2'-4½"			0 3/16"
T 31	2	24'-0"	5¾"	1'-8⅜"	5'-11⅜"	6⅝"	7'-0"	6⅝"	5'-11⅜"	2'-3⅝"	5¾"		0 7/16"
T 32	2	24'-0"		1'-9¼"	5'-11½"	6⅝"	7'-0"	6⅝"	5'-11½"	2'-2¾"			0 3/16"
T 33	2	24'-0"	5¾"	1'-10¼"	5'-11½"	6⅝"	7'-0⅛"	6⅝"	5'-11½"	2'-1⅝"	5¾"		0 5/8"
T 34	2	24'-0"		1'-11"	5'-11½"	6⅝"	7'-0¼"	6⅝"	5'-11½"	2'-0½"			0 1/16"
T 35	2	24'-0"	5¾"	2'-0"	5'-11½"	6⅝"	7'-0¼"	6⅝"	5'-11½"	1'-11½"	5¾"		0 3/4"
T 36	2	24'-0"		2'-0⅞"	5'-11½"	6⅝"	7'-0¼"	6⅝"	5'-11½"	1'-10⅝"			0 13/16"
T 37	2	24'-0"	5¾"	2'-1⅝"	5'-11⅝"	6⅝"	7'-0¼"	6⅝"	5'-11⅜"	1'-9⅝"	5¾"		0 7/8"
T 38	2	24'-0"		2'-2⅝"	5'-11⅝"	6⅝"	7'-0¼"	6⅝"	5'-11⅜"	1'-8⅜"			1"
T 39	2	24'-0"	5¾"	2'-3½"	5'-11⅝"	6⅝"	7'-0¼"	6⅝"	5'-11⅝"	1'-7¾"	5¾"		1 1/16"
T 40	2	24'-0"		2'-4½"	5'-11⅝"	6⅝"	7'-0⅜"	6⅝"	5'-11⅝"	1'-6⅝"			1 1/8"
T 41	1	24'-0"	5¾"	2'-5¼"	5'-11¾"	6⅝"	7'-0⅜"	6⅝"	5'-11¾"	1'-5⅝"	5¾"		1 3/16"

NOTES.

For Grade of Timber and Treatment see General Specifications.

Guard Rails to be framed in the field and not treated.

NO.	REVISION	DATE	BY	AP'V'D

BONNEVILLE POWER NAVIGATION PROJECT

28TH CONTRACT

BRIDGE ACROSS NAVIGATION CANAL

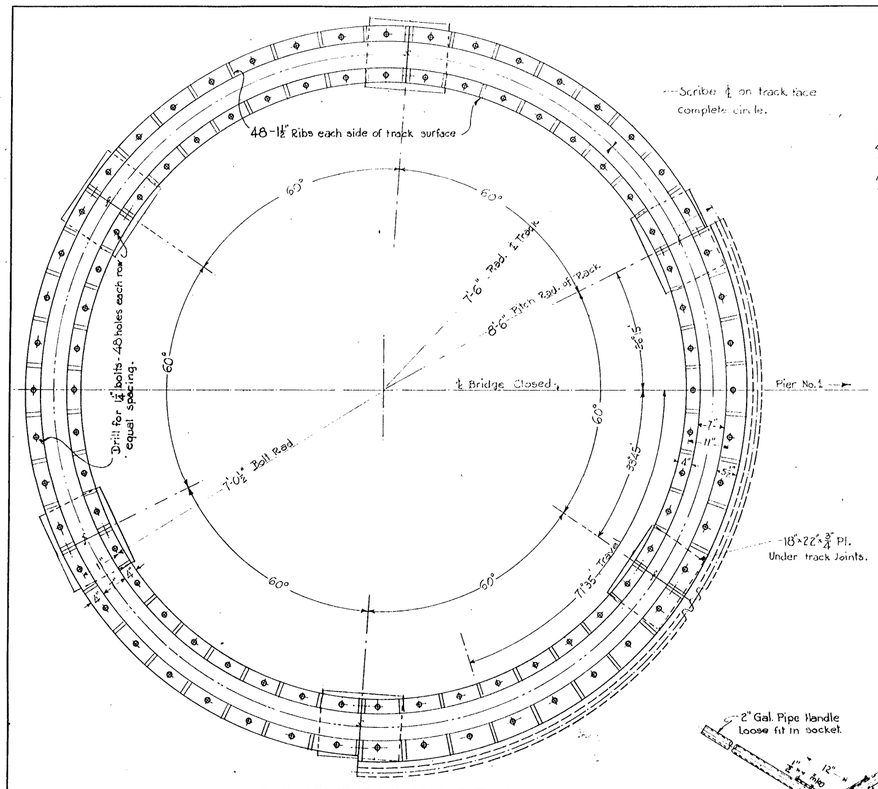
TIE PLAN AND DETAILS

SCALE AS SHOWN

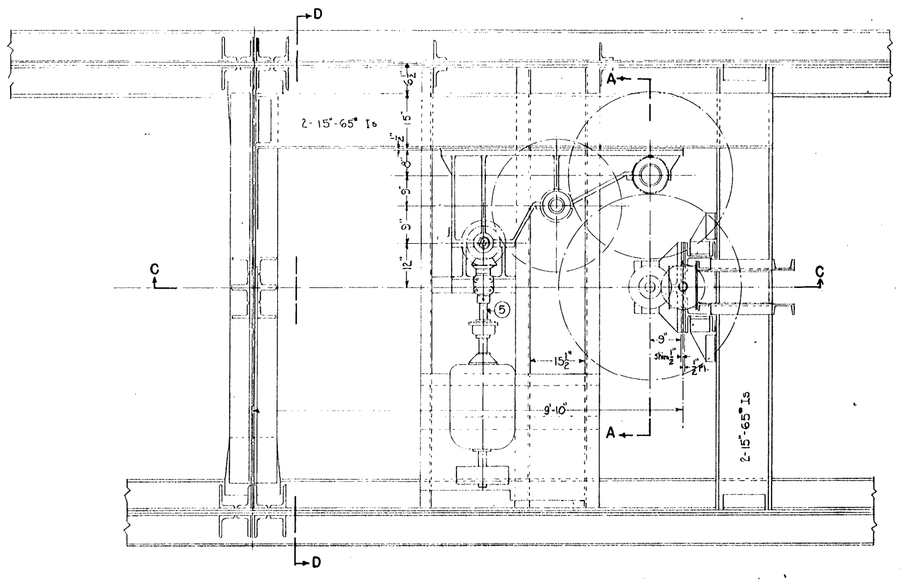
U. S. ENGINEER OFFICE, PORTLAND, OREGON DISTRICT

SUBMITTED: Geo. Mackenzie, ENGINEER — APPROVED: _____ MAJOR, CORPS OF ENGINEERS

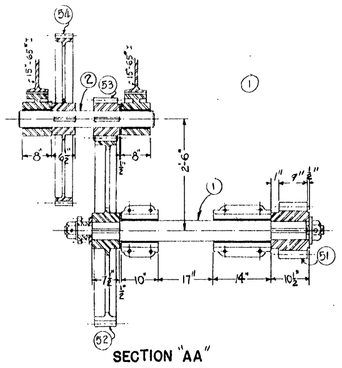
RECOMMENDED: Wm. Glassman, HEAD ENGINEER — DESIGNED BY W.O.J. DATE FEB 6 1935. DR. BY W.C.T. TR. BY W.C.T. CHECKED BY [illegible]



RACK SEGMENT AND ROLLER TRACK



SECTIONAL PLAN "EE"



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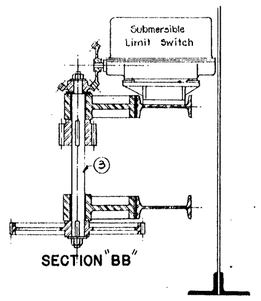

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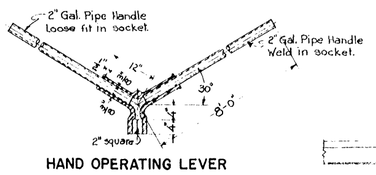
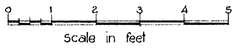
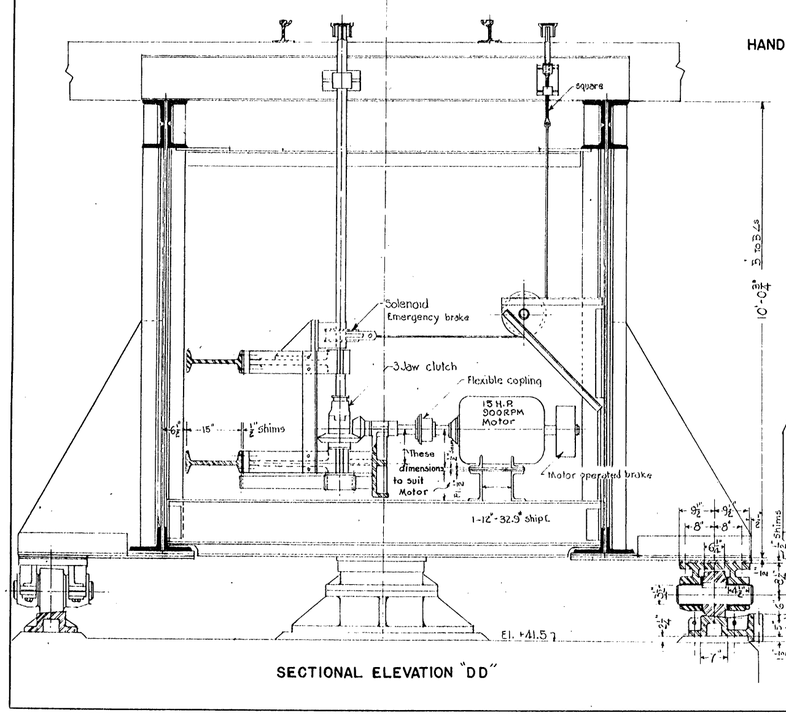


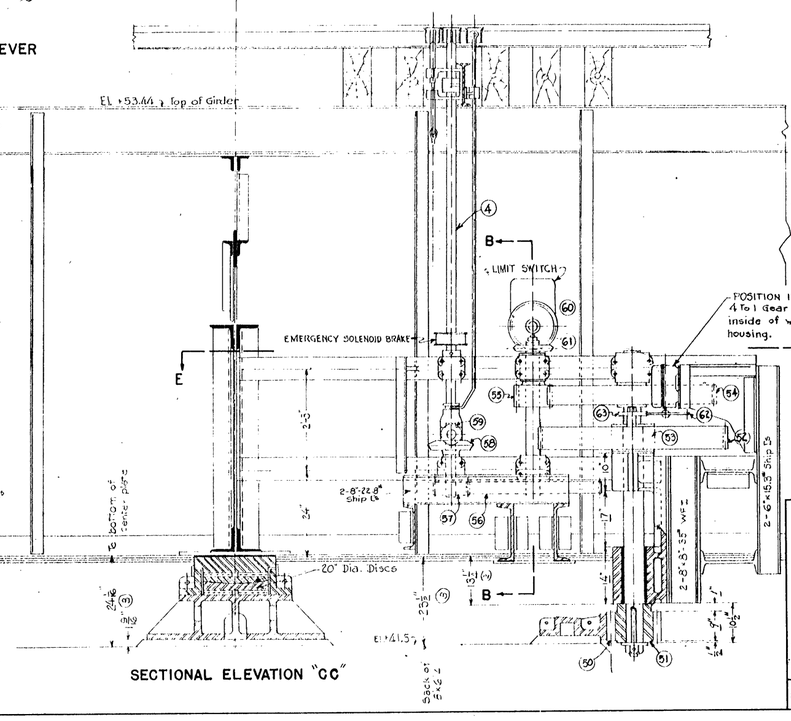
HAND OPERATING LEVER



EMERGENCY BRAKE
HAND RELEASE CRANK



SECTIONAL ELEVATION "DD"



SECTIONAL ELEVATION "CC"

GEAR TABLE – TURNING MACHINERY

All Gears to be Involute Cut Teeth.

Kind	Mark	Amount	Type	Material	Ratio	Pres. Angle	No. Teeth	Pitch	Pitch Dia.	Face	Bore	Hub Dia.	Hub Length	Remarks
Rack Seg	50	2	Spur	C.S.	19.7	20°	34	1	17'-0"	8"	1			
Pinion	51	1	"	F.S.	1	20°	13	1	13"	9"	6"	10½	10½	
Gear	52	1	"	C.S.	5	20°	75	1½	50"	6"	6"	11"	7½	
Pinion	53	1	"	F.S.	1	20°	15	1½	10"	6½	4½	8½	7½	
Gear	54	1	"	C.S.	5	20°	90	2	45"	5"	4½	8½	6½	
Pinion	55	1	"	F.S.	1	20°	18	2	9"	5½	3½	6½	6½	
Gear	56	1	"	C.S.	4	20°	108	3	36"	3"	3½	6½	4"	
Pinion	57	1	"	F.S.	1	20°	27	3	9"	3½	2½	4½	4"	
Gear	58	1	Bevel	C.S.	2	20°	48	4	12"	2½	2½	4½		Jaw clutch.
Pinion	59	1	"	C.S.	1	20°	24	4	6"	2½	2"	3½	3½	
Gear	60	1	"	BR'Z	1.2	14½°	96	8	12"	1"	1"	2½	1½	Limit Switch.
Pinion	61	1	"	"	1	14½°	80	8	10"	1"	1"	2½	2½	
Gear	62	1	Spur	"	2	14½°	144	12	12"	⅝"	To suit Pos. Indicator Motor.			
Pinion	63	1	"	"	1	14½°	72	12	6"	1"	2½	4½	3"	

SHAFTING

Mark	Amount	Material	Diameter	Approx. Length	No. Keyways	Remarks
1	1	Forged st	6½"	6'-0"	3	Reduced both ends – With nuts.
2	1	Hot rolled st	4½"	3'-0"	2	
3	1	"	3½"	3'-11"	3	Reduced both ends – With nuts.
4	1	Cold rolled st	2½"	10'-0"	4	2 Splines for jaw clutch – 1 End squared
5	1	"	2"	1'-8"	2	

BONNEVILLE POWER NAVIGATION PROJECT

28TH CONTRACT

BRIDGE ACROSS NAVIGATION CANAL

SWING SPAN

TURNING MACHINERY

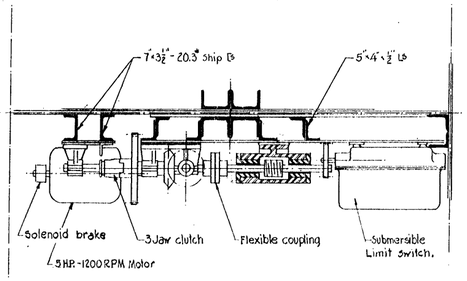
SCALE 3/4" = 1 FOOT

U. S. ENGINEER OFFICE, PORTLAND, OREGON DISTRICT

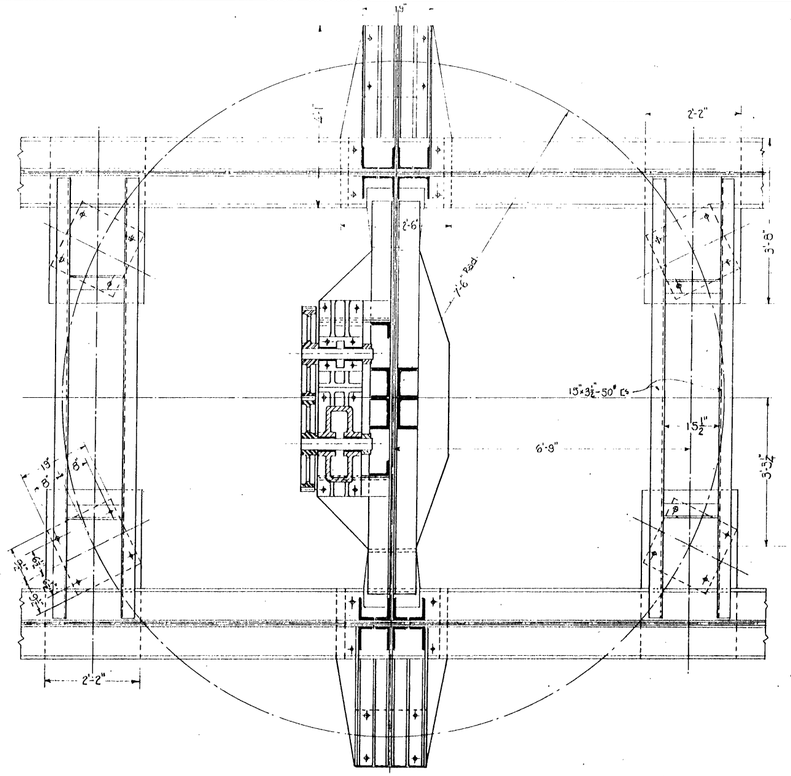
NO.	REVISION	DATE	BY	AP'V'D
3	Dimensions added or changed	7/1-35	A.C.D	
2	Gear Table revised	7/1-35	"	
1	Gear numbers added	7/1-35	A.C.D	

SUBMITTED: R.L. Mackenzie, ENGINEER — APPROVED: H. Williams, MAJOR, CORPS OF ENGINEERS

RECOMMENDED: [illegible], HEAD ENGINEER — DESIGNED BY C.W.B. DATE 1-16-35 DR. BY C.W.B. TR. BY A.C.D. CHECKED BY [illegible]



SECTIONAL PLAN "B B"



SECTIONAL PLAN "CC"

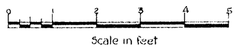
GEAR TABLE - CENTER WEDGE MACHINERY

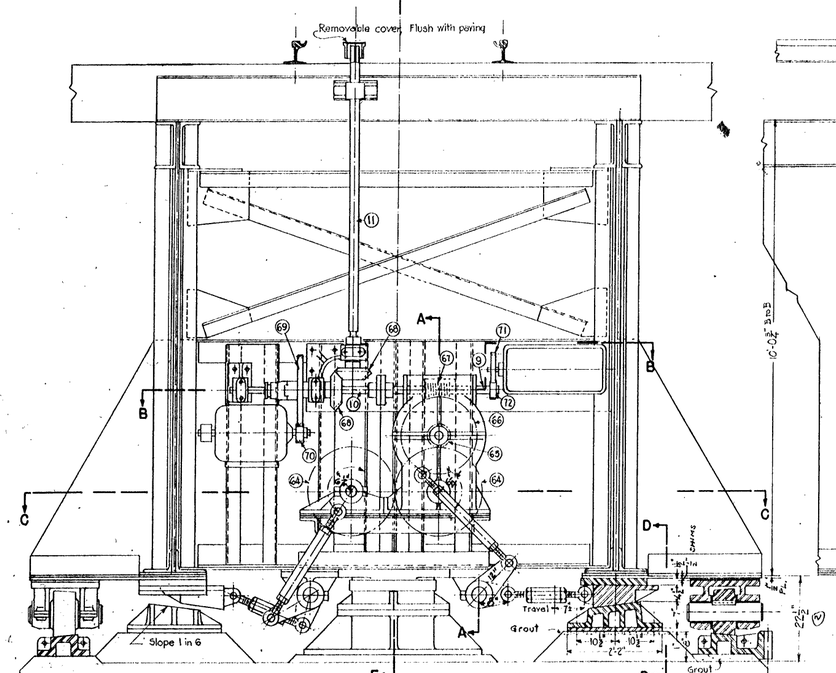
All Gears to be Involute Cut Teeth

Kind	Mark	Amount	Type	Material	Ratio	Pres. Angle	No. Teeth	Pitch	Pitch Dia.	Face	Bore	Hub Dia.	Hub Length	Remarks	
Gear	64	2	Spur	C.S.	4	20°	60	2½	24"	5"	4"	7½	5½		①
Pinion	65	1	"	F.S.	4	20°	15	2½	6"	5"	3½	5"	5½		①
Gear	66	1	Worm	BRZ	66	14½°	66	1"	21"*	3½	3½	4½	4"		
Worm	67	1	"	F.S.	1	14½°	1	1"	3½	4½	O	2½	5"	Integral with shaft. 9	
Gear	68	2	Bevel	C.S.	1	20°	30	3	10"	2½	2"	3½	3½		
Gear	69	1	Spur	C.S.	4	20°	144	6	18"	2½	2"			Jaw Clutch.	
Pinion	70	1	"	F.S.	4	20°	36	6	4½	2½				To Suit Motor.	
Gear	71	1	"	BRZ	2.2	14½°	66	6	30½	1½				Limit Switch.	
Pinion	72	1	"	BRZ	1	14½°	30	6	3½	1½	2"				

SHAFTING - CENTER WEDGE MACHINERY

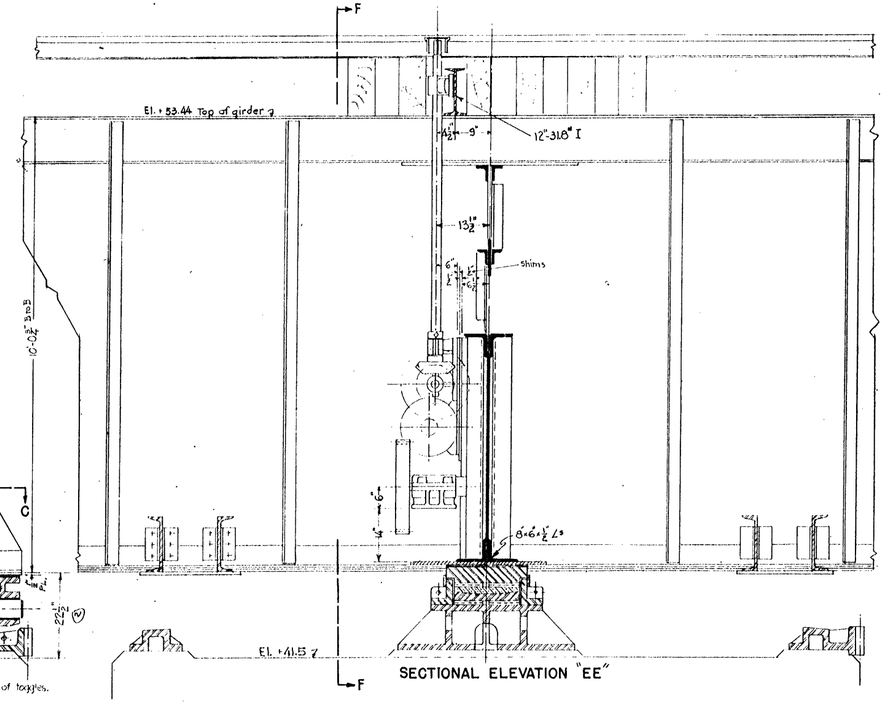
Mark	Amount	Material	Diameter	Approx. Length	No. Keyway	Remarks
6	2	Hot rolled steel	4½	3'-0"	2	
7	2	" " "	4"	1'-8"	1	
8	1	" " "	3½"	1'-6"	2	
9	1	Forged steel	2"	2'-6"	2	Integral with worm 67.
10	1	Cold rolled steel	2"	3'-5"	3	2 Splines for jaw clutch.
11	1	" "	2½"	7'-0"	1	One end reduced-One end squared.



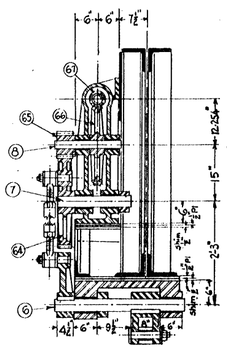


SECTIONAL ELEVATION "FF"

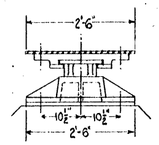
Note:- Position of wedges shown is to illustrate travel of toggles. In operation wedges act in unison.



SECTIONAL ELEVATION "EE"



SECTION "AA"



VIEW "DD"

NO.	REVISION	DATE	BY	APV'D
1	Gear Table revised	1/4/35	A.C.D.	Rev.

BONNEVILLE POWER NAVIGATION PROJECT

28 TH. CONTRACT

BRIDGE ACROSS NAVIGATION CANAL

SWING SPAN

CENTER WEDGE MACHINERY

SCALE 3/4"=1 FOOT.

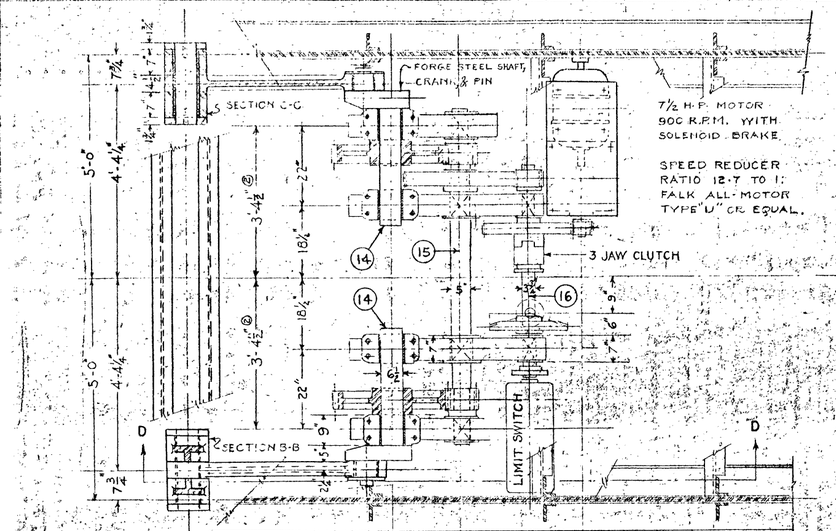
U. S. ENGINEER OFFICE, PORTLAND, OREGON DISTRICT

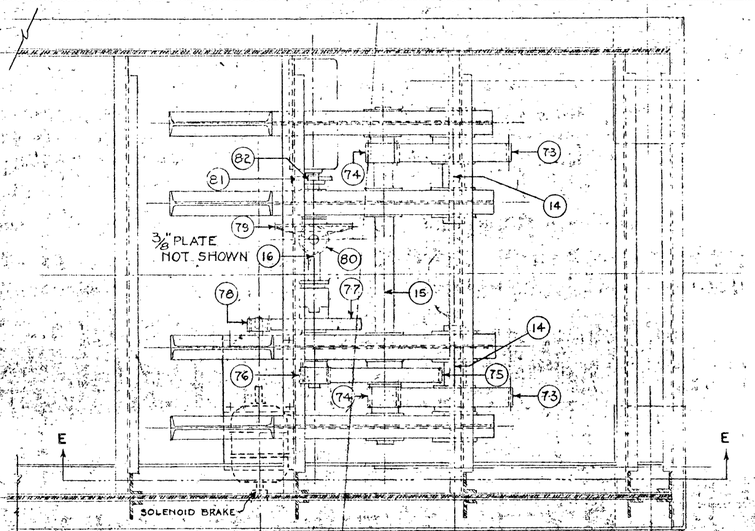
SUBMITTED K.L. Mackenzie ENGINEER — APPROVED D.D. Williams MAJOR, CORPS OF ENGINEERS

RECOMMENDED C.W. Harrison HEAD ENGINEER — DESIGNED BY C.W.B. DATE 1-16-'35 — DR. BY C.W.B. TR. BY A.C.D. CHECKED

WAR DEPARTMENT

CORPS OF ENGINEERS U.S. ARMY.



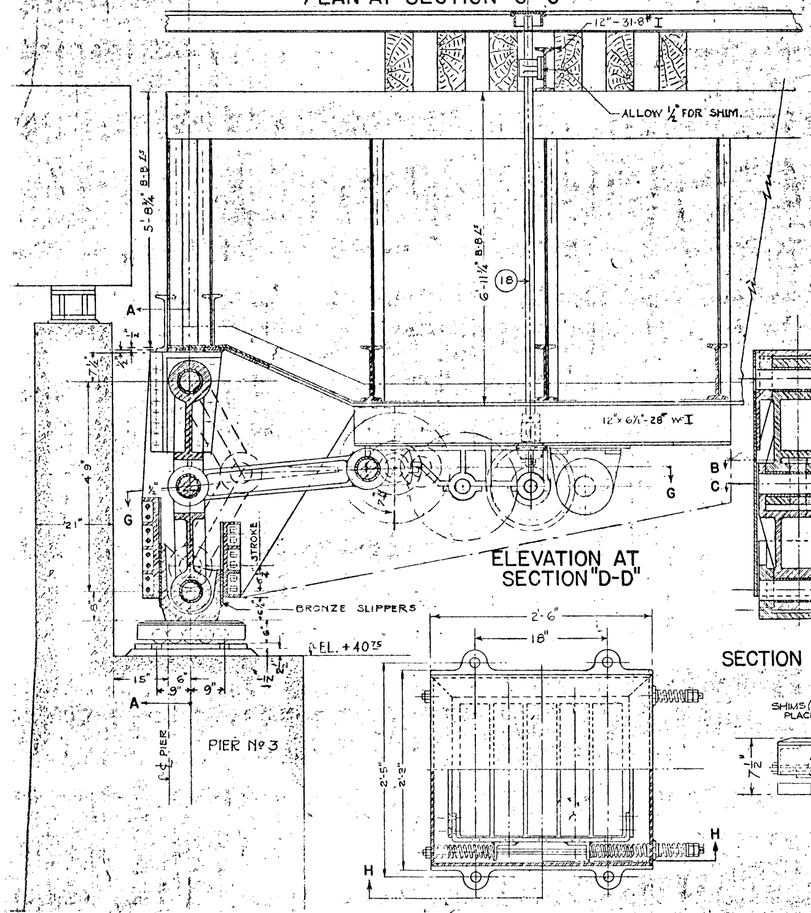


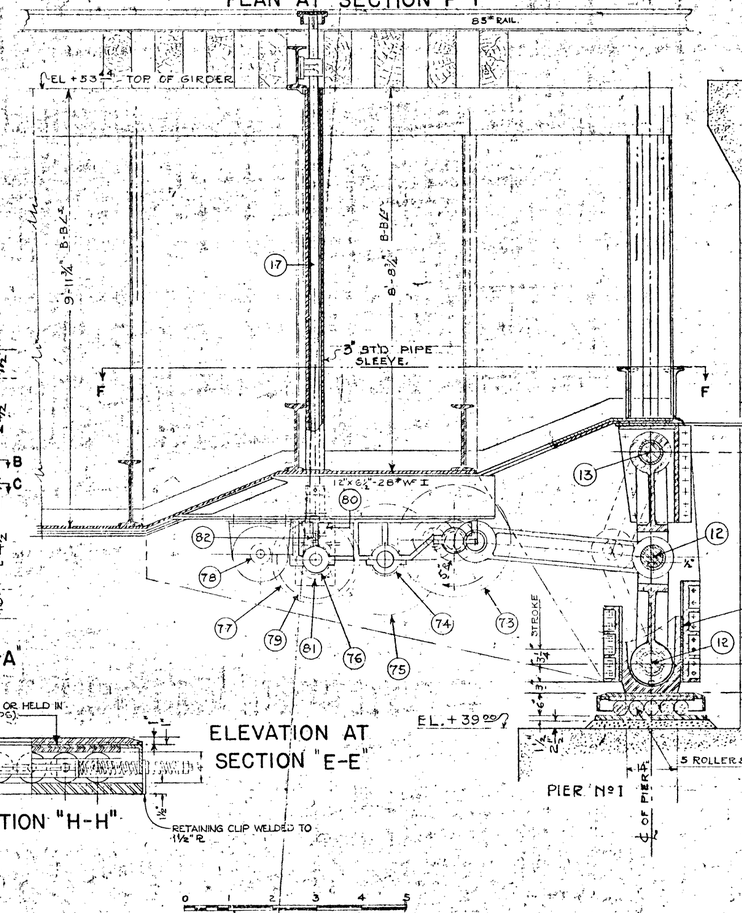
GEAR TABLE FOR END JACKS.
All Gears To be Involute Cut Teeth.

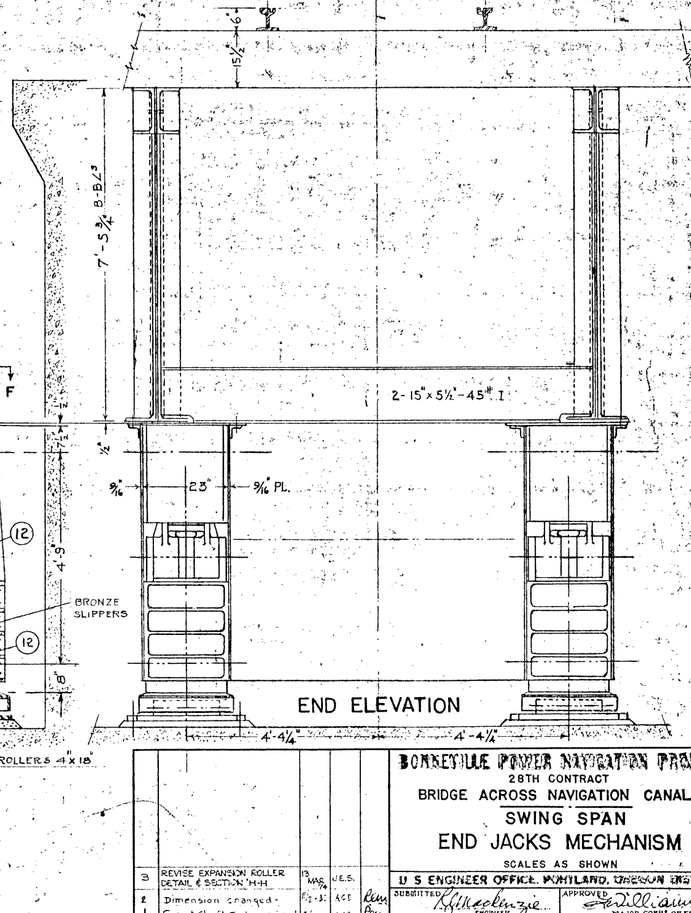
KIND	MARK	AMOUNT	TYPE	MATERIAL	RATIO	PRESS. ANGLE	NO. TEETH	P. PITCH	P. DIM.	FACE	BORE	HUB DIA.	HUB LENGTH	REMARKS.
Gear	73	4	Spur	CS	3.75	20°	60	2	30"	5"	6¼	12	7"	
Pinion	74	4	"	FS	1	20°	16	2	8"	6	4⅝	6¼	7¼	
Gear	75	2	"	CS	4.13	20°	75	2½	30"	4"	5"	9"	6"	
Pinion	76	2	"	FS	1	20°	18	2½	7.2"	4½	3½	6¼	6½	
Gear	77	2	"	CS	4.8	20°	72	3	24"	3"	2"	7	7"	To Suit Clutch
Pinion	78	2	"	FS	1	20°	16	3	5.333	3"	2"	7"		To suit Reducer.
Gear	79	2	Bevel	CS	3	20°	45	3	2.7"	2½	2	7	5"	Hand operat.
Pinion	80	2	"	CS	1	20°	27	3	7"	2½	1¼	4"	4"	rig shaft
Gear	81	2	Spur	BRZ	4	14½°	80	8	10"	1"	3½	5½	2"	Limit
Pinion	82	2	"	BRZ	1	14½°	20	8	2.5"	1¼	T. Suit			Switch.

SHAFTING

MARK.	AMOUNT.	MATERIAL	DIAMETER	APPROX. LENGTH	NUMBER KEYWAYS	REMARKS.
12	8	Hot Rolled St.	6"	1'-10"	0	Two Screw Dowels Each End.
13	4	do	6"	1'-11"	0	" " "
14	4	F.S.	6½"	3'-1"	2	Crank & Pin forged on one end.
15	2	Hot Rolled St.	5"	7'-7"	3	Both Ends Reduced.
16	2	do	3½"	4'-9"	5	Two Splines for Jaw Clutch - Ends reduced ①
17	1	Cold Rolled St.	2½"	11'-8"	1	One End Squared.
18	1	do	2½"	9'-11"	1	" " "







NO.	REVISION	DATE	BY	APP'D
3	REVISE EXPANSION ROLLER DETAIL & SECTION "H-H"	13 MAR 36	J.E.S.	
2	Dimension changed -	2-3-36	ACS	
1	Gear & Shaft Table revised	1-31-36	ACS	

BONNEVILLE POWER NAVIGATION PROJECT
28TH CONTRACT
BRIDGE ACROSS NAVIGATION CANAL
SWING SPAN
END JACKS MECHANISM
SCALES AS SHOWN

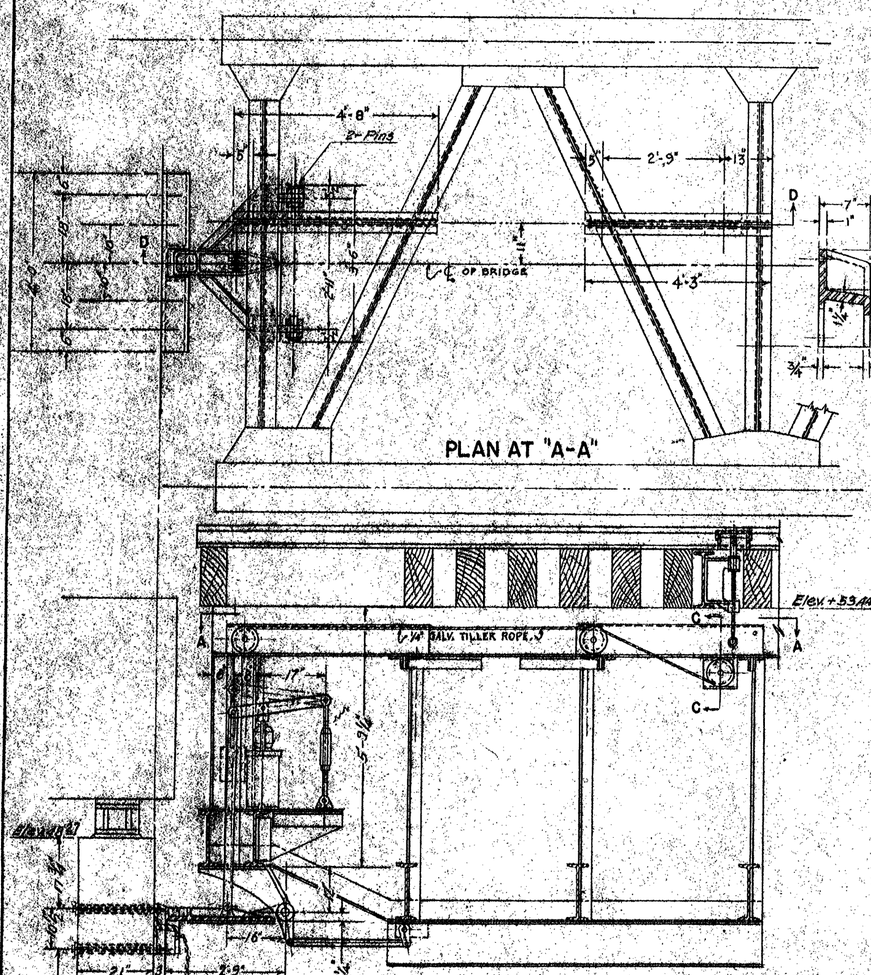
U S ENGINEER OFFICE, PORTLAND, OREGON, JANUARY.

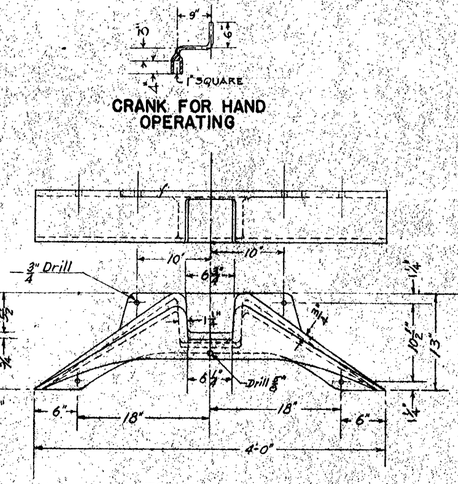
SUBMITTED K.B. Mackenzie ENGINEER
APPROVED E. Williams MAJOR CORPS OF ENGINEERS
RECOMMENDED HEAD ENGINEER
DRAWN BY C.W.B. DATE 1-6-36
TRACED BY W.C.T. CHECKED

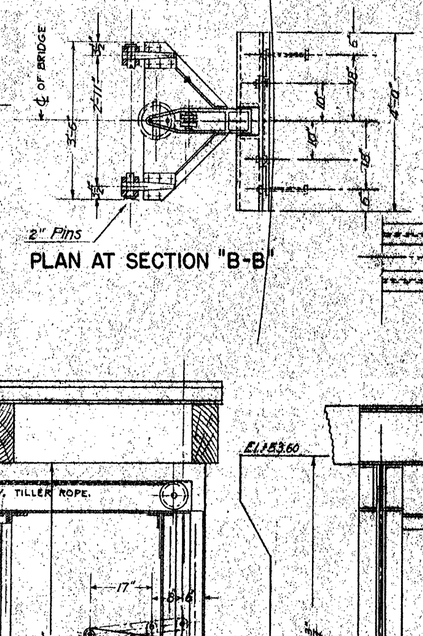
SHEET 9 OF 13 N-2-61

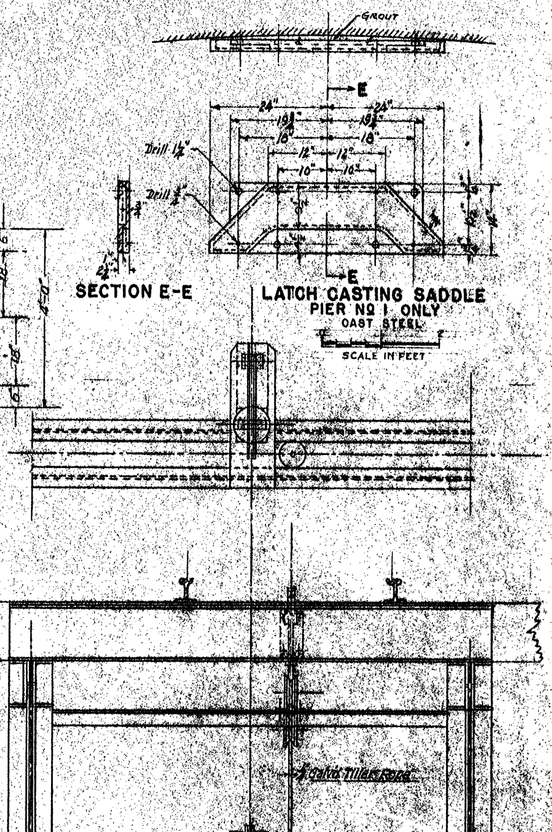
WAR DEPARTMENT

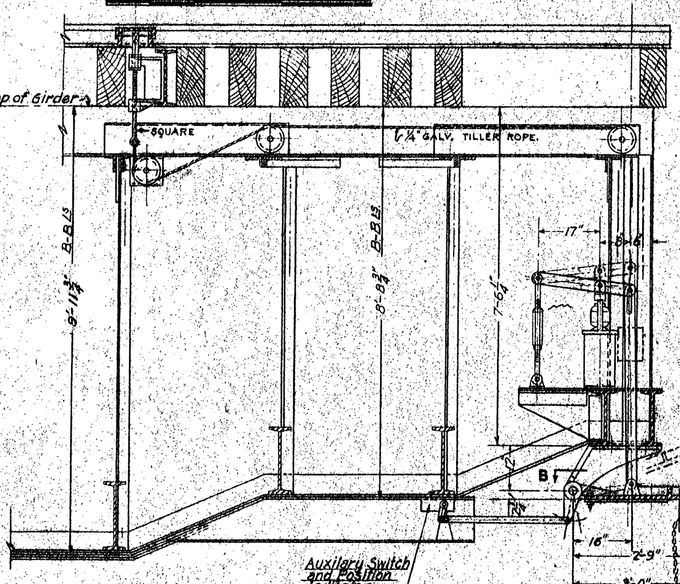
CORPS OF ENGINEERS U.S. ARMY

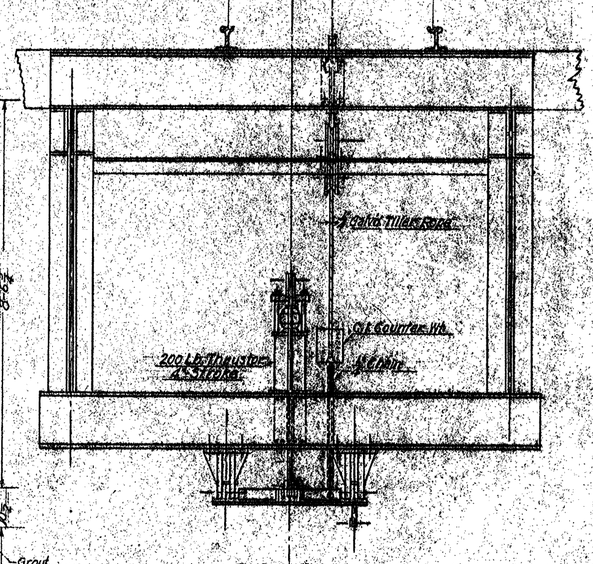


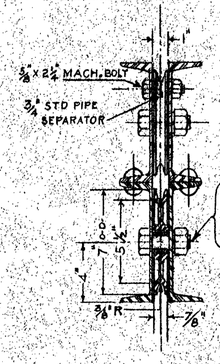












BONNEVILLE POWER NAVIGATION PROJECT
28TH CONTRACT
BRIDGE ACROSS NAVIGATION CANAL
SWING SPAN
CENTERING LATCH MECHANISM
SCALES AS SHOWN
U S ENGINEER OFFICE, PORTLAND, OREGON DISTRICT

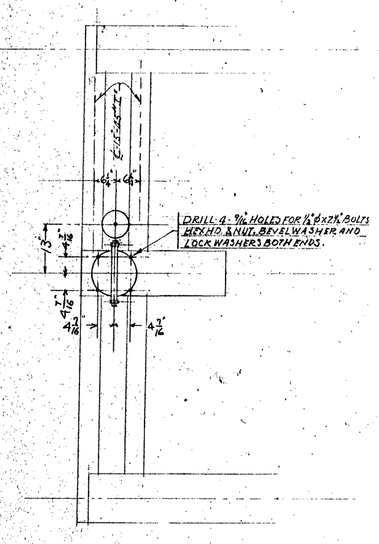
NO.	REVISION	DATE	BY	APV'D

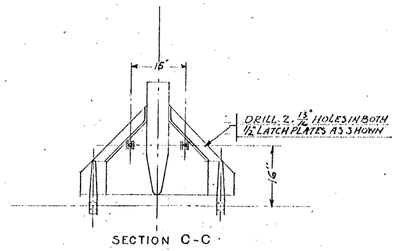
SUBMITTED _____ ENGINEER
APPROVED _____ MAJOR, CORPS OF ENGINEERS
RECOMMENDED _____ HEAD ENGINEER
DRAWN BY: C.W.B. DATE 1-16-35
TRACED BY W.C.T. CHIEF CLERK

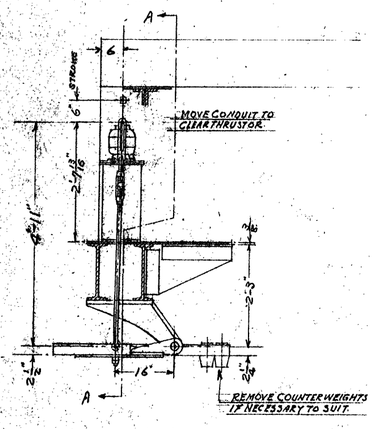
N-2-61

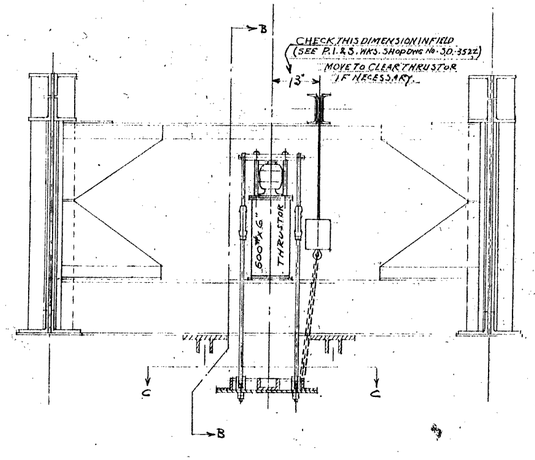
WAR DEPARTMENT.

CORPS OF ENGINEERS U.S. ARMY.

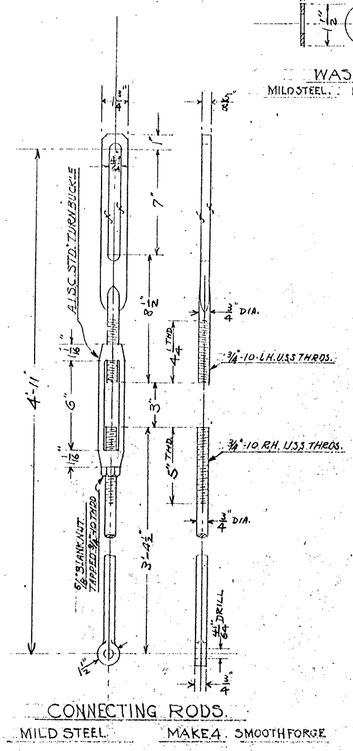


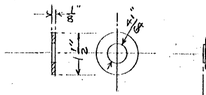


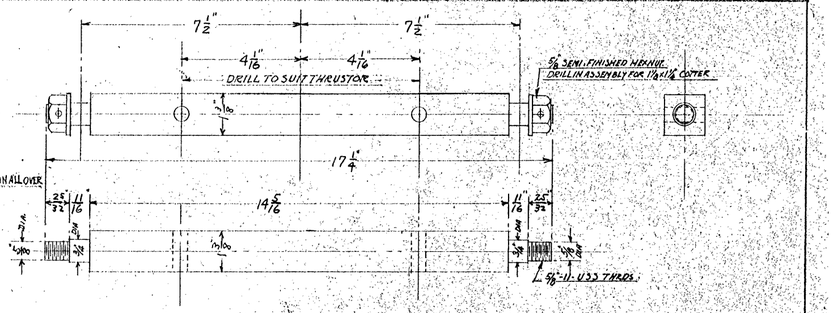


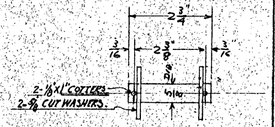


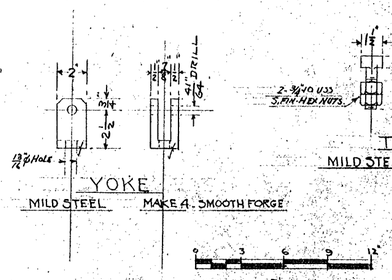
SWING END

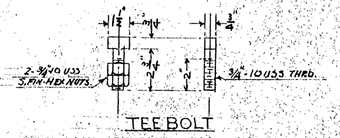


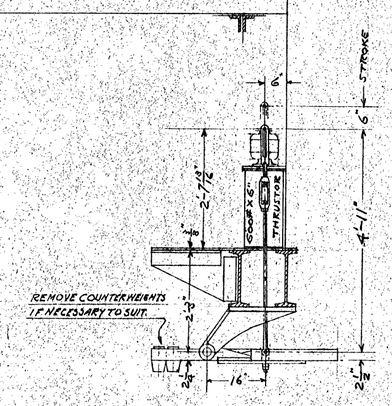












SCALE 3/4 IN = 1 FOOT

SCALE 3 IN. = 1 FOOT

NOTES

IN ADDITION TO THE DETAILED PARTS SHOWN THERE WILL BE FURNISHED TWO 600 LB. BY 6" STROKE GENERAL ELECTRIC CO., OR EQUAL, THRUSTORS, LOCATED AS SHOWN TO REPLACE THE 200 LB. BY 4" STROKE G.E. THRUSTORS, NOW IN PLACE.

PAINT. ALL SURFACES EXCEPT FINISHED WORKING PARTS, TWO SHOP COATS OF RED LEAD PAINT, AFTER AUTHORIZATION BY THE INSPECTOR. FINISHED SURFACES TO BE GIVEN A PROTECTING COAT OF WHITE LEAD AND TALLOW APPLIED HOT.

NO.	REVISION	DATE	BY	APV'D

BONNEVILLE PROJECT

BRIDGE ACROSS NAVIGATION CANAL

SWING SPAN

CENTERING LATCH MECHANISM

REVISIONS TO SHEET 10 - N2-61

SCALE AS SHOWN

U. S. ENGINEER OFFICE, SECOND PORTLAND DISTRICT (OREGON)

SUBMITTED: [signature] ENGINEER

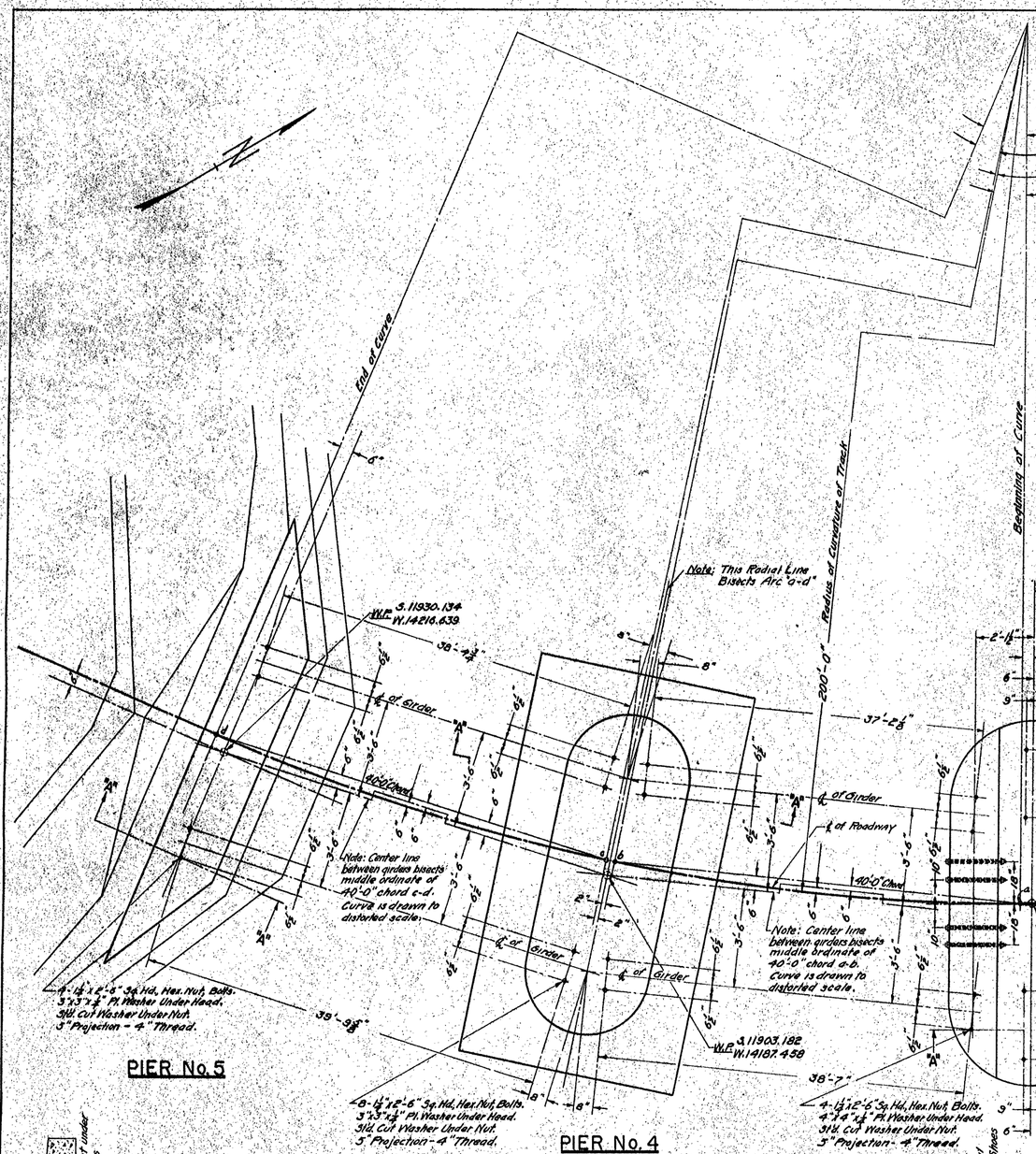
RECOMMENDED: [signature] PRINCIPAL ENGINEER

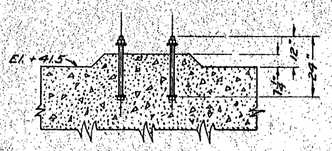
APPROVED: [signature] LT. COL. CORPS OF ENGINEERS

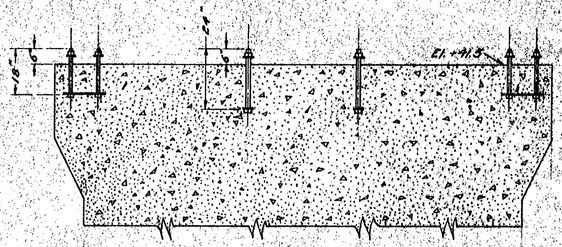
DESIGNED BY BAR DATE 4-10-36

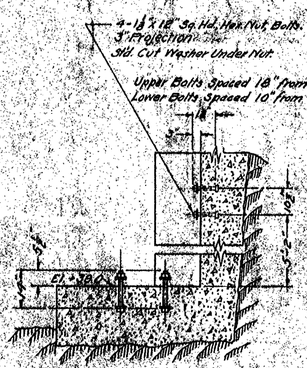
DR. BY C.H.B. TR. CHECKED BY O.O.D.

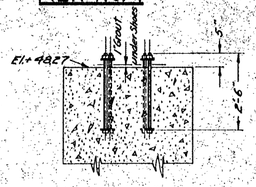
SHEET 10A. N-2-61

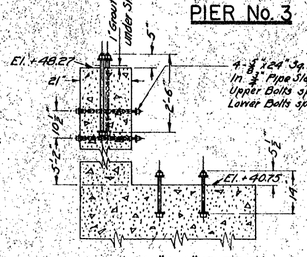


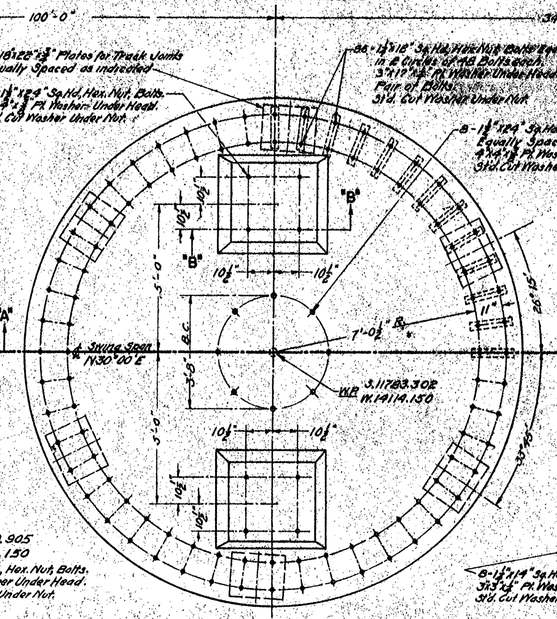












General Notes.
This drawing supersedes sheets 1, 2 and 3 of Drawing N-1-32.

NO.	REVISION	DATE	BY	AP'V'D

BONNEVILLE POWER NAVIGATION PROJECT

26TH CONTRACT

BRIDGE ACROSS NAVIGATION CANAL

BRIDGE PIERS

ANCHOR BOLTS PLAN

SCALE ½" = 1'-0"

U. S. ENGINEER OFFICE, PORTLAND, OREGON DISTRICT

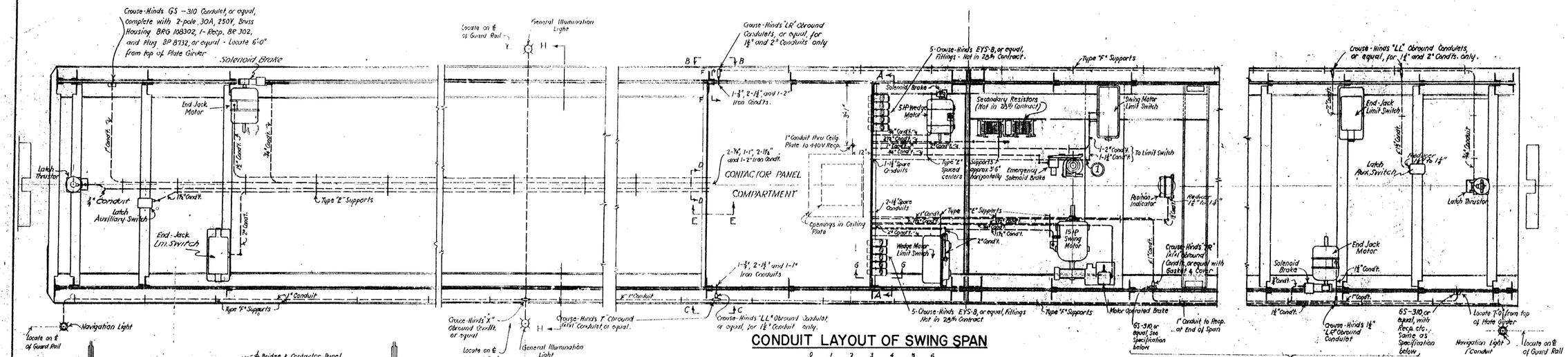
SUBMITTED: K.F. Mackenzie, ENGINEER

APPROVED: C. H. Williams, MAJOR, CORPS OF ENGINEERS

RECOMMENDED: C. J. Ells, HEAD ENGINEER

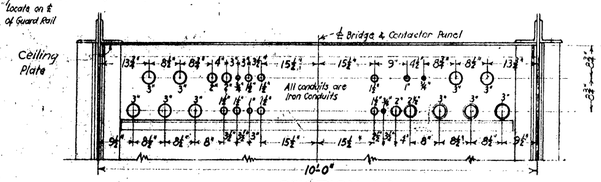
DESIGNED BY W.D. Smith DATE 1-16-35

DR. BY C.K.B. TR. BY H.E.L. CHECKED BY C.K.B. 1-16-35



CONDUIT LAYOUT OF SWING SPAN

SCALE IN FEET



SECTION AA

SCALE IN FEET

SECTION B-B

"LL" Obround Conduilets are not indicated here.

SECTION C C

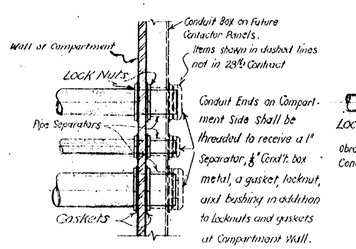
LR Obround Conduilet not indicated here.

SECTION D-D

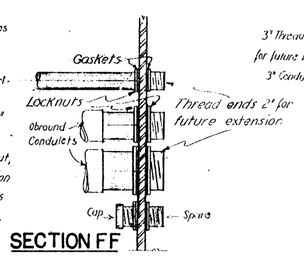
TYPICAL SUPPORT TYPE "E"

TYPICAL CONDUIT SEALING DETAIL

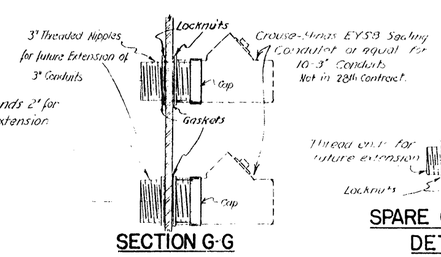
TYPICAL SUPPORT TYPE "F"



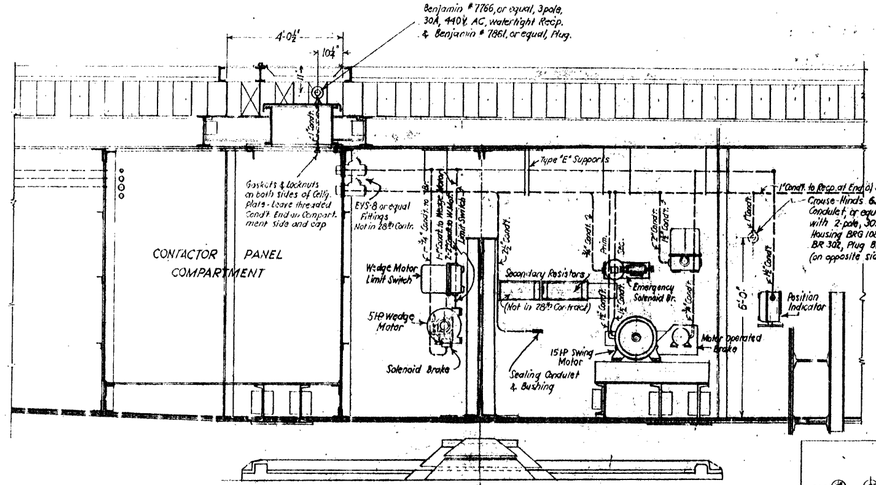
SECTION E-E



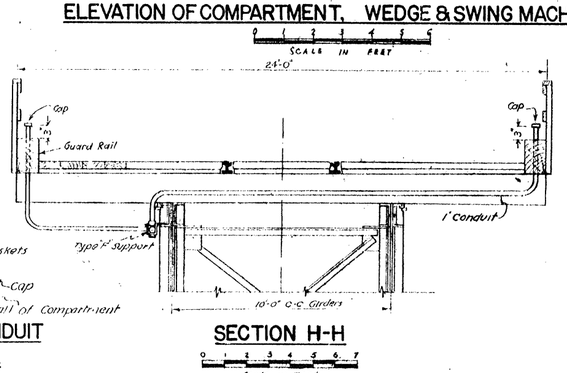
SECTION F-F



SECTION G-G

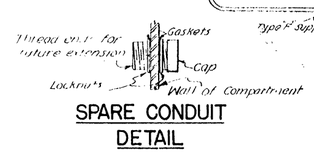


ELEVATION OF COMPARTMENT, WEDGE & SWING MACHINERY



SECTION H-H

Scale in Feet



SPARE CONDUIT DETAIL

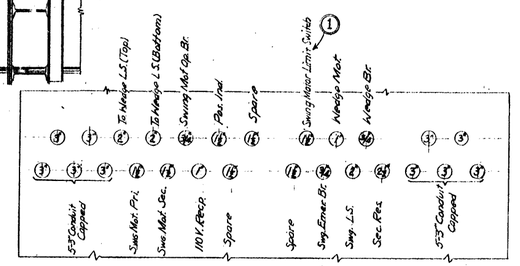


DIAGRAM OF CONDUIT AT SECTION A-A

No Scale

Note:

Contractor to check all conduit sizes against outlet on apparatus to be supplied.

A Crouse-Hinds "EYS" Sealing Conduilet, or equal, Fitting shall be supplied at each Motor, Brake, Limit Switch, Auxiliary Switch, Position Indicator, and Secondary Resistor.

All conduits and fittings shall be threaded.

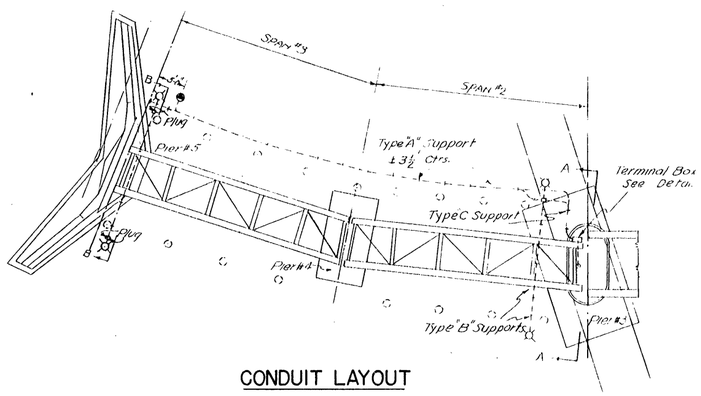
All conduit Supports shown are typical only. Contractor shall supply all necessary Supports to adequately support all Conduits.

Sheets 12 and 13 of N-2-61 Supersede Sheet 4 of N-2-43.

NO.	REVISION	DATE	BY	APV'D
1	Addtl. Cond't. to Swing Motor Limit Switch.	5-6-35	JWW	RMM

BONNEVILLE POWER NAVIGATION PROJECT
28TH CONTRACT
BRIDGE ACROSS NAVIGATION CANAL
ELECTRICAL DETAILS
SWING SPAN
SCALES AS SHOWN
U. S. ENGINEER OFFICE, PORTLAND, OREGON DISTRICT

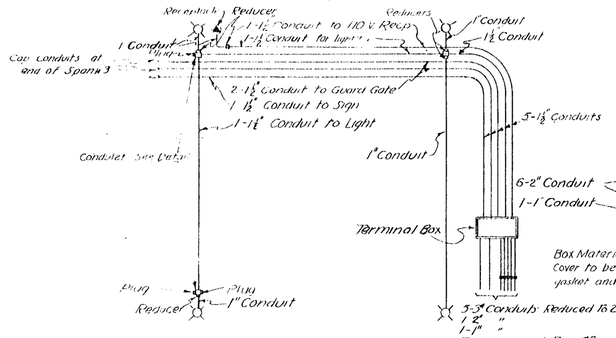
SUBMITTED: R.M. Mackenzie, ENGINEER
APPROVED: [illegible], MAJOR, CORPS OF ENGINEERS
RECOMMENDED: [illegible], HEAD ENGINEER
DRAWN BY: J.M.G. & J.W.W. DATE 1-26-35.
TRACED BY J.M.G. & J.W.W. CHECKED BY A.P.D.



CONDUIT LAYOUT

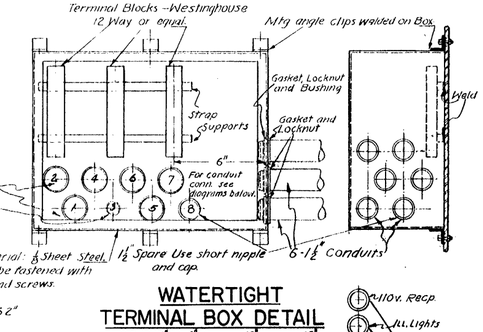
Scale in Feet

Legend:
- Ill. Light
- Receptacle



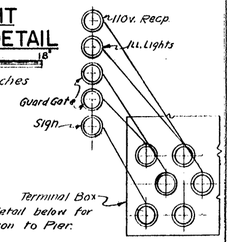
CONDUIT DIAGRAM

No Scale



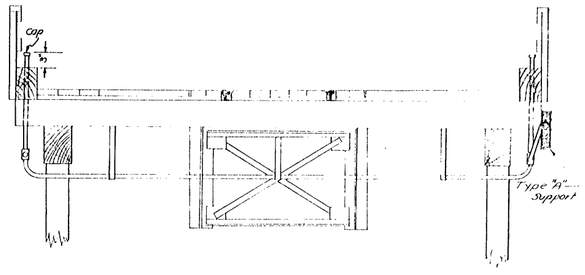
WATERTIGHT TERMINAL BOX DETAIL

Scale in Inches



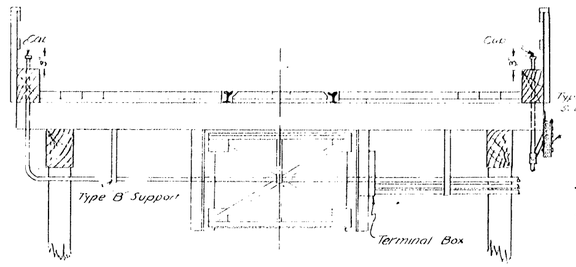
Note: All conduits and fittings to be threaded.

All conduit supports are typical only. Contractor shall supply all necessary supports to adequately support all conduit.

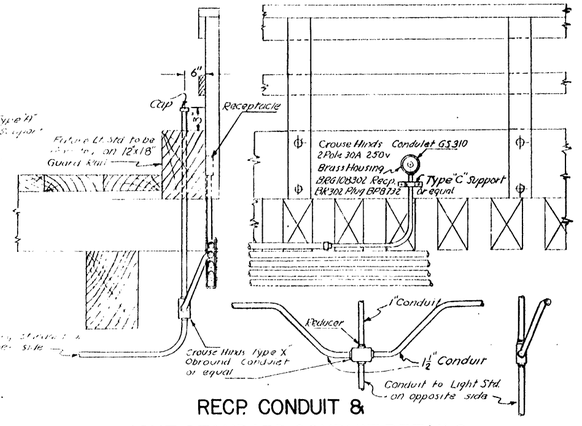


SECTION B-B

Scale in Feet

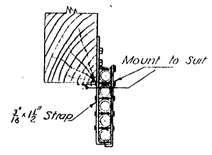


SECTION A-A

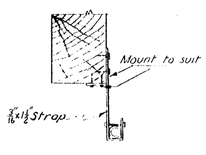


RECP. CONDUIT & LIGHT STANDARD CONDUIT DETAILS

Scale in Feet



TYPICAL SUPPORT TYPE "A"



TYPICAL SUPPORT TYPE "B"

TYPICAL SUPPORT TYPE "C"

Note: Sheet 12 of 13 of N-2-6 Supersedes Sheet 4 of N-2-43

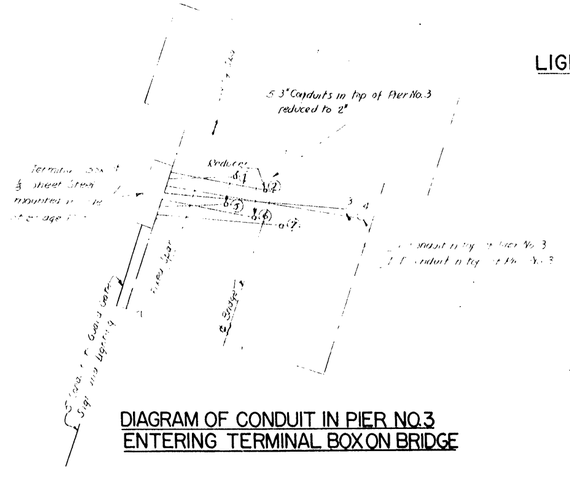


DIAGRAM OF CONDUIT IN PIER NO. 3 ENTERING TERMINAL BOX ON BRIDGE

BONNEVILLE POWER NAVIGATION PROJECT
28TH CONTRACT
BRIDGE ACROSS NAVIGATION CANAL
ELECTRICAL DETAILS
FIXED SPANS
SCALES AS SHOWN

U.S. ENGINEER OFFICE PORTLAND OREGON DISTRICT

SUBMITTED R.H. Mackenzie
RECOMMENDED
DIST. ENGINEER
A.P.M. [illegible]
NAVAL CONSTR. [illegible]
DRAWN BY JMG DATE 1-26-33
TRACED BY JMG CHECKED BY A.P.D.

SHEET 13 OF 13 N-2-61

EL. 55'-1 1/2" TOP OF DECK PLANKS

SCREW & NUT

2-L.H. FOR END JACKS
1-L.H FOR TURN. GEAR
1-R.H. FOR WEDGES
2-R.H. FOR LATCHES
1-R.H. FOR EM. BRAKE

1 1/2
1 1/2
3 1/2
8 5/8"
5/16
3
1" 3/4
MAX TRAVEL
7 1/2
3/4
3
FINISH
6 1/4
18
4/16

3" SHE CAP SCREWS AND LOCK WASHERS

2-RIBS

2-RIBS

2-RIBS

5-4800

5-4789

5'-1" MAX TRAV.

SECTION No. 2
SUGGESTED CHANGES

SECTION No. 1
AS DETAILED

HOLE TOO CLOSE TO EDGE OF SHIMS

3/32

ANGLE OF GUIDE TO SUIT-FOR TURNING GEAR

1 IN

BONNEVILLE POWER NAVIGATION PROJECT
BRIDGE ACROSS NAVIGATION CANAL
SWING SPAN
HAND OPERATING MECHANISM
PROPOSED CHANGE IN BRACKET S-4789

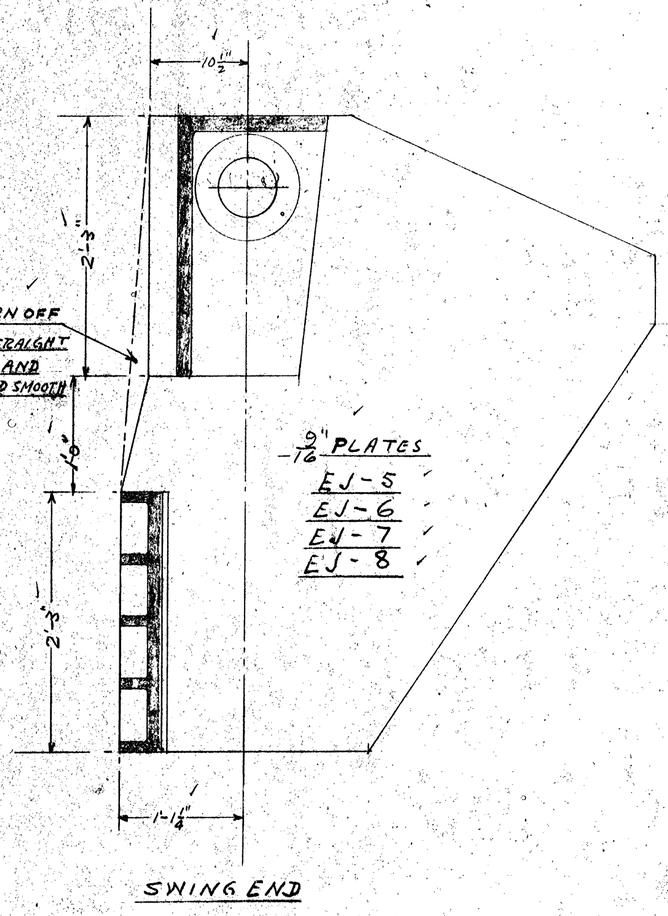
U S ENGINEER OFFICE, PORTLAND, OREGON DISTRICT

SUBMITTED: [signature] ENGINEER — APPROVED: [signature] MAJOR, CORPS OF ENGINEERS

RECOMMENDED: [signature] HEAD ENGINEER — DRAWN BY: C.W.S. DATE MAR. 28 '35

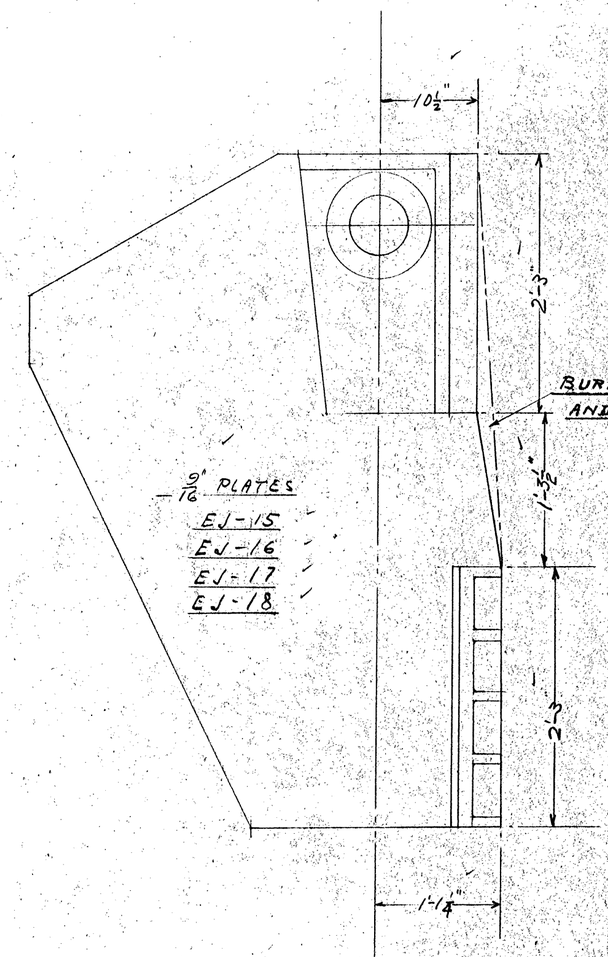
TRACED BY ..... CHECKED BY .....

N-2-70



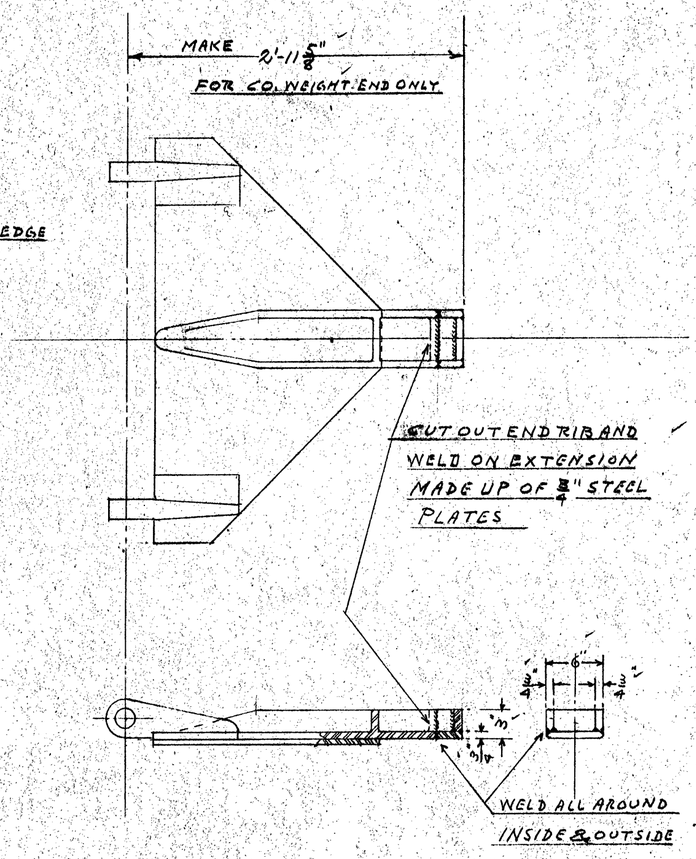
9/16" PLATES
EJ-5
EJ-6
EJ-7
EJ-8

SWING END



9/16" PLATES
EJ-15
EJ-16
EJ-17
EJ-18

CO. WEIGHT END

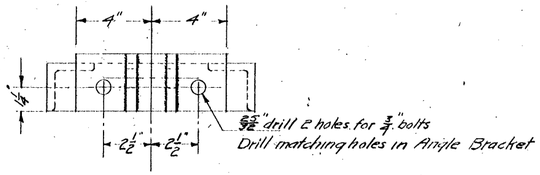


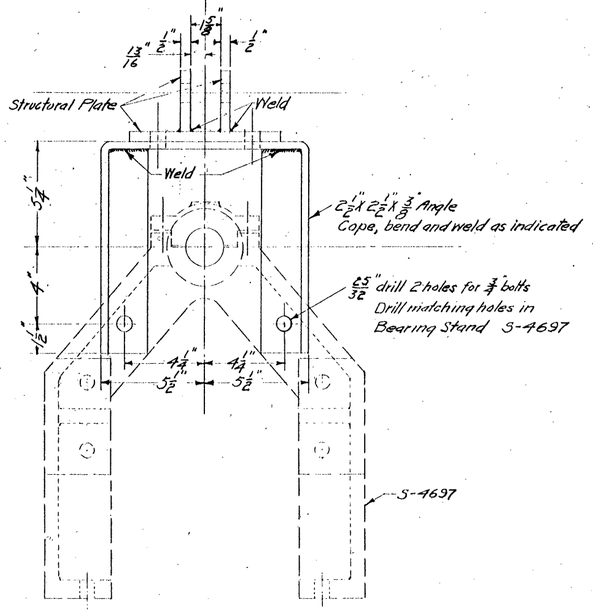
Note: This drawing No. changed from
N-2-72 to N-2-73

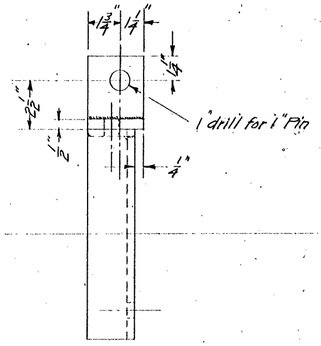
BONNEVILLE POWER NAVIGATION PROJECT
28TH CONTRACT
BRIDGE ACROSS NAVIGATION CANAL
SWING SPAN
ALTERATIONS
FOR CENTERING LATCH CLEARANCE
U. S. ENGINEER OFFICE, PORTLAND, OREGON DISTRICT

SUBMITTED: R.H. Mackenzie, ENGINEER	APPROVED: [illegible] Williams, MAJOR, CORPS OF ENGINEERS
RECOMMENDED: [illegible], HEAD ENGINEER	DRAWN BY: C.V.S. DATE 4-3-35
	TRACED BY: ..... CHECKED BY: [illegible]

N-2-73







General Notes:

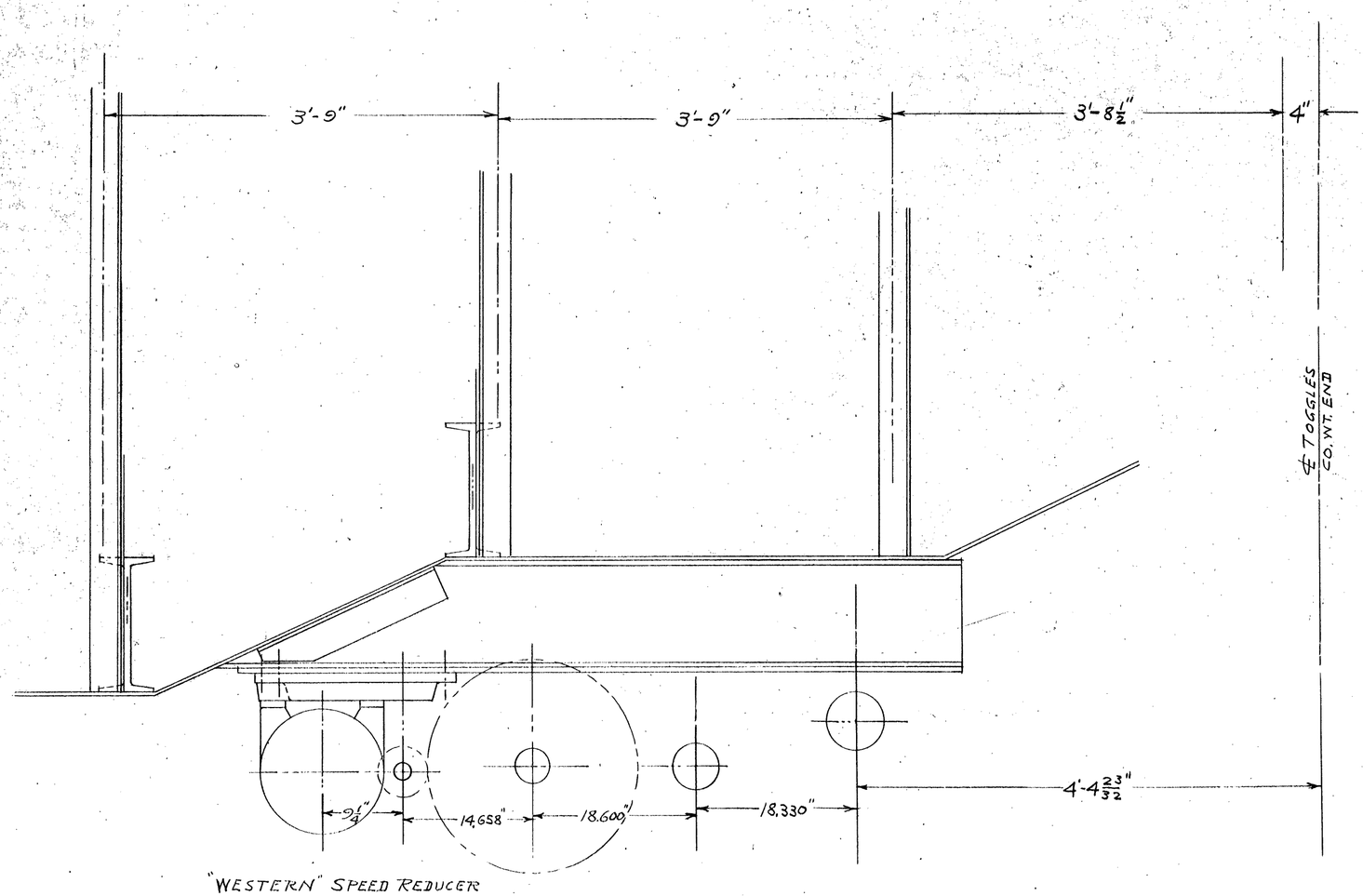
The clutch yoke mounting on the turning machinery for the swing span, as constructed encroaches upon the bridge track rail location and also entails an undesireably wide spacing of the contiguous ties.

It is required that these conditions be corrected. The clutch yoke mounting submitted herewith is suggested as acceptable.

BONNEVILLE POWER NAVIGATION PROJECT
28TH CONTRACT
BRIDGE ACROSS NAVIGATION CANAL
SWING SPAN
CORRECTIONS TO TURNING MACHINERY
CLUTCH YOKE MOUNTING
U S ENGINEER OFFICE, PORTLAND, OREGON DISTRICT

SUBMITTED: ENGINEER	APPROVED: MAJOR, CORPS OF ENGINEERS
RECOMMENDED: HEAD ENGINEER	DRAWN BY: H.G.L. DATE 4-10-35 C.W.A.
	TRACED BY ..... CHECKED BY .....

N-2-77



"WESTERN" SPEED REDUCER

BONNEVILLE POWER NAVIGATION PROJECT

ARRANGEMENT SKETCH

TO SHOW LOCATION OF SPEED REDUCER

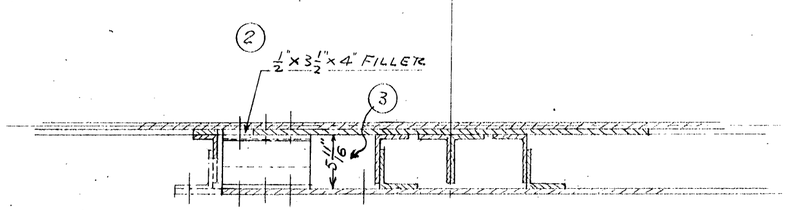
SWING SPAN

END JACKS MECHANISM.

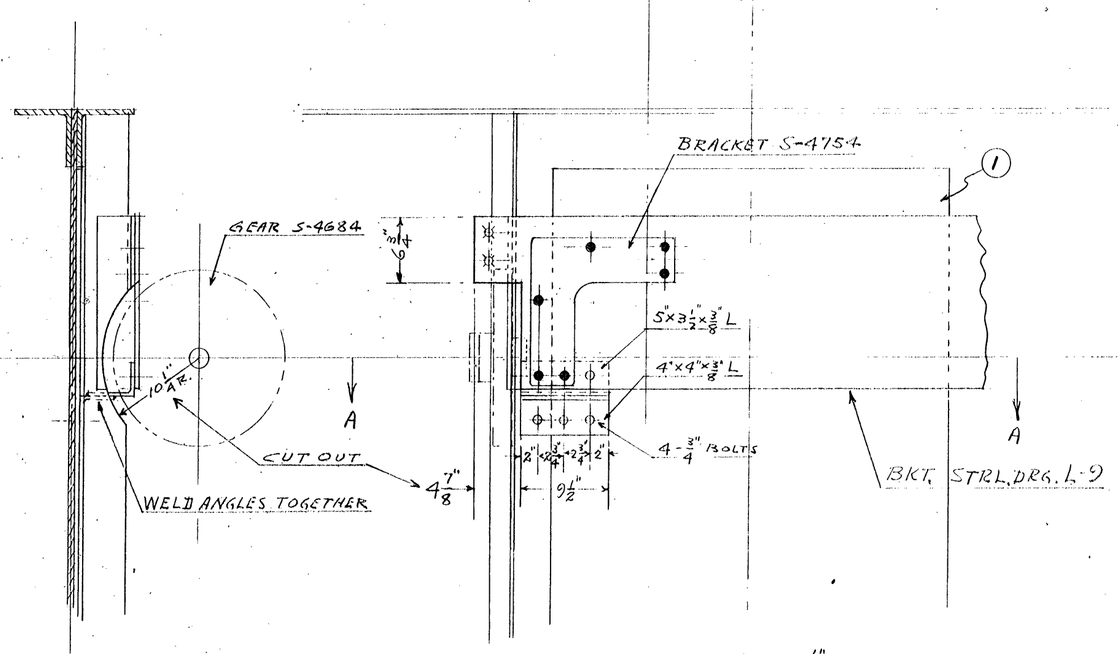
U. S. ENGINEER OFFICE, PORTLAND, OREGON DISTRICT

SUBMITTED: ..... ENGINEER	APPROVED: ..... MAJOR, CORPS OF ENGINEERS
RECOMMENDED: ..... HEAD ENGINEER	DRAWN BY: CWB DATE 2-28-35
	TRACED BY ..... CHECKED BY .....

N-2-79



SECTION A-A



SCALE 1 1/2" = 1 FT.

0 1 2 3 4

SCALE IN FEET

NO.	REVISION	DATE	BY	APP'D
3	DIM. 6 1/2" CHANGED TO 5 1/16"	6-25-35	C.W.B.	[illegible]
2	1/2"x3 1/2"x4" FILL PL. ADDED	6-25-35	C.W.B.	[illegible]
1	FILL PL. ADDED TO SUIT N-2-99	6-25-35	C.W.B.	[illegible]

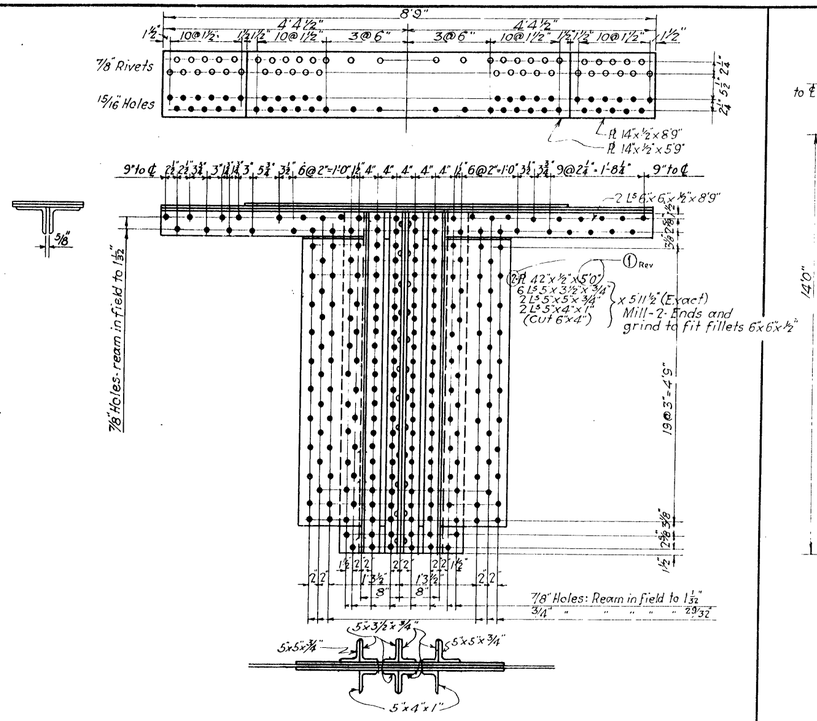
BONNEVILLE POWER NAVIGATION PROJECT
28TH CONTRACT
BRIDGE ACROSS NAVIGATION CANAL
SWING SPAN
ALTERATIONS
CHANGE IN BRACKET TO CLEAR GEAR S-4684
U S ENGINEER OFFICE, PORTLAND, OREGON DISTRICT

SUBMITTED: [signature] ENGINEER
APPROVED: [signature] MAJOR, CORPS OF ENGINEERS
RECOMMENDED: [signature] HEAD ENGINEER
DRAWN BY: C.W.B. DATE 5-8-35
TRACED BY: ..... CHECKED BY: [illegible]

N-2-80

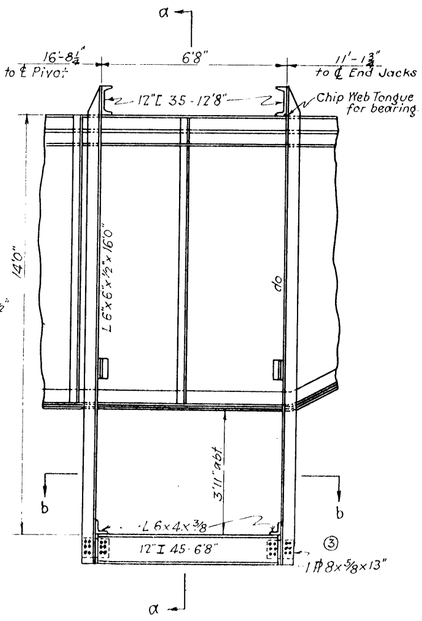
WAR DEPARTMENT

CORPS OF ENGINEERS, U.S. ARMY

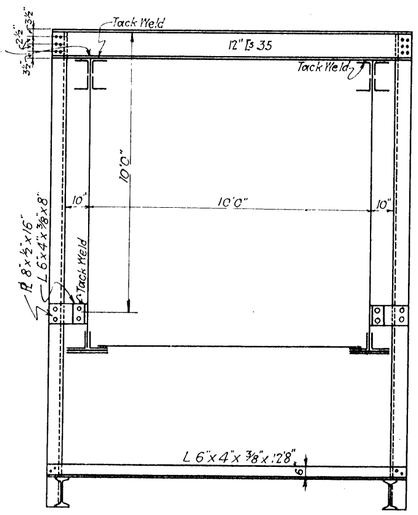


CROSS GIRDER (G-4)

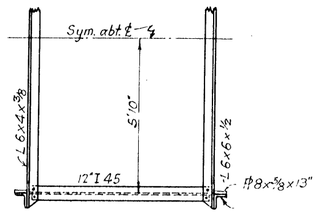
SCALE:- 3/4" = 1'-0"



SECTION aa



SECTION aa

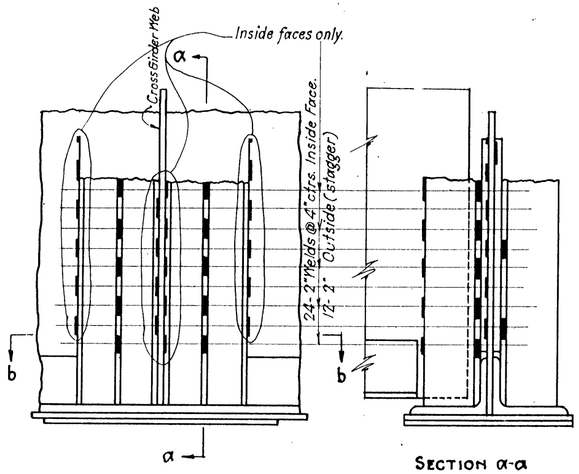


SECTION bb

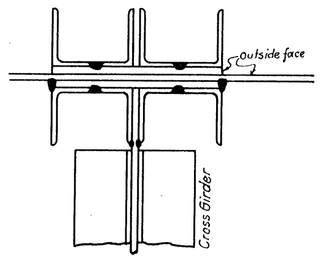
Note: Holes 13/16"ϕ
Rivets 3/4"ϕ
Provide 3/4"ϕ Turned Bolts, H.H.&N. for all open hole connections.
Paint all shop coat as specified.

CRADLE FOR TEMPORARY CONSTRUCTION COUNTERWEIGHT

Scale: 3/8"=1'0"



SECTION a-a



SECTION b-b

~ WELDING SPECIFICATIONS:-

All welding rod to be "G.E.-W.20" bare rod or approved equal.
Beads to be ⅜" minimum. Linear welds occuring opposite each other shall be staggered so that no plate metal will be fused on two sides at the same place.
On continuous linear welds metal within a radius of 10" shall be allowed to cool for one hour before further welding is done therein in order to reduce to a minimum any tendency for metal to distort.

Where the vertical leg of bottom chord angles has been sheared and welded at bends, weld top of angle leg to web (outside only) by 6-2" welds, 4" ctrs. each side of cut; spacings may be adjusted to miss stiffeners (See diagram below for location)

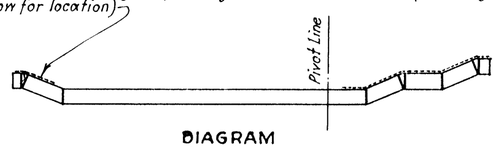


DIAGRAM
NOT TO SCALE

Specification.

Contractor will furnish materials shown and fabricate in accordance with A.R.E.A. specifications, except as noted in the Contract, Specs. and special instructions following:-

The purpose of the operation is to strengthen the cross girder in order to develope additional carrying capacity, and as the change involves connecting to an existing structure already in place, precision of workmanship is of the first importance. The contractor will verify all dimensions in the field.

New materials shall be, as far as practicable, fitted up and reamed at the shop, but units to be riveted to existing holes shall be shipped sub-punched as noted.

After shop inspection and acceptance paint all materials one shop coat of red lead and linseed oil. Surfaces in contact to receive coat of paint before assembly.

Before cutting into the existing girders all external loads causing stress in the girder shall be removed, in so far as is practicable. This will be accomplished mainly by jacking the main girders directly from the pier on both sides of the cross girder. Only slight strain is necessary to accomplish this, but it must be balanced with precision to the satisfaction of the District Engineer. The contractor will be held solely responsible for the safety and protection from damage of all members.

All machinery, and such brackets, lugs, etc., as necessary to provide adequate clearances for workmanlike accomplishment shall be removed.

The existing top chord angles shall be removed first by taking out all rivets affected and the new chord fitted and riveted 75 o/o. Following this, the ten (10) bearing stiffeners and fillers shall be removed and replaced by the new material.

Rivets shall be backed out from the driven side. Driven heads shall be chipped clean and shanks drilled ⅜"ϕ to ½ depth before they are backed out.

All rivets replacing those backed out shall be ⅛" larger in diameter. All holes shall be reamed after assembly to 1/32" greater diameter than the rivet. (In new work 1/16")

Rivets shall be driven cherry red (not hotter) and holes filled and inspected before heads are rolled. Where practicable, they shall be air-bucked, or double gunned, otherwise they shall be bucked with a 100# dolly fitted with a rivet snap of proper size.

Stiffener angles must be a driving fit, with backs ground to fit fillets of chord angles. They shall have full bearing and shall be checked with feelers on both sides to insure against bearing at high spots only. They shall not be drifted.

Intermediate stiffeners and brackets shall be replaced in a workmanlike manner.

Counterweight Cradle approved June 15, 1935.
Welding System approved June 8 1935
Cross Girder approved June 3, 1935.

NO	REVISION	DATE	BY	APV'D
3	Plate to cradle I beams	7/9/35	A.H.R.	
2	Location of Cradle	7-3-35	T.M.O.	
1	C.G. Gusset plate to 2@5'0"	6/5/35	A.H.R.	

BONNEVILLE POWER, NAVIGATION PROJECT.
BRIDGE ACROSS NAVIGATION CANAL

SWING SPAN CHANGES

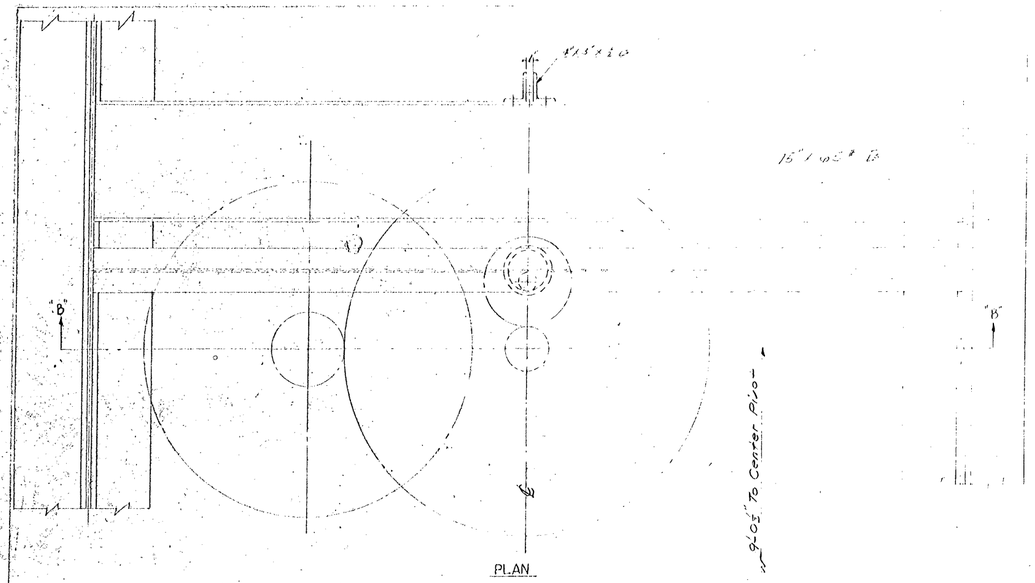
U.S. ENGINEERS OFFICE, 2ND. PORTLAND, DISTRICT (OREGON)

SUBMITTED R.S. Mackenzie ENGINEER
APPROVED H. J. Williams MAJOR, CORPS OF ENGINEERS
RECOMMENDED A. Drum HEAD ENGINEER
DRAWN BY
TRACED BY T.H.W. CHECKED BY A.H.R.

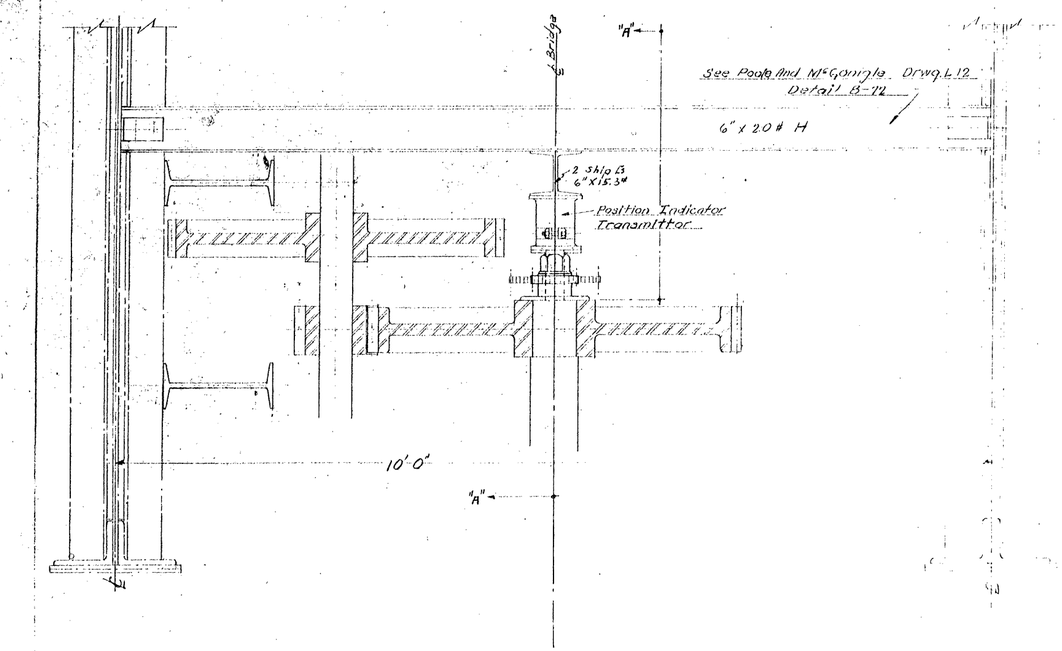
N-2-89

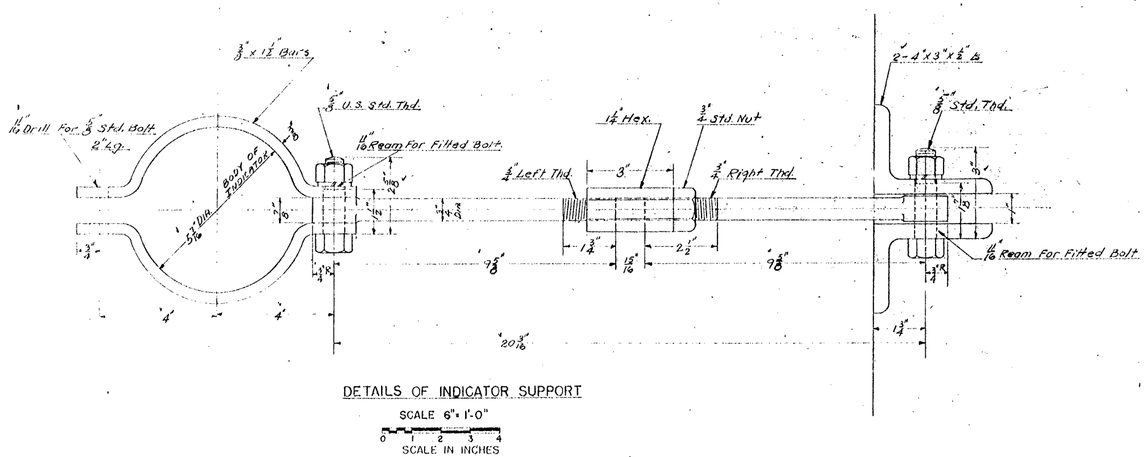
WAR DEPARTMENT

CORPS OF ENGINEERS U.S. ARMY



MATERIAL		Total Wts.
2 @ 4"x3"x 5/16" x 4'-4" Lg.	Str. St.	96.20 Lbs.
2 Bars 3/4" x 1 1/2" x 11 13/16" Lg.	Hot Rolled St.	3.67 "
1 - 1 3/4" Hex. Bar Stock 3" Lg.	C.R. St.	.78 "
2 - 3/4" Eye Bolts 9 3/8" Lg.	H.R. St.	2.92 "
1 - 3/4" x 3" Lg. Std. Bolt - Hex. Head	"	.40 "
1 - 11/16" Fitted Bolt - 2 3/8" Lg.	"	.52 "
1 - 11/16" " " - 3" Lg.	"	.56 "
1 - 3/4" Std. Hex. Nut	"	.19 "
3 - 3/4" Std. Hex. Nuts	"	.42 "
3 - 3/4" Lock Washers	(Spring St.)	.23 "
8 - 3/4" Rivets - 2 3/8" Lg.	Str. St.	5.84 "





GENERAL NOTES

REFERENCES

For Bridge Turning Machinery See Drwg. N-2-61 Sheet 11, And For Pacific Iron And Steel Works Drwg. S.O. 3506.
For Detail Of Indicator Support Beam See Poole & McGonigle Drwg. L12 -B72.

NO.	REVISION	DATE	BY	APP'D

APPROVED FOR CONSTRUCTION — Major, C. of E. — 7-18-35

BONNEVILLE POWER NAVIGATION PROJECT

28-TH CONTRACT

BRIDGE ACROSS NAVIGATION CANAL

SWING SPAN

INDICATOR SUPPORT

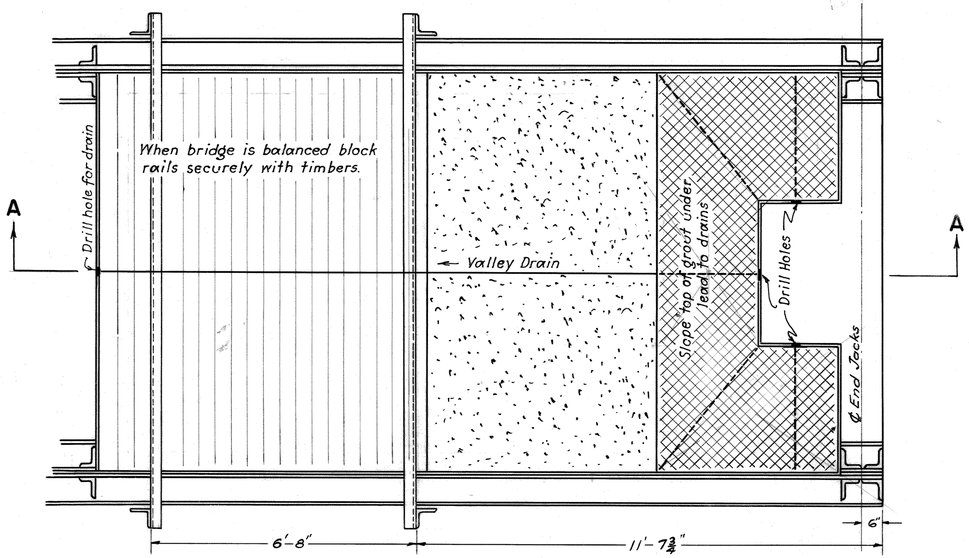
SCALE AS SHOWN

U. S. ENGINEER OFFICE, SECOND PORTLAND DISTRICT OREGON

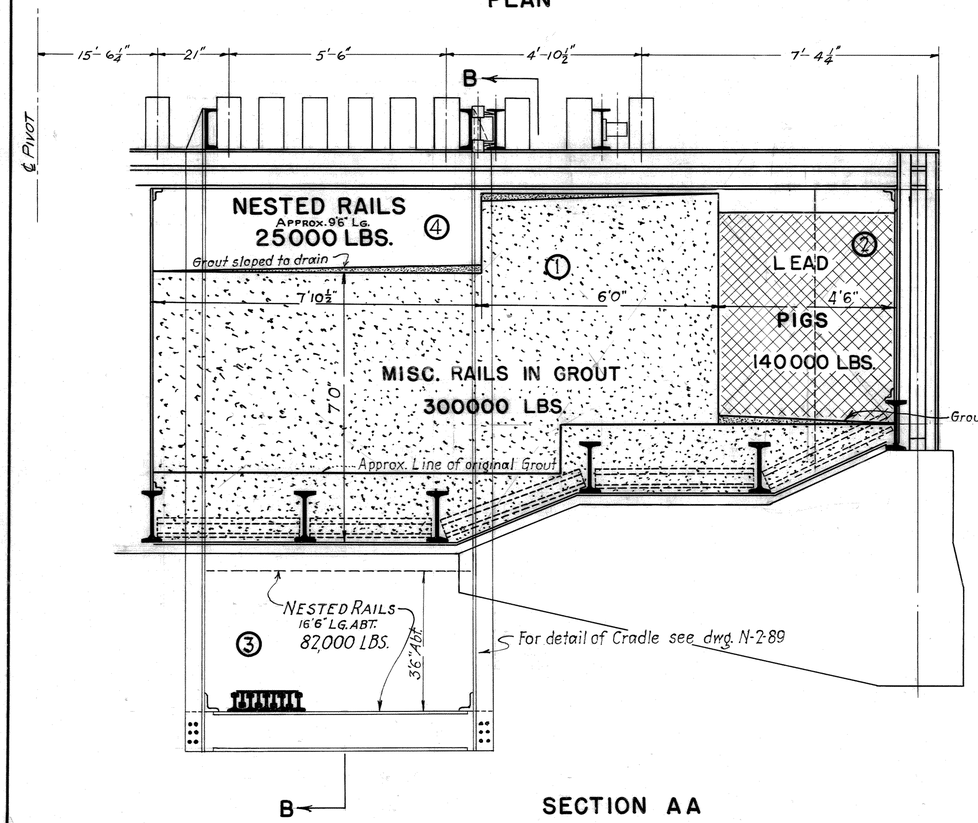
SUBMITTED: ENGINEER — APPROVED: MAJOR, CORPS OF ENGINEERS

RECOMMENDED: HEAD ENGINEER — DRAWN BY M.O.L. DATE 6-29-35 — TRACED BY — CHECKED BY

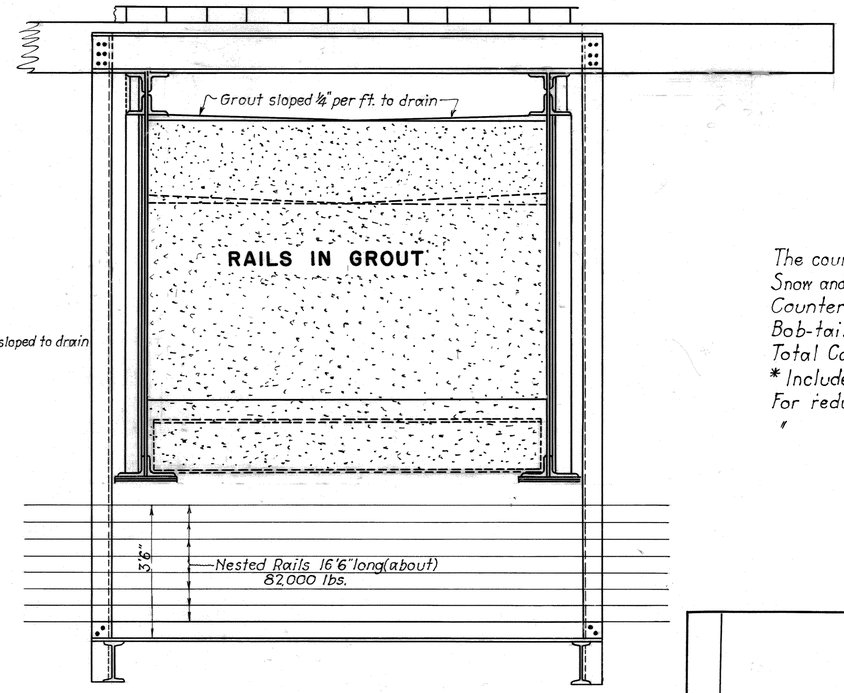
N-2-91



PLAN



SECTION AA



SECTION BB

The counterweight is designed to compensate dead load of bridge only.
Snow and ice are not provided for.
*Counterweight Moment 13,500,000 Ft. lbs.**
Bob-tail Dead Load Moment 2,700,000 " "
Total Cantilever Moment 16,200,000 " "
** Includes 5% for adjustment.*
For reduction of roadway width and to provide two sidewalks drop rail ③ only.
" " " " " " " single sidewalk " " ③ and ④

NO.	REVISION	DATE	BY	APV'D.
2	Cradle & Tie Changes	7-3-35	T.M.O.	RLM
1	General notes added	6-20-35	A.H.R.	RLM

BONNEVILLE POWER, NAVIGATION PROJECT
BRIDGE ACROSS NAVIGATION CANAL
SWING SPAN
COUNTERWEIGHT
SCALE: 1/2"=1'0"

U.S. ENGINEERS OFFICE, 2ND. PORTLAND DISTRICT (OREGON)
SUBMITTED: R.L. Mackenzie, ENGINEER
APPROVED: MAJOR, CORPS OF ENGRS.
RECOMMENDED: G.H. Eliassen, HEAD ENGINEER
DRAWN: June 19, 1935.
TRACED: T.H.W. CHECKED: E.G.H

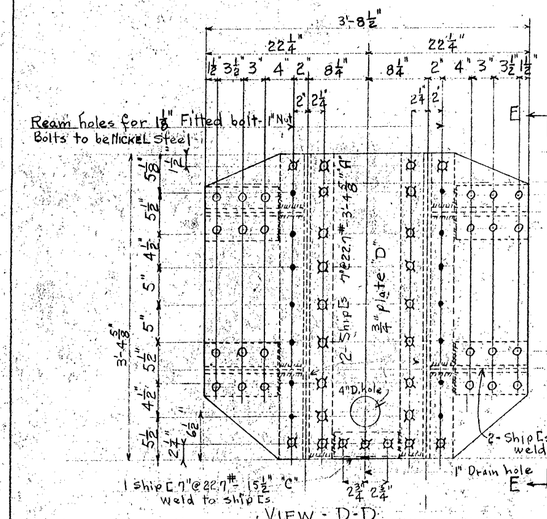
APPROVED FOR CONSTRUCTION 7/10/35 Major, C. of E.

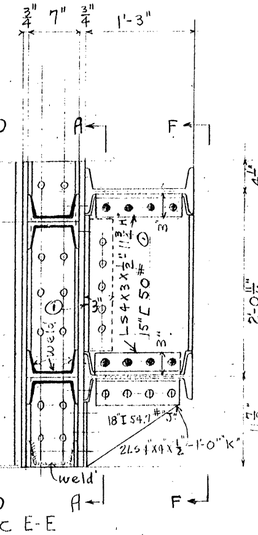
N-2-92

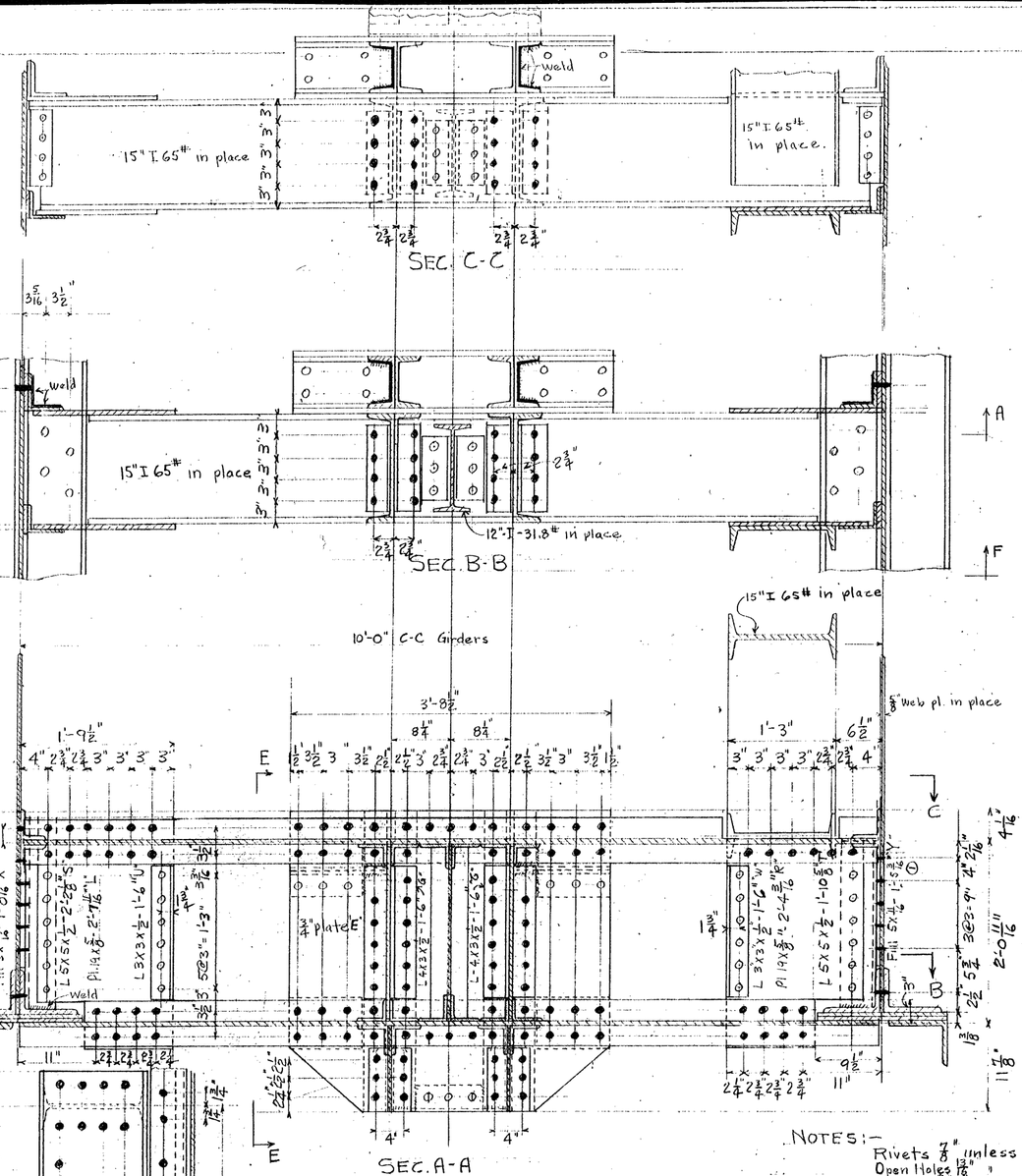
087-043

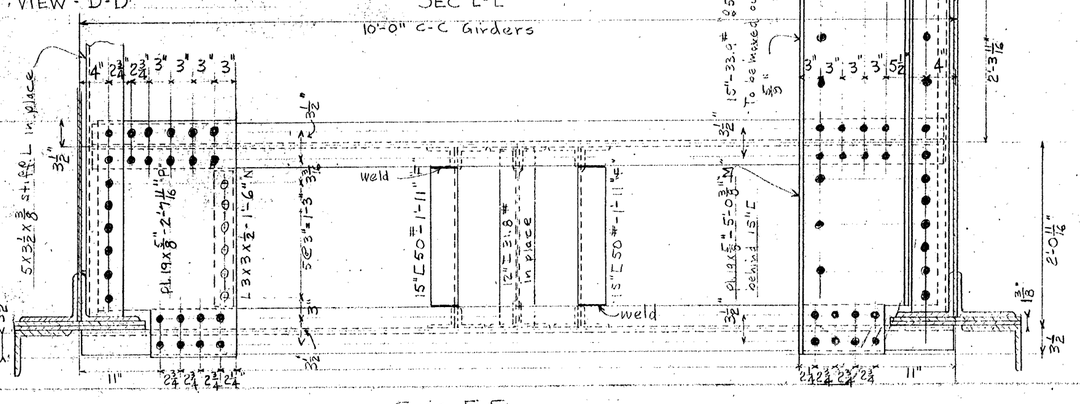
MATERIAL LIST- Reqd.

Mark	Description	No Reqd	Length	Wt/Ft	Total Wt	Remarks
"A"	7" Ship C. 22.7#	4	3'-4⅜"	22.7	312	
"B"	"	8	13½"	"	208	
"C"	"	1	15½"	"	29	
"D"+"E"	PH. ¾"x44½"	2	3'-4⅜"	113.5	713	Cut corners 170# - 57#
"F"	15" C- 50#	2	1'-11"	50.	192	
"G"	L - 4x3x½	2	1'-6"	11.1	33	
"H"	L "	8	11⅜" ①	"	89	
"J"	18"I-54.7#	2	1'-0"	54.7	55	Cut from one
"K"	L 4x4x½	4	1'-0"	12.8	52	
"L"	Pl. ⅝"x19"	1	2'-7⅞"	40.4	99	Cut corners 101# - 8#
"M"	Pl. " "	1	5'-0⅝"	"	195	" " 203 - 8#
"N"	L 3x3x½	1	1'-6"	9.4	14	
"P"	Pl. ⅝"x19"	1	2'-7⅞"	40.4	99	Cut corners 101# - 8#
"R"	Pl. ⅝"x19"	1	2'-4⅞"	"	89	" " 95# - 8#
"S"	L 5"x5"x½	1	2'-2⅜"	16.7	35	
"T"	L "	1	1'-10⅜"	"	31	
"U"	L 3x3x½	1	1'-6"	9.4	14	
"W"	L "	1	1'-6" ②	"	14	
"X"	pl. ⅛"x 5"	1	1'-8¼"	11.5	19	
"Y"	pl "	1	1'-5⅞" ①	"	16	
					2305# total	









NOTES:-
Rivets ⅞" unless noted
Open Holes ¹³⁄₁₆" " " ream to 15/16"
Welds - ⅜" fillet
Payment will be made on the basis of scale weights
Materials to be Structural Carbon Steel A.S.T.M. A-7-33
Paint - One Coat-Quick Drying Red Lead and Oil.

NO.	REVISION	DATE	BY	APV'D
1	Dimensions Corrected	8/23/35		

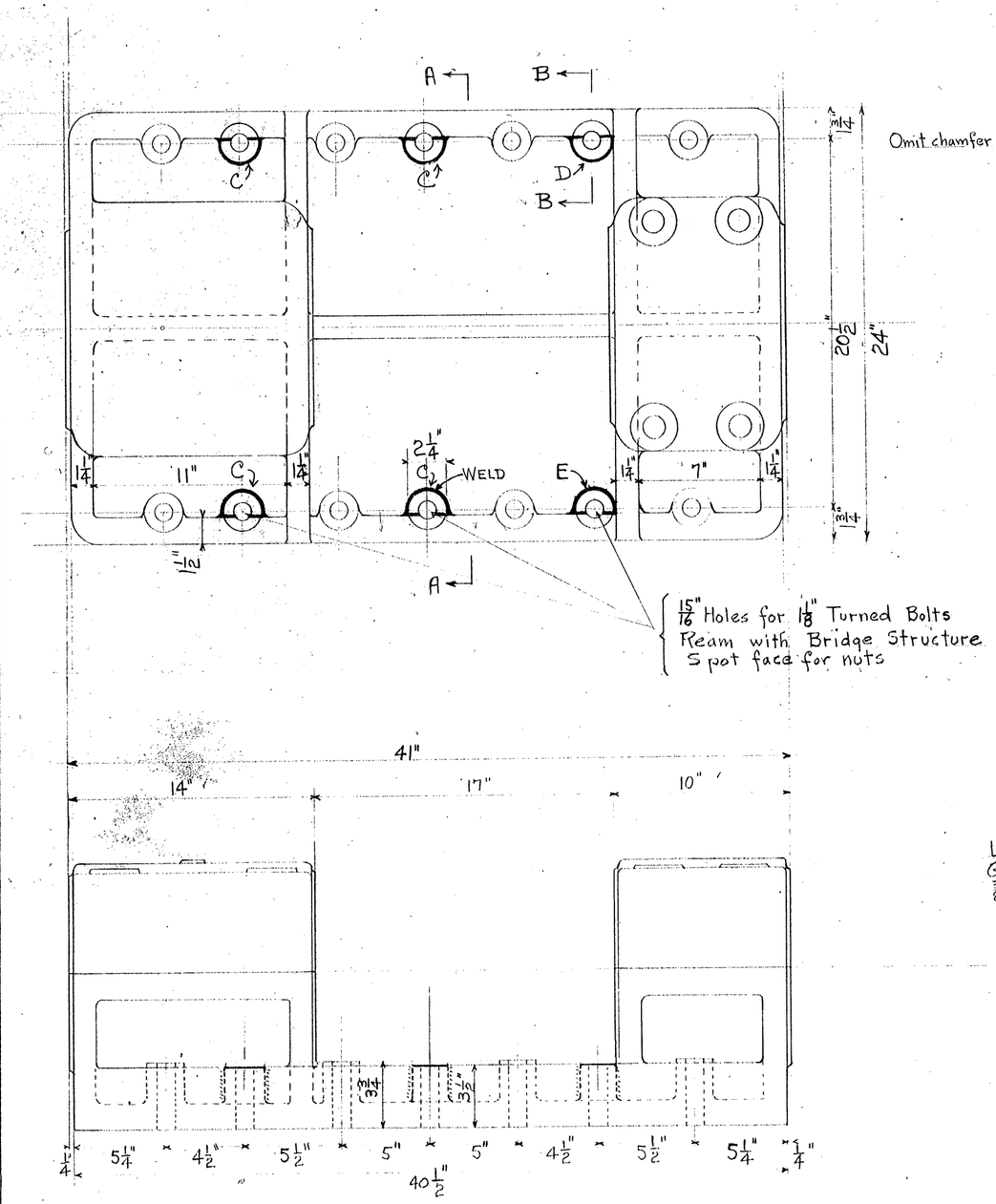
BONNEVILLE POWER NAVIGATION PROJECT

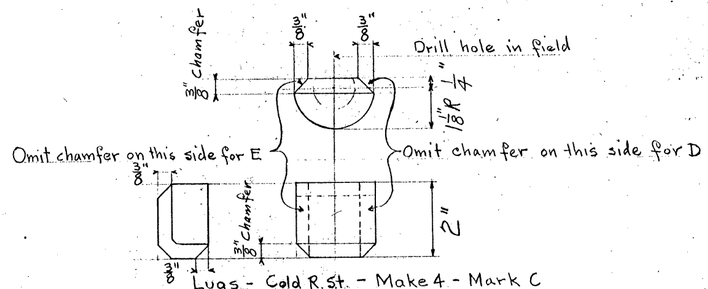
BRIDGE ACROSS NAVIGATION CANAL
SWING SPAN
MAIN PINION BRACKET (CHANGES)

U S ENGINEER OFFICE, SECOND PORTLAND DISTRICT, OREGON

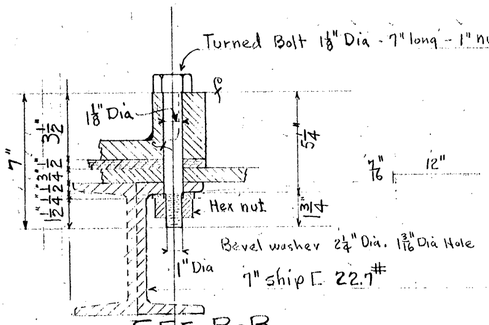
SUBMITTED R.M. Mackenzie, DISTRICT ENGINEER
APPROVED [signature], MAJOR, CORPS OF ENGRS.
REC. AMENDED [signature], ASSISTANT ENGINEER
DRAWN BY G.S.D. DATE 8-11-35
TRACED BY CHECKED BY C.H.R.

N-2-106





Lugs - Cold R.St. - Make 4 - Mark C
Lug - " " " - Make 1 - " D
Lug - " " " - Make 1 - " E



SEC. B-B.

Turned bolts - Nickel Steel — MAKE 14 MARK A
Bevel washers - Machine steel — MAKE 14 " B

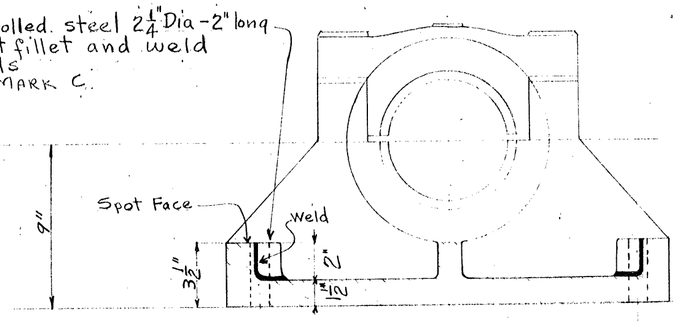
Bill of Material

Mark	Description	Number Required	Material	Weight
A	Turned bolts	14	Ni. Steel	45#
B	Bevel washers	14	Machine "	3#
C	Lugs	4	Cold R St.	7#
D	"	1	" "	
E	"	1	" "	

5 lin. ft. of ⅜" fillet weld

NOTES:-
For Detail of Bearing See Pac. I & S. works Dwg. No. S.D. 3504

Lugs - Cold rolled steel 2¼" Dia - 2" long
Grind to fit fillet and weld
⅜" fillet welds
MAKE 6 MARK C.



SEC. A-A

NO.		DATE	BY	APP'D
1	Detail of lugs added	8-26-35	G.S.D	R.C.M.

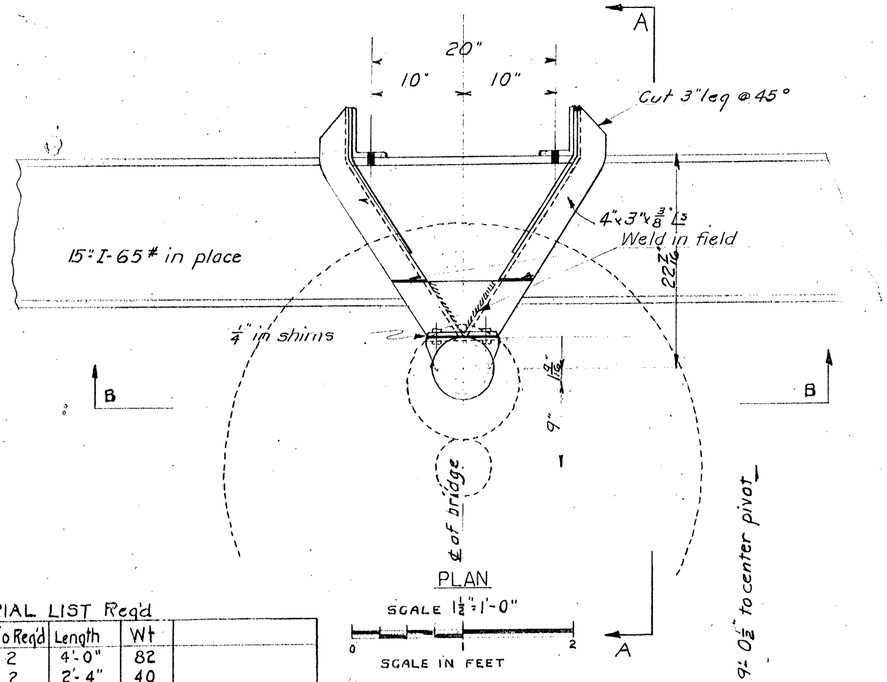
BONNEVILLE POWER NAVIGATION PROJECT

BRIDGE ACROSS NAVIGATION CANAL
SWING SPAN
PIVOT SHAFT BEARING (CHANGES)

U. S. ENGINEER OFFICE, SECOND PORTLAND DISTRICT (OREGON)

SUBMITTED: R.C. Mackenzie, ENGINEER
RECOMMENDED: ..., SECTION ENGINEER
APPROVED: ..., MAJOR, CORPS OF ENGINEERS
DRAWN BY G.S.D. DATE 8-22-35
TRACED BY ... CHECKED BY C.H.R.

N-2-107



PLAN

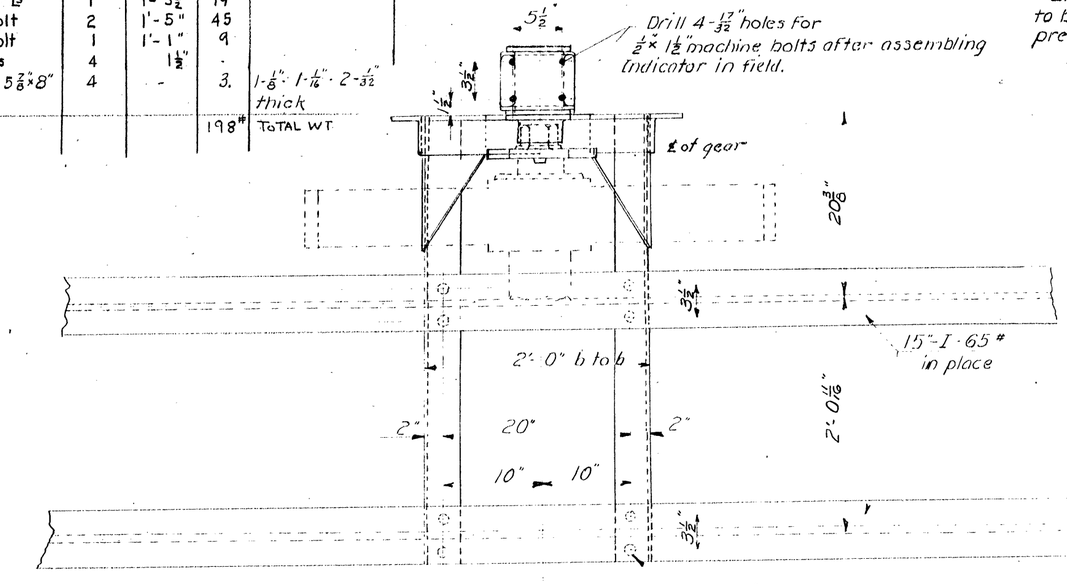
SCALE 1 1/2" = 1'-0"

SCALE IN FEET

A

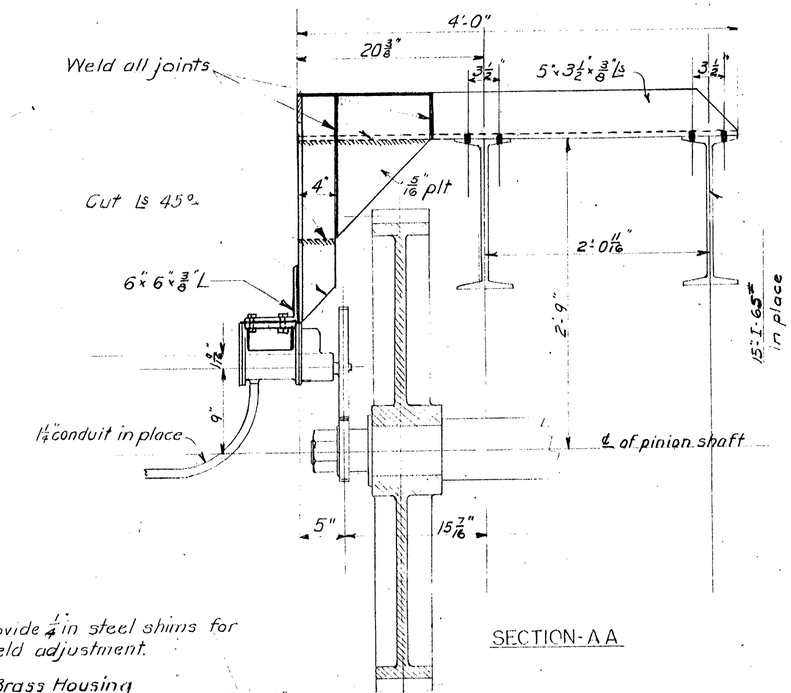
MATERIAL LIST Req'd

Description	No Req'd	Length	Wt	
5"x3 1/2"x3/8" Ls	2	4'-0"	82	
4"x3"x3/8" Ls	2	2'-4"	40	
6"x6"x3/8" Ls	1	1'-3 1/2"	19	
14"x5/16" plt	2	1'-5"	45	
8"x5/16" plt	1	1'-1"	9	
1/2" bolts	4	1 1/2"	-	
Shims. 5 7/8"x8"	4	-	3.	1-5/8" · 1-1/16" · 2-3/32" thick
			198#	TOTAL WT



SECTION-B B

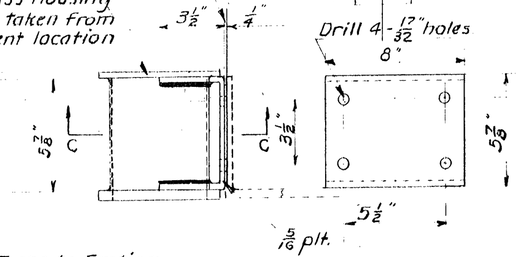
(View looking North)

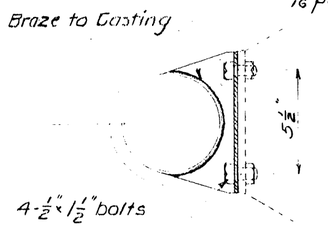


SECTION-A A

Provide 1/4" in steel shims for field adjustment.

Brass Housing to be taken from present location





Section-C C

DETAIL OF BASE

Scale 3" = 1'-0"

NOTES

Payments will be made on basis of scale weights.

Material to be Structural Carbon Steel A.S.T.M. A-7-33.

Paint - One shop coat of Quick Drying Red Lead and Oil.

REFERENCES

For Present Location see N-2-91.
For Cross beams " N-2-106.
For Assembly of Turning Machinery see sheet 7 N-2-61.

NO	REVISION	DATE	BY	APV'D
2	Shims added.	8/24	C.H.R.	R.G.M.
1	Dimension changed.	8/23	C.H.R.	R.G.M.

BONNEVILLE POWER NAVIGATION PROJECT

BRIDGE ACROSS NAVIGATION CANAL

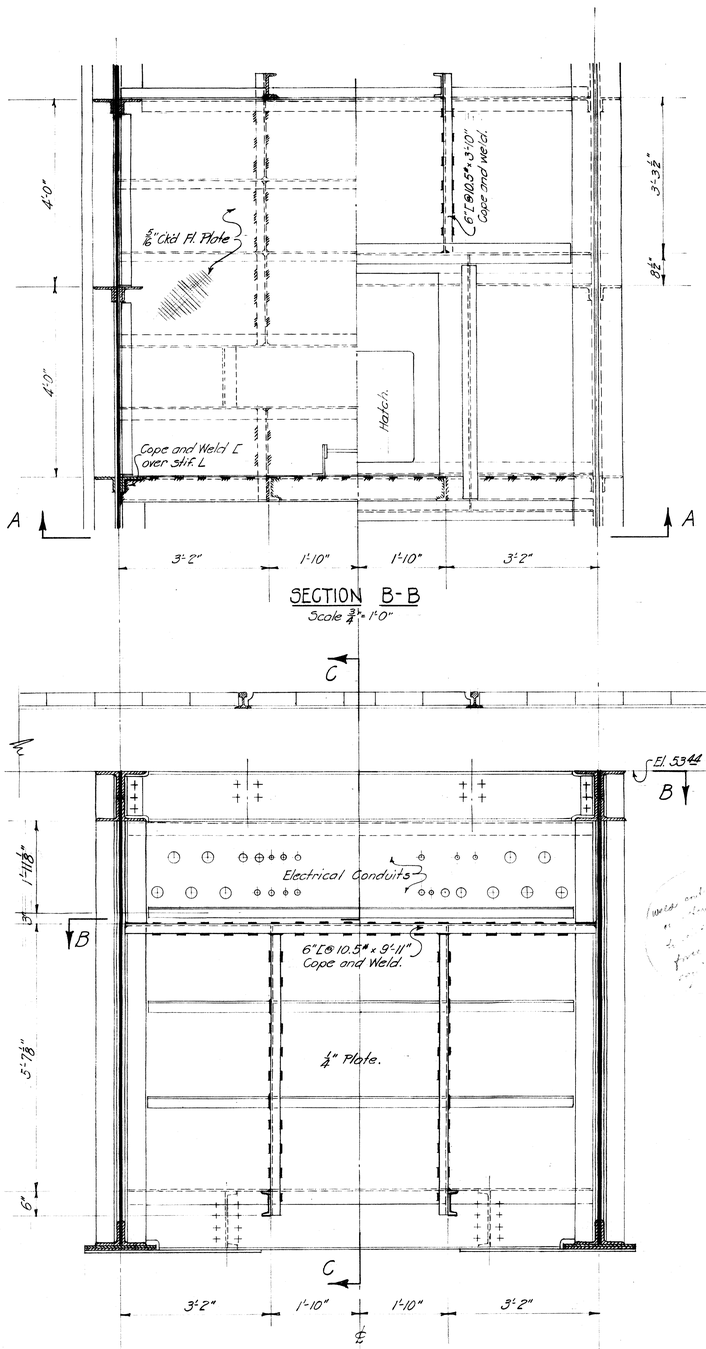
SWING SPAN

INDICATOR BRACKET CHANGES

R.G. Mackenzie H. DeWeams

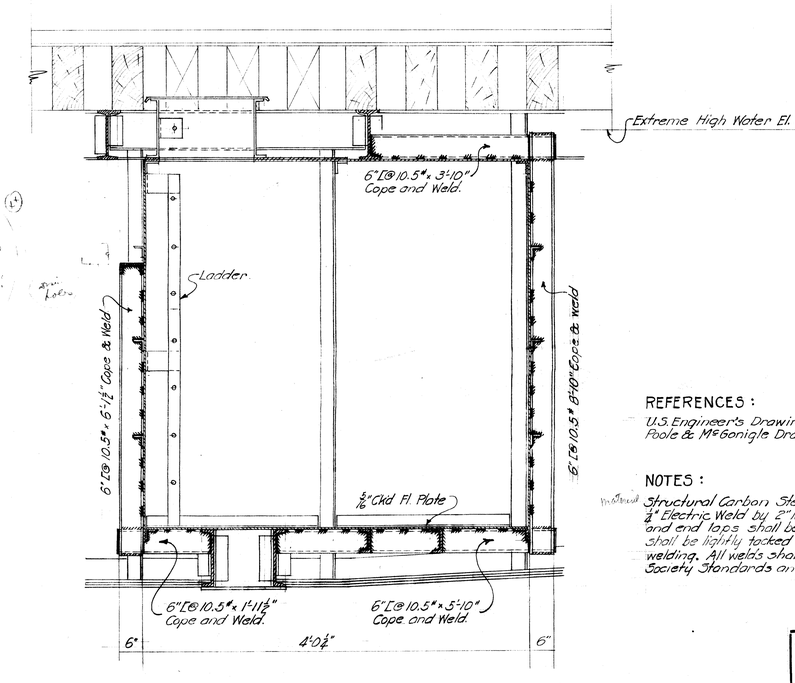
C.H.E. Aug. 8-20-35

N-2-108



SECTION B-B
Scale ¾"=1'-0"

ELEVATION A-A LOOKING SOUTH
Scale ¾"=1'-0"



SECTION C-C
Scale ¾"=1'-0"

REFERENCES :
U.S. Engineer's Drawing N-2-61 Sheet #3.
Poole & McGonigle Drawing No. F3604 Sheet #10

NOTES :
Structural Carbon Steel.
¼" Electric Weld by 2" long at 6" spaces except copes and end laps shall be ¼" bead continuous. All members shall be lightly tacked for correct alignment before welding. All welds shall conform to American Welding Society Standards and pass Government Inspection.

MATERIAL REQUIRED			
1	6"L@10.5#	9'-11"	105#
2	" "	6'-1⅛"	128
2	" "	1'-11⅝"	41
2	" "	5'-10"	123
2	" "	8'-10"	185
2	" "	3'-10"	81
	Total Weight		663#

NO.	REVISION	DATE	BY	APV'D

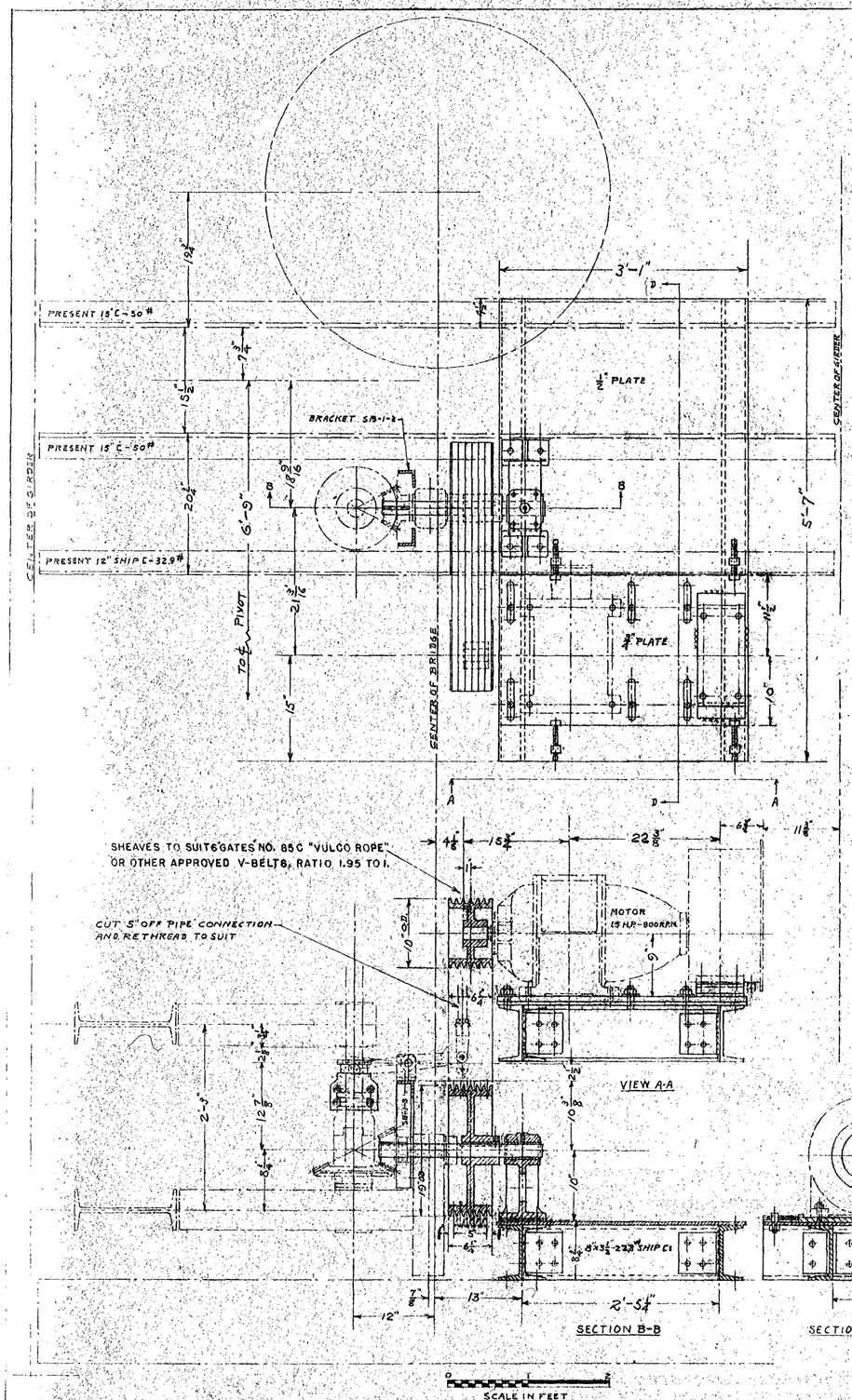
008-015

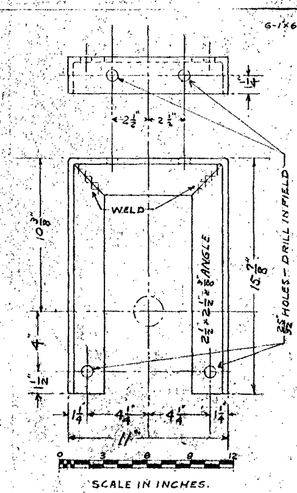
BONNEVILLE POWER NAVIGATION PROJECT
BRIDGE ACROSS NAVIGATION CANAL
SWING SPAN
CONTACTOR COMPARTMENT
REINFORCING DETAILS
SCALE AS SHOWN
U. S. ENGINEER OFFICE, SECOND PORTLAND DISTRICT (OREGON)

SUBMITTED: ASSOCIATE ENGINEER
APPROVED: LT. COL. CORPS OF ENGINEERS
RECOMMENDED: PRINCIPAL ENGINEER
DESIGNED BY ..... DATE .....
DR. BY V.C.H. TR. BY ..... CHECKED BY .....

N-2-117

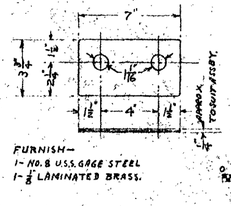
WAR DEPARTMENT — CORPS OF ENGINEERS U.S. ARMY.





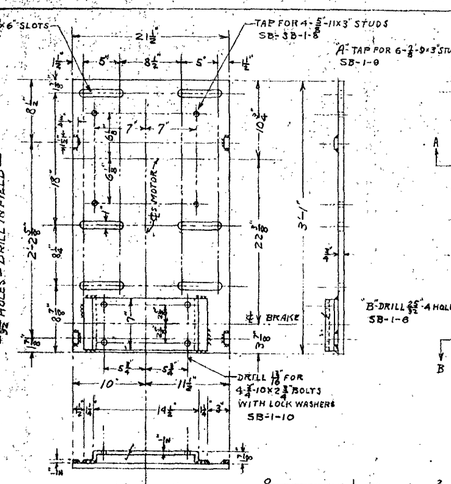
CLUTCH YOKE BRACKET

STR CAR STEEL — WT. 21 LB.
MARK SB-1-3 — MAKE 1.



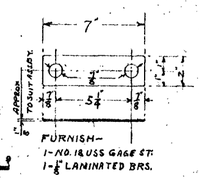
BEARING SHIMS

SHEET STEEL & LAM. BRS—WT. 2 LB.
MARK SB-1-4 — MAKE 2.



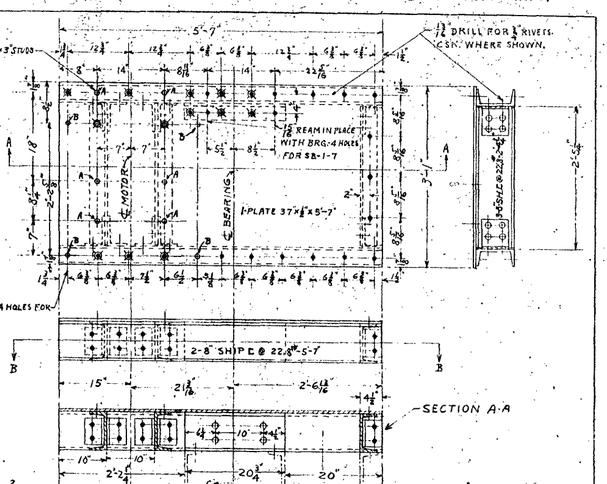
MOTOR SUB BASE

STR. CAR. STEEL — WT. 190 LB.
MARK SB-1-2 — MAKE 1.



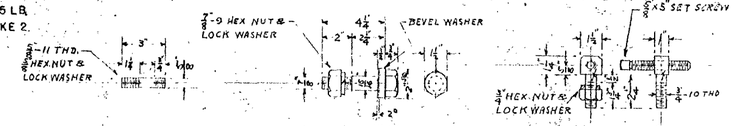
BRAKE SHIMS

SHEET STEEL & LAM. BRS—WT. 0.5 LB.
MARK SB-1-5 — MAKE 2.



BASE

STR. CAR. STEEL — WT. 900 LB.
MARK SB-1-1 — MAKE 1.



MOTOR STUDS

MACH. ST. — WT. 0.3 LB.
MARK SB-1-8 — MAKE 4

BEARING BOLTS

MACH. ST. — WT. 2 LB.
MARK SB-1-7 — MAKE 4

ADJUSTING SCREWS

MACH. ST. — 1.5 LB.
MARK SB-1-6 — MAKE 4

⅞-9 THD.-HEX NUT & STD. CUT WASHER

SUB-BASE STUDS

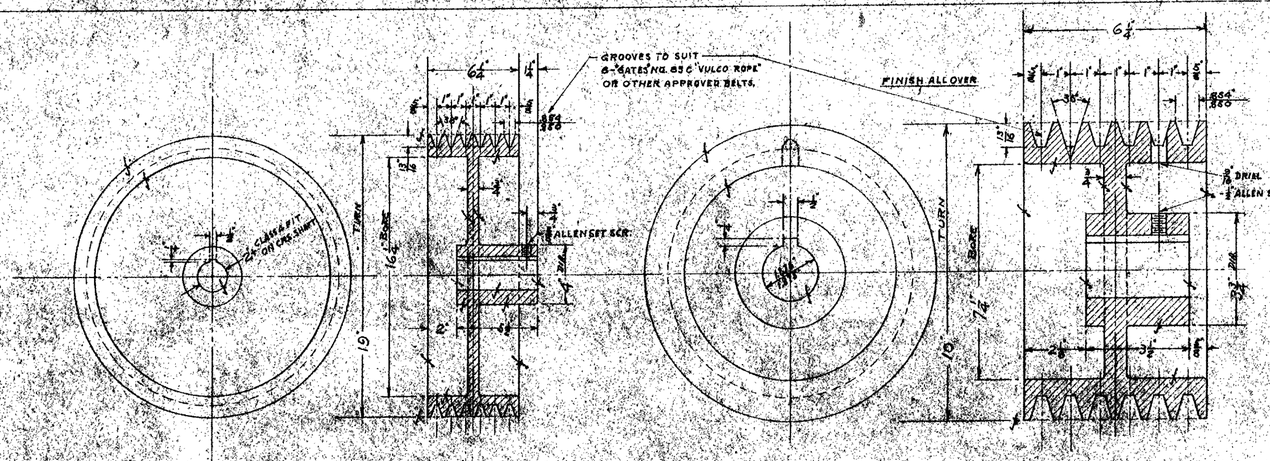
MACH. ST. — WT. 0.5 LB.
MARK SB-1-9 — MAKE 6

NOTES—
WEIGHTS ARE FOR EACH PIECE.
QUANTITIES ARE TOTAL REQUIRED.

NO	REVISION	DATE	BY	APV'D

BONNEVILLE PROJECT
CONTRACT W ENG SHIP LOCK
SWING BRIDGE
TURNING MACHINERY ALTERATIONS
SCALE AS SHOWN
U. S. ENGINEER OFFICE, SECOND PORTLAND DISTRICT, ORE.
SUBMITTED: C. E. Smith, ASSISTANT ENGINEER — APPROVED: Thos. M. Robbins, LT. COL. CORPS OF ENGINEERS
RECOMMENDED: Ben Morris, PRINCIPAL ENGINEER — DESIGNED BY BALE, DATE 3-12-37, DRAWN BY C.W.B., TR'D BY ..., CHK'D BY S.S.D.

SHEET 1. N-2-149

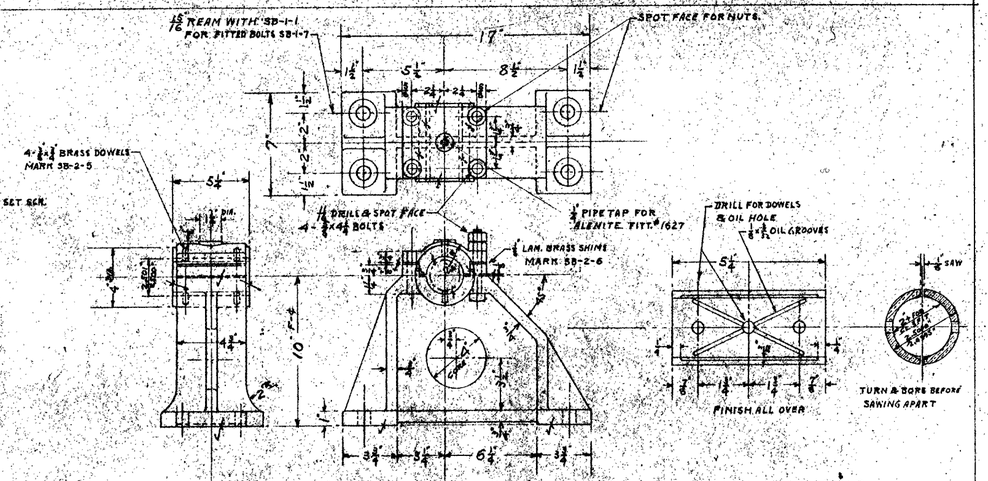


DRIVEN PULLEY

CAST IRON CLASS "B" WT. 150 LB.
MARK SB-2-1 MAKE 1

DRIVE PULLEY

CAST IRON CLASS "B" WT. 60 LB.
MARK SB-2-2 MAKE 1



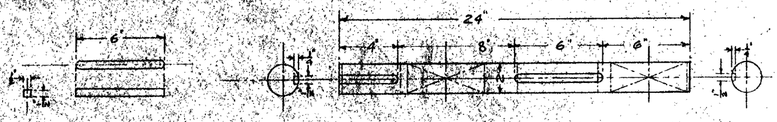
BEARING & CAP

BEARING
CAR. ST. CAST'G GR 2 WT 73 LB.
MARK SB-2-3 MAKE 1

CAP
CAR. ST. CAST'G GR 2 WT. 9 LB.
MARK SB-2-4 MAKE 1

BUSHING

BRONZE CLASS "C" WT. 3. LB.
MARK SB-2-7 MAKE 1

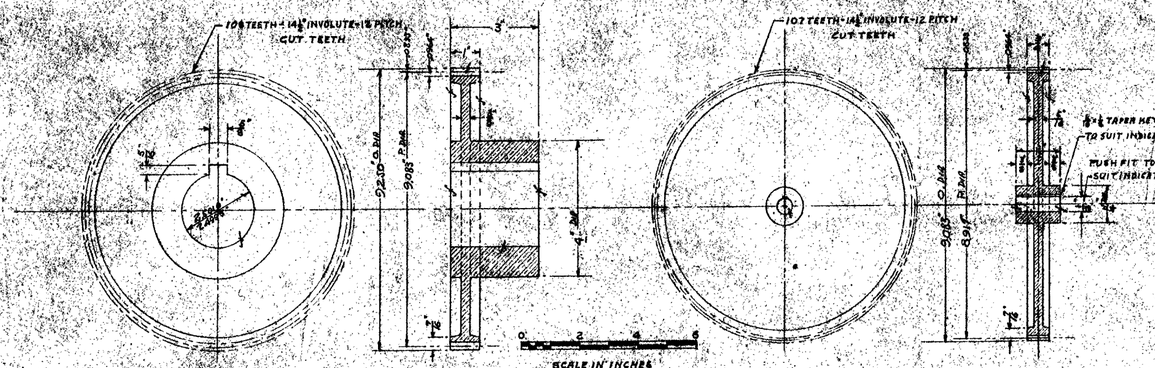


KEY

COLD ROLLED ST. WT. 0.4 LB.
MARK SB-2-9 MAKE 1

SHAFT

COLD ROLLED ST. WT. 21. LB.
MARK SB-2-8 MAKE 1

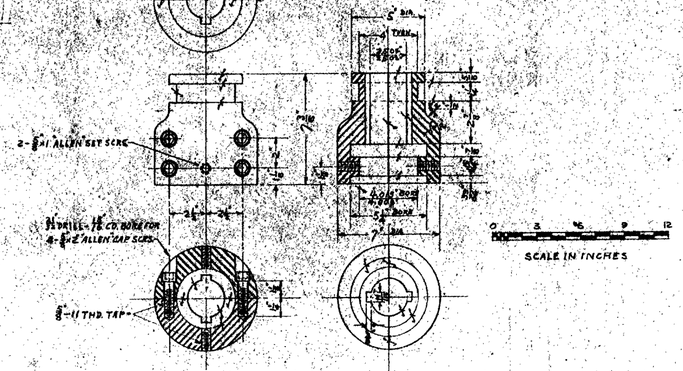


POSITION INDICATOR GEARS

BRONZE CLASS "D" WT. 17 LB.
MARK SB-2-10 MAKE 1

BRONZE CLASS "D" WT. 8 LB.
MARK SB-2-11 MAKE 1

NOTE—
THE ABOVE GEARS WILL TURN THE POSITION INDICATOR THRU FOUR TIMES THE ANGLE THAT THE BRIDGE SWINGS.



JAW CLUTCH COUPLING

CAR. ST. CASTING GRADE 2 38.5 LB.
MARK SB 2 12 MAKE 1

NOTES—
WEIGHTS ARE FOR EACH PIECE.
QUANTITIES ARE TOTAL REQUIRED.
SCRIBE PITCH CIRCLES ON GEARS.

NO.	REVISION	DATE	BY	APV'D

BONNEVILLE PROJECT

CONTRACT W ENG SHIP LOCK

SWING BRIDGE

TURNING MACHINERY ALTERATIONS

SCALE AS SHOWN

U. S. ENGINEER OFFICE, SECOND PORTLAND DISTRICT (OREGON)

SUBMITTED: E. E. Wallace SENIOR ENGINEER

APPROVED: C. W. Williams LT. COL. CORPS OF ENGINEERS

RECOMMENDED: Thos. Jones PRINCIPAL ENGINEER

DESIGNED BY BALE DATE 3-12-37.

DR. BY C.W.B. TR. BY..... CHECKED BY G.S.D.

CORPS OF ENGINEERS — U. S. ARMY

DWG. NO.	TITLE
	SHIP LOCK - EMERGENCY DAM BULKHEAD
N-1-62	BRIDGE PIERS, ANCHOR BOLT PLAN, GENERAL LAYOUT & DETAILS
N-1-64	CHANGES IN MONOLITH NO. 17 & ROCK BACKING
N-1-68	VALVE CHAMBER GATES EMBEDDED STEEL
N-1-70	DRAINAGE PIPES FOR NON'LTH. 25
71	COUNTERWEIGHT PROPOSED ARRANGEMENT
N-1-73	EMBEDDED STEEL-MACHINERY PITS
N-1-75	RELOCATION OF QUOIN POST ADJUSTMENT BEAM
N-1-76 SHT 1	LOWER GUIDE WALL - NORTH SIDE
2	LOWER GUIDE WALL - NORTH SIDE
	BRIDGE ACROSS NAVIGATION CHANNEL
N-1-77	BRIDGE & PIER PROTECTION-NORTH SIDE-
77A	SWING BRIDGE REST & FENDER DETAILS
77B	SWING BRIDGE FENDER CELL
77C	RECONSTRUCTION OF SWING BRIDGE FENDER CELL
	SHIP LOCK HAND RAILING DETAILS
N-1-79 SHT 1	SOUTH-WEST END OF LOCK
2	
3	NORTH WALL OF LOCKS
4	NORTH WALL OF LOCKS
5	FOR WALKWAYS AT EL. +25 & +65 IN MONOLITHS 20 TO 25 INCL.
	SHIP LOCK
N-1-80 SHT 1	CONDUIT SYSTEM BETWEEN SHIP LOCK & BRIDGE
2	ELECTRICAL DETAILS PULL BOX AT SWING BRIDGE PIER NO. 1
N-1-82	BRIDGE ACROSS NAVIGATION CANAL DRAINS FOR PIER 2
83	CONDUIT & PIPING CONNECTIONS SOUTH OF MONOLITH 11
N-1-84	FLOOR DETAILS FOR CONTROL HOUSES
85	EXTENSION OF 14" TYPE "C" LADDER
86	LOWER CONTROL HOUS ADDITION PLUMBING
N-1-88	TAINTER VALVE PIT ALTERATIONS
N-1-90 SHT 1	TAINTER VALVES MACHINERY PIT ALTERATIONS
2	TAINTER VALVES MACHINERY PIT ALTERATIONS
N-1-91	RAILINGS ADDITIONAL PLAN
92	HAND RAILING DETAILS
	COFFERDAMS, EXCAVATION AND ROADWAY FOR POWERHOUSE & LOCK
N-2-10 SHT 1	GENERAL PLAN - 5TH CONTRACT
2	POWER HOUSE EXCAVATION - 5TH CONTRACT
3	LOCK EXCAVATION COFFERDAM & ROADWAY DETAILS - 5TH CONTRACT
N-2-26	GENERAL PLAN OF NAVIGATION
29	TAINTER VALVES - GENERAL ARRANGEMENT
N-2-31	TAINTER VALVES - TRUNNION BEARING ANCHORAGE
32	TAINTER VALVES - GENERAL ARRANGEMENT & WATER SEALS
33	TAINTER VALVES - SCOUPING PLATE & WATER SEALS
N-2-41	SHIP LOCK MITER GATES QUOIN & MITER ENDS ASSEMBLY
42	CONCRETE RECESS FOR MITER GATE ANCHOR LINKAGE
	BRIDGE ACROSS NAVIGATION CANAL — 28TH CONTRACT
N-2-43 SHT 1	GENERAL SITE MAP
2	GENERAL LAYOUT
3	GENERAL ARRANGEMENT OF MACHINERY
4	ELECTRICAL DETAILS AND CONDUIT DIAGRAMS
	SWING BRIDGE
N-2-43A SHT 1	GENERAL PLAN
2	SWING SPAN (SPAN NO. 1)
N-2-43A SHT 3	FIXED SPANS (SPANS 2, 3,& 4)

DWG. NO.	TITLE
N-2-43A SHT 4	RECONSTRUCTION ABUTMENT, PIER ALTERATION & SECTIONS
5	RECONSTRUCTION BEAM SEATS
6	RECONSTRUCTION MISCELLANEOUS DETAILS
N-2-43A1	RECONSTRUCTION GRATING REPAIR
B	MODIFICATION TO FIXED SPAN BEARING AT PIER 3
	SHIP LOCK
N-2-44 SHT 1	UPPER ADJUSTING BEAMS FOR SETTING WALL QUOINS
2	UPPER ADJUSTING BEAMS FOR SETTING WALL QUOINS
	SHIP LOCK — EMERGENCY DAM
N-2-48 SHT 1	VALVE CHAMBER GATES ASSEMBLY & STRUCTURAL DETAILS
2	VALVE CHAMBER GATES SEAL DETAILS
3	VALVE CHAMBER GATES SKIN PLATE & GUIDE ROLLERS
4	VALVE CHAMBER GATES HOIST, LATCH PAWL & MISCL.
N-2-48 SHT 6	VALVE CHAMBER GATE ALTERATIONS FOR NEW TOP HORIZONTAL SEAL
7	EMERGENCY VALVE CHAMBERS - STOPLOG DETAILS
8	EMERGENCY VALVE CHAMBERS - STOPLOG DETAILS
9	EMERGENCY VALVE CHAMBERS - STOPLOG ROLLER GUIDE DETAILS
	NAVIGATION LOCK VALVE CHAMBER STOPLOG
N-2-48/10	DETAILS I
11	DETAILS II
12	DETAILS III
	SHIP LOCK EMERGENCY DAM
N-2-60 SHT 1	GENERAL SITE PLAN
2	BULKHEADS GENERAL PLAN AND STRESS SHEET
3	BULKHEADS NO 1 TO 3 INCL. PLAN & ELEVATIONS
4	BULKHEADS NO 1 TO 3 INCL. SECTIONS & END DETAILS
5	BULKHEADS NO 1 TO 3-END SHOES & MISCELLANEOUS DETAILS
N-2-60 SHT 6	BULKHEADS NO 1 TO 13 INCL. PICK-UP DETAILS
7	BULKHEADS NO 4 TO 13 INCL. PLAN AND ELEVATIONS
8	BULKHEADS NO 4 TO 13 INCL.-SE_TIONS & END DETAILS
N-2-60 SHT 9	BULKHEADS NO. 4 TO 13 INCL. END ROLLERS-ASSEMBLY & DETAILS
10	BULKHEADS NO 4 TO 13 INCL. END ROLLERS-DETAILS
11	LIFTING BEAM PLAN AND ELEVATION
12	LIFTING BEAM ROLLERS AND DETAILS
13	LIFTING BEAM HOOK ASSEMBLY AND DETAILS
N-2-60 SHT 14	LIFTING BEAM HOOK - DETAILS
15	DERRICKS GENERAL ARRANGEMENT & DATA
	BRIDGE ACROSS NAVIGATION CANAL
N-2-61 SHT 1	SWING SPAN COUNTERWEIGHT END
2	SWING SPAN SWING END
3	SWING SPAN DETAILS
4	SWING SPAN DETAILS
5	FIXED SPANS DETAILS
N-2-61 SHT 6	TIE PLAN AND DETAILS
7	SWING SPAN TURNING MACHINERY
8	SWING SPAN CENTER WEDGE MACHINERY
9	SWING SPAN END JACKS MECHANISM
10	SWING SPAN LATCH MECHANISM
N-2-61 SHT 10A	SWING SPAN CENTERING LATCH MECHANISM REVISIONS TO SHEET 10 - N-2-61
11	BRIDGE PIERS ANCHOR BOLTS PLAN
12	ELECTRICAL DETAILS SWING SPAN
13	ELECTRICAL DETAILS FIXED SPAN
	SHIP LOCK
N-2-62	TIMBER MITER SILLS - EMERGENCY DAM
N-2-63 SHT 4	TIMBER MITER GATES PINTLE CASTINGS & MISCL. DETAILS
N-2-63 SHT 6	TIMBER MITER GATES WICKET GATES-ASSEMBLY AND DETAILS
7	TIMBER MITER GATES GEOMETRY AND PLAN
	BRIDGE ACROSS NAVIGATION CANAL
N-2-69	COUNTERWEIGHT PROPOSED ARRANGEMENT
70	SWING SPAN HAND OPERATING MECHANISM PROPOSED CHANGE IN BRACKET S-4789
71	COUNTERWEIGHT PROPOSED ARRANGEMENT

DWG. NO.	TITLE
	TIMBER MITER GATES
N-2-72 SHT 1	DESIGN DATA
2	GENERAL ASSEMBLY & POST DETAILS
3	WALL ANCHORAGE & QUOIN POST CASTINGS
4	PINTLE CASTINGS & MISCEL. DETAILS
5	TEMPORARY MITER GATES OPERATING MACHINERY
N-2-72 SHT 6	TEMPORARY MITER GATES OPERATING SPAR
7	GEOMETRY AND PLAN
	BRIDGE ACROSS NAVIGATION CANAL
N-2-73	SWING SPAN ALTERATIONS FOR CENTERING LATCH CLEARANCE
74 SHT 1	TEMPORARY TRESTLE TO MONOLITH NO. 12
75	CONDUIT DETAILS PIER NO. 3
N-2-77	SWING SPAN CORRECTIONS TO TURNING MACHINERY CLUTCH YOKE MOUNTING
78	FIXED SPAN NO 2 CORRECTIONS TO NORTH ENDS OF GIRDERS
79	ARRANGEMENT SKETCH TO SHOW LOCATION OF SPEED REDUCER SWING SPAN END JACKS MECHANISM
80	SWING SPAN ALTERATIONS CHANGE IN BRACKET TO CLEAR S-4684
	36TH CONTRACT LOCK OPERATING EQUIPMENT LOWER MITER GATE
N-2-81 SHT 1	DESIGN DATA — SUPSD BY N-2-114
2	GENERAL ASSEMBLY — SUPSD BY N-2-114
3	QUOIN & MITER CASTINGS — SUPSD BY N-2-114
4	EMBEDDED QUOIN POST ELEVATIONS — SUPSD BY N-2-114
5	EMBEDDED QUOIN POST, SECTIONS AND DETAILS — SUPSD BY N-2-114
N-2-81 SHT 6	PINTLE CASTINGS ASSEMBLY & DETAILS — SUPSD BY N-2-114
7	LOWER SEALS ARRANGEMENT AND DETAILS — SUPSD BY N-2-114
8	AIR CHAMBER GIRDERS, 15 TO 20, AND CONNECTIONS — SUPSD BY N-2-114
9	TOP GIRDER, ANCHORAGE AND STRUT CONNECTIONS — SUPSD BY N-2-114
N-2-81 SHT 10	ADJUSTMENT FACILITIES FOR EMBEDDED QUOIN POSTS — SUPSD BY N-2-114
	LOCK OPERATING EQUIPMENT - UPPER MITER GATE
N-2-82 SHT 1	DESIGN DATA — SUPSD BY N-2-115
2	GENERAL ASSEMBLY — SUPSD BY N-2-115
3	QUOIN & MITER CASTINGS — SUPSD BY N-2-115
4	EMBEDDED QUOIN POST, ELEVATIONS — SUPSD BY N-2-115
5	WATER CHAMBER GIRDERS 2 TO 6, AND CONNECTIONS — SUPSD BY N-2-115
	LOCK OPERATING EQUIPMENT - MITER GATE MACHINERY
N-2-83 SHT 1	DESIGN DATA — SUPSD BY N-2-116
1A	COMPUTATION CURVES FOR MITER GATES OPERATING MACHINERY — SUPSD BY N-2-116
2	GENERAL ASSEMBLY — SUPSD BY N-2-116
3	OPERATING STRUT ARRANGEMENT DETAILS OF SECTOR AND ARM — SUPSD BY N-2-116
	LOCK OPERATING EQUIPMENT - TAINTER VALVES
N-2-84 SHT 1	DESIGN DATA
2	GENERAL ASSEMBLY
3	SEALS & SEAL CASTINNGS
4	TUNNION & GUIDE ROLLER DETAILS
	LOCK OPERATING EQUIPMENT - TAINTER VALVE MACHINERY
N-2-85 SHT 1	GENERAL ASSEMBLY
2	HOIST ASSEMBLY
3	GEARS PINIONS AND SHEAVES
4	BEARING DETAILS
5	SHAFTS, BUSHINGS, SPROCKET, ETC.
N-2-85 SHT 6	HOIST & COUNTERWEIGHT SHEAVE FRAMES
7	CHAIN SHEAVE DETAILS
8	RADIUS FRAME, STRUT'S & YOKES
9	COUNTERWEIGHT AND DETAILS
10	HOIST FRAME GRATINGS & LOWER PLATFORM
N-2-85 SHT 11	DETAILS OF CHAIN, UPPER STRUT, AND CABLE CONNECTIONS

DWG. NO.	TITLE
N-2-85 SHT 12	GEAR GUARDS
13	OVERLOAD CLUTCH DETAILS
14	COVERS FOR PITS AND FLOATING MOORING BITT RECESSES
15	GREASING LAYOUT & PARTS LIST
16	ELECTRICAL DETAILS
	LOCK OPERATING EQUIPMENT - FLOATING MOORING BITT
N-2-86 SHT 1	GENERAL ARRANGEMENT AND DETAILS SUPSD BY N-2-102
2	PONTOON DETAILS
3	DETAILS OF YOKE, BITT STOCK SPINDLE & ROLLER SUPSD BY N-2-102
	33RD CONTRACT
N-2-87	LIFTING BAR FOR VALVE GATES
	BRIDGE ACROSS NAVIGATION CANAL
N-2-89	SWING SPAN CHANGES
90	SWING BRIDGE CHANGES IN LOWER FLANGE GIRDER
91	SWING SPAN INDICATOR SUPPORT
92	SWING SPAN COUNTERWEIGHT
93	SWING SPAN - SOUTH END LUBRICATION PLATFORM
	SHIP LOCK — EMERGENCY DAM
N-2-94	DERRICK OPERATOR'S CAB
95 SHT 1	33RD CONTRACT PROPOSED CHANGES IN BULKHEADS ETC.
N-2-97	LIFTING BEAM CENTER OF GRAVITY ADJUSTMENT
98	CENTER OF GRAVITY ADJUSTMENT FOR LIFTING BEAM
99 SHT 1	PROVISIONS FOR TEMPORARY LIFT GATES
100 SHT 1	PROVISIONS FOR TEMPORARY LIFT GATES BULKHEADS NO. 4 TO 8 INCLUSIVE PLAN & ELEVATIONS
2	PROVISIONS FOR TEMPORARY LIFT GATES BULKHEADS NO. 4 TO 8 INCLUSIVE SECTIONS & END DETAILS
	BRIDGE ACROSS NAVIGATION CANAL LOCK
N-2-101	COUNTERWEIGHT FOR CENTERING LATCH MECHANISM
N-2-102 SHT 1	FLOATING MOORING BITT GENERAL ARRANGEMENT
2	FLOATING MOORING BITT DETAILS OF PONTOON & BITT STOCK
3	DETAILS OF YOKE
4	FLOATING MOORING BITT BEARING DETAILS
N-2-104	SHIP LOCK EMERGENCY DAM SUGGESTED CORRECTIONS TO ROLLER HOUSING ER-1-ER
105	SHIP LOCK EMERGENCY DAM ARRANGEMENT OF LIFTING BEAM SHEAVES
106	BRIDGE ACROSS NAVIGATION CANAL SWING SPAN MAIN PINION BRACKET (CHANGES)
107	BRIDGE ACROSS NAVIGATION CANAL SWING SPAN PINION SHAFT BEARING (CHANGES)
108	BRIDGE ACROSS NAVIGATION CANAL SWING SPAN INDICATOR BRACKET CHANGES
N-2-109/1	TAINTER VALVE OPERATOR PLANS, SECTIONS AND HYDRAULIC SYSTEM
2	TAINTER VALVE OPERATOR DETAILS
N-2-111 SHT 1	TAINTER VALVES - COUNTERWEIGHT PIT INSPECTION DOOR
2	TAINTER VALVES - COUNTERWEIGHT PIT INSPECTION DOOR
N-2-112	DERRICK BOOM POINT STUDY
113	FLOATING MOORING BITT RECESS MEASURING TEMPLATE

THIS PRINT REDUCED TO ONE-HALF SCALE

REVISION	DATE	DESCRIPTION	BY

U. S. ARMY ENGINEER DISTRICT, PORTLAND
CORPS OF ENGINEERS

DESIGNED BY
DRAWN BY
TRACED BY
CHECKED BY
REVIEWED:
SUPERVISED: MKV
NAME AND TITLE — CHIEF O & M MANUAL WRITING SECTION
SUBMITTED:
RECOMMENDED:

BONNEVILLE DAM PROJECT
COLUMBIA RIVER OREGON-WASHINGTON

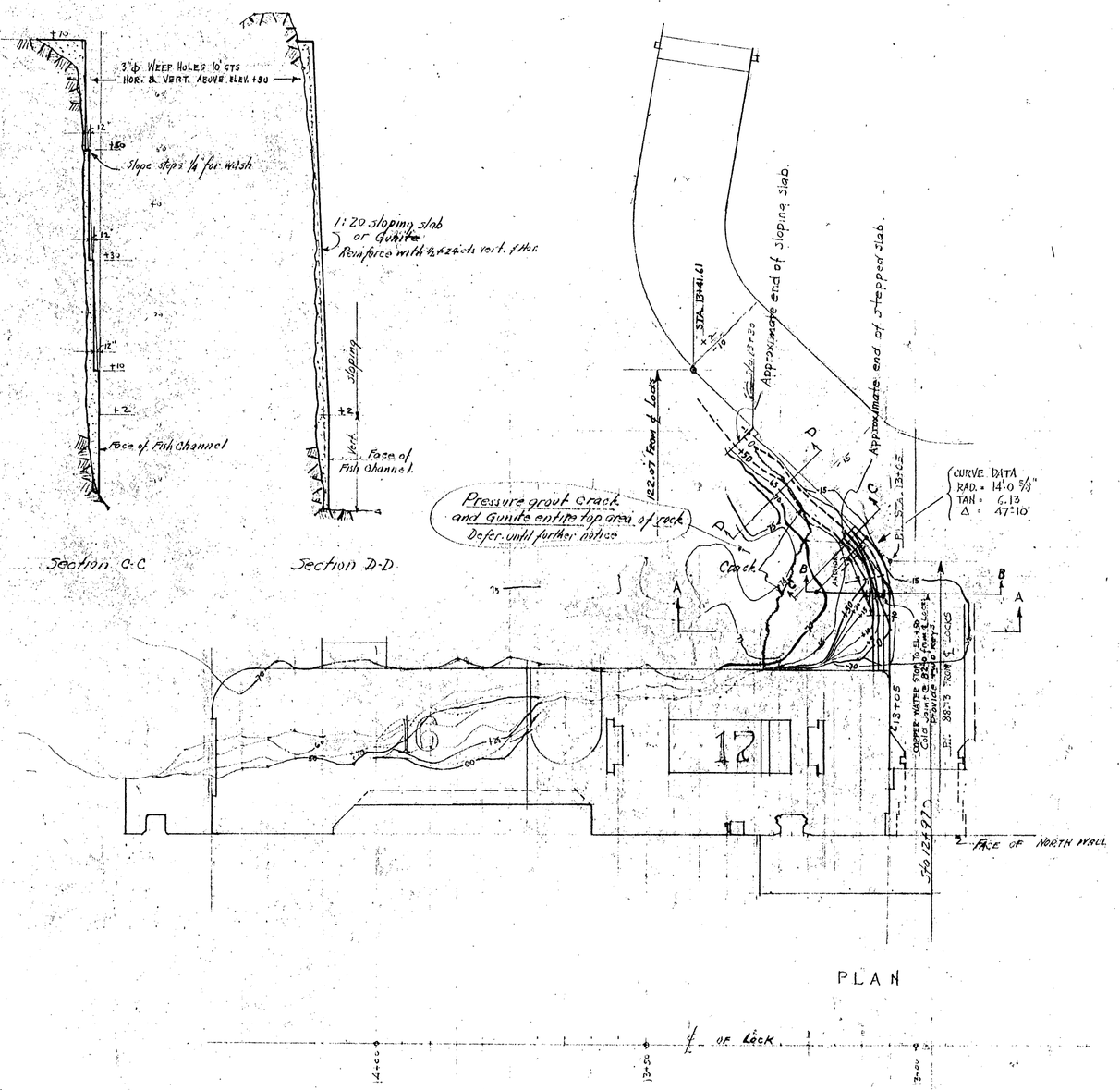
LOCK EMERGENCY DAM BULKHEAD EQUIPMENT INDEX

APPROVED:
DATE 1 JUL 79
SCALE AS SHOWN
SPEC. NO.
BDG-10-0-0/7
SHEET OF

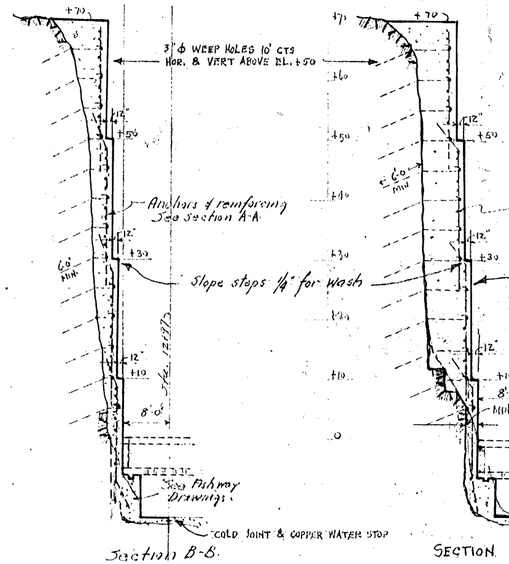
ARMY — KILHAM STATIONERY & PRINTING CO., PORTLAND, ORE.

Section C-C

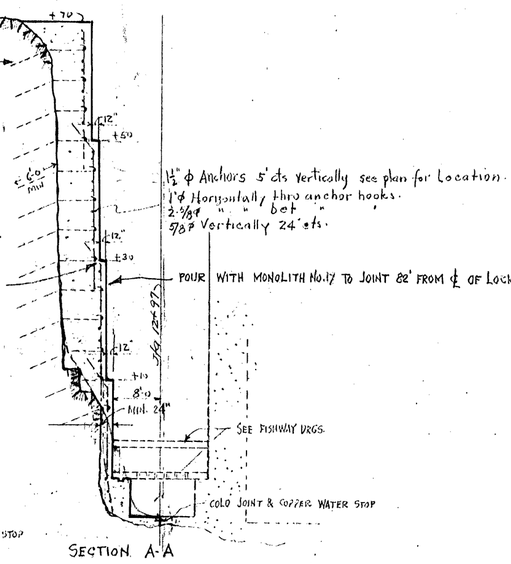
Section D-D



PLAN



Section B-B



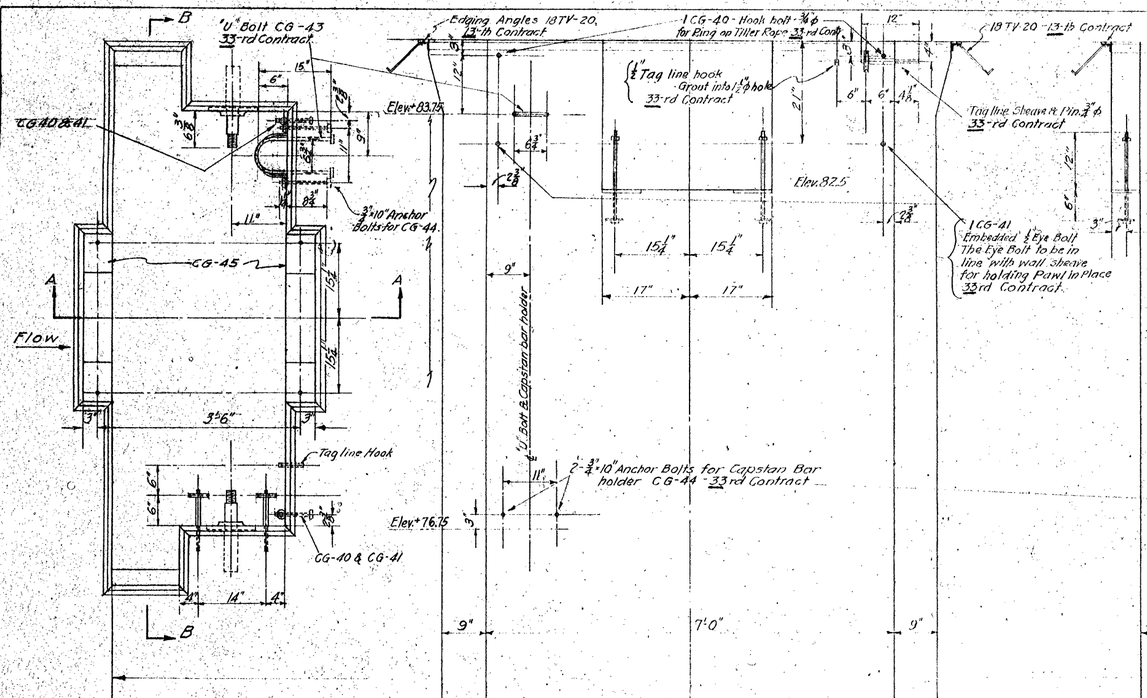
SECTION A-A

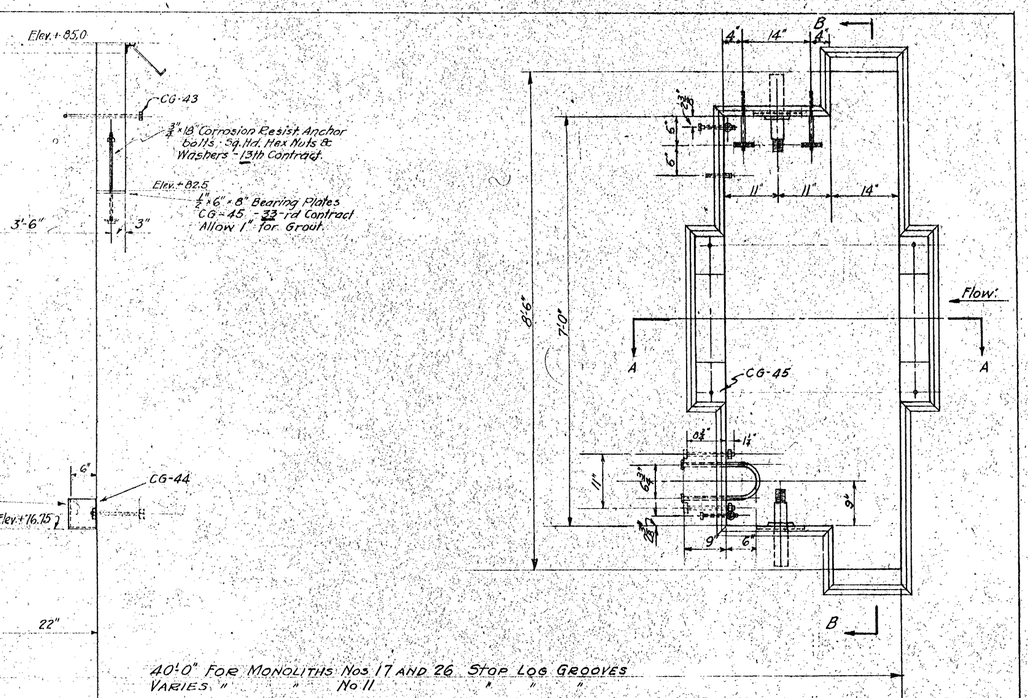
BONNEVILLE POWER NAVIGATION PROJECT
13 TH CONTRACT - CONCRETE
POWER HOUSE SUBSTRUCTURE & NAVIGATION LOCK
SHIP LOCK
CHANGES IN MONOLITH No.17 & ROCK BACKING
SCALE 1"=10'
U. S. ENGINEER OFFICE, SECOND PORTLAND DISTRICT (OREGON)
SUBMITTED: K. McKenzie, ENGINEER
RECOMMENDED: Art Kruse, SENIOR ENGINEER
APPROVED: [illegible], LT. COL. CORPS OF ENGINEERS
DESIGNED BY ... DATE 9-30-55
DRAWN BY ... TRACED BY ... CHECKED BY ...

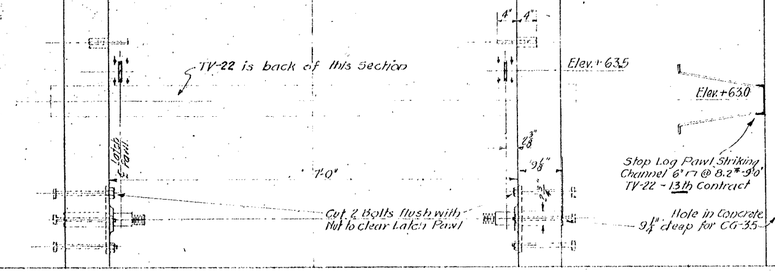
N-1-64

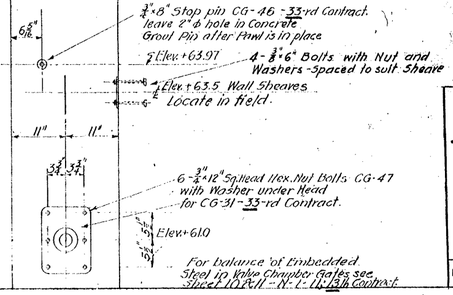
WAR DEPARTMENT

CORPS OF ENGINEERS U.S. ARMY.









REFERENCES

For Details - Embedded Steel - 13th Cont. Sht. 10 & 11, N-1-11

For Details - Embedded Steel - 33rd Cont. Sheet 4, N-2-48

NO.	REVISION	DATE	BY	APV'D

BONNEVILLE POWER NAVIGATION PROJECT

VALVE CHAMBER GATES

EMBEDDED STEEL

SCALES AS SHOWN

U. S. ENGINEER OFFICE, SECOND PORTLAND DISTRICT (OREGON)

SUBMITTED: _____ ENGINEER

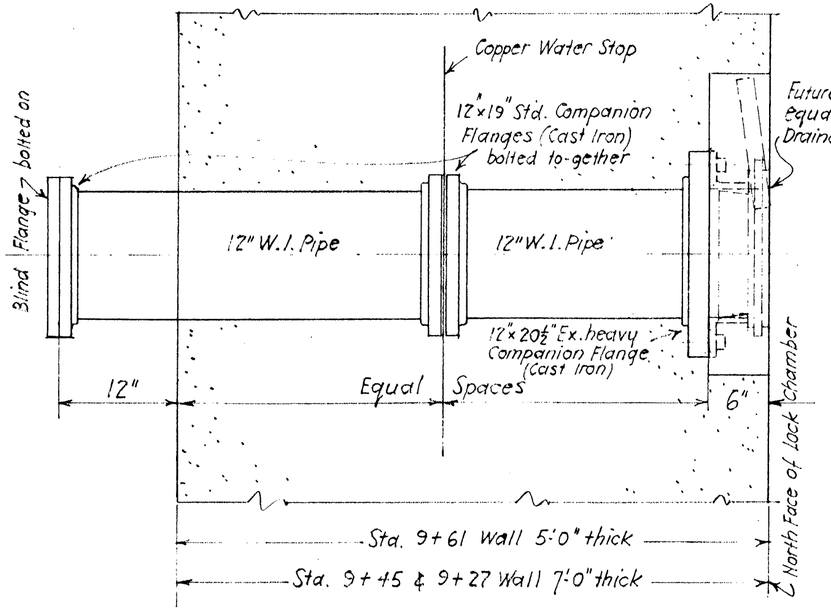
APPROVED: _____ LT. COL. CORPS OF ENGINEERS

RECOMMENDED: _____ SENIOR ENGINEER

DESIGNED BY M.B.L. DATE 10-10-35

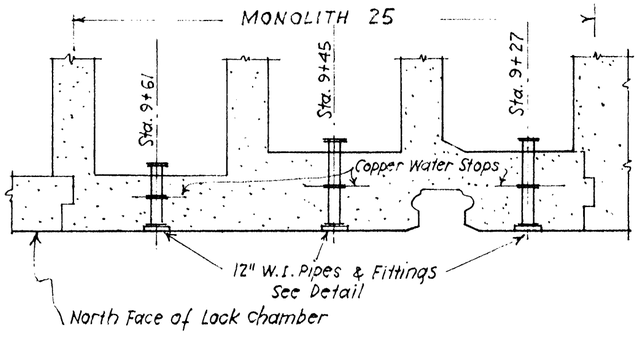
DR. BY M.B.L. TR. BY M.B.L. CHECKED BY S.S.O.

N-1-68



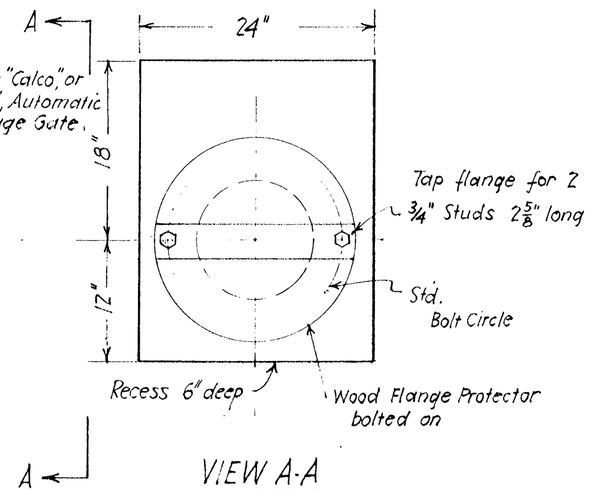
DETAIL OF PIPE & FITTINGS

SCALE 1" = 1'-0"



LOCATION PLAN

Locate Pipes at Elevations as directed by Contracting Officer.



VIEW A-A

NO.	REVISION	DATE	BY	APP'VD.
1	Changed Ex. hvy Flange Details	10-18-35	JWH	

BONNEVILLE POWER NAVIGATION PROJECT
(13TH) CONT. W 698 eng. 607
POWER HOUSE SUBSTRUCTURE & NAVIGATION LOCK
SHIP LOCK
DRAINAGE PIPES FOR MON'LTH. 25
SCALES AS SHOWN

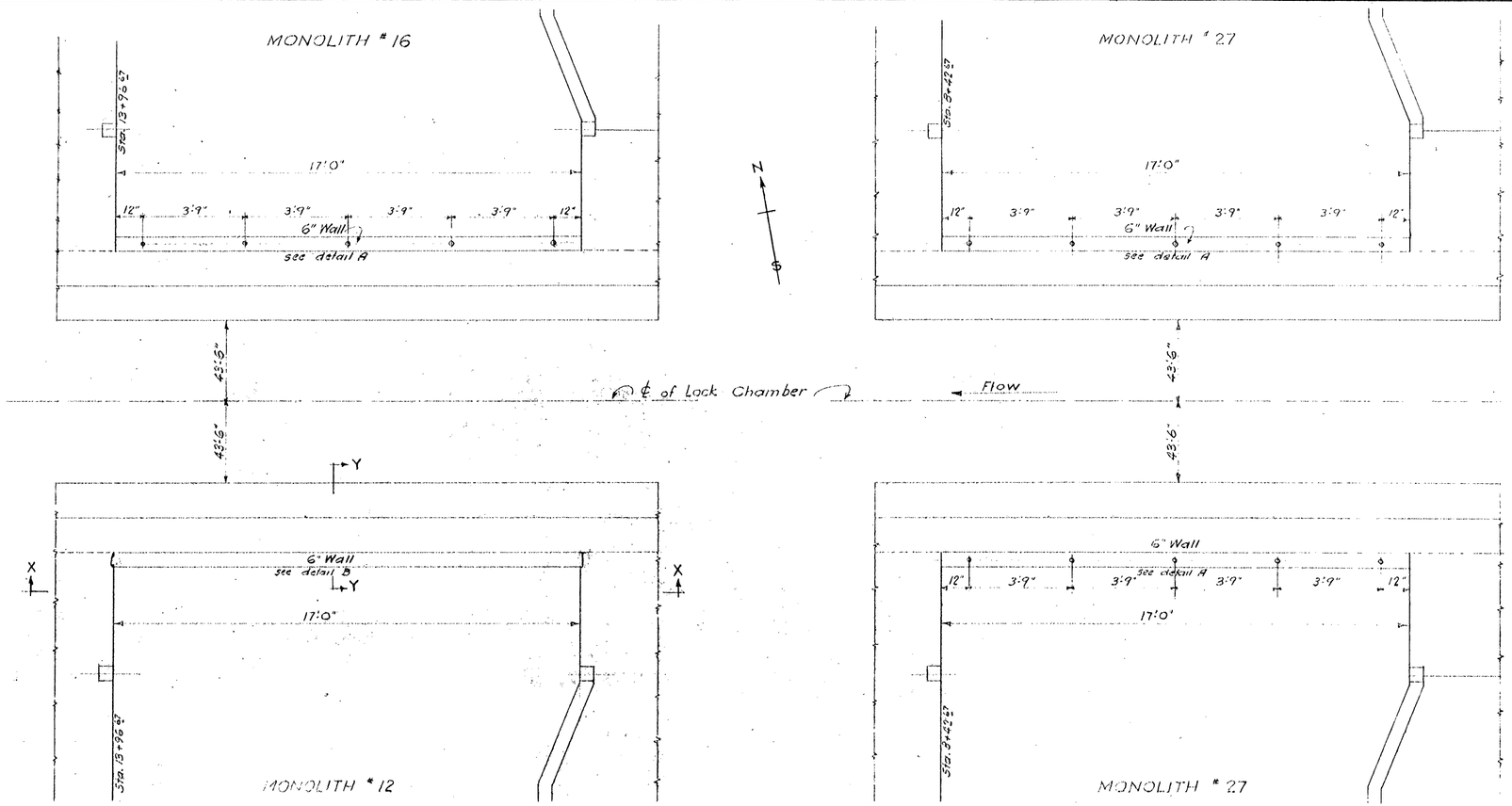
U.S. ENGINEER OFFICE, SECOND PORTLAND DISTRICT, (OREGON)

SUBMITTED: ENGINEER
APPROVED: LT. COL. CORPS OF ENGRS
RECOMMENDED: PRINCIPAL ENGINEER
DESIGNED BY ---- DAT.
DR. BY JWH TR. BY ---- CHECKED B. ----

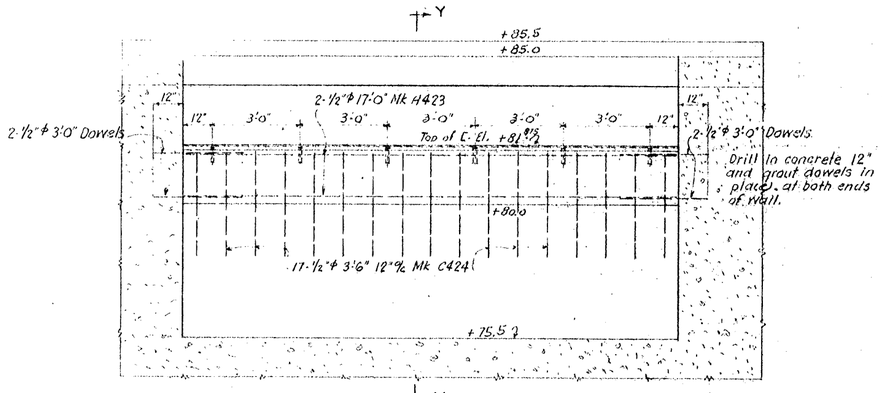
N-1-70

WAR DEPARTMENT

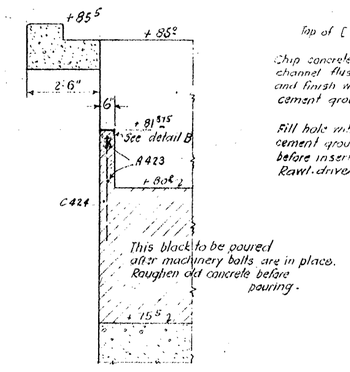
CORPS OF ENGINEERS, U. S. ARMY



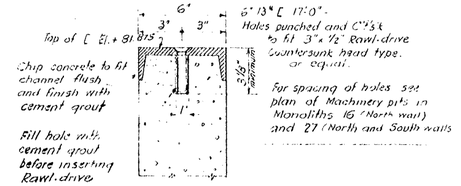
PLAN OF MACHINERY PITS



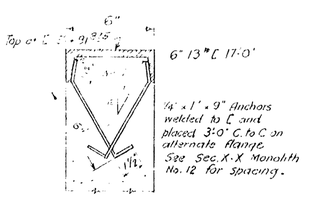
SECTION X - X



SECTION Y-Y



DETAIL A
3 required



DETAIL B
1 required

0 1 2 3 4 5 6 7 8 9 10
Scale of feet.

0 3 6 9 12
Scale in inches.

BILL OF MATERIAL

4 - 6" ℄ 13# - 17'-0" lg.	884 #
6 - 1/4" x 1" - 0'-9"	3.83 #
15 - 1/2" x 3" Rawl drive Ckt head type	
total wt. Struc. Steel	887.83 #

NO	REVISION	DATE	BY	AP'V'D

BONNEVILLE POWER NAVIGATION PROJECT

(13 TH. CONT.) W698 ENG 607

POWER HOUSE SUBSTRUCTURE & NAVIGATION LOCK

SHIP LOCK

EMBEDDED STEEL-MACHINERY PITS

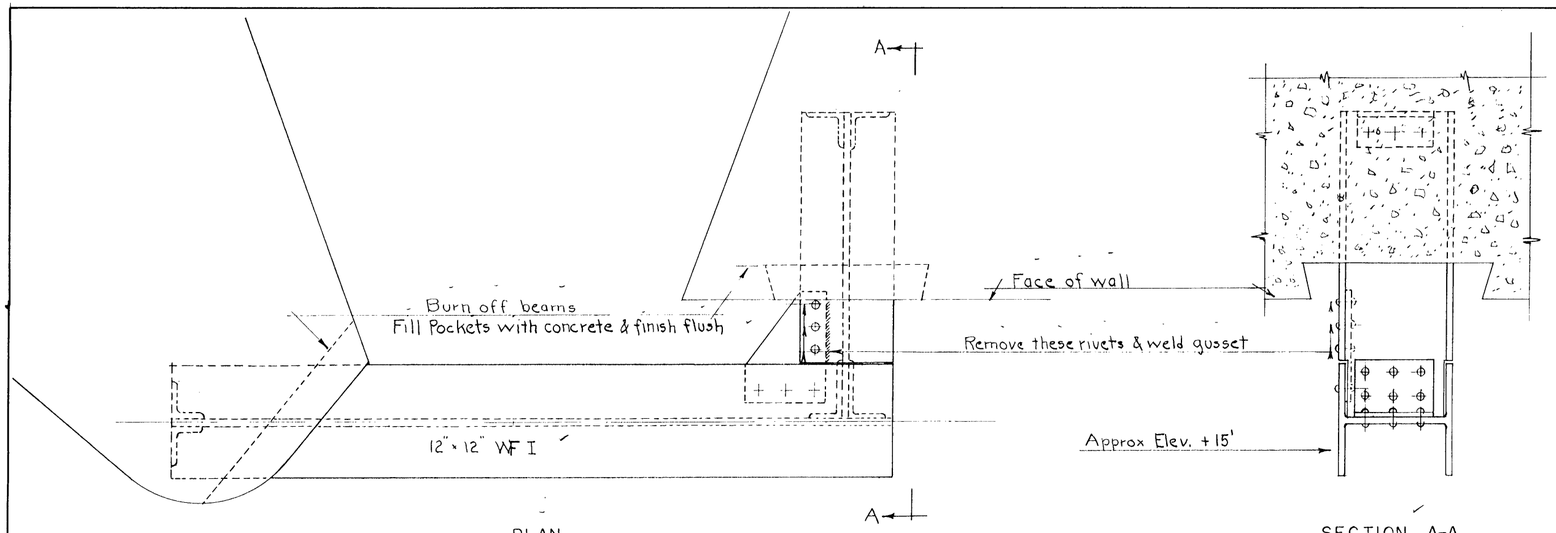
SCALES AS SHOWN

U. S. ENGINEER OFFICE, SECOND PORTLAND DISTRICT (OREGON)

SUBMITTED: Associate Engineer — APPROVED: Lt. Col. Corps of Engineers

RECOMMENDED: Principal Engineer — DESIGNED BY — DRAWN BY R.L. — TRACED BY — CHECKED BY — DATE NOV 13 1935

N-1-73



PLAN

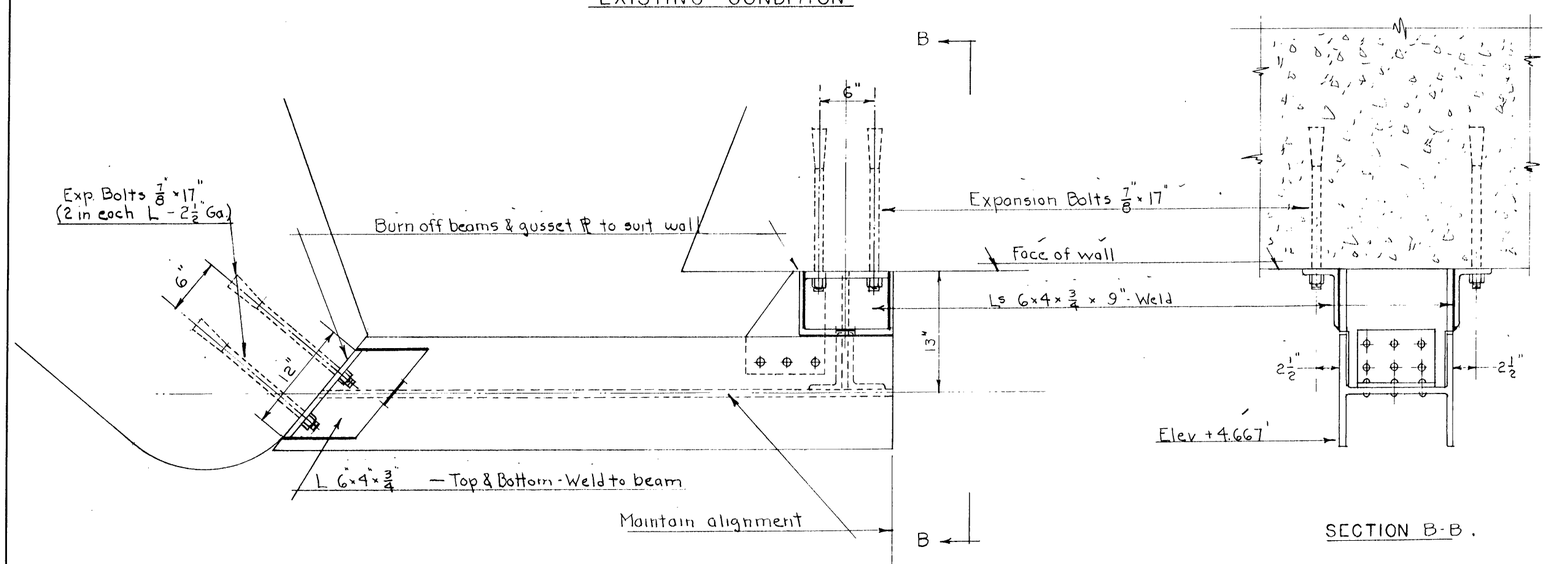
SECTION A-A

NOTES

Remove Quoin Post Adjustment Beam at Lower Gate from present incorrect elevation and relocate as shown.

Welds $\frac{3}{8}$" fillet. For welding see Par. 616 - Specifications

EXISTING CONDITION



PLAN

SECTION B-B.

REFERENCES

For Quoin Post Adjustment Beams see N-1-37

REINSTALLATION

NO.	REVISION	DATE	BY	APV'D

BONNEVILLE POWER & NAVIGATION PROJECT

(13-TH) CONTRACT W 698 ENG 607

POWER HOUSE SUBSTRUCTURE & NAVIGATION LOCK

SHIP LOCK

RELOCATION OF QUOIN POST ADJUSTMENT BEAM

SCALES AS SHOWN

U. S. ENGINEER OFFICE, SECOND PORTLAND DISTRICT (OREGON)

SUBMITTED: ENGINEER — APPROVED: LT. COL. CORPS OF ENGINEERS

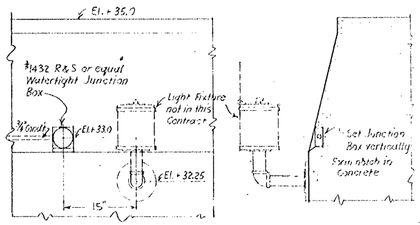
RECOMMENDED: PRINCIPAL ENGINEER

DESIGNED BY ... DATE 11-30-35.

DR. BY E.A.H. TR. BY E.A.H. CHECKED BY G.S.D.

WAR DEPARTMENT

CORPS OF ENGINEERS, U. S. ARMY

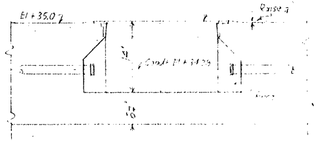


DETAILS OF JUNCTION BOX IN FACE OF GUIDE WALL

SCALE IN FEET

PLAN

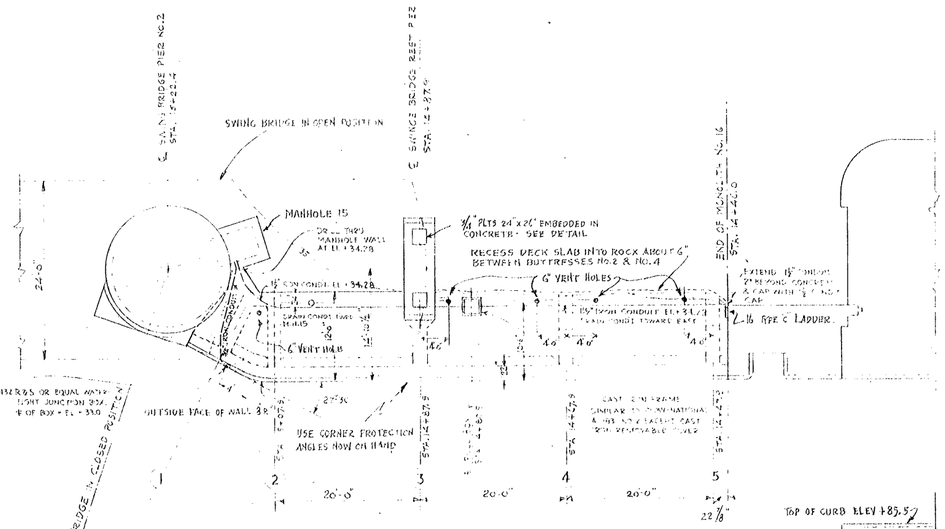
Cast-on frame similar to Dow-National A-1831 No 2 except no lip and with removable cover } Use Pull Box Frames & Cover now on hand marked PB5.



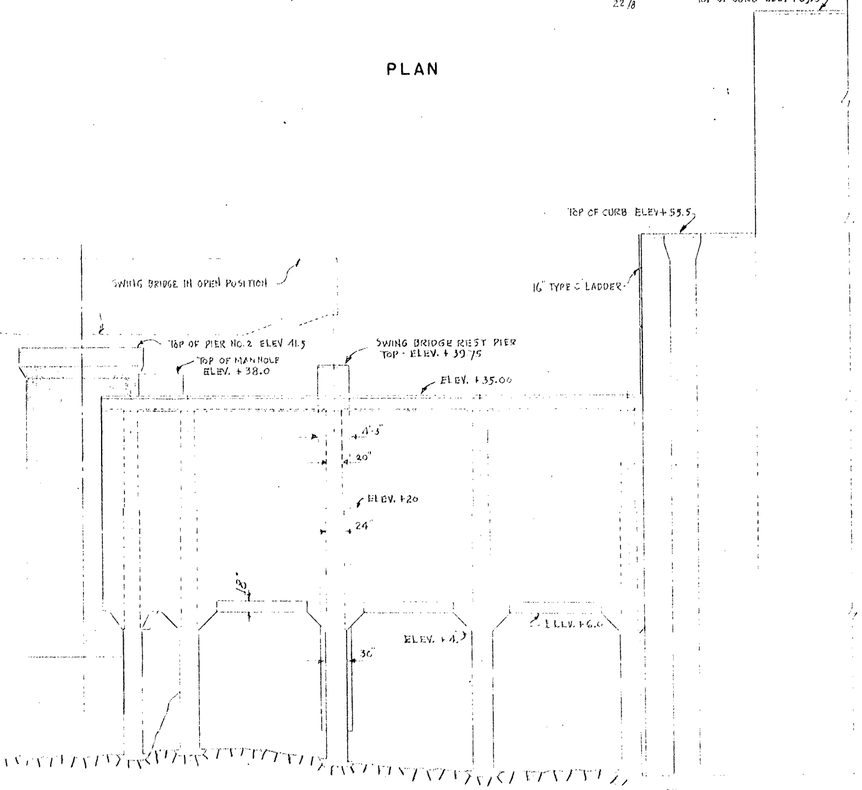
SECTION X-X

DETAILS OF PULL BOX AT STA 12+38.0

SCALE IN FEET

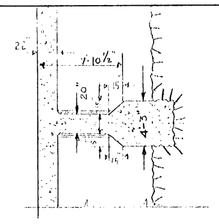


PLAN

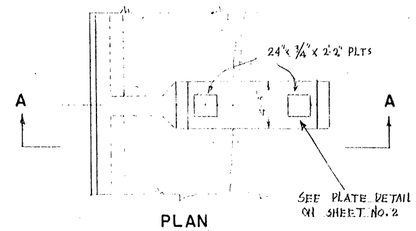


ELEVATION

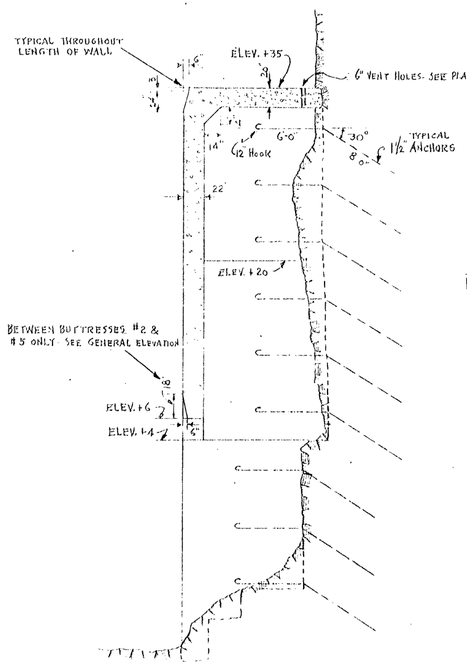
SCALE



SECTION B-B

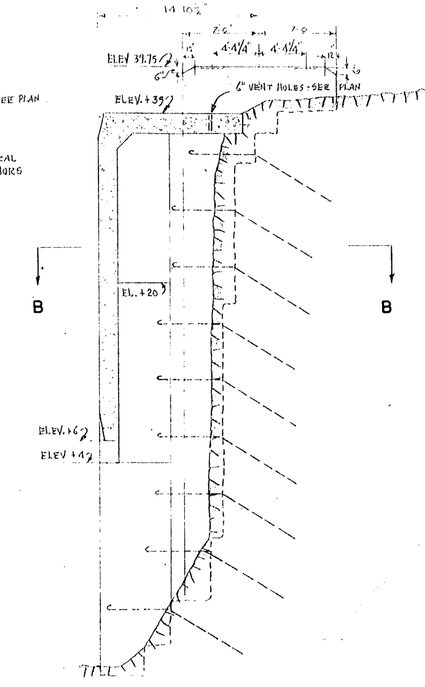


PLAN



BUTTRESSES 4 & 5

NOTE: CHASE ROCK FOR BUTTRESSES AS DIRECTED BY CONTRACTING OFFICER IN FIELD



SECTION A-A

SWING BRIDGE REST PIER & BUTTRESS No 3

CHASE ROCK FOR PIER 12" MINIMUM

0 5 10

SCALE

NOTE: CONCRETE BELOW ELEV. +4 - CLASS B
" ABOVE " " CLASS A

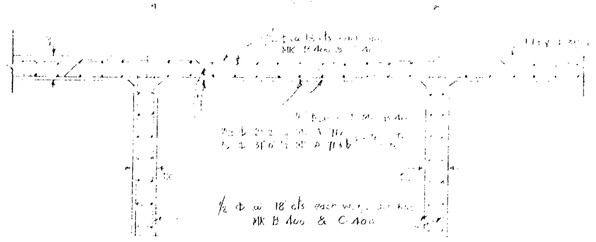
SEE SHEET No. - FOR REINFORCING DETAILS
SEE DRG N-1-[illegible] SHEET 2 FOR TYPE C LADDER DETAILS

NO.	REVISION	DATE	BY	APV'D

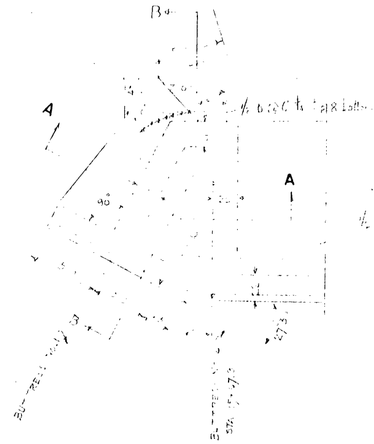
BONNEVILLE POWER NAVIGATION PROJECT
(13 TH) CONT. W698 ENG 607
POWER HOUSE SUBSTRUCTURE & NAVIGATION LOCK
SHIP LOCK
LOWER GUIDE WALL - NORTH SIDE
SCALES AS SHOWN
U. S. ENGINEER OFFICE, SECOND PORTLAND DISTRICT (OREGON)

SUBMITTED: ENGINEER — APPROVED: LT. COL. CORPS OF ENGINEERS
RECOMMENDED: PRINCIPAL ENGINEER — DESIGNED BY R.L. DATE 2/17/43
OR BY AEH JR BY AEH CHECKED BY

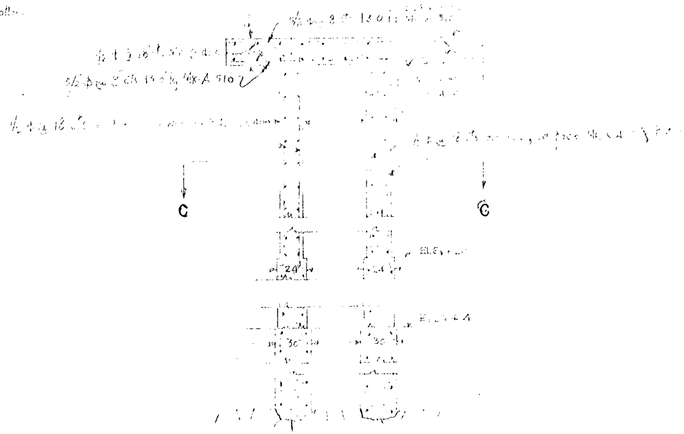
SHEET 1 N-1-76



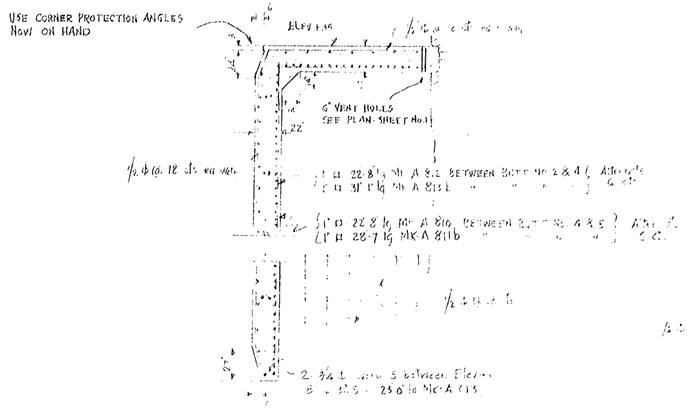
TYPICAL DECK SLAB REINFORCING - BUTTRESSES No2 TO No5



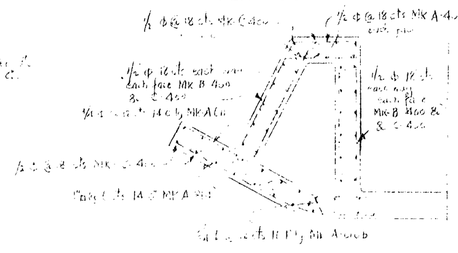
PLAN - BUTTRESSES No1 & No2



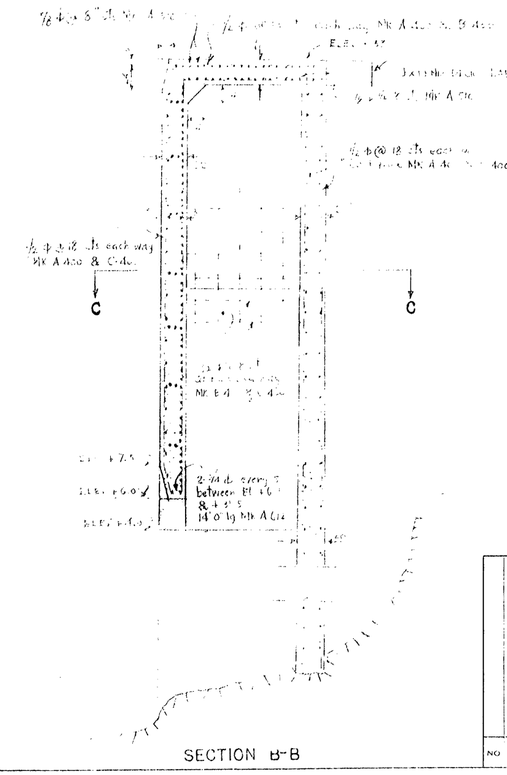
SECTION A-A



TYPICAL WALL REINFORCING - BUTTRESSES No2 TO No5



SECTION C-C



SECTION B-B

PLATE DETAIL FOR SWING BRIDGE KEEPER

REINFORCING STEEL SCHEDULE

LOCATION	NO.	SIZE	LENGTH UNBENT	MARK	REMARKS
WALL BETWEEN BUTTRESSES 4 & 5	22		22'-8"	A-810a	
	21		28'-7"	A-811b	
WALL BETWEEN BUTTRESSES 2 &	54		22'-	A-	
	14		31'-	A-	
WALL BETWEEN BUTTRESSES 2 & ENG. WALL	6		22'-	A-8	SPECIAL
DECK SLAB BETWEEN BUTTRESSES 4 & 5	11	7/8	22'-3	A-7	
	11	3/4		A-7	
DECK SLAB BETWEEN BUTTRESSES 2 & 4	22	7/8	22'-2"	A-712	
	21	7/8		A-7	
WALL BETWEEN BUTTRESSES No 2 & No 4	28	3/4	14'-	A-	
	14	7/8	10'-	A-	
DECK SLAB BETWEEN BUTTRESS No 2 & END	14	5/8	3'-	A-5	TOP BOTTOM
	14	3/4	17'-	A-	
	560			C-4	
	560			A-4	
	560			B-4	
	14	3/4	4'-	A-7	
	14	3/4	2'-	A-7	

NO	REVISION	DATE	BY	APV'D

BONNEVILLE POWER NAVIGATION PROJECT

(13 TH) CONT. W 698 ENG 607.

POWER HOUSE SUBSTRUCTURE & NAVIGATION LOCK

SHIP LOCK

LOWER GUIDE WALL - NORTH SIDE

SCALES AS SHOWN

U. S. ENGINEER OFFICE, SECOND PORTLAND DISTRICT (OREGON)

SUBMITTED _____ APPROVED _____ LT. COL. CORPS OF ENGINEERS

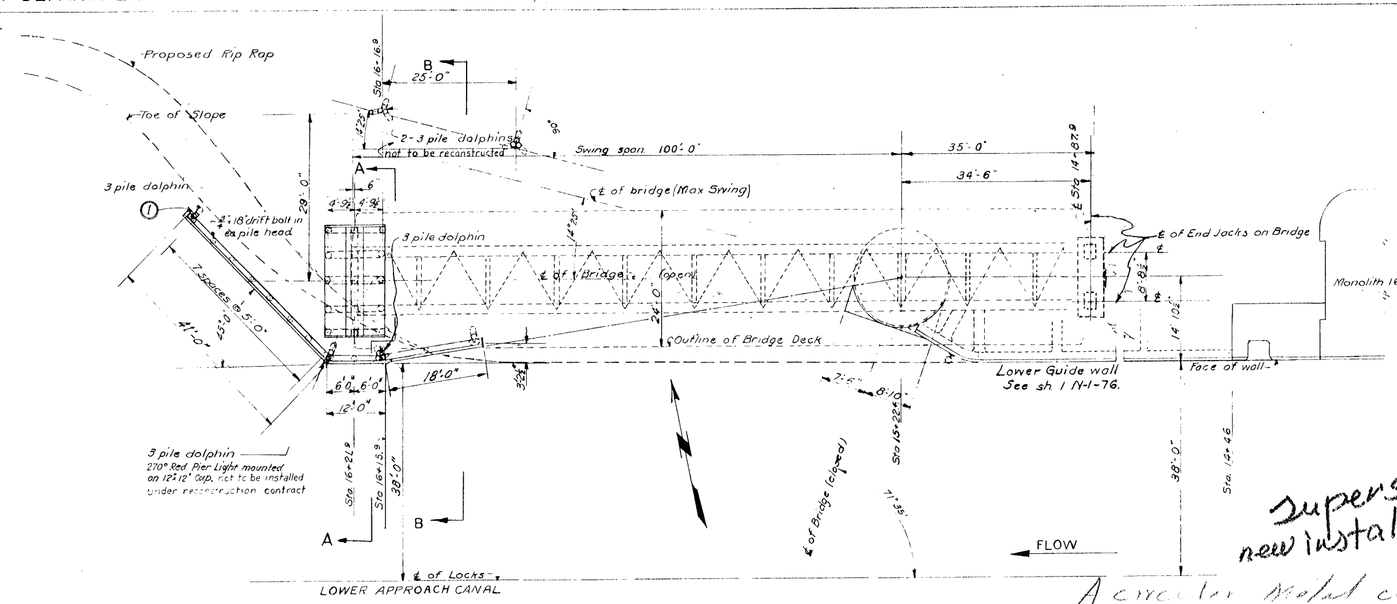
RECOMMENDED _____ DESIGNED BY _____ DATE _____

_____ DRAWN BY _____ TRACED BY _____ CHECKED BY _____

DISTRICT ENGINEER

WAR DEPARTMENT

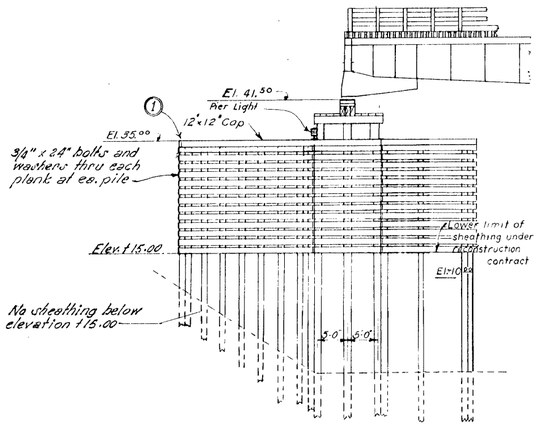
CORPS OF ENGINEERS U. S. ARMY.



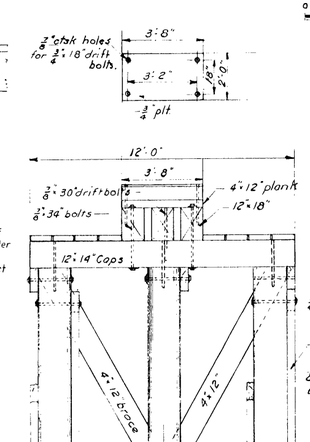
PLAN

Scale $\frac{3}{32}$" = 1'-0"

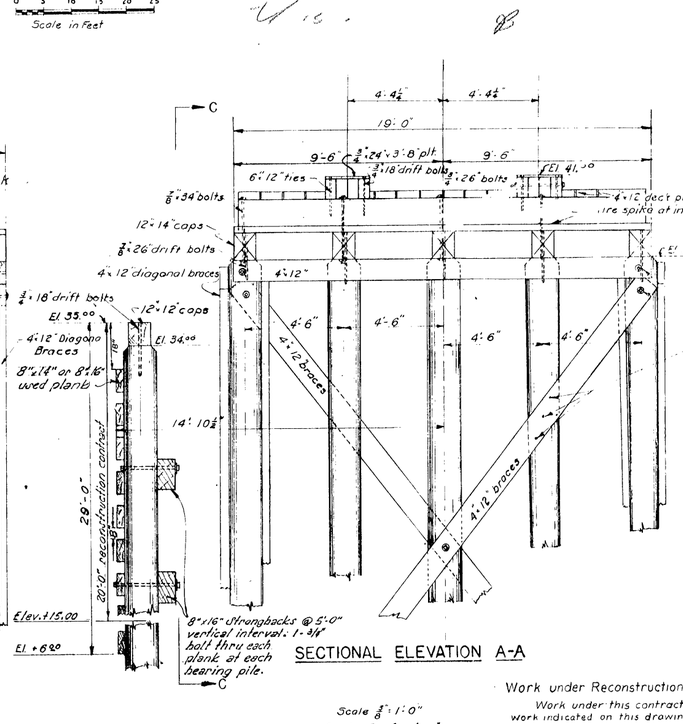
Scale in Feet



ELEVATION



ELEVATION C-C



SECTIONAL ELEVATION A-A

Scale $\frac{3}{8}$" = 1'-0"

Scale in Feet

NOTE:
As constructed under Contract No. DA-35-026-eng-4364, Oct. 17, 1950. Date of notice to proceed Contract completed on 22 Dec. 1950.

Work under Reconstruction Contract

Work under this contract will include all work indicated on this drawing, except,

b. Two 3 pile dolphins
c. One Pier light.
d. Sheathing below El. +10.0 on fender wall

List of material has not been revised to exclude material not to be installed under reconstruction contract.

(1) This symbol indicates Revision no.

LIST OF MATERIAL

No. Req'd	Description	Size	Length		Remarks
20	Piling		60'		Creosote treated
15	"		65'		"
7	"		60'		"
6	"		60'		3000 lin. ft. (approx)
				B.M.	
4	Caps Guide wall	12×12	12'-0"	576	Rough
1	" "	12×12	16'-0"	192	"
1	" "	12×12	10'-0"	120	"
5	" Pier	12×14	12'-0"	840	Rough lumber
3	Stringers	12×18	20'-0"	1080	Framed and
8	Ties	6×12	4'-0"	192	treated by
5	Braces	4×12	20'-0"	2400	pressure method.
4	"	4×12	40'-0"	640	
4	"	4×12	36'-0"	576	
20	Deck	4×12	10'-0"	800	S4S
20	Sheathing	4×12	16'-0"	1280	Rough
60	"	4×12	12'-0"	2880	"
10	Bolts, with washers	7/8"×34"		60#	
30	" "	3/4"×25"		128	
5	Drift bolts	4½"×30"			
15	" "	8"×26"			
15	" "	3/4"×18"		125	
	Spikes				
2	Plates	3/4"×24	3'-8"	450#	

NOTES

as per specifications.

All material to be Douglas Fir Construction Grade.

All piling to be creosote treated and shall be a minimum of 14" at butt as per specifications.

All piling to be driven to a minimum penetration of twenty feet where possible.

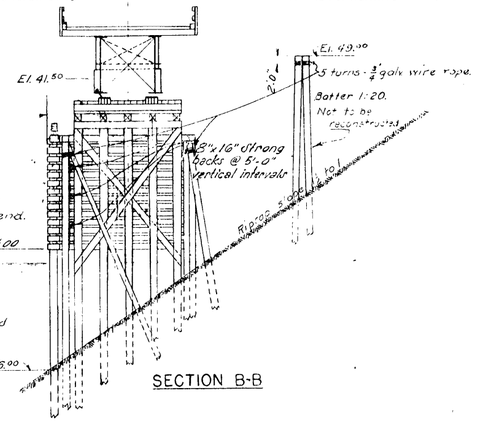
All piling shall be driven until the penetration under the last blow shall not exceed:

$s = 1 = \frac{wh}{15000}$ for drop hammer } Pier protection
$s = 0.1 = \frac{wh}{15000}$ for steam hammer } & Bridge rest.

$s = 1 = \frac{wh}{10000}$ for drop hammer } dolphins.
$s = 0.1 = \frac{wh}{10000}$ for steam hammer }

where s = penetration in inches
w = weight of hammer
h = fall of hammer in ft.

To ℄ of Locks 52'-10½" (Field dimension 52.9')



SECTION B-B

NOTES.

Drift bolts not to have heads or points. Holes for drift bolts to be bored 1/16" less in diameter than nominal diameter of bolts.

Batter all dolphin piling 1:20 where shown dotted and wrap each dolphin at top with 5 turns of 3/4" galv. wire rope.

List of Material given for guidance only. Contractor to check quantities before ordering.

All Lumber & Timbers listed as treated shall be creosote treated by pressure method according to specification.

REFERENCES.

General Layout-Bridge across Navigation Canal sh. 2	N-2-43.
Swing Bridge Pier Details sh. 6	N-1-11.
Excavation Details for Lower Canal	N-3-38 B.
Proposed Rip Rap-Approach Canal	R-1-91.
Lower Guide Wall-North Side sh. 1 & 2	N-1-76.
Swing Span	N-2-61.
Location of ground surface for piling for Swing Bridge Rest and Dolphins falling within Riprap Area.	N-3-66 A.
For Details of Draw Rest Pier Lights	Sht. 11 of N-2-401.

Superseded by new installation N-1-77A, 77B, 77C.

A corrugated metal culvert has been installed in place of this.

NO.	REVISION	DATE	BY	APP'D
4	Revised as Const. Contract No. 4364	10-19-51	O.H.L.	[illegible]
	REVISED ACCORDING TO CONTRACT NO. 4364.	10-15-51		[illegible]
2	Revision to indicate work under reconstruction contract	8-8-47	C.E.M.	[illegible]
1	Omitted 180° Draw Rest Pier Light	5-13-36	J.W.H.	[illegible]

BONNEVILLE PROJECT

BRIDGE ACROSS NAVIGATION CANAL.

BRIDGE & PIER PROTECTION

— NORTH SIDE —

SCALE AS SHOWN

U. S. ENGINEER OFFICE, SECOND DIST. PORTLAND, DISTRICT OREGON

SUBMITTED: [illegible] ENGINEER

RECOMMENDED: [illegible] PRINCIPAL ENGINEER

APPROVED: [illegible] LT. COL. CORPS OF ENGINEERS

DESIGNED BY C.H.S. DATE 3-9-1936

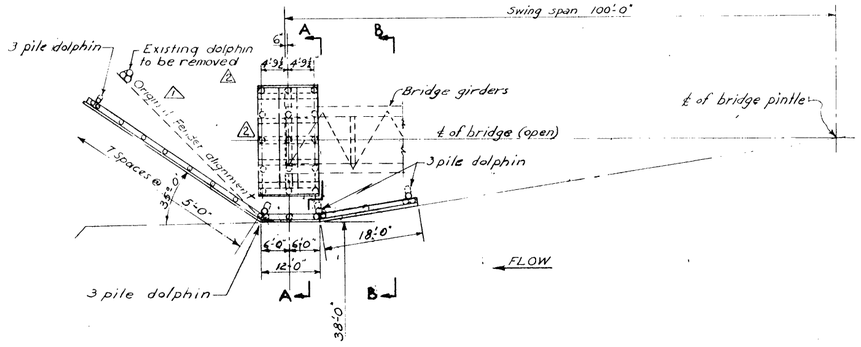
DR. BY C.H.S. TR. BY ..... CHECKED BY M.H.L.

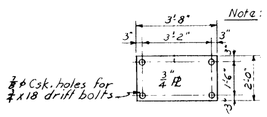
N-1-77.

17

CORPS OF ENGINEERS

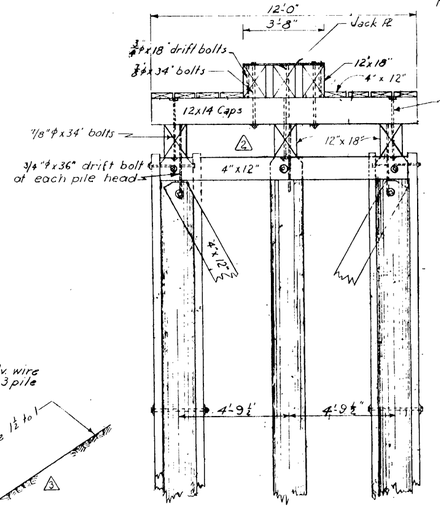
U. S. ARMY





Note: Existing jack plates to be reused

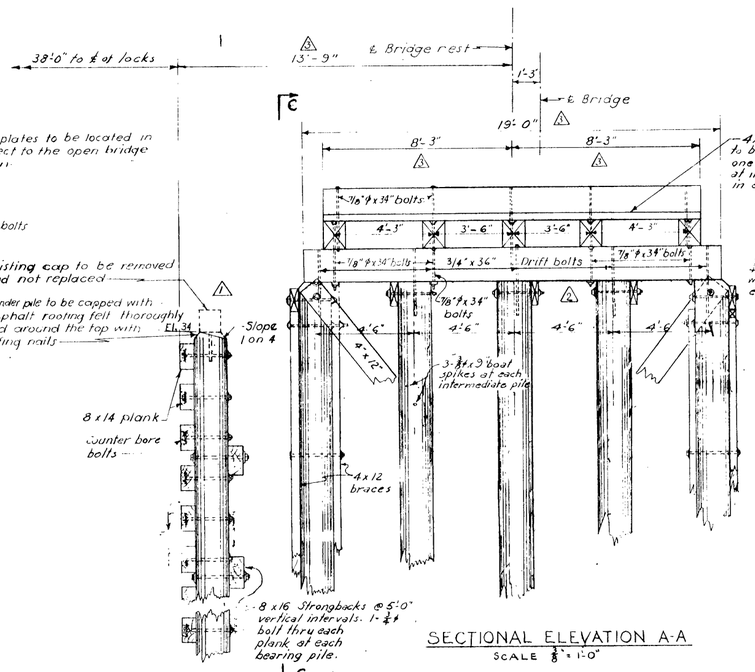
PLAN OF JACK ℓ



ELEVATION C-C

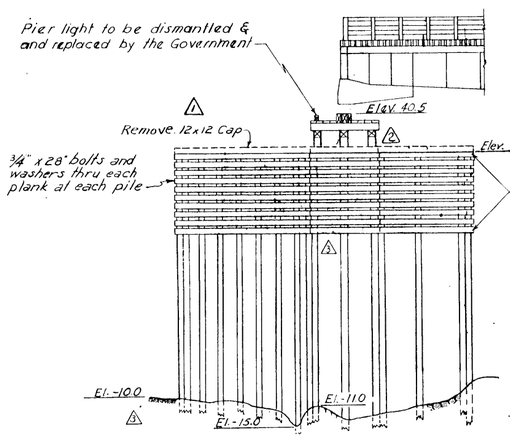
SCALE ⅜" = 1'-0"

NOTE: Jack plates to be located in respect to the open bridge position.



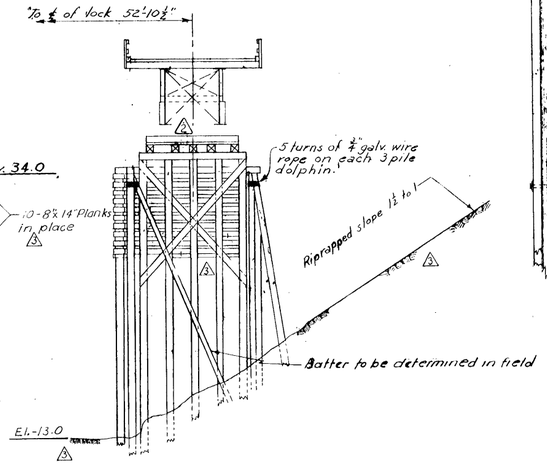
SECTIONAL ELEVATION A-A

SCALE ⅜" = 1'-0"

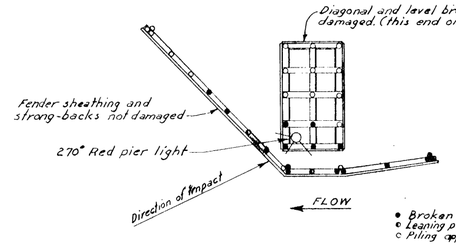


ELEVATION

SCALE ⅛" = 1'-0"



SECTION, B-B



Note: All diagonal and level bracing shattered except as noted.

- Broken piling
- Leaning piling (Break possible below ground)
- Piling apparently not damaged

DAMAGE DIAGRAM

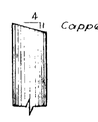
(As Observed, 6 October 1954)

Note: Dismantling may disclose more extensive damage or deterioration than indicated on the "DAMAGE DIAGRAM"

PLAN

SCALE ℄ = 1'-0"

℄ of locks ℄ Lower approach canal



4 Capped as noted above.

NEW FENDER & DOLPHIN CUTOFF

No Scale

Next to original tracing

AS CONSTRUCTED

CONTRACT NO. DA-35-026-Eng-25134

CONTRACTOR Hanley Salvage Co

DATE OF [illegible] 26 Nov 55

DATE OF [illegible] CONTRACT 6 May 55

DATE OF ACCEPTANCE 6 May 55

REVISION	DATE	DESCRIPTION	BY
3	6-18-55	As constructed	EWH
2	4-20-55	Revised deck framing, deleted dolphin	EWH
1	2-23-55	Deleted pile cap & added original fender alignment	EWH

CORPS OF ENGINEERS, U. S. ARMY

OFFICE OF THE DISTRICT ENGINEER, PORTLAND, OREGON

BONNEVILLE DAM

COLUMBIA RIVER, OREGON AND WASHINGTON

SWING BRIDGE REST & FENDER DETAILS

DESIGNED: G.B.S.

DRAWN: E.B.G. Price

CHECKED: G.B.S.

REVIEWED: for Chief, Safety Branch

SUPERVISED: Chief, Structures Design Section

SUBMITTED: Chief, Design Branch

RECOMMENDED: Chief, Engineering Division

APPROVED: Colonel, C.E. District Engineer

DATE 2-23-55

SCALE AS SHOWN

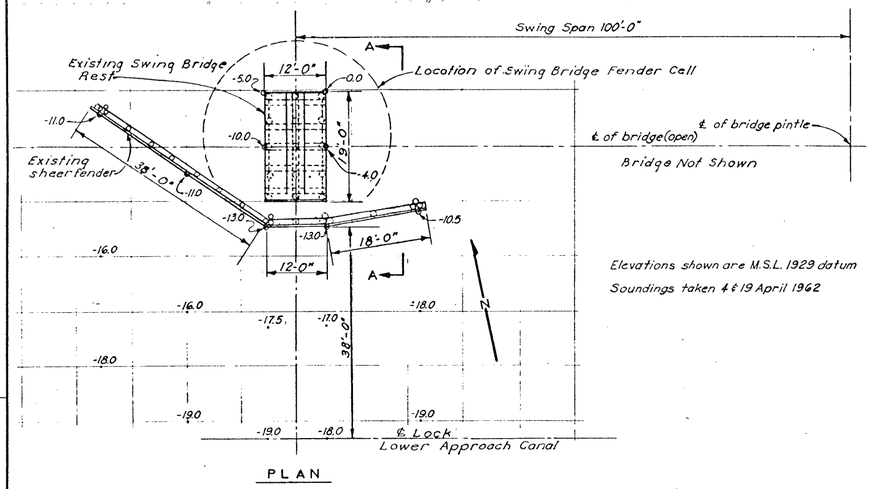
SPEC. NO.

SHEET OF N-1-77 A

THIS PRINT REDUCED TO ONE-HALF SCALE

ARMY—KILHAM STATIONERY & PRINTING CO., PORTLAND, OREGON. DRAWING 319-W 180-7-54 108334

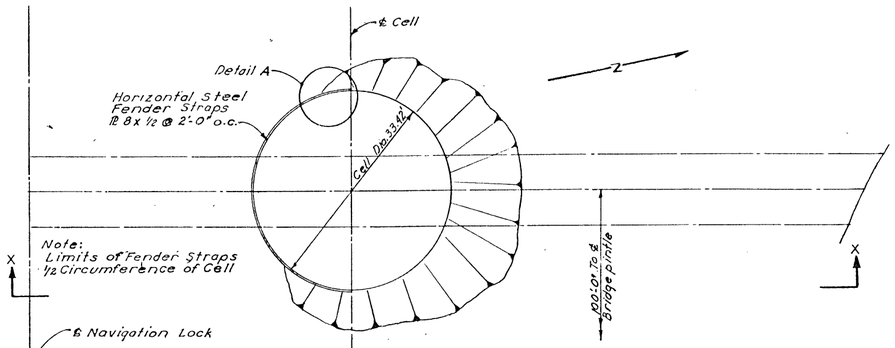
CORPS OF ENGINEERS U. S. ARMY



PLAN

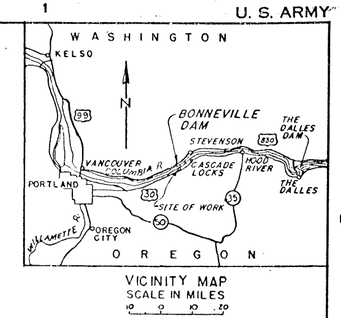
Elevations shown are M.S.L. 1929 datum

Soundings taken 4 & 19 April 1962



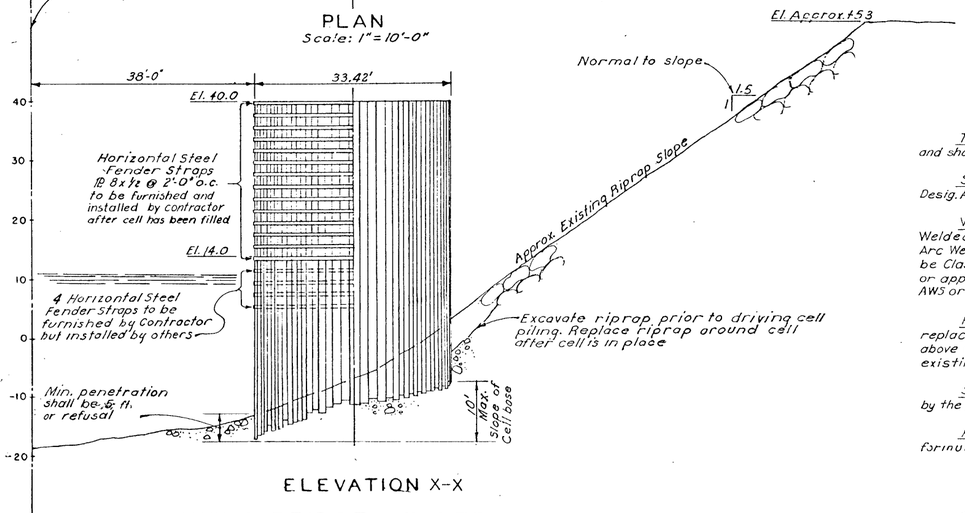
PLAN

Scale: 1"=10'-0"



VICINITY MAP

SCALE IN MILES



ELEVATION X-X

SWING BRIDGE FENDER CELL

Scale: 1"=10'-0"

NOTES

The steel sheet pile shall be furnished by the contractor and shall be new or used SP-6a, MP-101, I-28S or equal. ASTM Desig. A-?

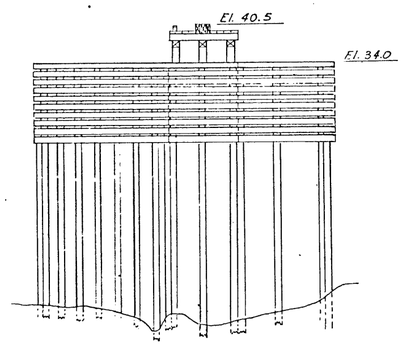
Structural Steel unless otherwise noted shall be ASTM Desig. A-7 or Fed. Spec. QQ-S-741a, Type I.

Welding: All welding shall conform to AWS Specs. for Welded Highway and Railway Bridges and shall be Electric Arc Welding by the Shielded Arc Process: Electrodes shall be Class E 6010 for D.C. welder or Class E 6011 for A.C. welder or approved equal. Welders shall have previously qualified under AWS or ASME codes within one year prior to beginning work.

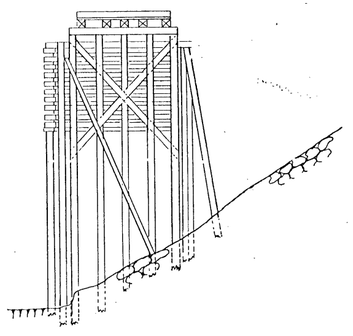
Riprap removed for construction of cell shall be replaced after completion of cell and fill. Riprap replaced above water surface, shall be hand placed to match existing installation.

Sand and Gravel Fill material will be made available by the government.

Point shall be Black Hull Point, Maritime Administration Formula 52-MA-105A



ELEVATION

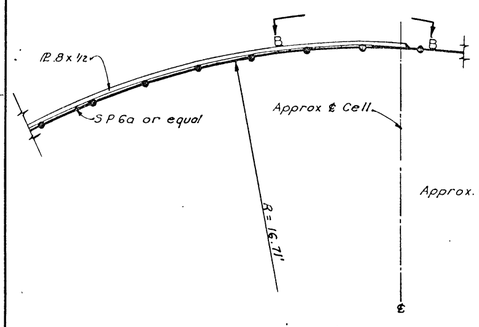


SECTION A-A

EXISTING SWING BRIDGE REST & SHEER FENDER

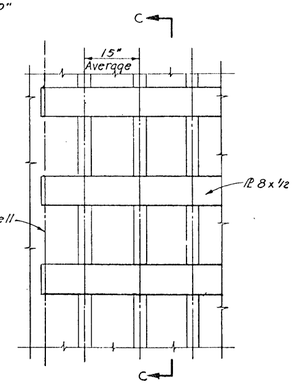
TO BE REMOVED

Scale: 3/32"=1'-0"



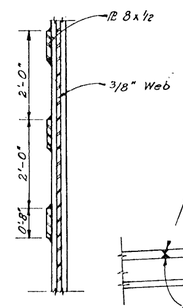
DETAIL A

Scale: 3/16"=1'-0"



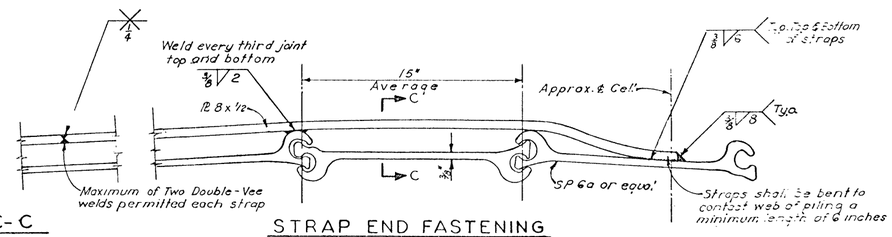
ELEVATION B-B

Scale: 3/16"=1'-0"



SECTION C-C

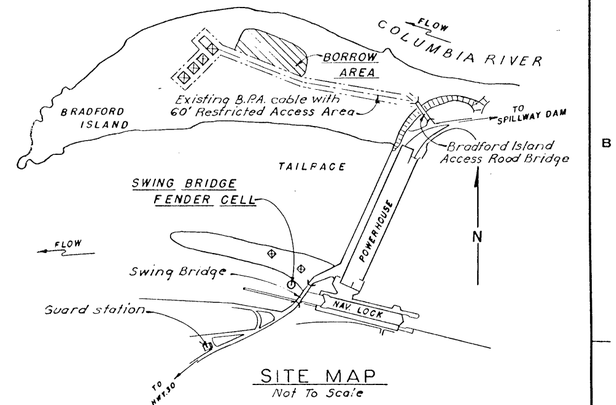
Scale: 1/16"=1'-0"



STRAP END FASTENING

No Scale

HORIZONTAL STEEL FENDER STRAP DETAILS



SITE MAP

Not To Scale

REVISION	DATE	DESCRIPTION	BY

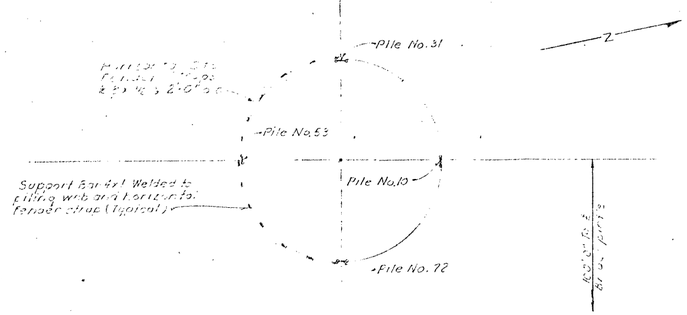
U. S. ARMY ENGINEER DISTRICT, PORTLAND
CORPS OF ENGINEERS
OFFICE OF THE DISTRICT ENGINEER, PORTLAND, OREGON

BONNEVILLE DAM
COLUMBIA RIVER OREGON - WASHINGTON

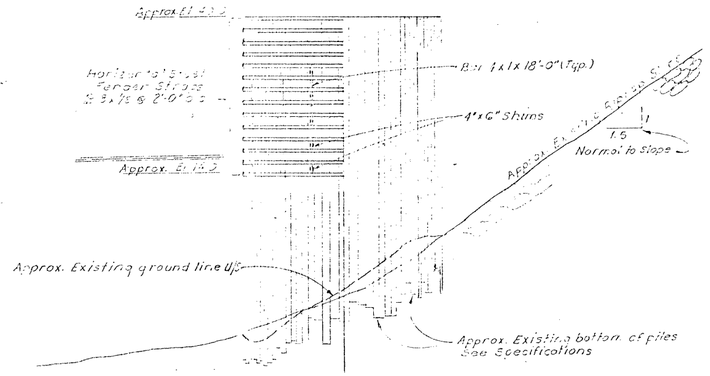
SWING BRIDGE FENDER CELL

DESIGNED: G.O.S.M.B.	
DRAWN: M.B.	
CHECKED: G.O.S.	
REVIEWED: W.A. Swindle, CHIEF, NAVIGATION BRANCH	
SUPERVISED: Heber C. Heine, CHIEF, STRUCTURES SECTION	APPROVED: [signature], COLONEL, CE, DISTRICT ENGINEER — DATE: 19 SEP 62
SUBMITTED: Wm. A. Elmer, Jr. for, CHIEF, DESIGN BRANCH	SCALE AS SHOWN — SPEC. NO.
RECOMMENDED: [signature], CHIEF, ENGINEERING DIVISION	SHEET OF — N-1-77B

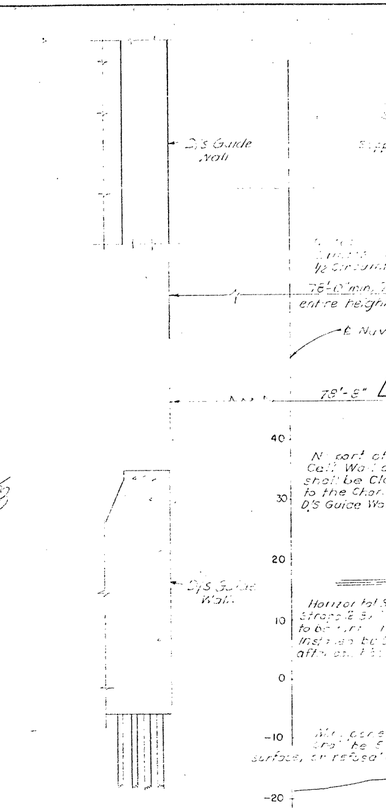
CORPS OF ENGINEERS U. S. ARMY

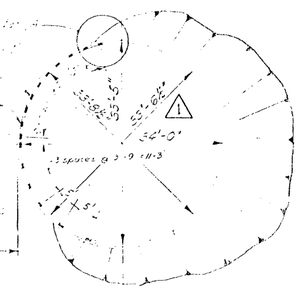


PLAN
Scale: 1" = 10'-0"

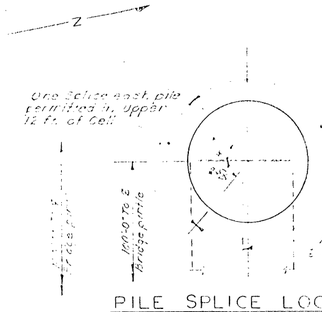


ELEVATION
EXISTING FENDER CELL
(TO BE REMOVED)
Scale: 1" = 10'-0"

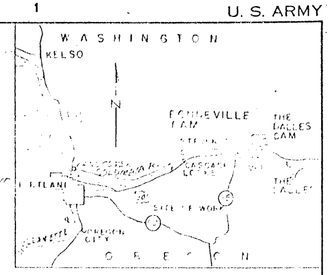


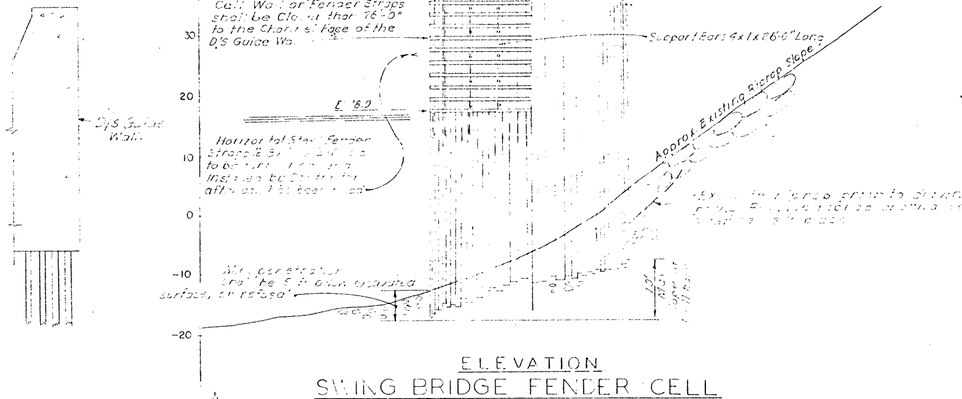


PLAN
Scale: 1" = 10'-0"



PILE SPLICE LOCATION
No Scale





ELEVATION
SWING BRIDGE FENDER CELL
(TO BE CONSTRUCTED)
Scale: 1" = 10'-0

NOTES

All Metal of the existing cell which meets the specified requirements shall be used in constructing the new cell. All additional metal required for completing the reconstructed cell shall be furnished by the Contractor.

Non-structural steel shall be fabricated by the fabricator shall be A.S.T.M. A36, A.W.S.M. Grade or equal ASTM designation.

Metal to Metal Bearing Steel Parts shall be Cold Turned that be A.S.T.M. A-7 or Fed. Spec. QQ-S-741, Type I.

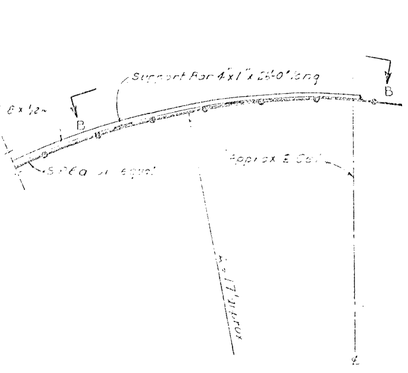
Welding: All welding shall conform to AWS Specs. for Welded Highway and Railway Bridges and shall be Electric Arc Welding by the Shielded Arc Process. Electrodes shall be Class E6010 for D.C welders or Class E601 for A.C welder of approved equal. Welders shall have previously qualified under AWS or AEMC codes within one year prior to beginning work.

Fitting of Parts: All plane surfaces in bearing contact provisions of current specification of the American Welding Society.

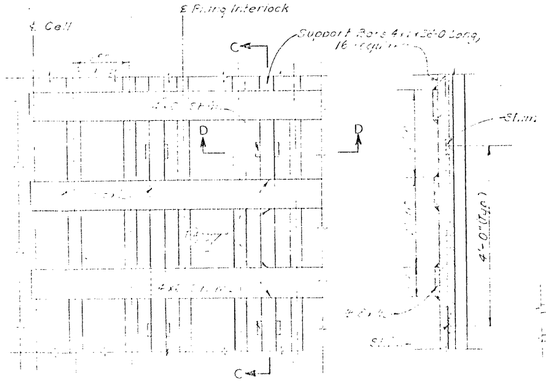
Riprap removed for construction of cell shall be replaced after completion of cell and fill. Riprap replaced shall match surface, shall be hand placed to match existing installation.

Sand and Gravel Fill material will be made available by the Government.

SITE MAP
No Scale

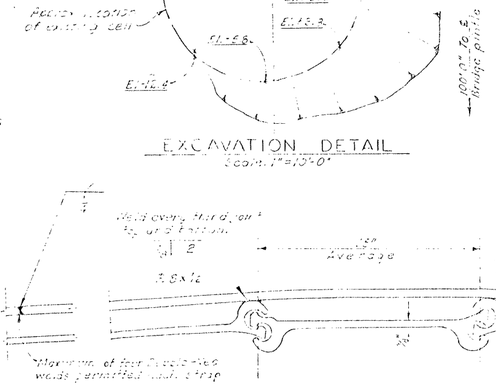


DETAIL A
Scale: 1" = 1'-0"

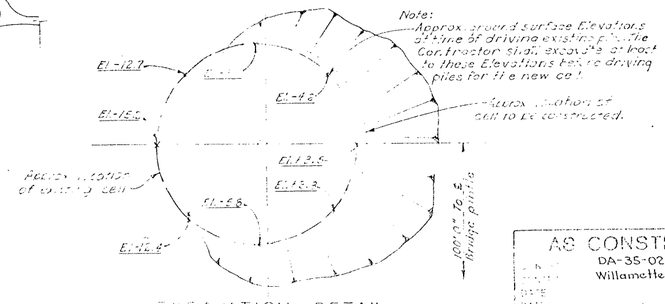


ELEVATION B-B
Scale: 1" = 1'-0"

SECTION C-C
No Scale



SECTION D-D
No Scale



EXCAVATION DETAIL
Scale: 1" = 10'-0"

AS CONSTRUCTED
DA-35-026-civeng-63-308
Willamette Tug & Barge Co.
8 Mar 63
22 Apr 63
6 May 63

STRAP END FASTENING
No Scale

HORIZONTAL STEEL FENDER STRAP DETAILS

REVISION	DATE	DESCRIPTION	BY
1	5 Dec 63	As Constructed	

U. S. ARMY ENGINEER DISTRICT, PORTLAND
CORPS OF ENGINEERS
OFFICE OF THE DISTRICT ENGINEER, PORTLAND, OREGON

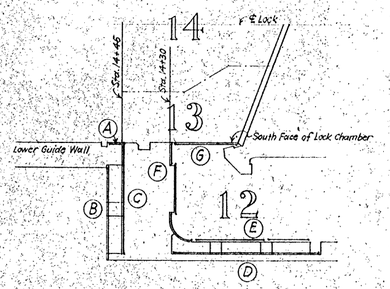
DESIGNED:
DRAWN: R. B.
CHECKED:
PREPARED:
REVIEWED:
CHIEF, SAFETY BRANCH
SUPERVISED: Hebert C. Horine
CHIEF, STRUCTURES SECTION
SUBMITTED:
CHIEF, ENGINEERING DIVISION
APPROVED:
COLONEL, C.E., DISTRICT ENGINEER
DATE:

BONNEVILLE DAM
COLUMBIA RIVER OREGON - WASHINGTON
RECONSTRUCTION OF SWING BRIDGE FENDER CELL

SCALE AS SHOWN | SPEC. NO.

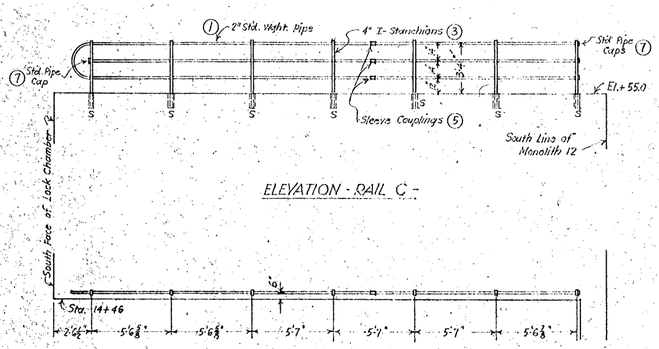
SHEET OF

N-1-77C



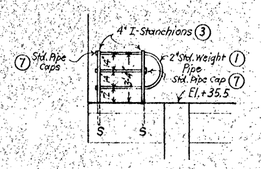
LOCATION PLAN

No Scale

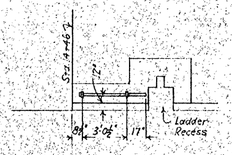


ELEVATION - RAIL C -

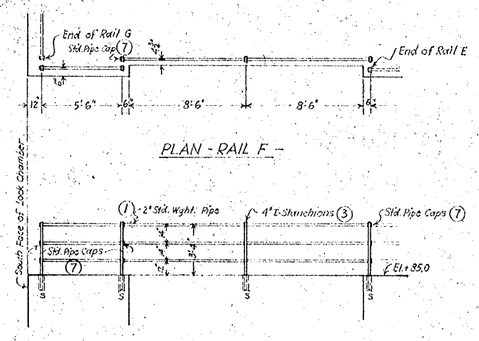
PLAN - RAIL C -



ELEVATION - RAIL A -

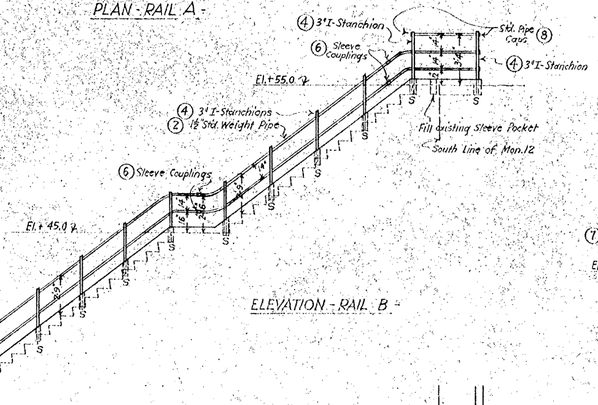


PLAN - RAIL A -

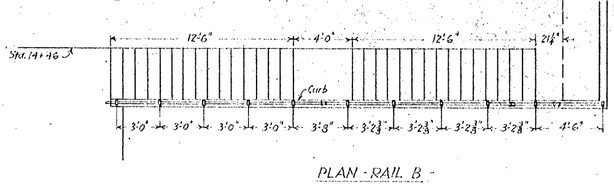


PLAN - RAIL F -

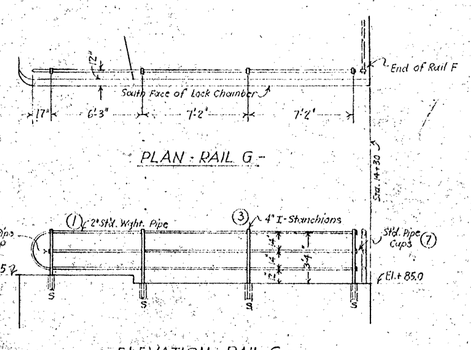
ELEVATION - RAIL F -



ELEVATION - RAIL B -



PLAN - RAIL B -

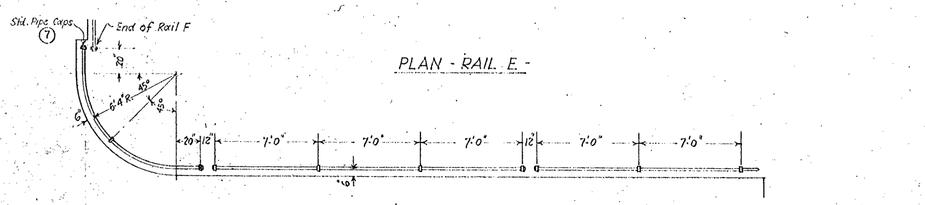


PLAN - RAIL G -

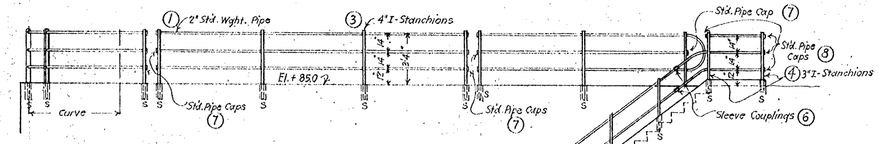
ELEVATION - RAIL G -

0 5 10

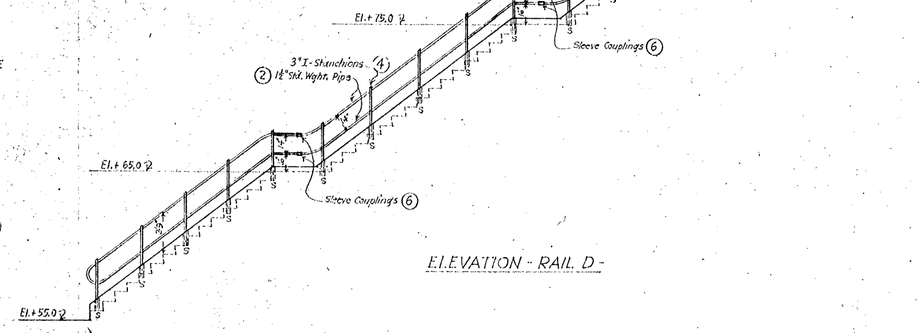
Scale in Feet



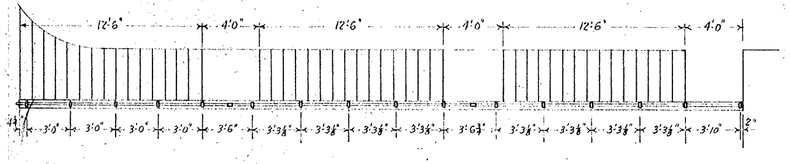
PLAN - RAIL E -



ELEVATION - RAIL E -



ELEVATION - RAIL D -



PLAN - RAIL D -

BILL OF MATERIAL

MARK	DESCRIPTION	MARK / UNIT	(1) lin.ft.	(2) lin.ft.	(3) ea.	(4) ea.	(5) ea.	(6) ea.	(7) ea.	(8) ea.	S ea.
(1)	2" Standard weight steel pipe, 2.375" O.D.	RAIL A	14		2				4		2
(2)	1½" " " " 1.9" O.D.	" B		86		11		4		4	11
(3)	4" - 7.7 lb I- Beam Stanchion, as detailed	" C	105		7		3		4		7
(4)	3" - 6.5 lb I- " " "	" D		130		16		6		4	16
(5)	Sleeve Coupling for 2" Std. wght. steel pipe, as detailed	" E	151		10				16		10
(6)	" " " 1½" " " " " "	" F	73		5				12		5
(7)	2" Std. Pipe Cap	" G	67		4				4		4
(8)	1½" " " "										
S	2½" Standard weight steel pipe sleeve, 2.5" I.D., 12" long	TOTALS	410	216	28	27	3	10	40	8	55

REFERENCES: For concrete details see drawings N-1-11 and N-1-16.
For Details see Sht. 2 of N-1-79.

NOTES: Verify all dimensions in field before manufacturing railings.

NO.	REVISION	DATE	BY	APV'D

BONNEVILLE POWER NAVIGATION PROJECT

POWER HOUSE, SUBSTRUCTURE & NAVIGATION LOCK
SHIP LOCK

HAND RAILING DETAILS

SOUTH-WEST END OF LOCK

SCALES AS SHOWN

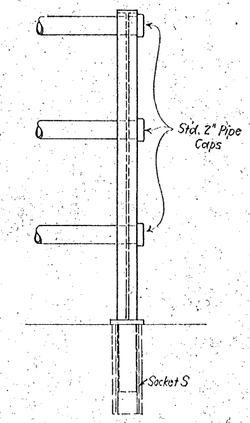
U. S. ENGINEER OFFICE, SECOND PORTLAND DISTRICT (OREGON)

SUBMITTED: [signature] ENGINEER

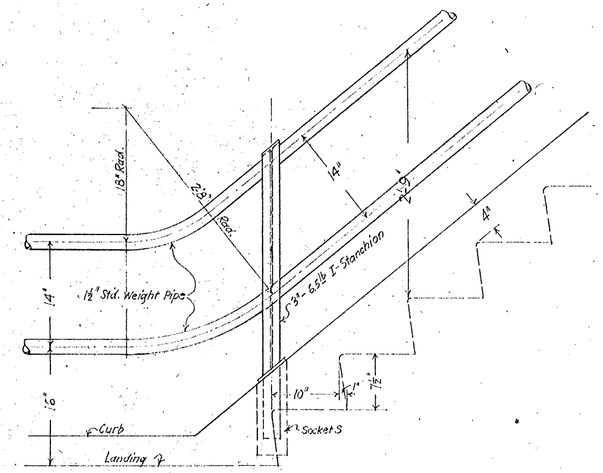
APPROVED: [signature] LT. COL. CORPS OF ENGINEERS

RECOMMENDED: [signature] PRINCIPAL ENGINEER

DESIGNED BY R.L.M. DATE 1/24/36
DR. BY J.W.H. IN BY. CHECKED BY C.H.R.

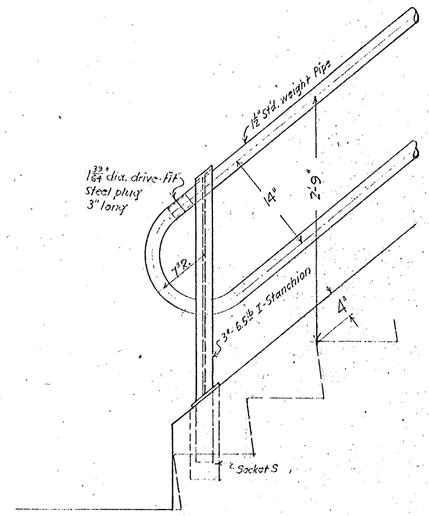


TYPICAL TERMINAL

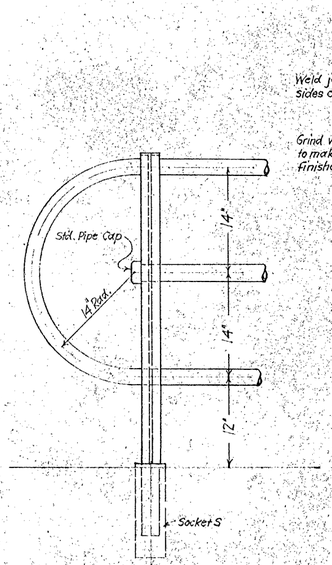


Note: Curves in front of landings shall have same radius except reversed.

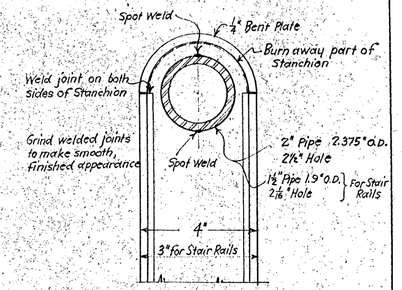
STAIR RAIL AT LANDINGS



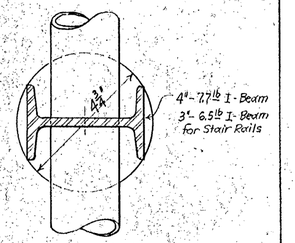
TERMINAL AT BOTTOM OF STAIR RAILS



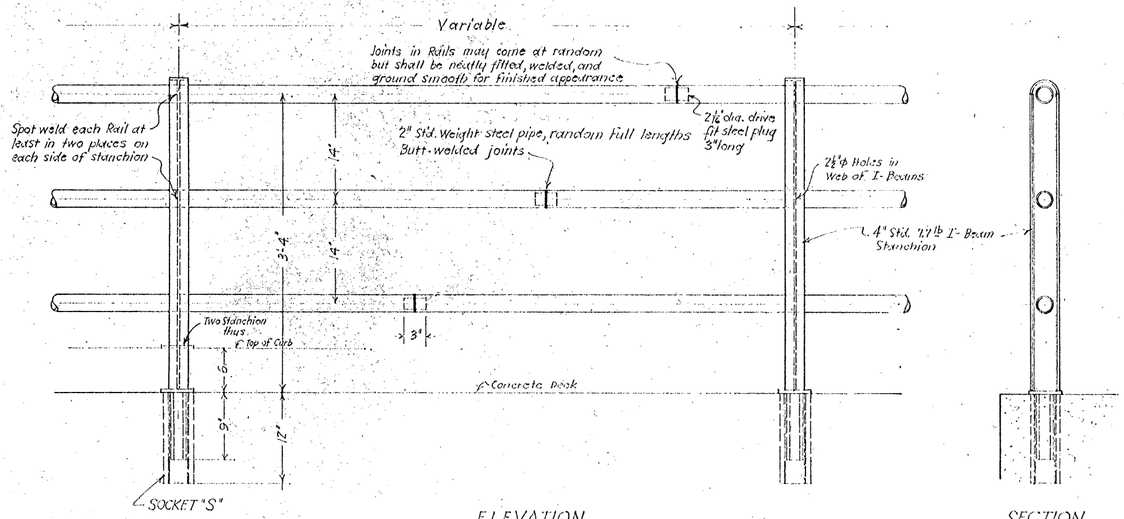
TERMINAL FOR RAILS A, C, E, G, H, K, L²



TOP



PLAN



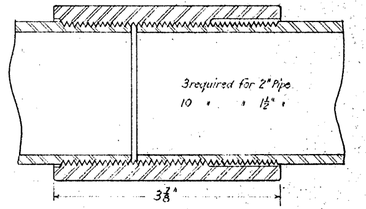
ELEVATION

SECTION

PLAN

TYPICAL DETAILS

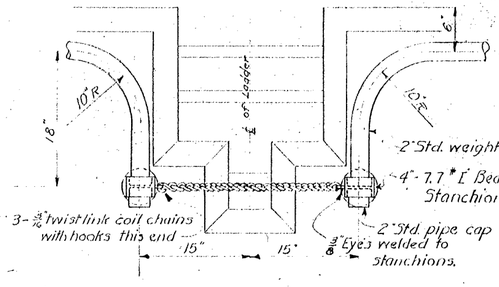
Scale in Feet



SLEEVE COUPLING

For Rails B, C & D

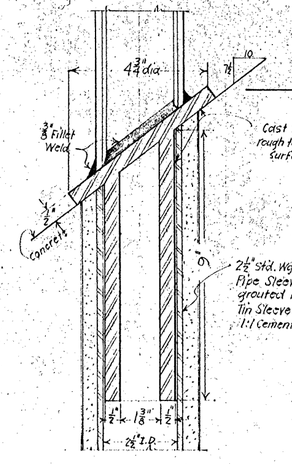
Scale in Inches



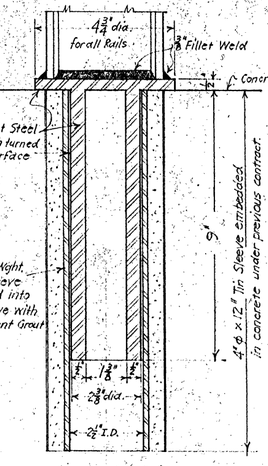
PLAN

LADDER OPENING

RAILING I



SOCKET "S" FOR STAIR RAILS



SOCKET "S"

STANCHION DETAIL

Scale in Inches

This detail applies to Stair Rails also. Note difference in size of pipe & stanchions

NO.	REVISION	DATE	BY	APV'D

BONNEVILLE POWER NAVIGATION PROJECT

POWER HOUSE, SUBSTRUCTURE, & NAVIGATION LOCK
SHIP LOCK

HAND RAILING DETAILS

SCALES AS SHOWN

U. S. ENGINEER OFFICE, SECOND PORTLAND DISTRICT (OREGON)

SUBMITTED: ASSOCIATE ENGINEER

APPROVED: LT. COL. CORPS OF ENGINEERS

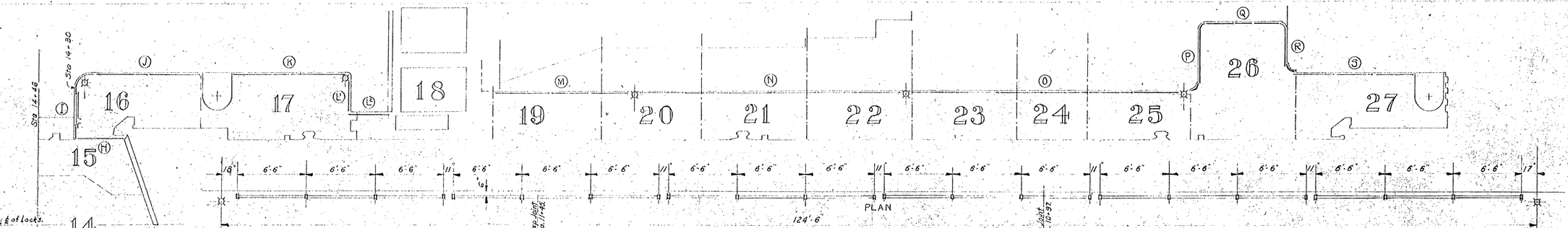
RECOMMENDED: PRINCIPAL ENGINEER

DESIGNED BY R.L.M. DATE 1/24/36

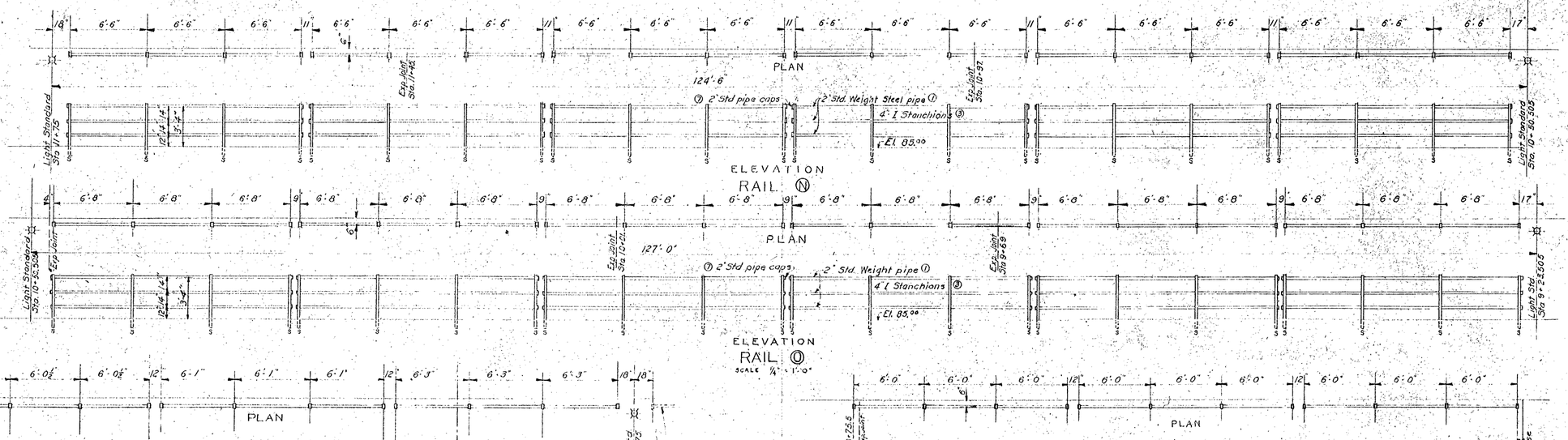
DR. BY JWH TR. BY JWH CHECKED BY C.M.R.

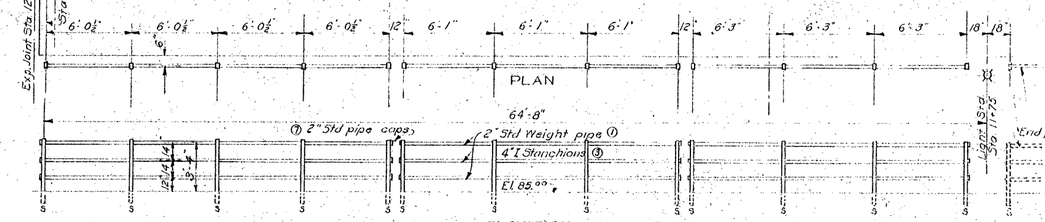
WAR DEPARTMENT

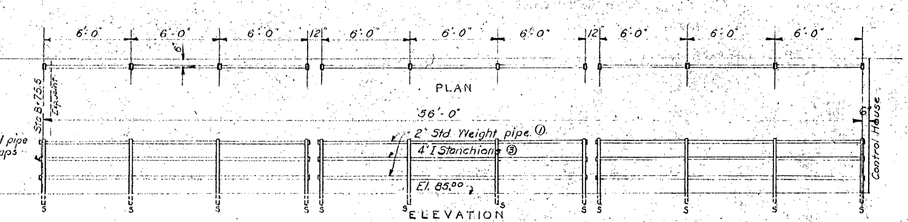
CORPS OF ENGINEERS U. S. ARMY

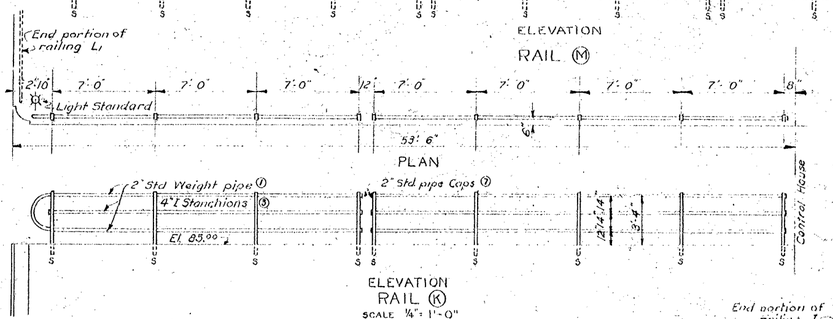


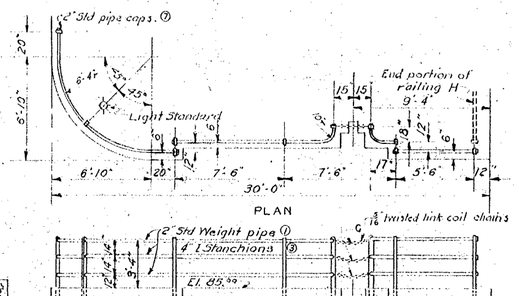
LOCATION PLAN
Not to Scale

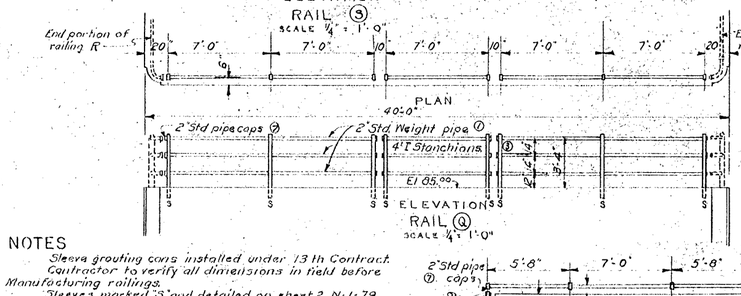


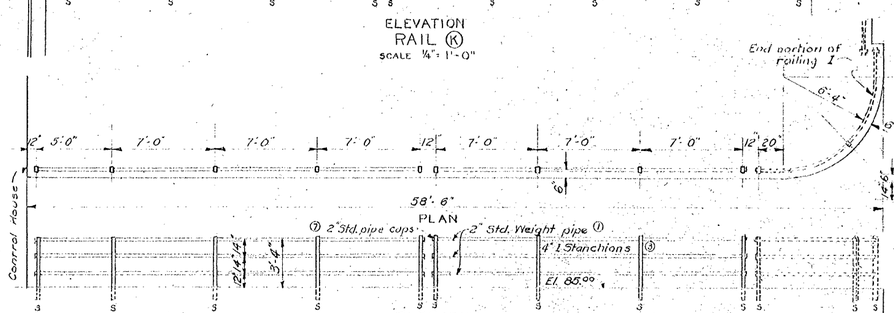


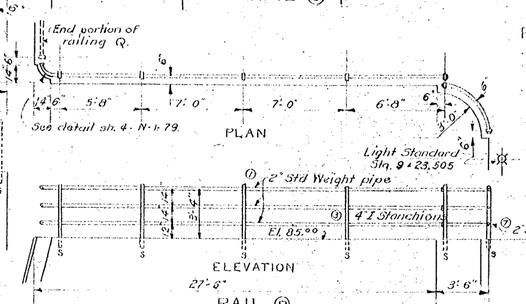


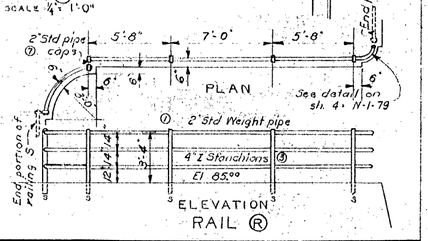












NOTES

Sleeve grouting cons installed under 13 th Contract. Contractor to verify all dimensions in field before Manufacturing railings.
Sleeves marked "S" and detailed on sheet 2 N-1-79 to be furnished and installed under this Contract.

REFERENCES

Masonry Details North Wall N-1-11
Hand Railing Details Southwest End ... sh 1. N-1-79
Hand Railing Details, Miscellaneous .. sh 2. N-1-79
Hand Railing Details, Bill of Material for North Wall ..... sh 4. N-1-79

SCALE IN FEET

NO.	REVISION	DATE	BY	APV'D

BONNEVILLE POWER NAVIGATION PROJECT

HAND RAILING DETAILS
NORTH WALL OF LOCKS

SCALES AS SHOWN

U. S. ENGINEER OFFICE, SECOND PORTLAND DISTRICT (OREGON)

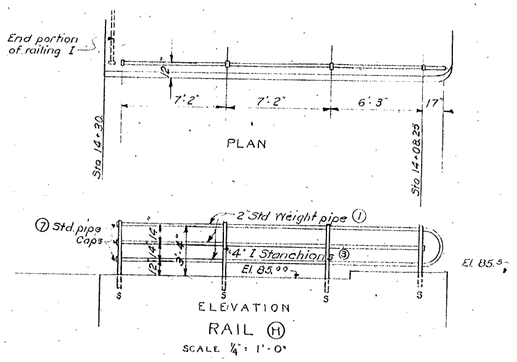
SUBMITTED: ASSOC. ENGINEER — APPROVED: LT. COL., CORPS OF ENGINEERS

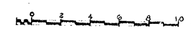
RECOMMENDED: PRINCIPAL ENGINEER — DESIGNED BY R.L.D. DATE 1/24/36 — DR. BY C.W.K. TR. BY ... CHECKED BY JWH.

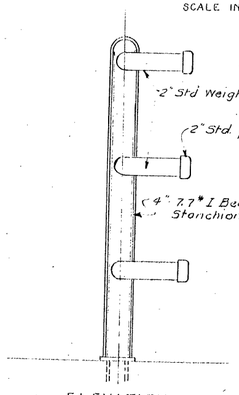
SHEET 3 N-1-79

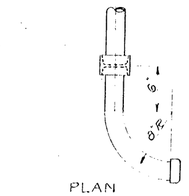
WAR DEPARTMENT

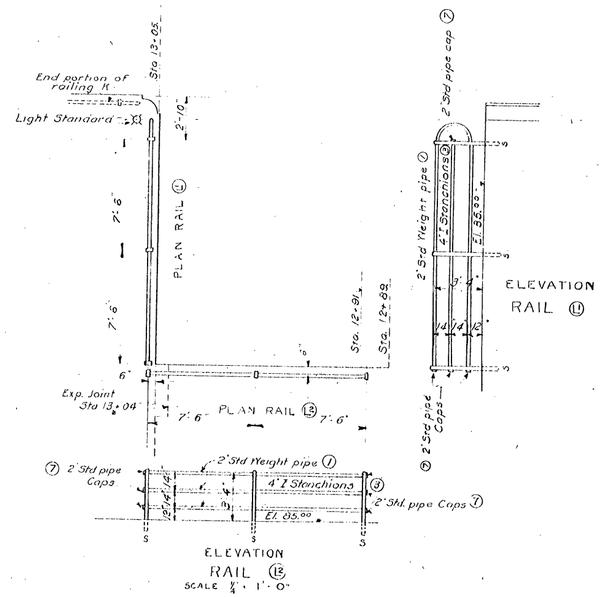
CORPS OF ENGINEERS U.S. ARMY











BILL OF MATERIAL. - North Wall - El 85.00 only.

MARK	DESCRIPTION
①	2" std weight steel pipe 2.375" O.D.
②	1½" std weight steel pipe 1.9" O.D.
③	4" 7.7# I Beam Stanchion, as detailed.
④	3" 6.9# I Beam Stanchion, as detailed.
⑤	Sleeve Coupling for 2" std weight steel pipe as detailed.
⑥	Sleeve Coupling for 1½" std weight steel pipe as detailed.
⑦	2" std pipe cap
⑧	1½" std pipe cap.
S	2½" std weight steel pipe sleeve 2'5" I.D. 12" long.
C	⅝" twist link coil chain 2'-5" with hooks.

MARK	①	②	③	④	⑤	⑥	⑦	⑧	S	C
UNIT	lin.ft.	lin.ft.	ea.	ea.	ea.	ea.	ea.	ea.	ea.	ea.
RAIL H	67		4				4		4	
" I	108		10				24		10	3
" J	144		9				12		9	
" K	155		9				10		9	
" L' 2	98		6				10		6	
" M	168		13				18		13	
" N	360		24				36		24	
" O	369		24				36		24	
" P	102		7				12		7	
" Q	110		8				18		8	
" R	77		6				12		6	
" S	167		12				18		12	
TOTAL	1945		132				210		132	3

NOTES:

Sleeve grouting cans installed under 13th Contract. Contractor to verify all dimensions in field before Manufacturing railings.

Sleeves marked 'S' and detailed on sheet 2. N-1-79 to be furnished and installed under this Contract.

REFERENCES:

Masonry Details - North Wall	N-1-11, N-1-16.
Hand Railing Details - Southwest End	sh 1. N-1-79.
Hand Railing Details - Miscellaneous	sh 2. N-1-79.
Hand Railing Details - North Wall	sh 3. N-1-79.

NO.	REVISION	DATE	BY	APV'D

BONNEVILLE POWER NAVIGATION PROJECT

HAND RAILING DETAILS
NORTH WALL OF LOCKS

SCALES AS SHOWN.

U.S. ENGINEER OFFICE SECOND PORTLAND DISTRICT OREGON

SUBMITTED: [signature] ASST. ENGINEER

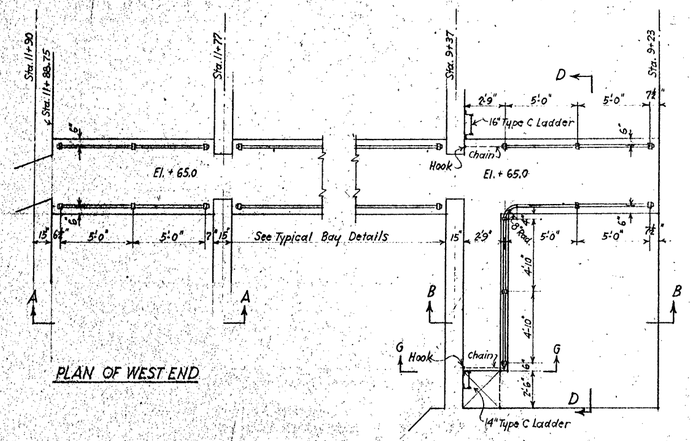
APPROVED: [signature] LT. COL. CORPS OF ENGINEERS

RECOMMENDED: [signature] PRINCIPAL ENGINEER

DESIGNED BY R.S.A. DATE 7/14/36

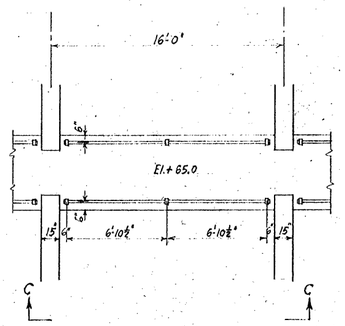
DRAWN BY [illegible] CHECKED BY [illegible]

SHEET 4 N-1-79



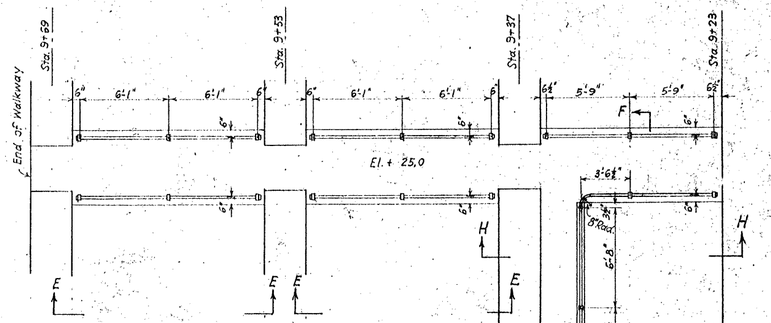
PLAN OF WEST END

PLAN OF EAST END



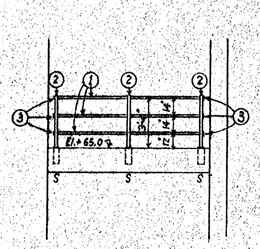
PLAN OF TYPICAL BAY BETWEEN STA. 11+77 AND 9+37

15 Bays thus

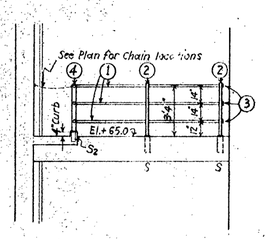


PLAN

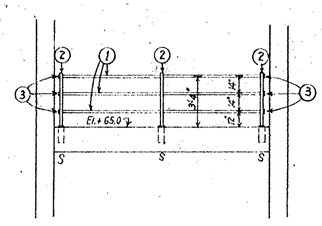
RAILING FOR WALKWAY AT El. + 65° IN MONOLITHS 20 TO 25 INCL.



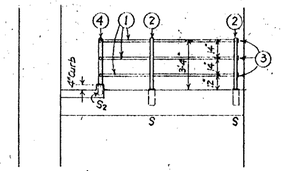
ELEVATION A-A



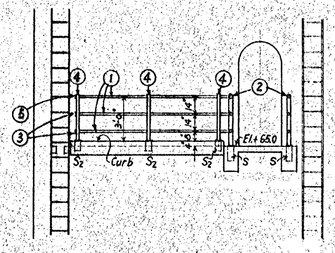
ELEVATION B-B



ELEVATION C-C



ELEVATION H-H



ELEVATION D-D

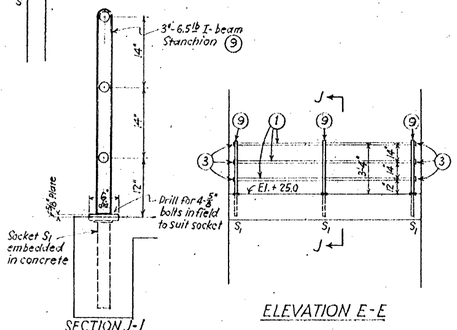
0 2 4 6 8 10

SCALE IN FEET FOR PLANS & ELEVATIONS EXCEPT AS NOTED

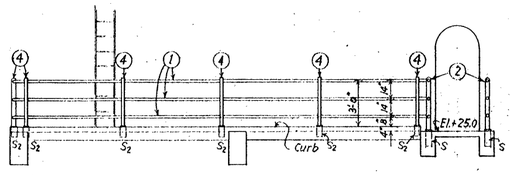
BILL OF MATERIAL

MARK	QUANTITY	UNIT	DESCRIPTION
①	1800	lin ft.	1½" Std. weight black Steel Pipe, 1.9" O.D. with threads & couplings
*②	106	ea.	3'-6.5 lb steel I-beam Stanchions with cast steel footing, 4'-3¼" long overall
③	240	"	1½" black Standard Pipe Caps
*④	9	"	3'-6.5 lb steel I-beam Stanchions with cast Steel footing, 3'-5⅛" long, overall
⑤	2	"	1½" Std. black pipe cups with ⅜" galv. shouldered Eye screwed & welded to 1½" pipe cap
⑥	2	"	⅝" galv. Twist-Link Coil Chain 2'-10" long overall, with hook to Fit a ⅜" Eye at one end and connected with Eye on item marked 5 at other end.
⑦	2	"	⅜" Diamond NY, or equal, Expansion Shield to fit a ⅜" Eye bolt
⑧	2	"	⅜" galv. Eye-bolt, shouldered
*⑨	12	"	3'-6.5 lb Steel I-beam Stanchions with ⅝" x 6" dia. steel plate footing, as detailed, 3'-6¼" long overall. Steel plate footing to be drilled in field by U.S. Govt.
S	106	"	2½" Std. weight steel pipe Sleeve, 2.5" I.D. 12" long
S_2	9	"	2½" " " " " 2.5" " 8" "

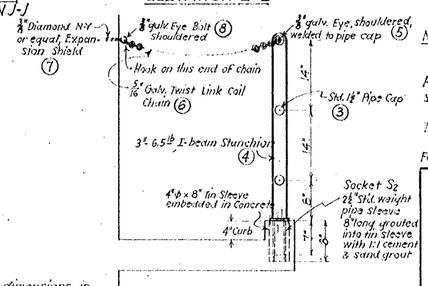
* Items marked with asterisk are detailed on Drawing N-3-71A



ELEVATION E-E



ELEVATION F-F



SECTION G-G

0 1 2

SCALE IN FEET

NOTE: Verify all dimensions in field before manufacturing railing. Tin sleeve grouting cans installed under a previous contract.

NOTES & REFERENCES:

Pipe shall be 1½" standard weight pipe and all stanchions shall be 3'-6.5 lb I-beam stanchions. Pipe lengths shall be made up with standard pipe couplings.

The stanchions required for these railings are detailed on drawing N-3-71A.

For Concrete Details see Drawings N-1-34.

NO.	REVISION	DATE	BY	APV'D

BONNEVILLE PROJECT

SHIP LOCK

HAND RAILING DETAILS

FOR WALKWAYS AT El. + 25 & + 65 IN MONOLITHS 20 TO 25 INCL.

SCALES AS SHOWN

U. S. ENGINEER OFFICE, SECOND PORTLAND DISTRICT, OREGON

SUBMITTED: ASSOCIATE ENGINEER

APPROVED: DIVISION ENGINEER

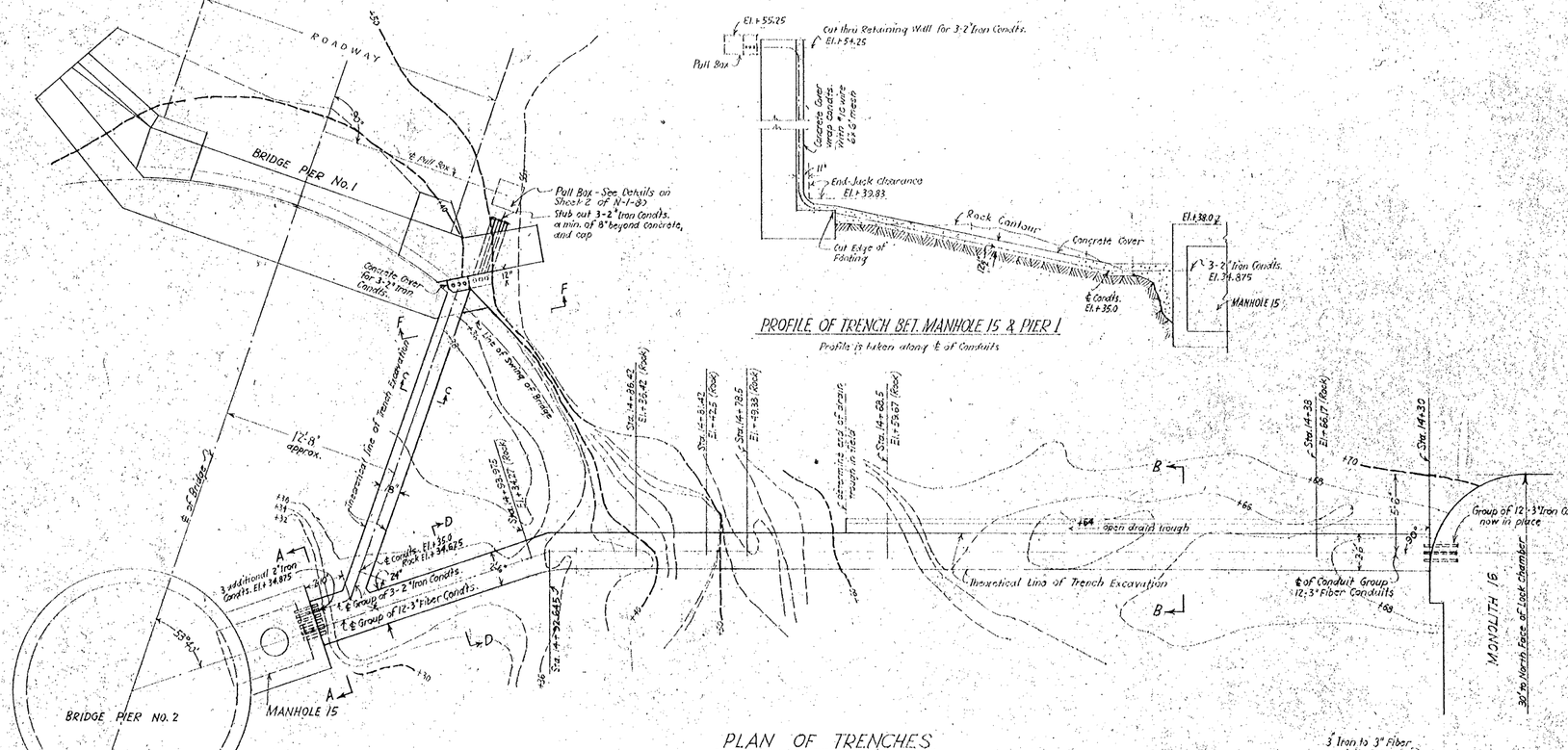
RECOMMENDED: PRINCIPAL ENGINEER

DESIGNED BY R.L.M. DATE 3-29-34

DR. BY JWH CH. BY ..... CHECKED BY G.L.F.

WAR DEPARTMENT

CORPS OF ENGINEERS, U. S. ARMY



PROFILE OF TRENCH BET. MANHOLE 15 & PIER 1

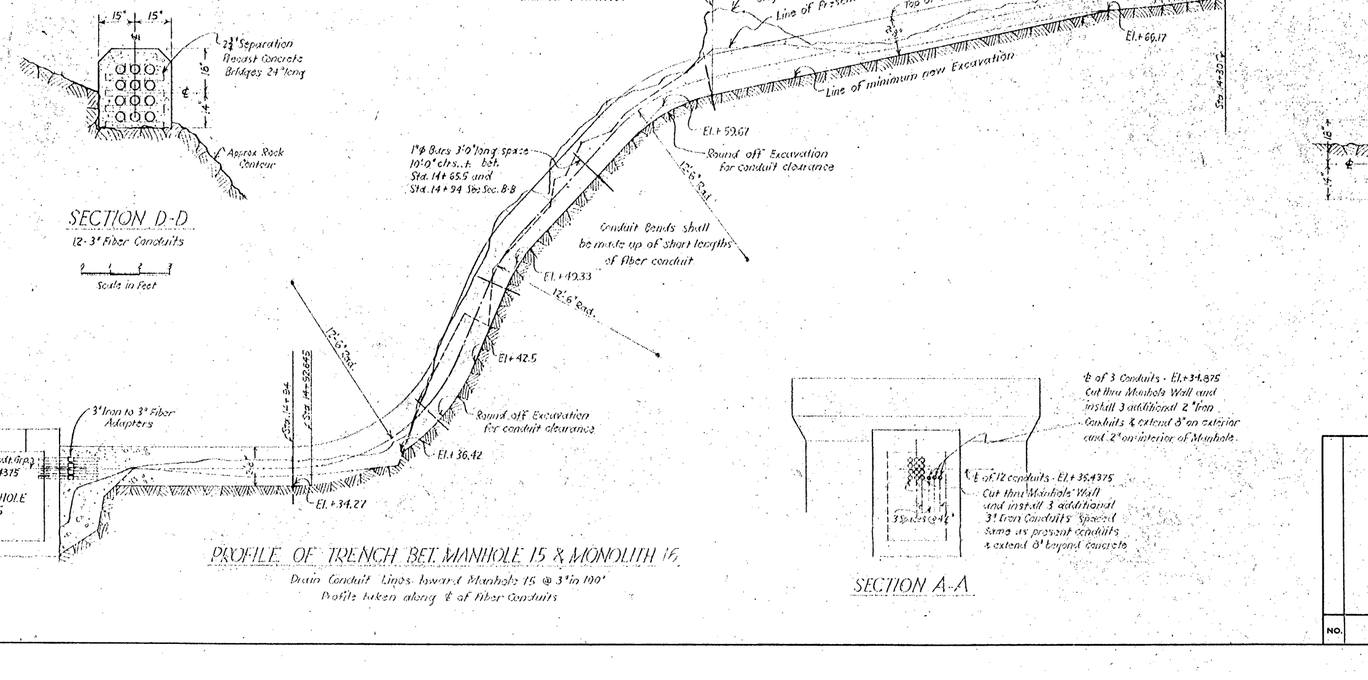
Profile is taken along ℄ of Conduits

SECTION F-F

PLAN OF TRENCHES

SCALE IN FEET

This Scale applies except where marked otherwise.



PROFILE OF TRENCH BET MANHOLE 15 & MONOLITH 16

Drain Conduit Lines Inward Manhole 15 @ 3"in 100'

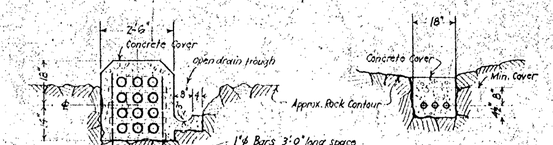
Profile taken along ℄ of Fiber Conduits

SECTION D-D

12-3" Fiber Conduits

Scale in Feet

SECTION A-A



SECTION B-B

12-3" Fiber Conduits Concrete (precast) Bridges 24" long for 2½" Separation, spaced 3'-0" ctrs. full length of Fiber conduit runs.

SECTION C-C

3-2" Iron Conduits

Scale in Feet

References: For Pull Box Details see Sheet 2 of N-1-80.

NO.	REVISION	DATE	BY	APV'D

BONNEVILLE POWER NAVIGATION PROJECT

(13 TH) CONT. W 698 ENG 607.

POWER HOUSE SUBSTRUCTURE & NAVIGATION LOCK

SHIP LOCK

CONDUIT SYSTEM

BETWEEN SHIP LOCK & BRIDGE

SCALES AS SHOWN

U. S. ENGINEER OFFICE, SECOND PORTLAND DISTRICT (OREGON)

SUBMITTED: ASSOCIATE ENGINEER

APPROVED: LT. COL. CORPS OF ENGINEERS

RECOMMENDED: PRINCIPAL ENGINEER

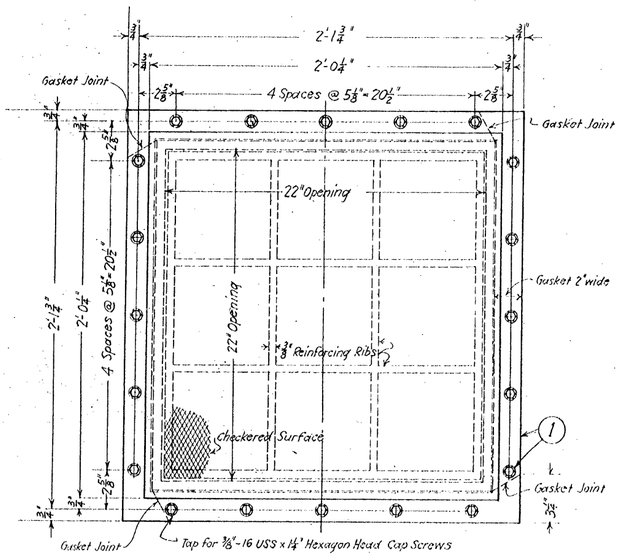
DESIGNED BY J.W.H. DATE 1-25-'36

DR. BY J.W.H. TR. BY J.W.H. CHECKED BY O.L.C. APP. O.L.C.

SHEET 1 OF N-1-80

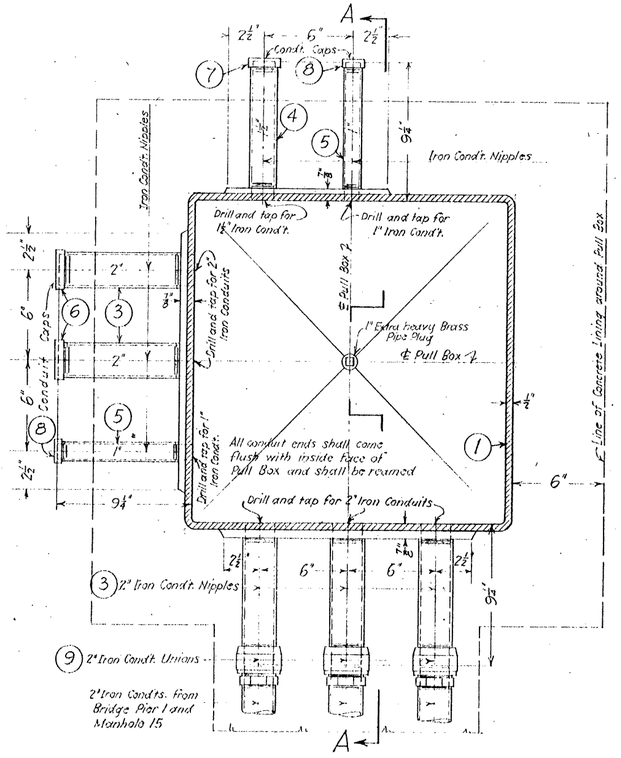
WAR DEPARTMENT

CORPS OF ENGINEERS, U. S. ARMY

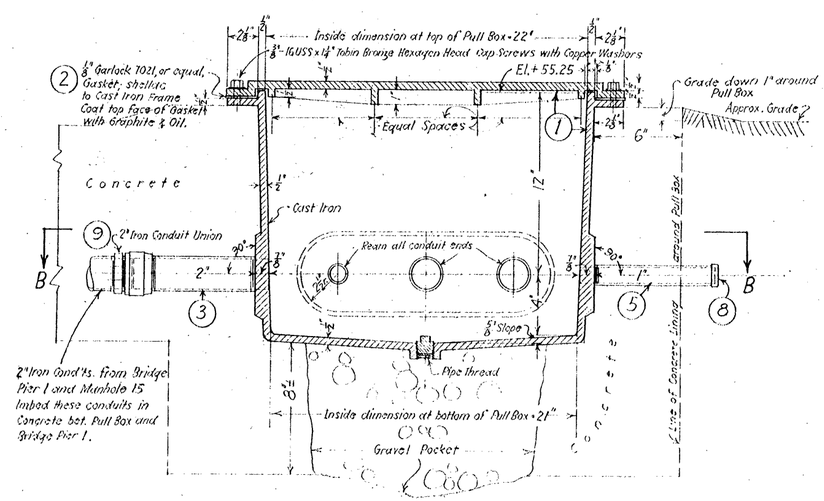


PLAN OF COVER

Cast Iron

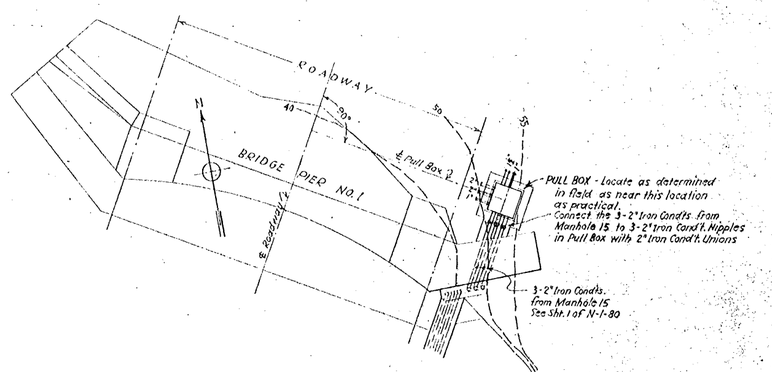


PLAN AT B-B



SECTION A-A

Scale in Inches



LOCATION PLAN

Scale in Feet

BILL OF MATERIAL

MARK	QUANTITY	UNIT	DESCRIPTION
(1)	1	ea.	Cast Iron Pull Box complete with Cast Iron Cover, 20-⅜"-16 USS x 1¼" Hexagon Head Cap Screws, 20 Soft copper washers for ⅜" cap Screws, and 1-1" Extra-heavy Brass Pipe Plug, as detailed less conduit-nipples, caps, and unions.
2	as required		Garlock 7021, or equal, 1/8" thick, Hot Oil Asbestos Sheet-Packing, cut to detail.
3	5	ea.	2" Iron Conduit Nipples 9¾" long, threaded both ends
4	1	"	1½" " " " " " " "
5	2	"	1" " " " " " " "
6	2	"	2" " " Caps
7	1	"	1½" " " "
8	2	"	1" " " "
(9)	3	"	2" " " Unions, equal to Steel City Electric Co's #330

NOTE: Mark Numbers in Circles in Bill of Material designate items which shall be furnished by Purchase Order. All other items will be furnished by Resident Engineer.

NO.	REVISION	DATE	BY	APV'D

BONNEVILLE POWER NAVIGATION PROJECT

ELECTRICAL DETAILS

PULL BOX AT SWING BRIDGE PIER NO.1.

SCALES AS SHOWN

U. S. ENGINEER OFFICE, SECOND PORTLAND DISTRICT (OREGON)

SUBMITTED: ASSOCIATE ENGINEER — APPROVED: LT. COL. CORPS OF ENGINEERS

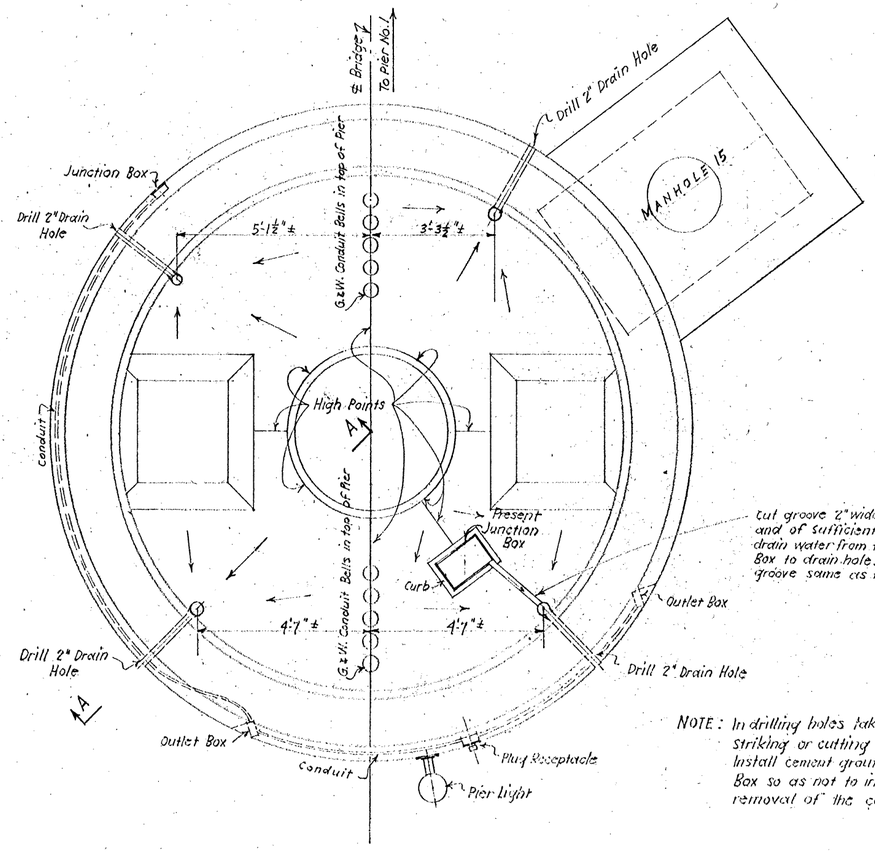
RECOMMENDED: PRINCIPAL ENGINEER

DESIGNED BY J.W.H. DATE 1-31-1936

DR. BY J.W.H. TR. BY — CHECKED BY A.P.D. A.G.C.

SHEET 2 OF

N-1-80

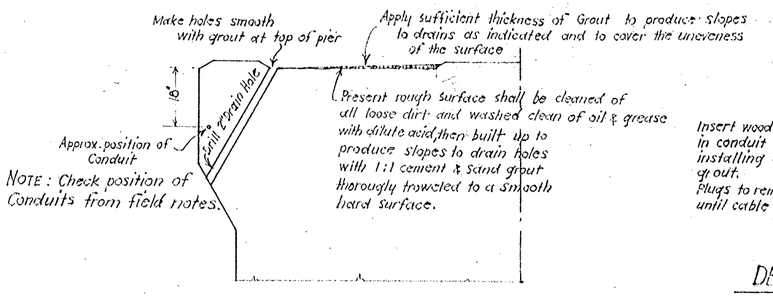


cut groove 2" wide (approx.) and of sufficient depth to drain water from top of Junction Box to drain hole. Finish drain groove same as top of pier

NOTE: In drilling holes take care to prevent striking or cutting conduits. Install cement grout around Junction Box so as not to interfere with the removal of the cover.

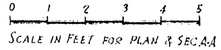
PLAN OF TOP OF SWING BRIDGE PIER NO. 2

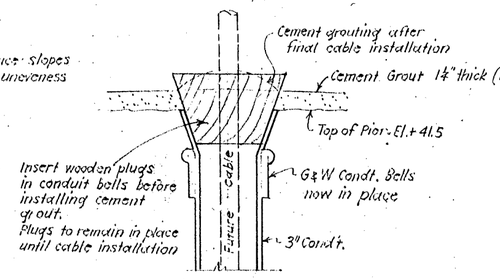
Arrows indicate Slope toward drain holes.



NOTE: Check position of Conduits from field notes.

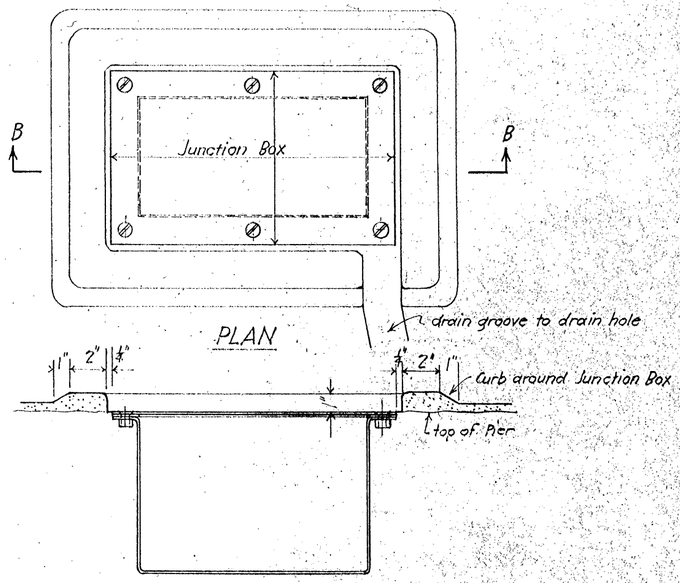
SECTION A-A





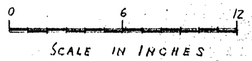
DETAIL AT G & W CONDUIT BELLS

No Scale



SECTION B-B

DETAIL OF CURB AROUND JUNCTION BOX



NO.	REVISION	DATE	BY	APP'D

BONNEVILLE POWER NAVIGATION PROJECT

BRIDGE ACROSS NAVIGATION CANAL

DRAINS FOR PIER 2

SCALES AS SHOWN

U. S. ENGINEER OFFICE, SECOND PORTLAND DISTRICT (OREGON)

SUBMITTED: ASSOCIATE ENGINEER

RECOMMENDED: PRINCIPAL ENGINEER

APPROVED: LT. COL. CORPS OF ENGINEERS

DESIGNED BY JWH. DATE 2-14-36

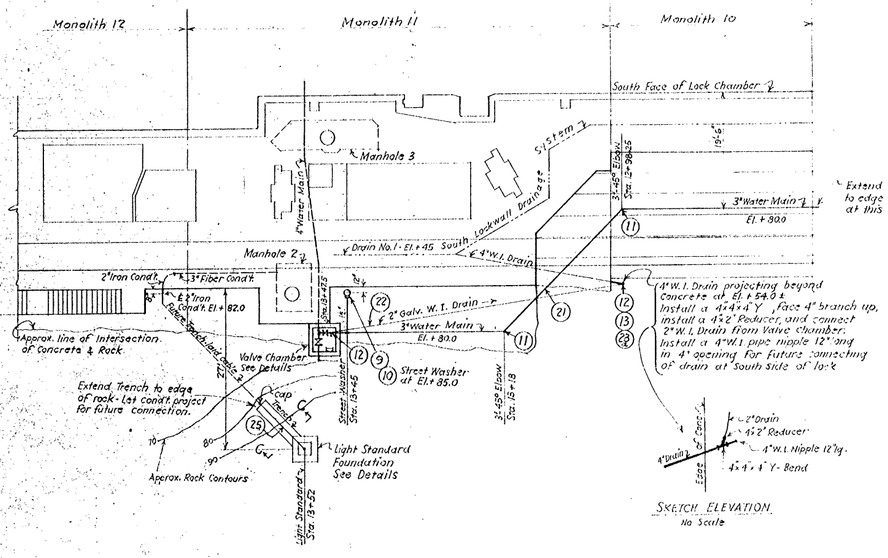
DR. BY JWH. TR. BY ..... CHECKED BY C.J.F.

APP'D

N-1-82

WAR DEPARTMENT

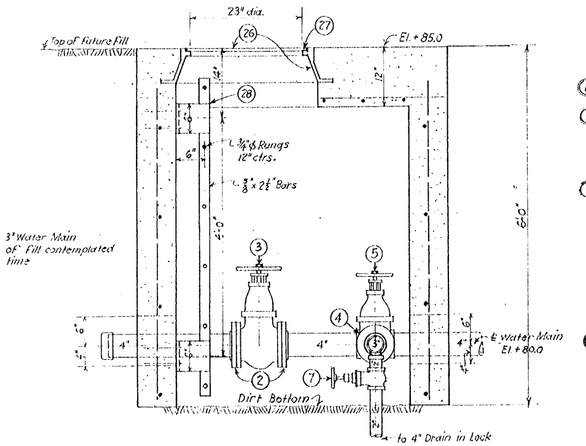
CORPS OF ENGINEERS, U. S. ARMY



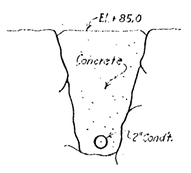
SKETCH ELEVATION
No Scale

LOCATION PLAN OF WATER MAIN VALVE CHAMBER, WATER MAINS & LIGHT STANDARD ADJACENT TO SOUTH SIDE OF SHIP LOCK

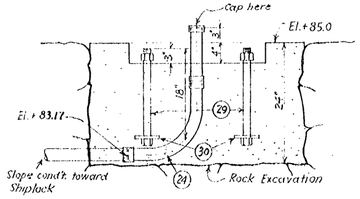
0 10 20 30
SCALE IN FEET



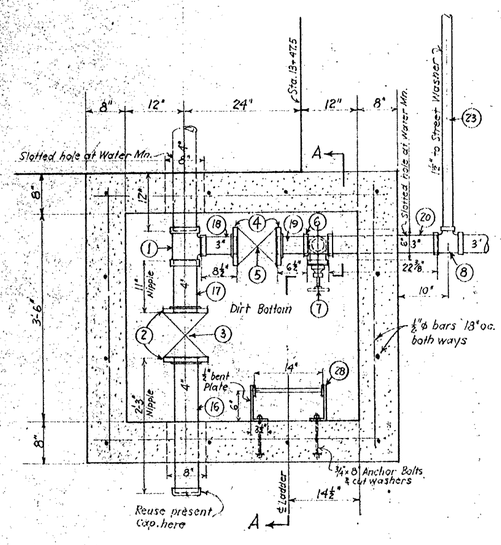
SECTION A-A



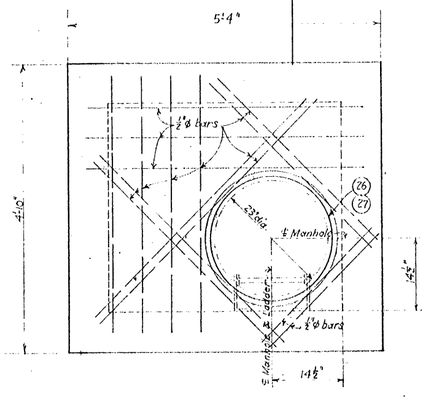
SECTION C-C



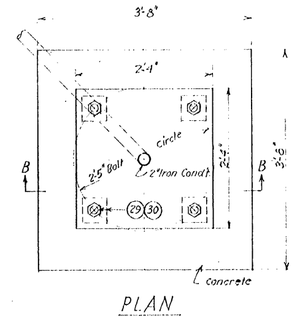
SECTION B-B



PLAN



PLAN OF TOP



PLAN

LIGHT STANDARD FOUNDATION
For Light Standard at Sta. 13+52

0 1 2 3 4
Scale in Feet for Details

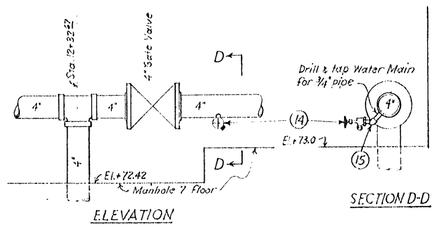
VALVE CHAMBER DETAILS

BILL OF MATERIAL

MARK	QUANTITY	UNIT	DESCRIPTION
			PIPE & FITTINGS
(1)	1	ea.	4"x4"x3" Std. galv. malleable iron beaded Tee-fitting
(2)	2	"	4" galv. malleable iron Std. Companion Flanges with Std. drilling and bolts
(3)	1	"	4" Std. Flanged Wedge Gate Valve similar to Crane Co's. # 461, tapped for Std. drilling
(4)	2	"	3" galv. malleable iron std. companion Flanges with std. drilling and bolts
(5)	1	"	3" Std. Flanged Wedge Gate Valve Similar to Crane Co's. # 461, tapped for Std. drilling
(6)	1	"	3"x3"x2" Std. galv. malleable iron. beaded Tee-fitting
(1) 7	1	"	2" Brass Wedge Gate Valve Similar to Crane Co's # 449½
(1) 8	1	"	3"x3"x1½" Std. galv. malleable iron beaded Tee-fitting
9	1	"	1½" Std. galv. malleable iron beaded 90° Ell fitting
(10)	1	"	Street Washer equal to John C. Ruppert Co's. of St. Louis, Mo. Eclipse # 42 with 1½" Supply and nozzle with brass nipple and 1" hose connection.
(1) 11	2	"	3" Std. galv. malleable iron beaded 45° Ell-fittings
12	2	"	2" " " " " " 90° " "
(13)	1	"	4"x4"x4" Std. galv. malleable iron beaded Y-bend Fitting
14	1	"	¾" Brass Hose Valve Similar to Crane Co's. # 58
15	1	"	¾" Std. galv. malleable iron beaded 45° Ell-Fitting
(16)	1	"	4" Galv. wrought iron pipe nipple 2'-3" long
(17)	1	"	4" " " " " " 11" "
(18)	1	"	3" " " " " " 8½" "
(19)	1	"	3" " " " " " 6½" "
(20)	1	"	3" " " " " " 22⅜" "
(1) 21	100	lin.ft.	3" " " " "
22	85	"	2" " " " "
23	25	"	1½" " " " "
23a	1	ea.	4"x2" Std. galv. malleable iron beaded Reducer fitting
			ELECTRICAL MATERIAL
24	1	ea.	2"- 90° Iron conduit Elbow
25	15	lin.Ft.	2" Iron Conduit with 2-2" Condt. Caps
			MISCELLANEOUS
(26)	1	ea.	23" dia. opening Cast Iron Manhole cover & Frame
(27)	1	"	40" x 40" Sheet of Garlock # 7021, or equal, ⅛" thick Hot Asbestos Sheet Packing; cut gasket to fit cover Frame, see detail on Sheet 11 of N-2-401.
(28)	1	"	14" Type C Ladder, as detailed complete with Bolts
(29)	4	"	1½"x 18" Anchor Bolts complete with nuts
(30)	4	"	5"x 5"x ¾" Steel Plate Washers
			REINFORCING STEEL
			8-½"ø bars 5'-0" long - horizontals in Valve Chbr. Walls
			8-½"ø " 4'-6" " " " " "
			12-½"ø " 5'-6" " verticals " " "
31			5-½"ø " 5'-0" " Top Slab of Valve Chamber
			6-½"ø " 4'-6" " " " " "
			2-½"ø " 4'-0" " " " " "
			2-½"ø " 2'-6" " " " " "

All pipe shall conform to A.S.T.M. Specifications # A-72-33

NOTE: Mark Numbers in circles in Bill of Material designate items which shall be Furnished by Purchase Order. All other items will be Furnished by Resident Engineer.



ELEVATION

SECTION D-D

DRAIN VALVE FOR WATER MAIN IN MANHOLE 7

(1) This symbol indicates Revision Number.

NO.	REVISION	DATE	BY	APV'D
1	Omitted items marked 7, 8, 11 & 21 from Purchase Order	3-27-36	JVH	

BONNEVILLE PROJECT

SHIP LOCK

CONDUIT & PIPING CONNECTIONS SOUTH OF MONOLITH 11

SCALES AS SHOWN

U S ENGINEER OFFICE, SECOND PORTLAND DISTRICT, OREGON

SUBMITTED: ASSOCIATE ENGINEER

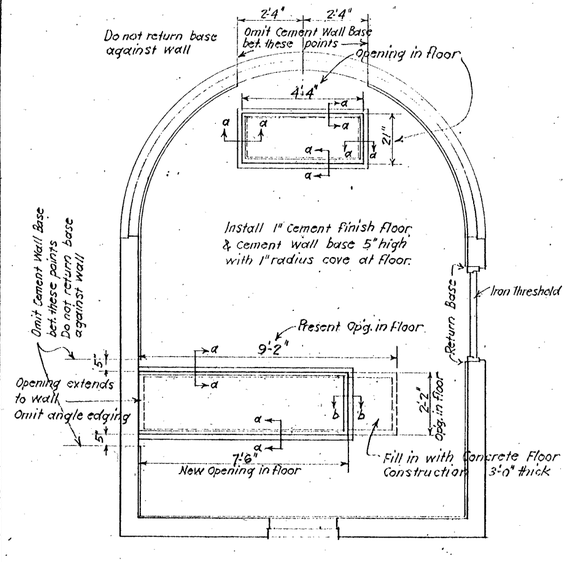
RECOMMENDED: PRINCIPAL ENGINEER

APPROVED: LT. COL. CORPS OF ENGINEERS

ORIGINAL BY JVH DATE 3-26-36

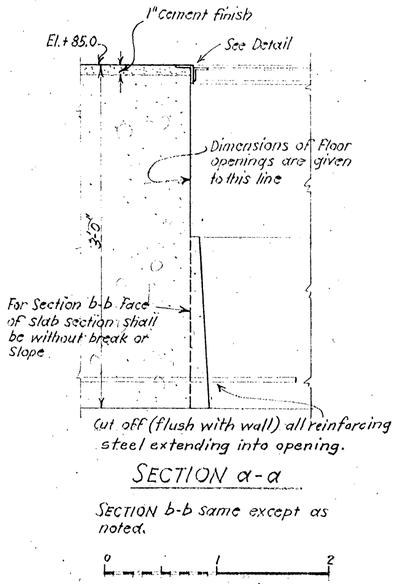
CH. BY JVH CHECKED BY C.J.F.

N-1-83



PLAN OF CONTROL HOUSE 1
(Monolith 17)

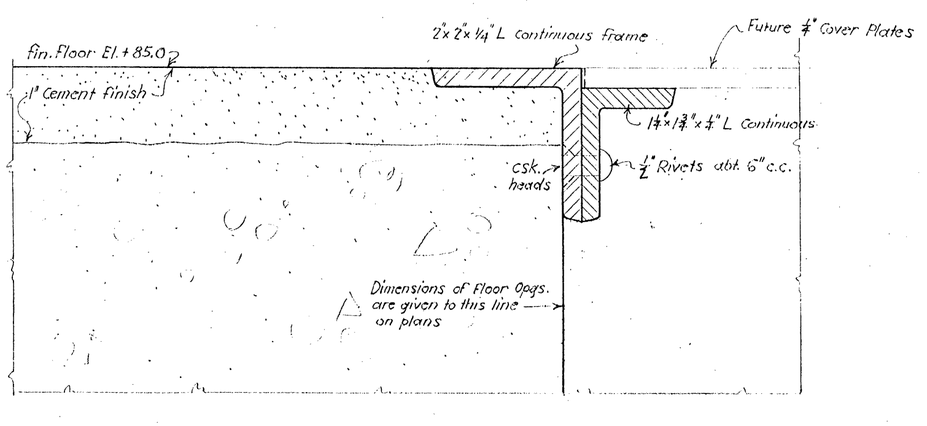
0 1 2 3 4 5
Scale in Feet



SECTION a-a

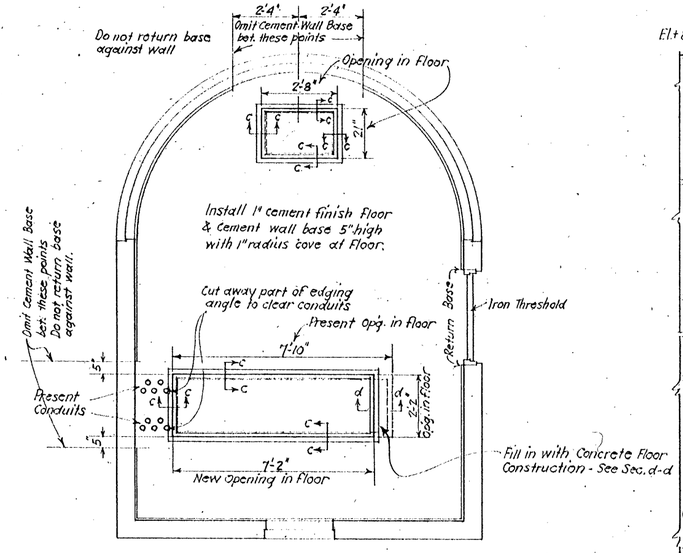
SECTION b-b same except as noted.

0 1 2
Scale in feet for Sections a-a, b-b, c-c, d-d.

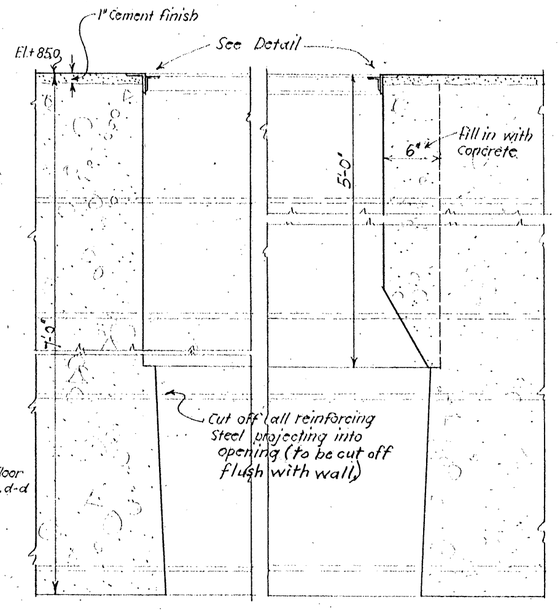


DETAIL OF EDGING AROUND FLOOR OPENINGS

0 1 2 3
Scale in Inches

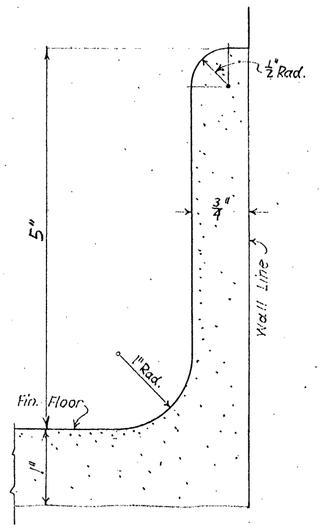


PLAN OF CONTROL HOUSE 2
(Monolith 27)



SECTION c-c

SECTION d-d



CEMENT WALL BASE SECTION

APPROVED FOR CONSTRUCTION H.C. Sherry
Major, Corps of Engineers

NO.	REVISION	DATE	BY	APV'D

BONNEVILLE PROJECT
(13 TH) CONT. W 698 eng. 607

SHIP LOCK
FLOOR DETAILS FOR CONTROL HOUSES

SCALE AS SHOWN

U. S. ENGINEER OFFICE, SECOND PORTLAND DISTRICT PORTLAND, OREGON

SUBMITTED ..... DESIGNER

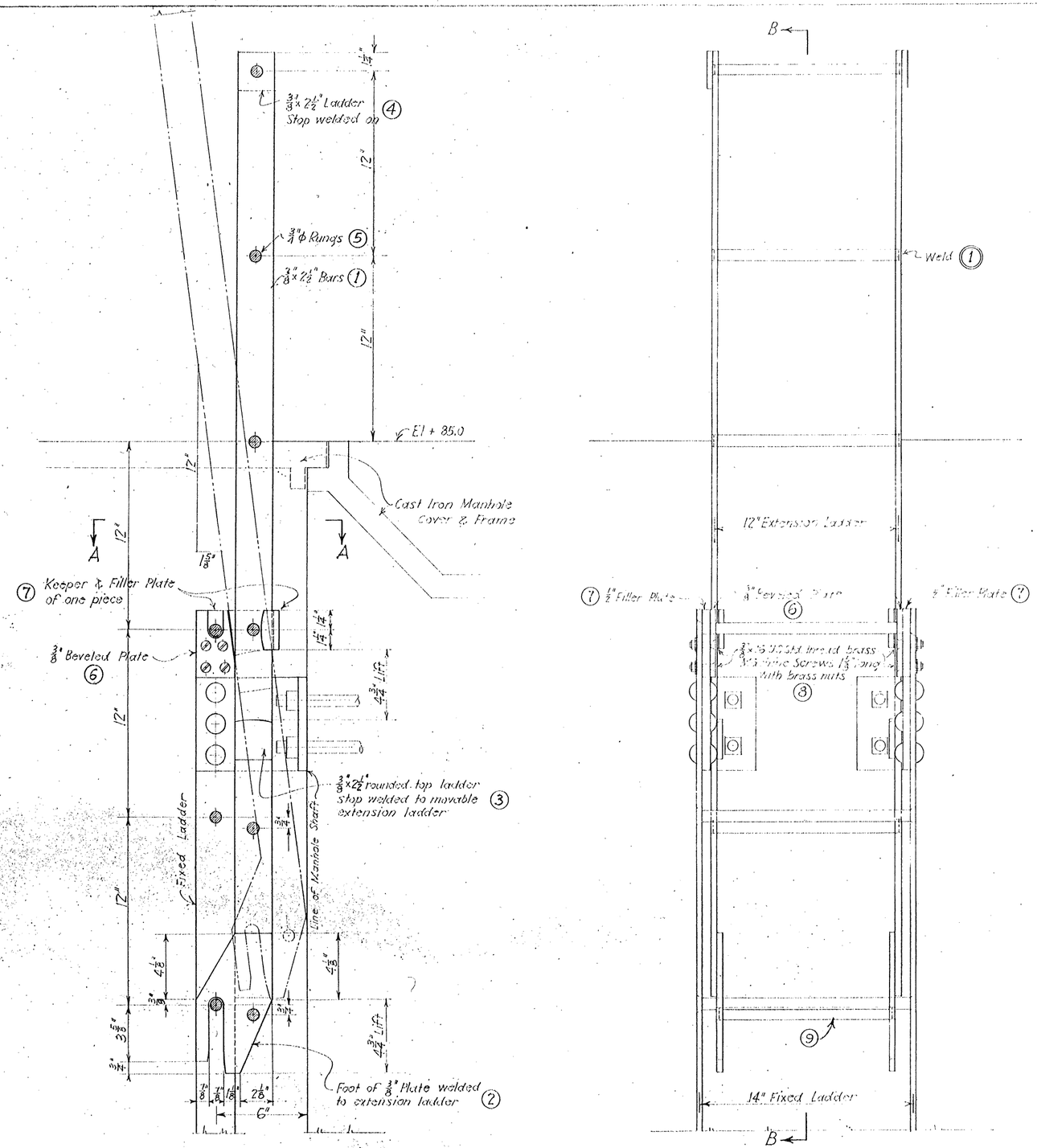
RECOMMENDED Ole Vennes PRINCIPAL ENGINEER

APPROVED: LT. COL. CORPS OF ENGINEERS

DES. (NPS) BY ..... DATE 5-23-36

DR. BY JWH TR. BY ..... CHECKED BY A.P.D.

N-1-84

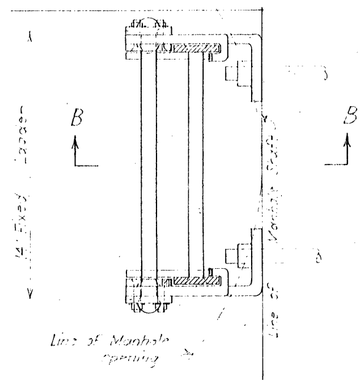


SECTION B-B

ELEVATION

0 6 12

Scale in Inches



PLAN AT A-A

BILL OF MATERIAL FOR ONE EXTENSION

Mark	Quantity	Unit	Description
(1)	2	ea.	3/8" x 2½" Structl. Steel Bars 5'-0" long punched to receive 3/4" ϕ rungs
(2)	2	"	5" x 8 7/8" x 3/8" " " Plates, as per detail
(3)	2	"	2½" x 3/8" x 2½" " " Ladder Steps with rounded top
(4)	2	"	2½" x 3/8" x 2½" " " Ladder Steps
(5)	5	"	3/4" ϕ Rungs " " 12" long Finished, weld ends.
(6)	2	"	3/8" x 2½" plates, " " beveled as per detail, 4½" long
(7)	2	"	4½" x 7" x 1/2" pl. " " Keeper & Filler Plates, as per detail
(8)	8	"	3/8" x 16 U.S.Std. thread brass machine screws 1¾" long, with brass nuts and brass washers. Machine screws shall be Flat headed.
(9)	1	"	3/4" ϕ Rung, Structl. Steel 12" long finished, weld ends.

18 EXTENSION LADDERS REQUIRED.

APPROVED FOR CONSTRUCTION H. A. Skerry
Major, Corps of Engineers

For Instruction details of 14" Type "C" Ladder see Sht. II of VII

NO.	REVISION	DATE	BY	APV'D
1	Bill of Material-Weld rungs	6-5-36	JWH.	A.A.S.

BONNEVILLE PROJECT

SHIP LOCK

EXTENSION FOR 14" TYPE "C" LADDER

SCALE AS SHOWN

U.S. ENGINEER OFFICE, SECOND PORTLAND DISTRICT, OREGON

SUBMITTED: [illegible] APPROVED: [illegible]

RECOMMENDED: [signature] DISTRICT ENGINEER

DESIGNED BY JWH. DRAWN BY JWH. TRACED BY [illegible] CHECKED BY APD

DATE 5-27-36

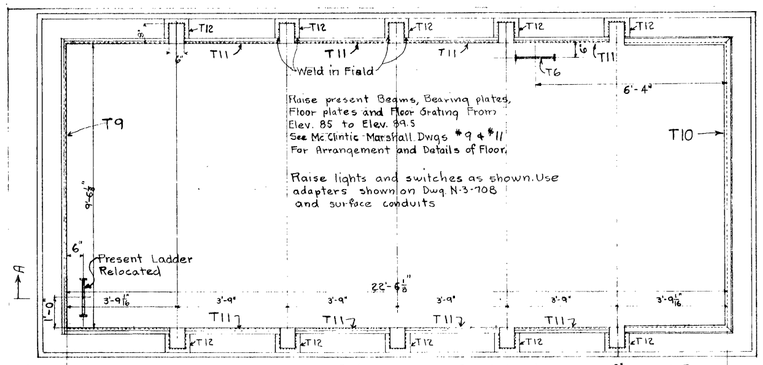
(1) This symbol indicates revision.

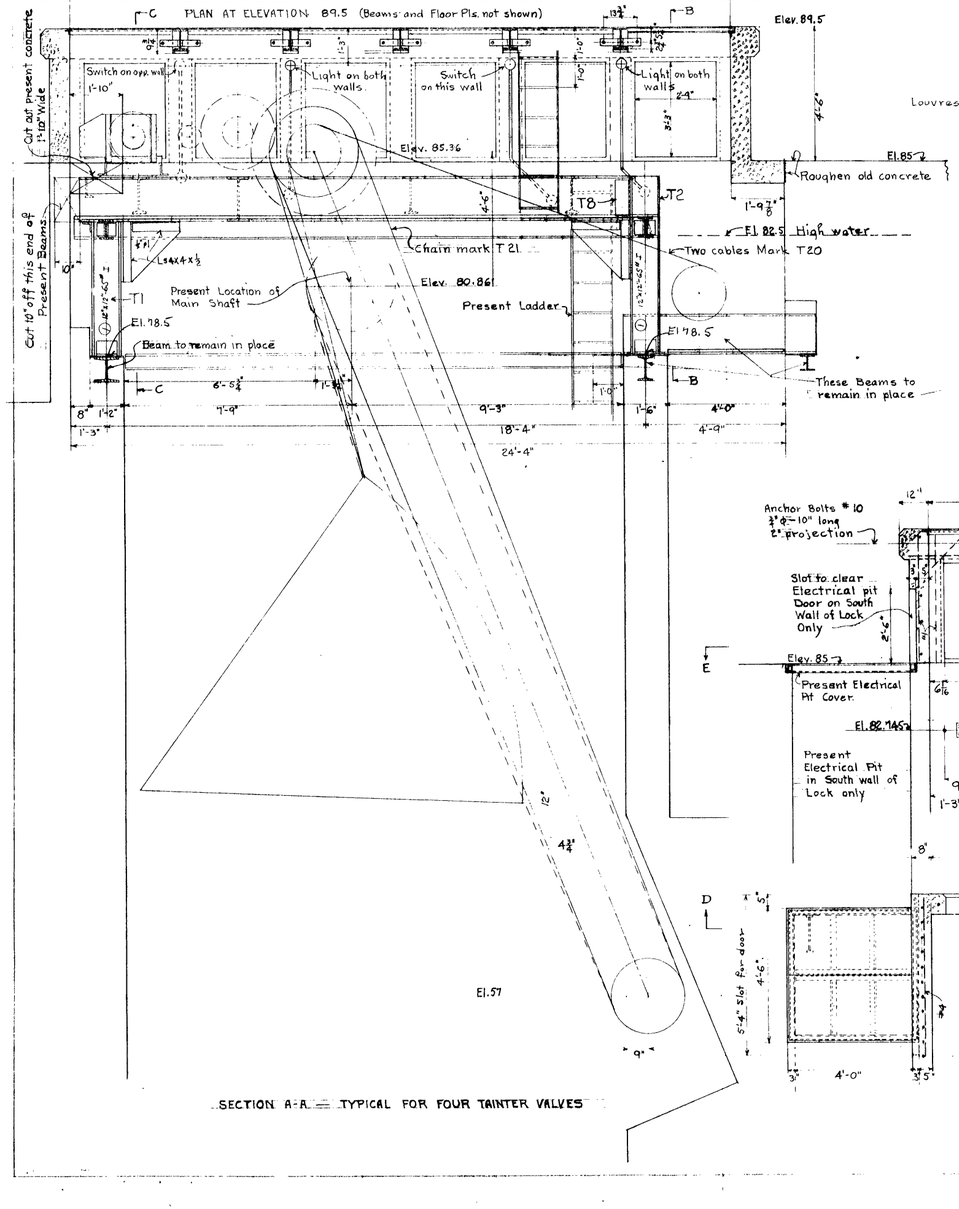
11-1-35

WAR DEPARTMENT

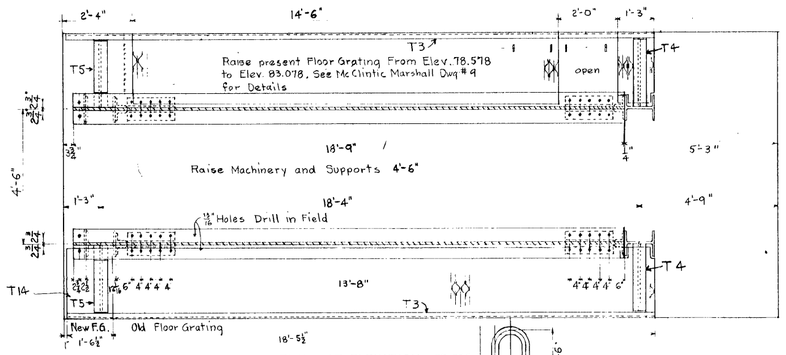
CORPS OF ENGINEERS U.S. ARMY

PLAN AT ELEVATION 89.5 (Beams and Floor Pls. not shown)

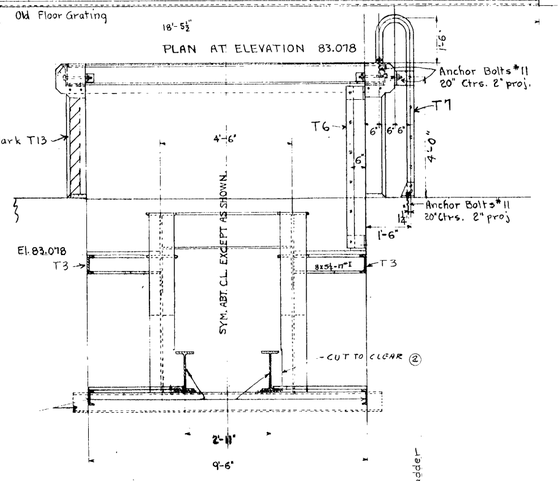




SECTION A-A — TYPICAL FOR FOUR TAINTER VALVES

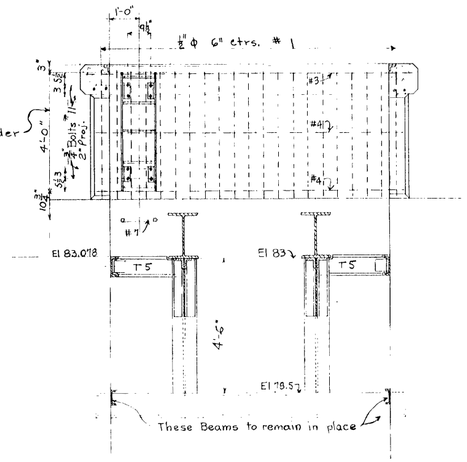


PLAN AT ELEVATION 83.078

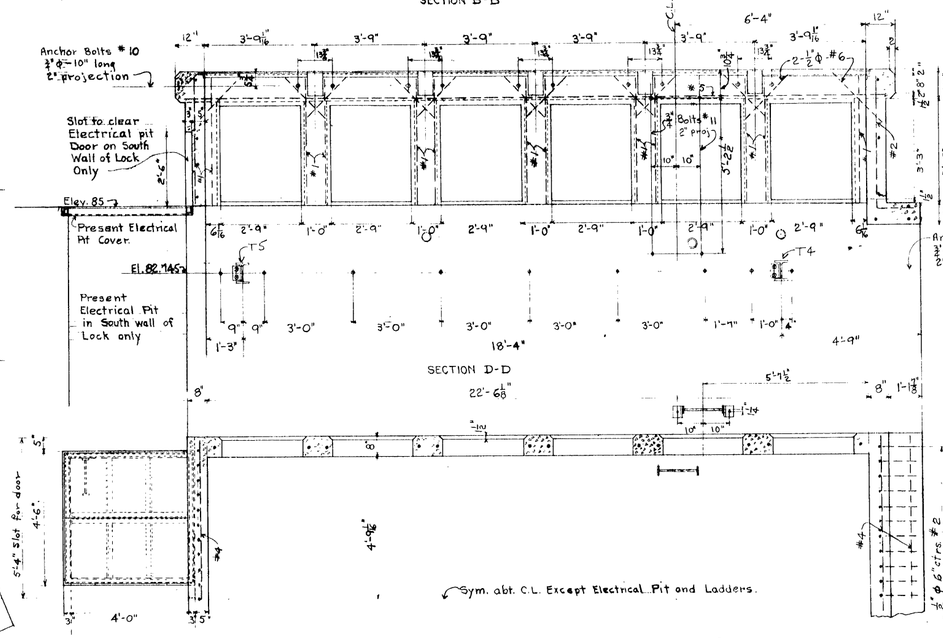


SECTION B-B

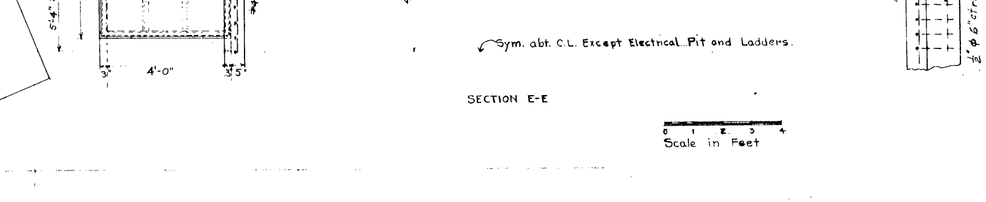
Move present 4'-0" Ladder to new position



SECTION C-C



SECTION D-D



Sym. abt. C.L. Except Electrical Pit and Ladders.

SECTION E-E

Scale in Feet

Bill of Reinforcing Steel and Anchor Bolts

Mark	No.	Size	Length	Location	Type
1	180	2" ϕ	4'-3"	Vertical in wall	Straight
2	84	2" ϕ	5'-9"	" " "	4'-5" | 1'-4"
3	8	2" ϕ	11'-0"	Horizontal in wall	Straight
4	28	2" ϕ	10'-4"	" " "	"
5	16	2" ϕ	24'-0"	" " "	"
6	192	1/2" ϕ	2'-0"	Diagonal " "	"
7	4	1" ϕ	3'-6"	Ladder	
8					
9					
10	152	3/4" ϕ	0'-10"	Anchor Bolts	
11	72	3/4" ϕ	0'-8"	" "	"

Quantities Listed above are for four Tainter Valves

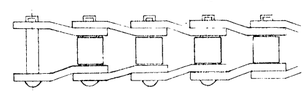
Ends of cable to be brommed and cleaned before placing in Socket for Zincing
Zinc per cable 5.3 #
Copper wire per cable .32 #
Use present Sockets

Approx. 40'-1" Check in Field

6' 2" — No. 14 Gage Copper Wire — 2' 6"

3/8" Dia Flexible Hoisting Rope 6 Strands of 37 Wires, with independent wire rope center, equal to Roebling Blue Center

Steel Wire Cable - Mark T20 - Make 8
Weight 1.2 lbs. per ft.



28 pitches @ 4.063 = 9-5 3/4"

Link-Belt SS-124 3-Bar Hyper Chain - Mark T21
Each Length 28 pitches Make 4 Lengths

Notes:-
Quantities are for four Tainter Valves

Reference Drawings:-
N-1-90 Sh. 2 Details of Steel
N-3-708 Electrical Details

No.	Revision	Date	By	Apv'd
3	Install at intake valves only	10-7-37	C.V.B.	
2	Note added	7-12-37	C.V.B.	
1	Title changed from Winches	7-1-37	C.V.B.	

BONNEVILLE PROJECT

CONTRACT NO. W1694 ENG-350 - SH 2 LOCK

TAINTER VALVES

MACHINERY PIT ALTERATIONS

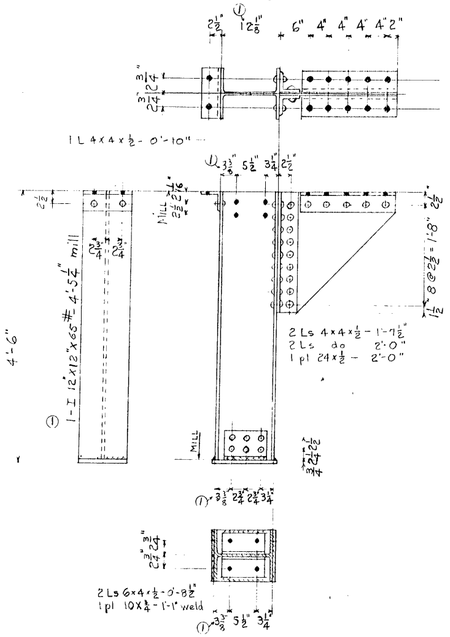
U. S. ENGINEER OFFICE, SECOND DISTRICT, PORTLAND, OREGON

Submitted: C. E. Galbraith, Senior Engineer — Approved: R. Williams, Lt. Col., Corps of Engineers

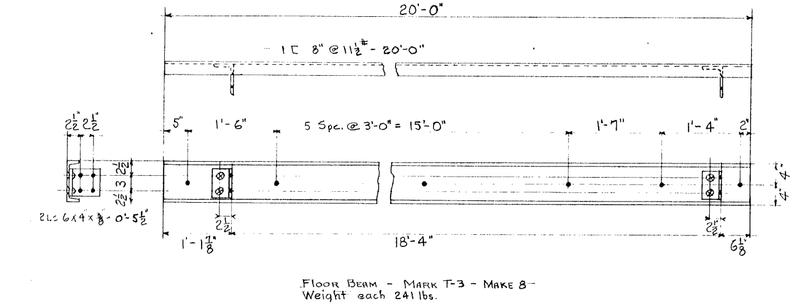
Recommended: [illegible], Principal Engineer — Designed by C.V.B., Date 9-3-37

Lin. by G.S.D. Tr'd by [illegible] Approved by C.V.B.

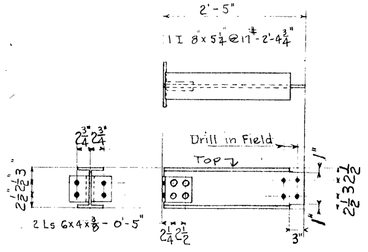
SHEET 1 N-1-90 18



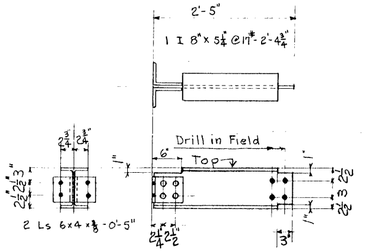
POST - MARK T-1 - MAKE 8
Weight each 325 lbs.



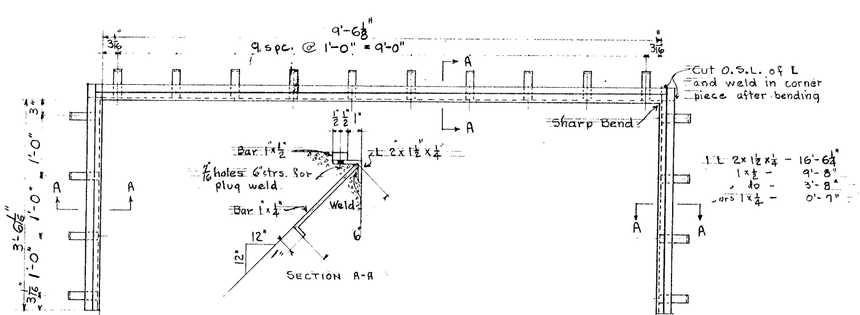
FLOOR BEAM - MARK T-3 - MAKE 8
Weight each 241 lbs.



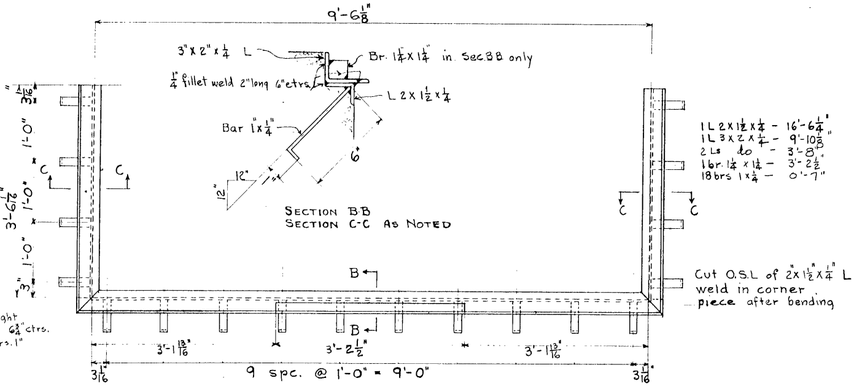
FLOOR BEAM - MARK T-4 - MAKE 8
Weight each 51 lbs.



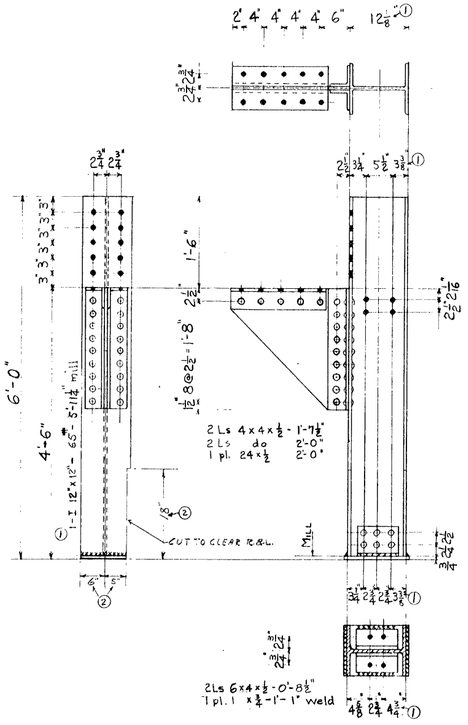
FLOOR BEAM - MARK T-5 - MAKE 8
Weight each 51 lbs.



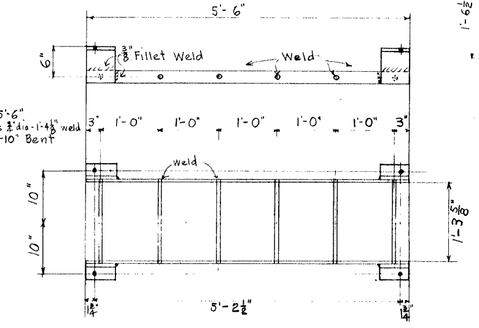
EDGE ANGLES - T-9 - MAKE 4
Weight each 84 lbs.



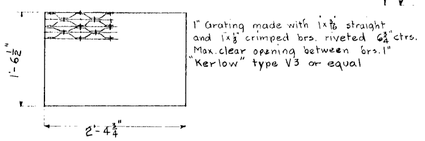
EDGE ANGLES - T-10 - MAKE 4
Weight each 142 lbs.



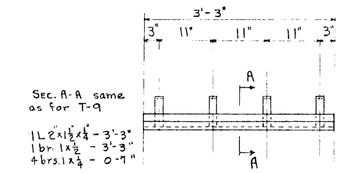
POST - MARK T-2 & T-2 L MAKE 4 ②
Weight each 611 lbs.
②



LADDER - MARK T-6 - MAKE 4
Weight each 81 lbs.

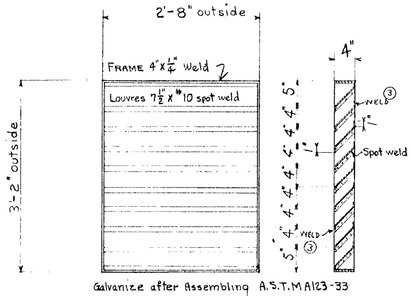


Floor Grating Mark T14
MAKE 4 Wt. each 37 lbs.



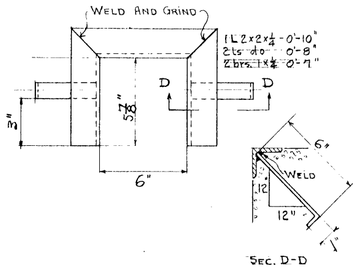
Sec. A-A same as for T-9
1 L 2"x1½"x¼" - 3'-3"
1 br. 1x⅜ - 3'-3"
4 brs. 1x¼ - 0'-7"

EDGE ANGLES - T-11 - MAKE 32
Weight each 16 lbs.



Galvanize after Assembling A.S.T.M A123-33

LOUVRES - MARK T-13 - MAKE 48
Weight each 127 lbs.



EDGE ANGLE-MARK T12 - MAKE 40
Weight each 8 lbs.

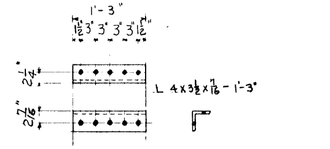
LIST OF FIELD RIVETS - FEDERAL SPECIFICATION Q-Q-S-751 - BUTTON HEAD

70 - ⅞" dia Rivets	2" long	
40 - do	2⅜" "	
90 - do	2½" "	Total weight of rivets 230 lbs
240 do	3" "	

GENERAL NOTES:
All Bars, Plates and Shapes to be Structural Carbon Steel Federal Specification. Q-Q-S-751
Steel on this drawing for four Tainter Valve Machinery Pits - Total weight of Steel 19,692 lbs.
" " " " Field Rivs. 230 "
Total 19922 lbs

Welding shall conform to the American Welding Society standards for electric arc welding Code of welding part 1
Rivets ⅞" unless noted
Open holes 1⅛" "
Shop paint 1 ct. red lead and linseed oil
Parts embedded in concrete not painted

REFERENCE DRAWINGS:-
N-1-90 SH. 1 Gen. Arrgt.



BEAM CONNECTION ANGLES - MARK T8 - MAKE 16
Weight each 13 lbs.

NO.	REVISION	DATE	BY	APV'D
(5)	T-15-L.I.P REMOVED-NOTES ADDED	C.W.B.	7-12-37	C.E.G.
(2)	DIMENSIONS & NOTES ADDED	C.W.B.	7-12-37	C.E.G.
(1)	"DIMENSIONS CHANGED	C.W.B.	7-12-37	C.E.G.
(1)	T1 & T2 I CHANGED FROM 12x10-53#	C.W.B.	7-12-37	C.E.G.

BONNEVILLE PROJECT

CONTRACT NO. W 694 ENG. 350 - SHIP LOCK

TAINTER VALVES

MACHINERY PIT ALTERATIONS

DETAILS

U. S. ENGINEER OFFICE, SECOND PORTLAND DISTRICT (OREGON)

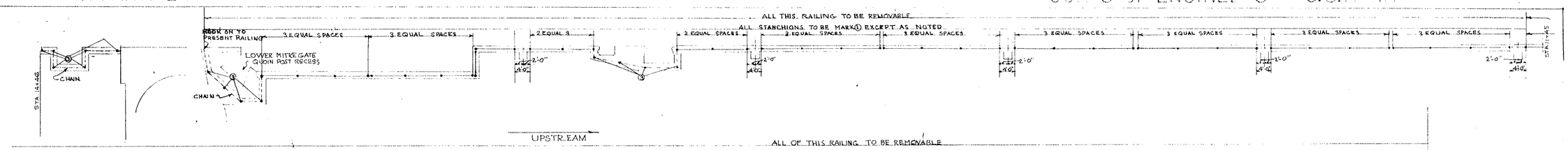
SUBMITTED: C.E. Galbraith, SENIOR ENGINEER — APPROVED: E. Williams, LT. COL. CORPS OF ENGINEERS

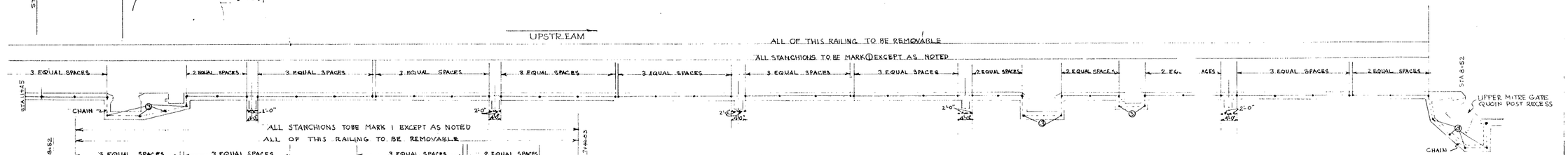
RECOMMENDED: Otto Koomen, PRINCIPAL ENGINEER — DESIGNED BY C.W.B. DATE 6-3-37

DR. BY GSD TR. BY ..... CHECKED BY C.W.B.

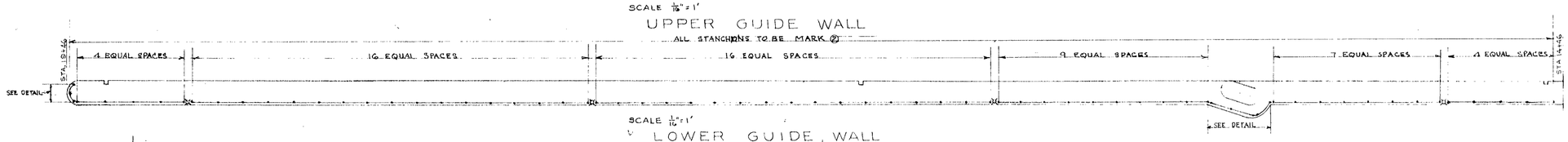
WAR DEPARTMENT

CORPS OF ENGINEERS U.S. ARMY

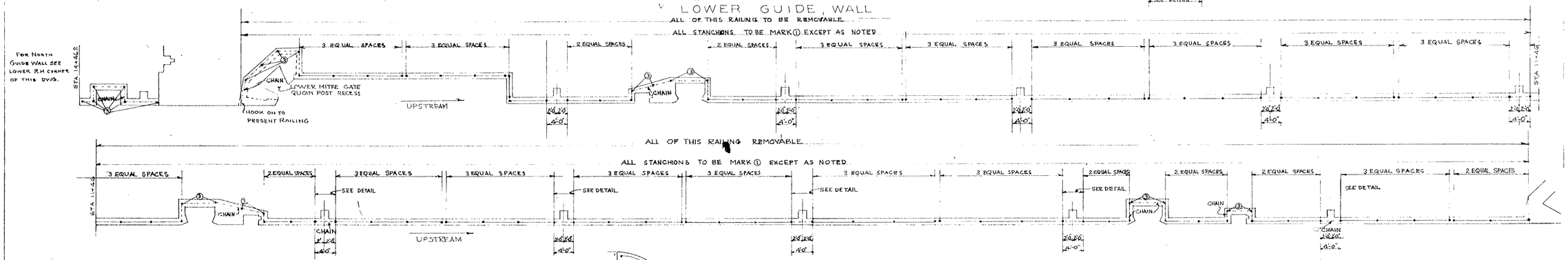


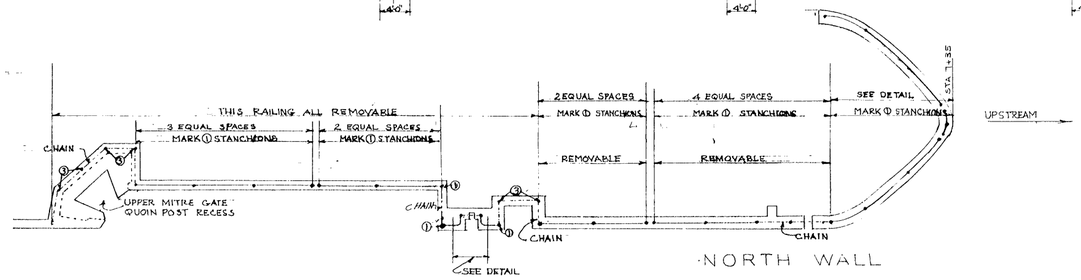


SCALE $\frac{1}{16}$"=1'

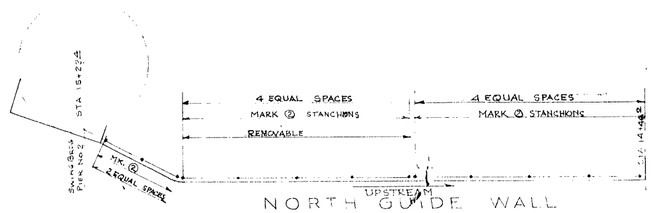


SCALE $\frac{1}{16}$"=1'





NORTH WALL



NORTH GUIDE WALL

SEE DRWG. N-1-92 FOR DETAILS & BILL OF MATERIALS

NO.	REVISION	DATE	BY	APVD

BONNEVILLE PROJECT

SHIP LOCK

RAILINGS

ADDITIONAL PLAN

SCALE: $\frac{1}{8}$" IN = 1 FT EXCEPT AS INDICATED

U S ENGINEER OFFICE BONNEVILLE DISTRICT (OREGON)

SUBMITTED C. C. Talbot DISTRICT ENGINEER — APPROVED Thomas M. Robinson MAJOR, CORPS OF ENGINEERS

RECOMMENDED SENIOR ENGINEER

DESIGNED BY APD DATE 1-28-38

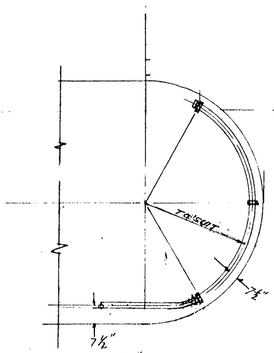
DR. BY APD CHECKED BY H.R.W.

N-1-91

20

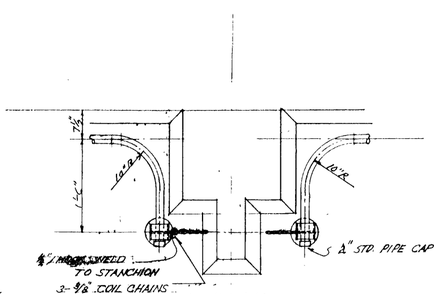
WAR DEPARTMENT

CORPS OF ENGINEERS U.S.ARMY



TYPICAL DETAIL AT END OF GUIDE WALLS

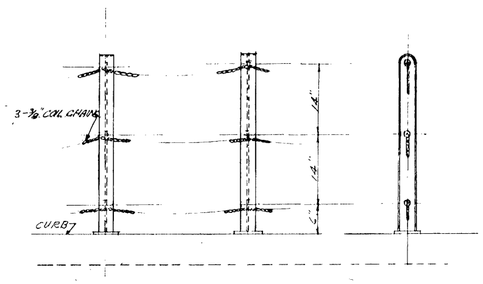
SCALE 1½"=1'-0"



PLAN

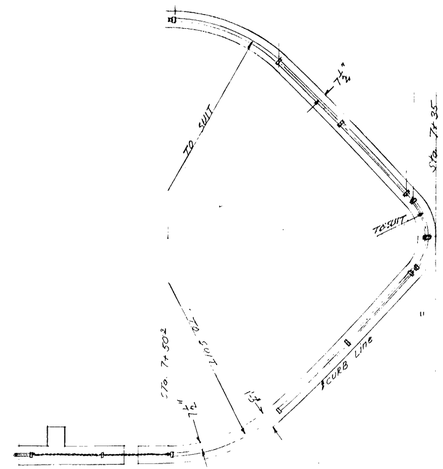
TYPICAL DETAIL AT LADDER OPENING

SCALE 1"-1'-0"



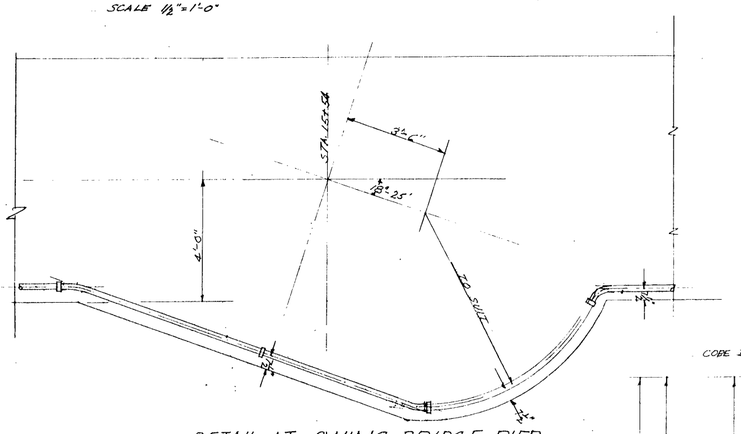
TYPICAL DETAIL OF CHAIN RAIL

SCALE 1"= 1'-0"



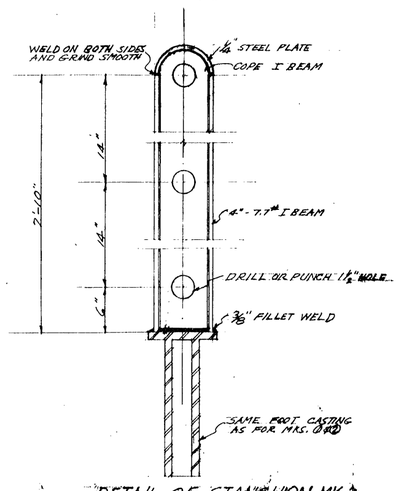
DETAIL AT CHAIN FENDER PIER NOSE

SCALE ½"=1'-0"



DETAIL AT SWING BRIDGE PIER IN LOWER GUIDE WALL

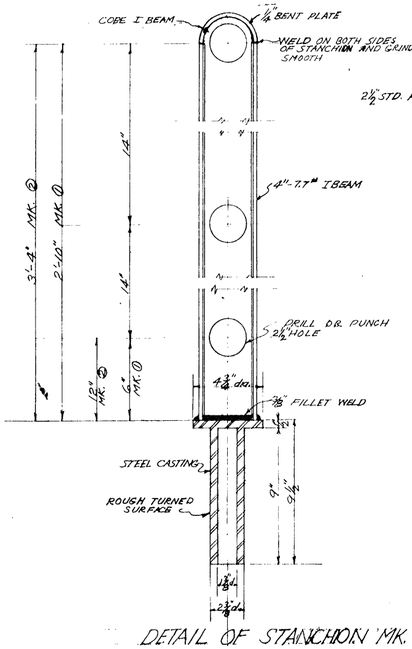
SCALE ½"=1'-0"



DETAIL OF STANCHION MK. 3

REQUIRED MK.3

SCALE 3"=1'-0"

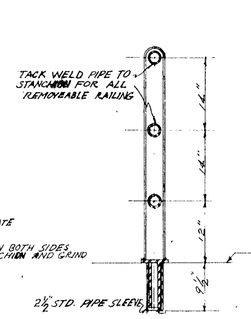


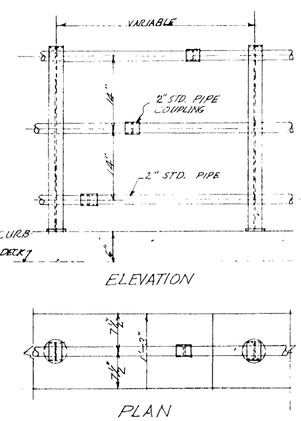
DETAIL OF STANCHION MK. 1 & 2

REQUIRED MK. ①

REQUIRED MK. ②

SCALE 3"=1'-0"



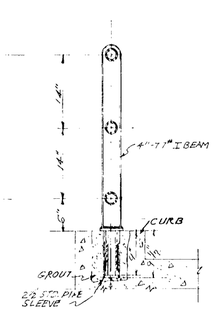


ELEVATION

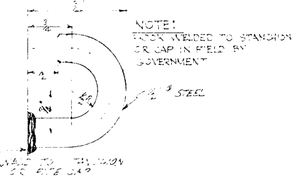
PLAN

TYPICAL DETAILS

SCALE 1"=1'-0"



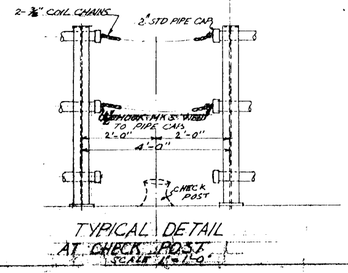
BILL OF MATERIAL				
MARK	No.	SIZE	LENGTH	DESCRIPTION
1	227	SEE DETAIL		STANCHION COMPLETE
2	145	DO.		DO.
3	57	DO.		DO.
4	6550FT.	2"	RANDOM	2" STD. PIPE - BLK. STEEL
5	255	½"	SEE DETAIL	½" HOOK COMPLETE
6		⅜	11'5"	⅜ COIL CHAIN
7	550	2"		2" STD. BLK. STEEL PIPE CAPS
8	350FT.	2½"	RANDOM	2½" STD. BLK. STEEL PIPE



DETAIL OF HOOK MK. 5

255 REQ'D. STEEL

SCALE - FULL SIZE



TYPICAL DETAIL AT CHECK POST

SCALE 1"=1'-0"

NO	REVISION	DATE	BY	APV'D

BONNEVILLE PROJECT

SHIP LOCK

HAND RAILING DETAILS

SCALE AS SHOWN

U. S. ENGINEER OFFICE, BONNEVILLE, OREG.

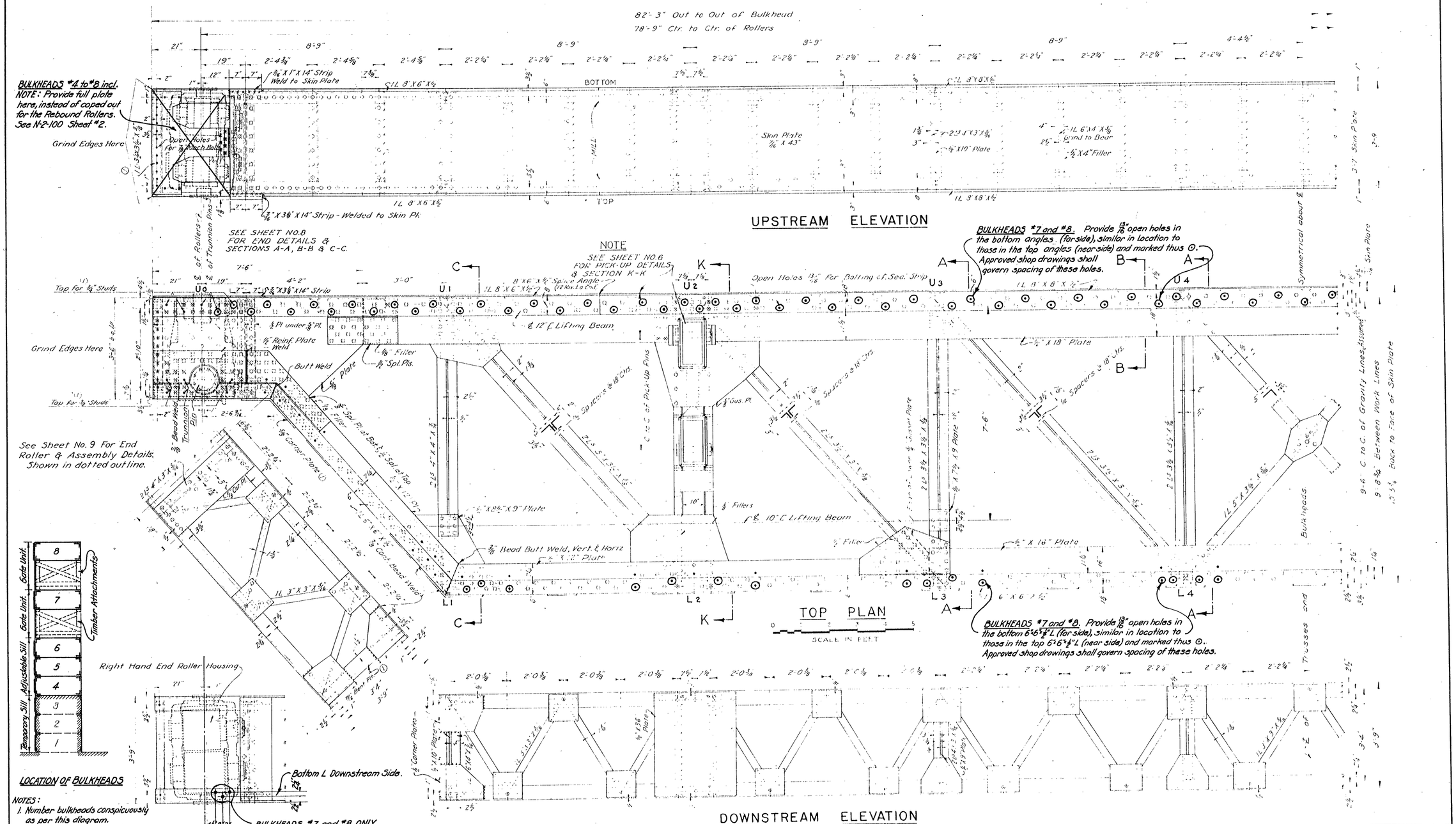
SUBMITTED: E. C. Galbraith, SENIOR ENGINEER — APPROVED: Thomas M. Hardin, MAJOR, CORPS OF ENGINEERS, DIST. ENGR.

RECOMMENDED: Tidball, SENIOR ENGINEER — 4/11/38

N-1-92

WAR DEPARTMENT

CORPS OF ENGINEERS, U.S. ARMY



NOTES:
1. Number bulkheads conspicuously as per this diagram.
2. Bulkhead numbers in notes refer to this diagram.

NOTES

In order to permit shipment, field connections may be made at the option of the Contractor, details to be submitted for Approval of the Contracting Officer.

For additional notes see General Notes on Sheet No 3

REFERENCES

	Sheet No.
Design Data	2
Details of Pick Up & Sec K-K	" 6
Sections A-A, B-B & C-C	" 8
Details of Castings & End Rollers	9-10

Mark EB-4 to EB-13
Make 10 Complete Units
Material, Structural Nickel Steel

Est Weight of Steel in One Unit	48 620 lbs
" " Seal Strip & Buffers	993
" " Castings & End Rollers	3 943
Est Total Weight Complete Gate	53 443 lbs

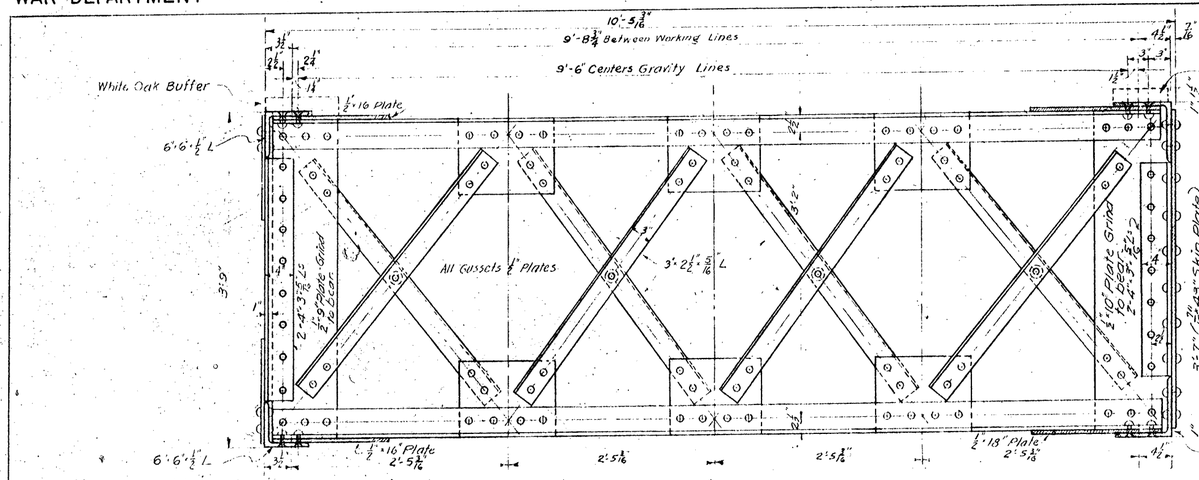
REPRODUCED FROM SHEET 7 OF 15, N-2-60 -- REVISION OF 7-15-35

BONNEVILLE POWER NAVIGATION PROJECT
33-RD CONTRACT
SHIP LOCK – EMERGENCY DAM
PROVISIONS FOR TEMPORARY LIFT GATES
BULKHEADS NO. 4 TO 8 INCLUSIVE
PLAN & ELEVATIONS
SCALES AS SHOWN

U.S. ENGINEER OFFICE, SPECIAL PORTLAND DISTRICT, OREGON

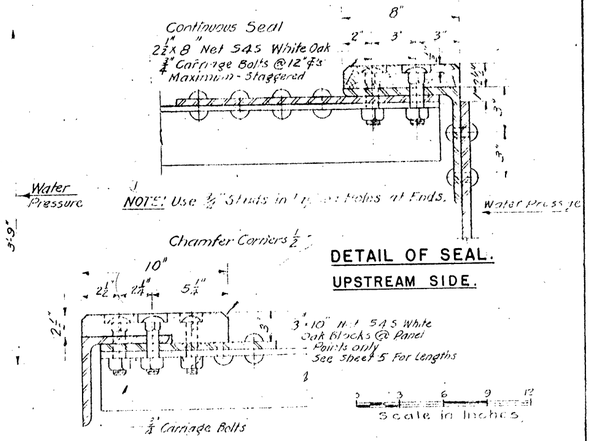
SUBMITTED: K.M. Mackenzie, ENGINEER
RECOMMENDED: [illegible], DISTRICT ENGINEER
APPROVED: [illegible], MAJOR, CORPS OF ENGINEERS
DRAWN BY V.C.H. DATE 7-19-35
TRACED BY [illegible] CHECKED BY [illegible]

SHEET 1 N-2-100



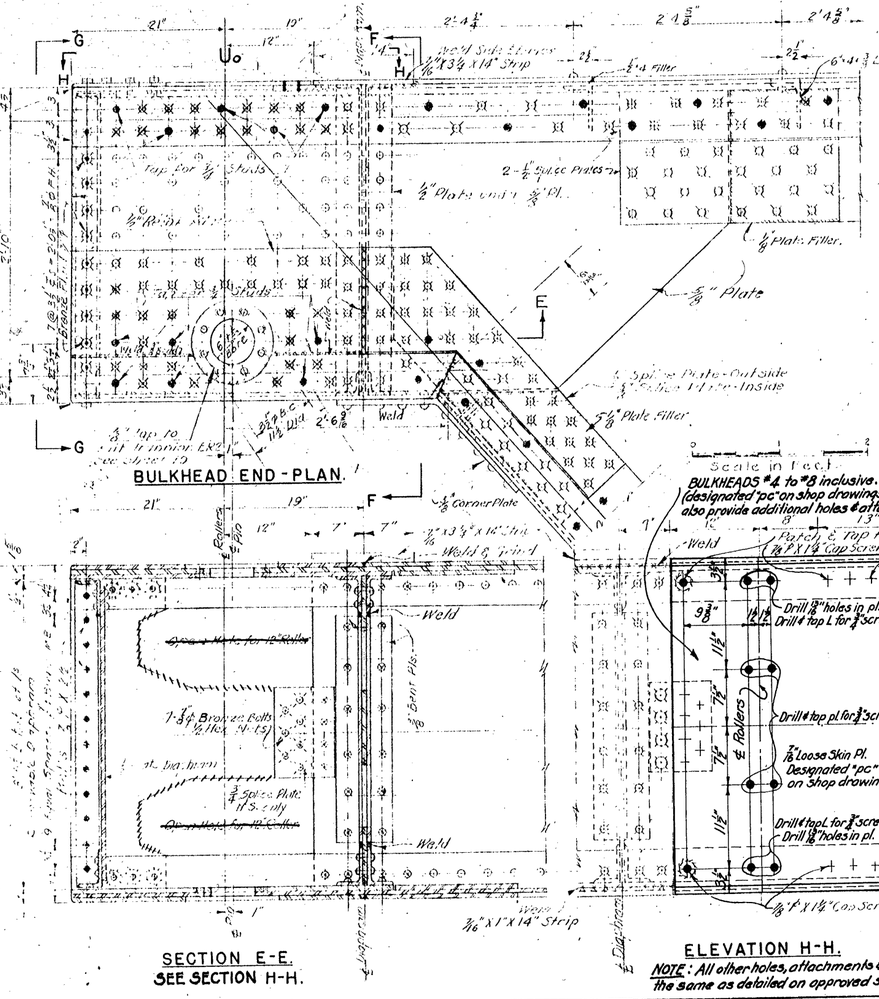
SECTION A-A.

SECTION B-B.



DETAIL OF SEAL.

UPSTREAM SIDE.



BULKHEAD END - PLAN.

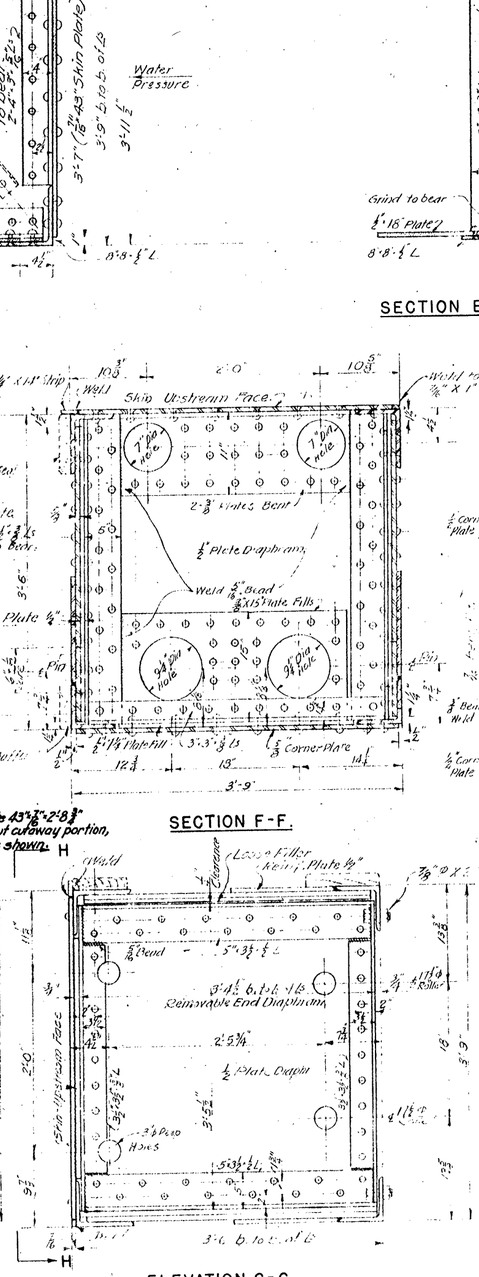
SECTION E-E.
SEE SECTION H-H.

BULKHEADS #4 to #8 inclusive. Provide plate 43⅜"·1'-2⅛" (designated "pc" on shop drawings) full & without cutaway portion, also provide additional holes & attachments as shown.

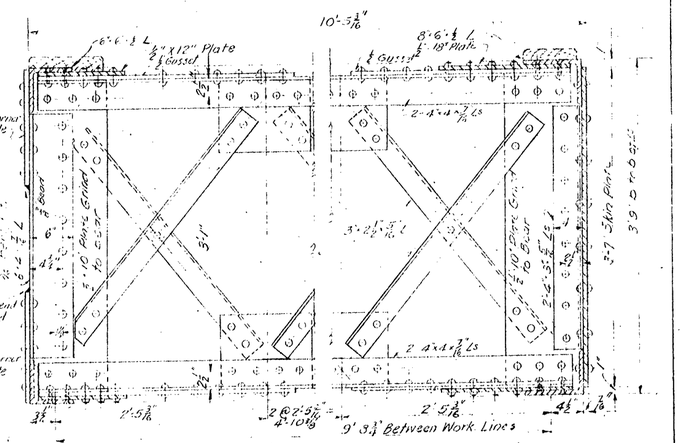
ELEVATION H-H.

NOTE: All other holes, attachments & notes shall be the same as detailed on approved shop drawings.

SECTION F-F.



ELEVATION G-G.



SECTION C-C.

DETAIL OF BUFFER.

DOWNSTREAM SIDE.

REFERENCES.

For Location of Sections AA, B-B, C-C See Sheet 7 of 15-N-2-60.
For Weights - See Sheet "7
For General Notes - See Sheet "3

BOLTS

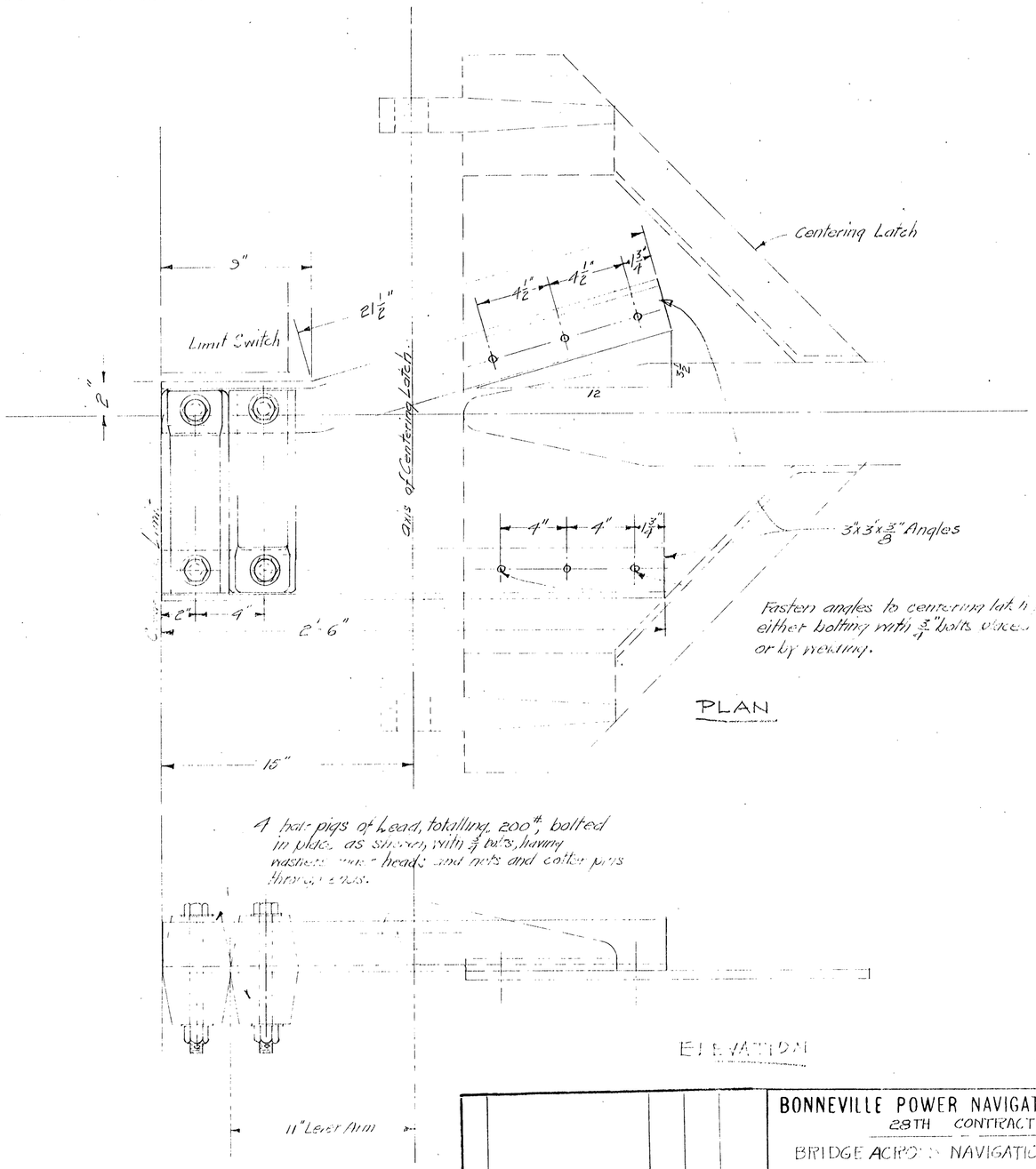
TYPE	MATERIAL	NUT	SIZE	QUANT.	WT EACH	TOTAL WT.
Hex. Cap Screw	Bronze	---	⅞" X 1¾"	140	0.409 lb.	57 lbs.
Mach. Bolts	"	Hex.	⅞" X 2"	40	0.954 lb.	40 lbs.
Mach. Bolts	"		⅞" X 2⅝"	240	1.060 lb.	254 lbs.
Flat Head Screws	"	¼ Hex.	¼" X 2"	140	0.640 lb.	90 lbs.
Cap Head Screws	"	Hex.	⅞" X 2¾"	160	0.950 lb.	152 lbs.
Flat Head Screws	"	Hex.	⅞" X 3¾"	240	1.036 lb.	249 lbs.

BONNEVILLE POWER NAVIGATION PROJECT
33-RD CONTRACT
SHIP LOCK-EMERGENCY DAM
PROVISIONS FOR TEMPORARY LIFT GATES
BULKHEADS NO. 4 TO 8 INCLUSIVE
SECTIONS & END DETAILS
SCALES AS SHOWN

U. S. ENGINEER OFFICE, SECOND PORTLAND DISTRICT, OREGON

SUBMITTED: N.W. Mackenzie, ENGINEER
RECOMMENDED: ..., HEAD ENGINEER
APPROVED: ..., MAJOR, CORPS OF ENGINEERS
DRAWN BY V.C.H. DATE 7-19-35
TRACED BY ... CHECKED BY ...

REPRODUCED FROM SHEET 8 OF 15, N-2-60 — REVISION OF 7-15-35



Fasten angles to centering latch plate by either bolting with ¾" bolts placed as indicated or by welding.

PLAN

4 bar pigs of Lead, totalling 200#, bolted in place as shown, with ¾ bolts, having washers under heads and nuts and cotter pins through ends.

ELEVATION

Note
Two installations required, as shown.

NO	REVISION	DATE	BY	APP'D

BONNEVILLE POWER NAVIGATION PROJECT
28TH CONTRACT

BRIDGE ACROSS NAVIGATION CANAL

COUNTERWEIGHT FOR CENTERING LATCH MECHANISM

SCALE 3" = 1'-0"

U. S. ENGINEER OFFICE, SECOND PORTLAND DISTRICT (OREGON)

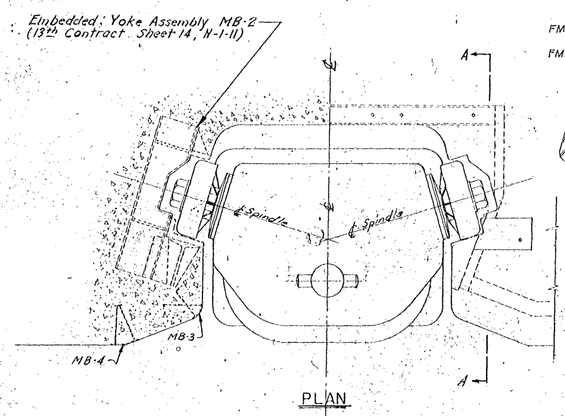
SUBMITTED R. R. Mackenzie, ENGINEER — APPROVED H. C. Williams, MAJOR, CORPS OF ENGINEERS

RECOMMENDED E. A. Starcke, HEAD ENGINEER — DRAWN BY H. G. L. DATE 7-19-35 — TRACED BY — CHECKED BY

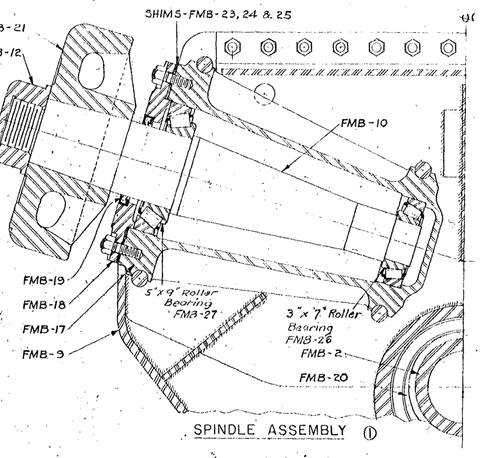
N-2 101

WAR DEPARTMENT

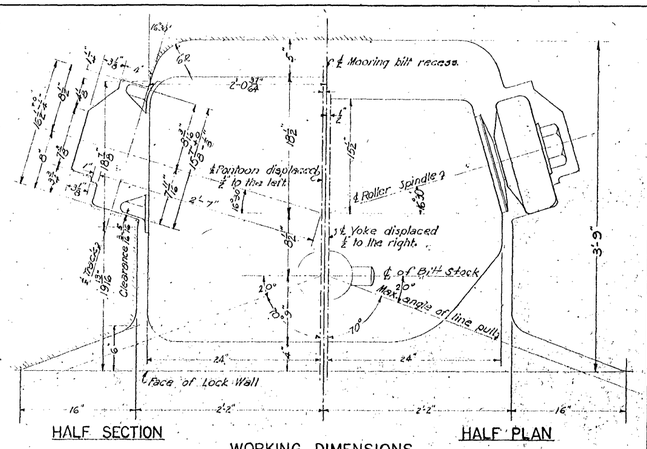
CORPS OF ENGINEERS U.S. ARMY



PLAN



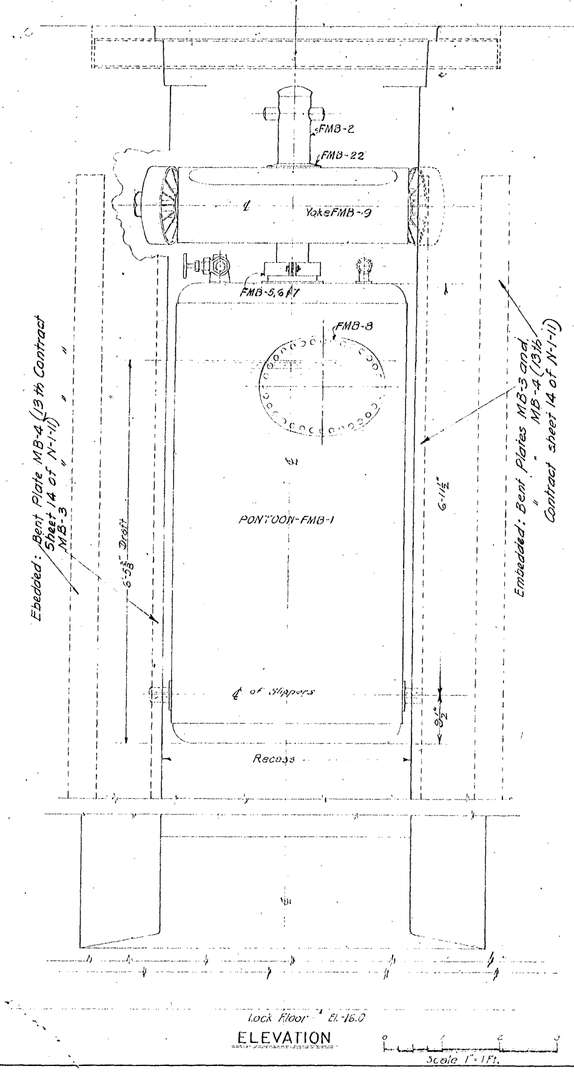
SPINDLE ASSEMBLY ①



HALF SECTION

WORKING DIMENSIONS

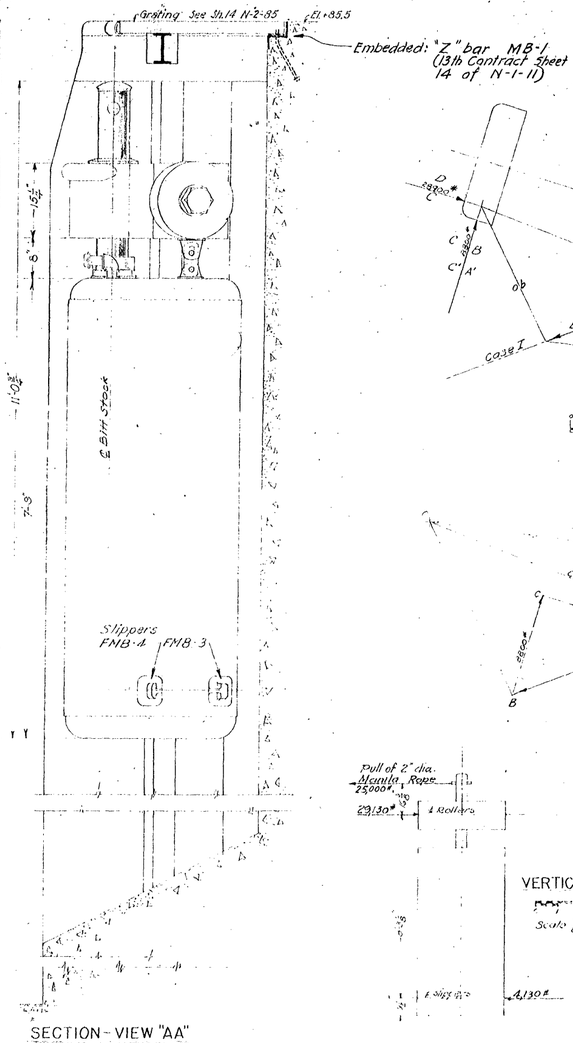
HALF PLAN



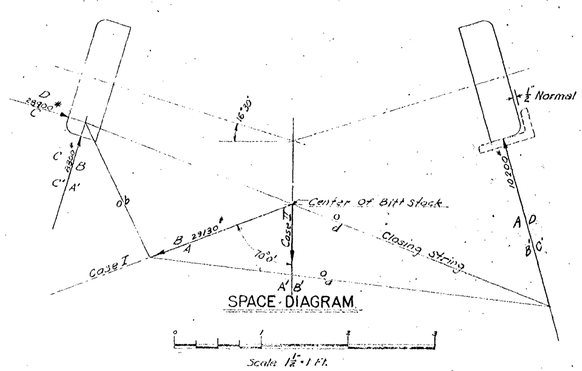
Lock Floor El. 16.0

ELEVATION

Scale 1"=1Ft.

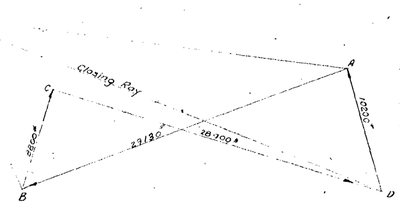


SECTION - VIEW "AA"



SPACE DIAGRAM

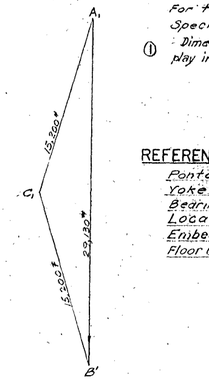
Scale 1½"=1 Ft.



FORCE DIAGRAM, CASE I

0 5000 10000 15000

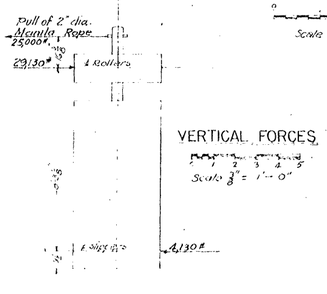
Scale 1 inch = 5,000 lb.



FORCE DIAGRAM, CASE II

0 5,000 10,000 15,000

Scale 1 inch = 5,000 lb.



VERTICAL FORCES

Scale ⅜" = 1'-0"

PARTS FOR ONE MOORING BITT

Name	Mark	Req.	Wt. Each	Wt. Total	Material	Detailed
Pontoon Shell	FMB-1	1	2188	2188	Str. carbon steel	Sh. 2 - N-2-102
" Slipper	FMB-3	2	9.0	18.0	Nickel Steel Casting	" " "
" Slipper	FMB-4	2	10.6	21.2	" " "	" " "
Pipe & Fittings			43	43.0	12" Std. gal. pipe	" " "
Manhole Cap Screws	FMB-8	32	.23	7.36	Tobin Bronze	Sh.4 " "
Bitt Stock	FMB-2	1	457	457	6" (xx Heavy) St. Pipe	Sh. 2 - N-2-102
Caps "	"	1	13.5	13.5	Str. Carbon Steel	" " "
Pins (Set)	"	1	22.2	22.2	Cold Rolled "	" " "
Bands "	"	1	10	100	Stainless "	" " "
Yoke Shell	FMB-9	1	845	845	Str. carbon steel	Sh. 3 - N-2-102
Bearing Casting	FMB-16	1	152	152	Nickel Steel Casting	" " "
Bitt Stock Bearing	FMB-20	1	37	37	" " " "	Sh.4 " "
Bushing	FMB-13	1	23.4	23.4	" " "	Sh.3 " "
Keeper Pin	FMB-15	3	1	3.0	" " Forgings	" " "
Links (set)	FMB-14	1	25.6	25.6	" " "	" " "
Dowels 1" ø	—	24		11.4	" " "	" " "
Rods .18 ø	—	8		34.8	" " "	" " "
Bitt Stock Collar	FMB-22	1	20	20.0	Str. Carbon Steel	Sh.4 " "
Steel Pipe	FMB-9	1	37	37.0	3" (xx Heavy) St. Pipe	Sh.3 " "
Roller	FMB-21	2	168	336	Nickel Steel Casting	Sh. 4 - N-2 - 102
Spindle	FMB-10	2	123.6	247.2	Nickel Steel Forgings	Sh. 3 " "
" Key	FMB-11	2	.23	0.5	" " "	" " "
Spindle Cap Nut	FMB-12	2	13.4	26.8	" " "	" " "
Bolt Steel	FMB-9	28	.714	20.0	Bolt Steel	" " "
Boxing						
Spindle Housing	FMB-17	2	245	490	Nickel Steel Casting	Sh. 4 N-2-102
Cover Plate	FMB-18	2	28	56	" " " "	" " "
Oil Seal	FMB-19	2	.5	1.0	Garlock "Klozure"	" " "
Inner Bearing	FMB-26	2	8	16	7" Timken Roller Bear	Cone No. 9378 Cup No. 9320
Outer "	FMB-27	2	18.75	37.5	9" " " "	" " 97500 " " 97900
Cover Plate Studs	⅝ø	24	.29	7.0	Nickel Steel Forging	Sh.4 N-2-102
Shims	FMB-23	2	.81	1.02	Brass Shim Stock	" " "
"	FMB-24	6	.18	1.08	" " " "	" " "
"	FMB-25	6	.13	0.78	" " " "	" " "
Lubricating System		1	0.5	0.5	Alemite	Sh.3 " "
" "		1	4	4	Copper Tubing (xx)	" " "
W.T. Gland Nut	FMB-5	1	25.5	25.5	Carbon Steel Casting	Sh.2 N-2-102
(Set) " " Bolts		1	1.0	1.0	Bolt Steel	" " "
Gland	FMB-6	1	22.4	22.4	Carbon Steel Casting	" " "
Packing Ring	FMB-7	1	1.4	1.4	Soft Pure Rubber	" " "

Total weight of Mooring Bitt Assembly = 5245 lbs.

NOTES

Center of Gravity of all weights shall coincide with center of flotation, as nearly as practicable.

For tolerances, allowances and gages see paragraph 711 - Specifications.

① Dimensions of spindle & housing are calculated so as to have an end play in the bearings when new, of .003" with shims as shown.

REFERENCES

Pontoon Sheet 2 N-2-102
Yoke " 3 "
Bearings " 4 "
Locations " N-1-52
Embedded Steel Sht. 14 N-1-11, N-1-45 & Sht. 1 N-1-59
Floor Grating Sheet 14 N-2-85.

NO.	REVISION	DATE	BY	APP'D
1	Spindle Assembly bearing sizes changed. Symbols revised	11/25/35	A.C.D.	T.H.C.
1	Boxing Part List changed	10/25/35	A.C.D.	
1	Note added			
	ISSUED FOR CONSTRUCTION	9-8-35	[illegible]	[illegible]

BONNEVILLE POWER NAVIGATION PROJECT
(36-TH) CONTRACT W 694 ENG-47.
LOCK OPERATING EQUIPMENT.
FLOATING MOORING BITT
GENERAL ARRANGEMENT

SCALES AS SHOWN.

U. S. ENGINEER OFFICE, SECOND PORTLAND DISTRICT (OREGON)

SUBMITTED: [signature] ENGINEER — APPROVED: [signature] LT. COL. CORPS OF ENGINEERS

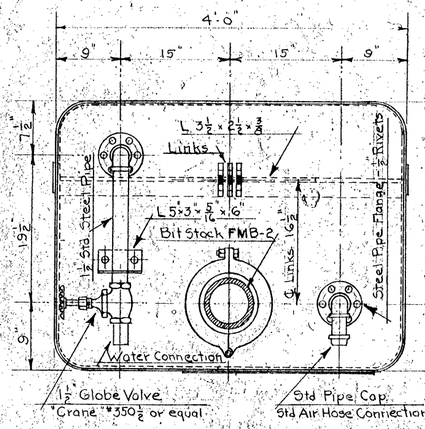
RECOMMENDED: [signature] SENIOR ENGINEER

DESIGNED BY A.A.D. & E.C.D. DATE 9-8-35
DRAWN BY A.C.D. TRACED BY A.C.D. CHECKED BY F.T.O.

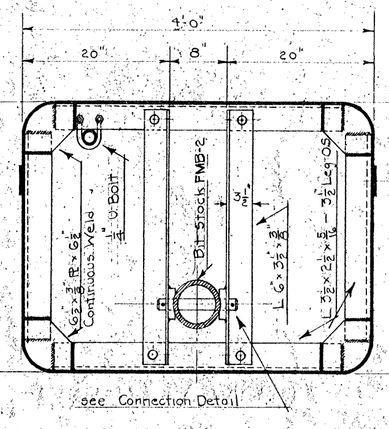
THIS DRAWING SUPERSEDES DRAWING NO N-2-86 NOT BEARING THIS CAPTION

WAR DEPARTMENT

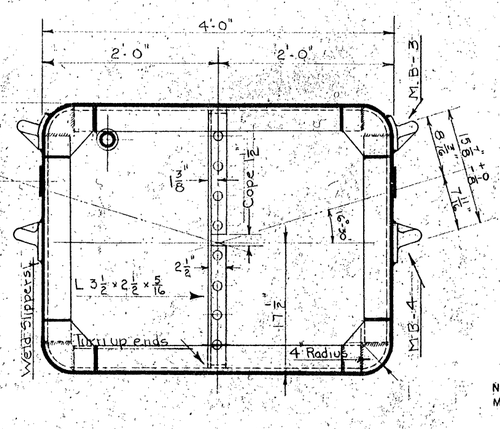
CORPS OF ENGINEERS U. S. ARMY



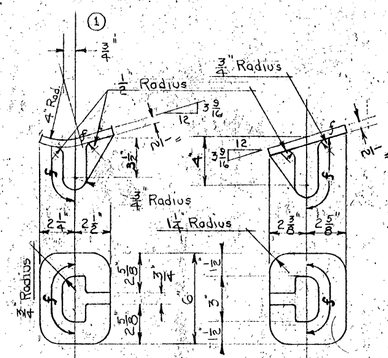
PLAN

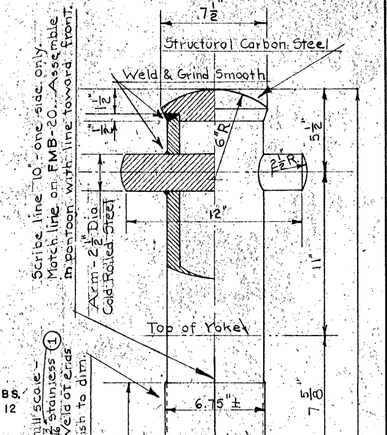


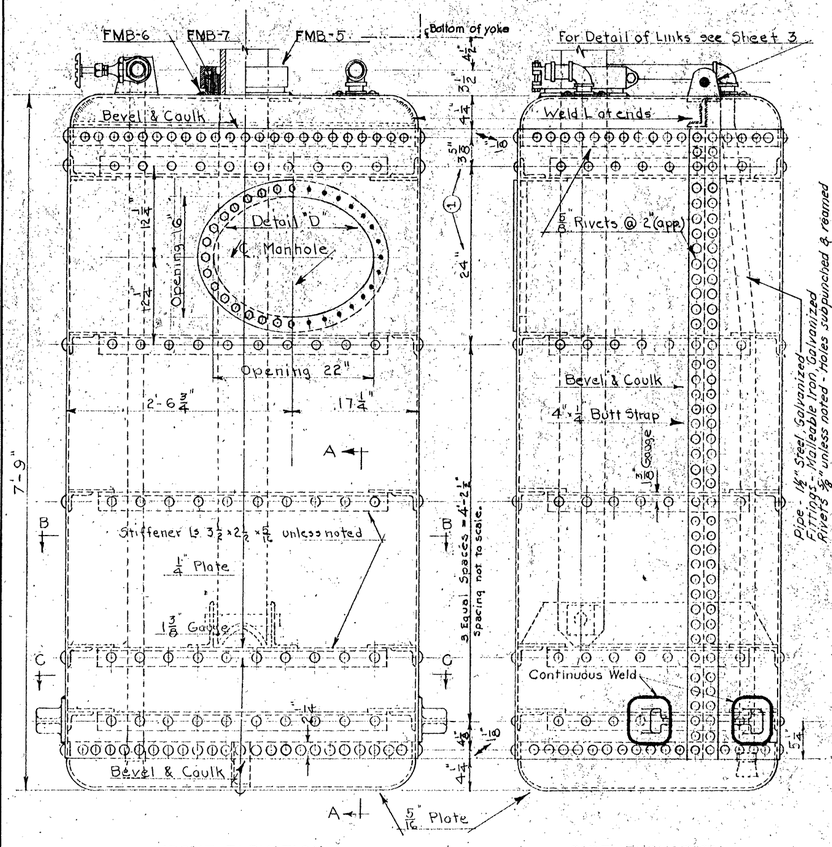
SECTION "B-B"



SECTION "C-C"

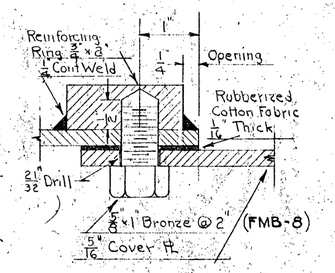




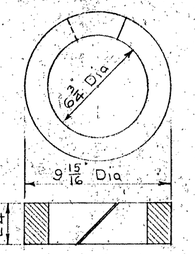


FRONT ELEVATION

SIDE ELEVATION

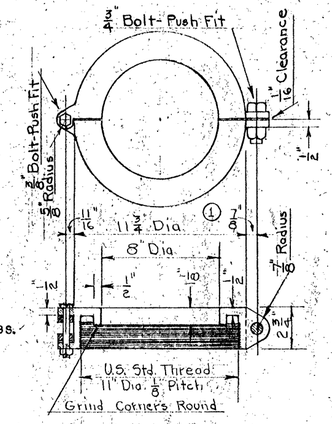


DETAIL "D"



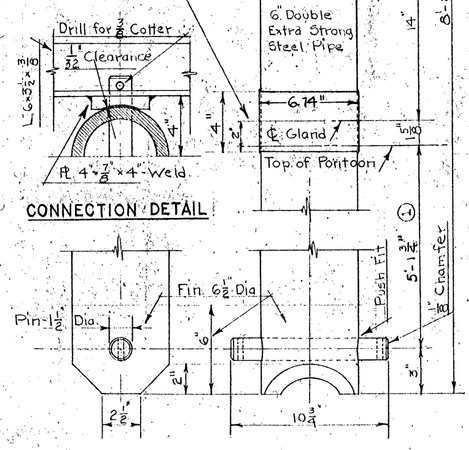
PACKING RING

SOFT, PURE RUBBER WEIGHT 1.4 LBS.
MARK FMB-7 MAKE 6



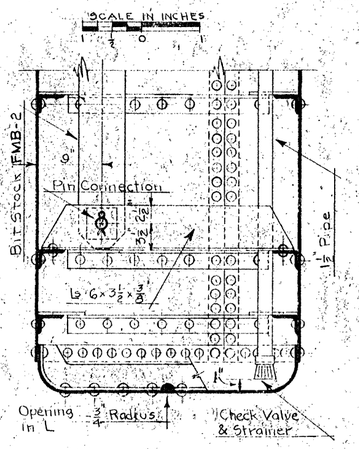
GLAND NUT

CARBON STEEL CASTING WEIGHT 25.5 LBS.
BOLT STEEL 0.8 "
MARK FMB-5 MAKE 6

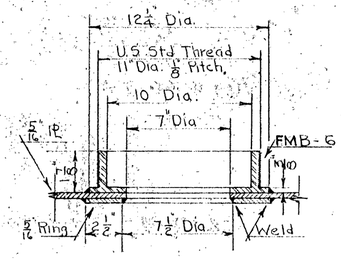


BITT STOCK

STEEL PIPE	WEIGHT 457 LBS
STRUCT. CARBON STEEL	13.5 "
COLD ROLLED STEEL	22.2 "
STAINLESS STEEL	10.0 "
MARK FMB-2	MAKE 6



SECTION "A-A"



GLAND

CARBON STEEL CASTING WEIGHT 22.4 LBS
MARK FMB-6 MAKE 6

PONTOON

STRUCTURAL CARBON STEEL	WEIGHT 2188 LBS.
STEEL PIPE & FITTINGS	43 LBS.
MARK FMB-1	MAKE 6

SCALE IN FEET 1 0 1

SCALE IN INCHES 3 0 3 6 9

EXCEPT AS NOTED

NOTES

For Tolerances, allowances & gages see Paragraph 711 - Specifications.
Quantities shown are for 6 Mooring Bitts.
Weights given are for each piece.
For welding see paragraph 713 - Specifications.
All fillet welds ⅜" continuous unless otherwise noted.
Details shown on this Sheet are: FMB*1 to *7 inclusive.

REFERENCES

For General Assembly see N-2-102 Sheet 1
For Bearing FMB-20 see Sheet 4 N-2-102

NO.	REVISION	DATE	BY	APV'D
1	Corrected dim. FMB1, 2&3 Added dimension FMB 5	10/4/35	T.A.H	[illegible]
	ISSUED FOR CONSTRUCTION	9/10/35	[illegible]	[illegible]

THIS DRAWING SUPERSEDES DRAWING NO. N-2-86 NOT BEARING THIS CAPTION

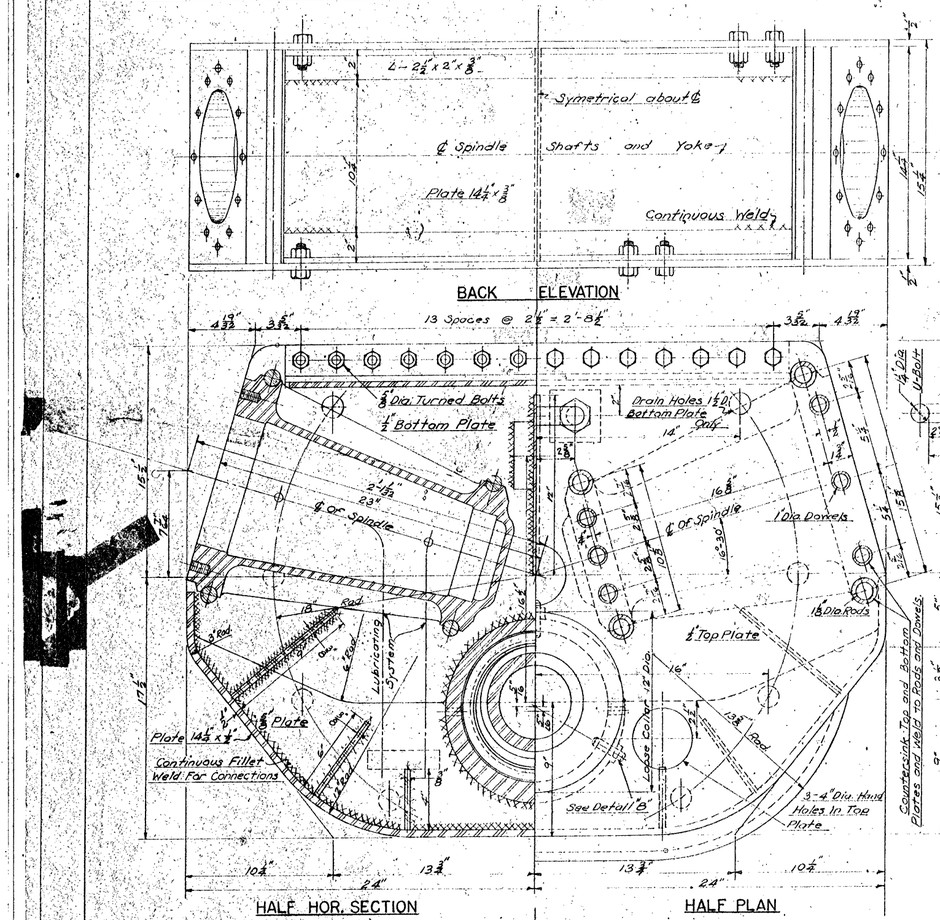
BONNEVILLE POWER NAVIGATION PROJECT
(36-TH) CONTRACT W 694 ENG- 47
LOCK OPERATING EQUIPMENT

FLOATING MOORING BITT
DETAILS OF, PONTOON & BITT STOCK
SCALES AS NOTED

U. S. ENGINEER OFFICE, SECOND PORTLAND DISTRICT (OREGON)

SUBMITTED R.A. Mackenzie, ASSISTANT ENGINEER
APPROVED Chas. D. Williams, LT.COL. CORPS OF ENGINEERS
RECOMMENDED [illegible], SENIOR ENGINEER
DESIGNED BY A.L.D. & E.E.B. DRAWN BY F.A.H. DATE 9-9-35
TRACED BY F.A.H. CHECKED BY F.T.D.
J.R.H.

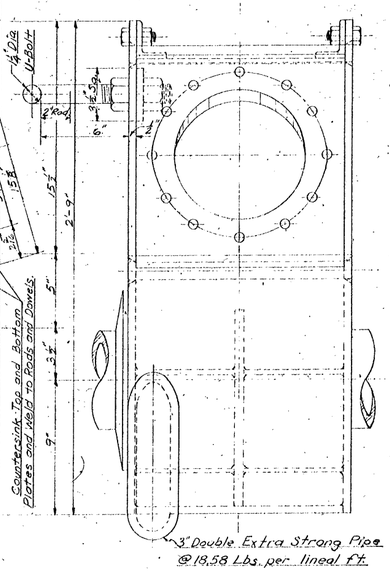
SHEET 2 OF 4 - N-2-102



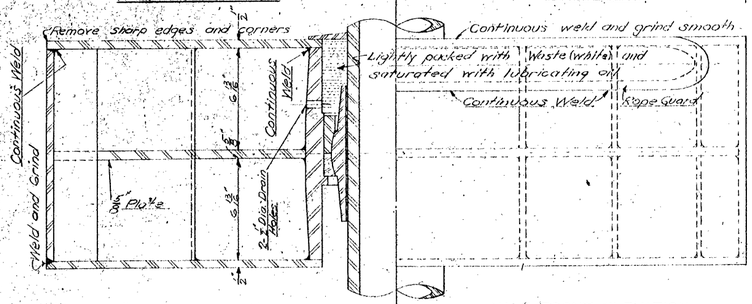
BACK ELEVATION

HALF HOR. SECTION

HALF PLAN



END ELEVATION

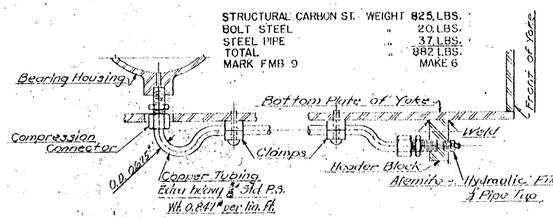


HALF SECTION

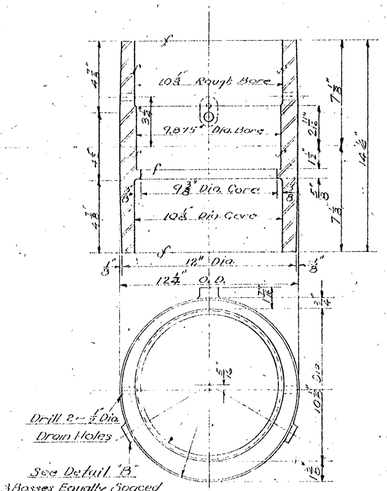
YOKE

HALF FRONT ELEVATION

STRUCTURAL CARBON ST.	WEIGHT	825 LBS.
BOLT STEEL	"	20 LBS.
STEEL PIPE	"	37 LBS.
TOTAL	"	882 LBS.
MARK FMB 9		MAKE 6

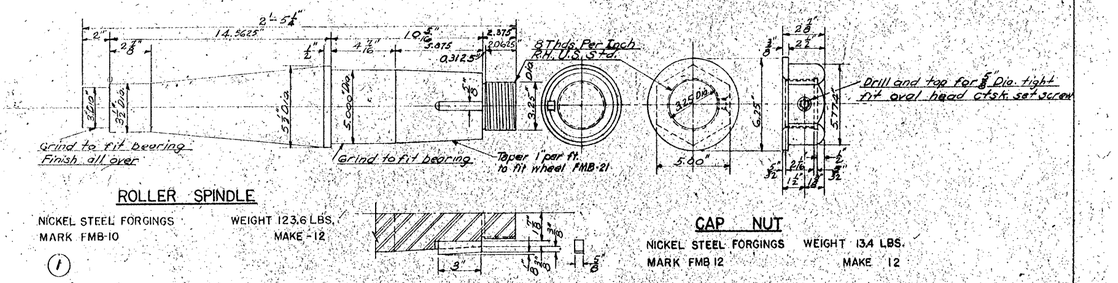


LUBRICATING SYSTEM



YOKE BEARING CASTING

NICKEL STEEL CASTING WEIGHT 152 LBS.
MARK FMB 16 MAKE - 6



ROLLER SPINDLE

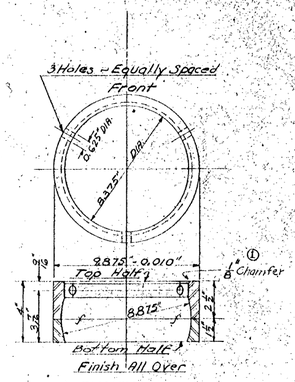
NICKEL STEEL FORGINGS WEIGHT 123.6 LBS.
MARK FMB-10 MAKE-12

CAP NUT

NICKEL STEEL FORGINGS WEIGHT 13.4 LBS.
MARK FMB 12 MAKE 12

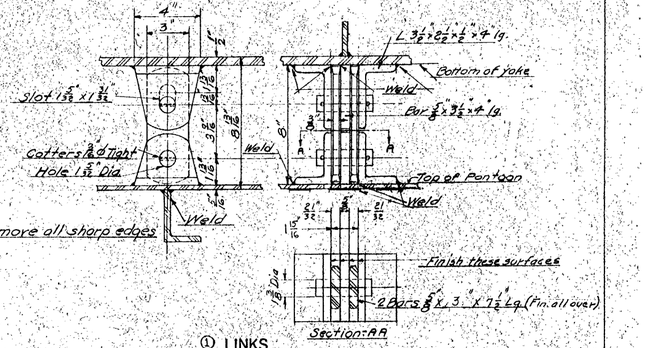
KEY

NICKEL STEEL FORGINGS WEIGHT .23 LBS
MARK FMB 11 MAKE-12



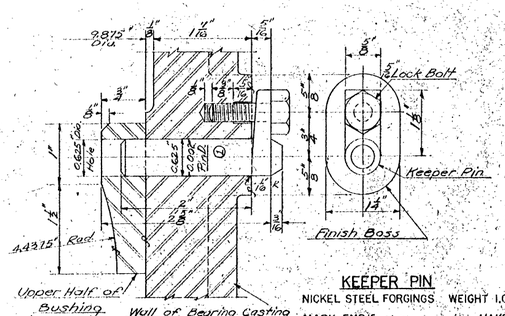
BUSHING

NICKEL STEEL CASTING WEIGHT 23.4 LBS.
MARK FMB 13 MAKE - 6



① LINKS

NICKEL STEEL FORGING WEIGHT 25.6 LBS.
MARK FMB 14 MAKE - 8 SETS



KEEPER PIN

NICKEL STEEL FORGINGS WEIGHT 1.0 LB.
MARK FMB 15 MAKE-18

DETAIL "B"
SCALE-FULL SIZE

NOTES

Quantities shown are for 6 Mooring Bitts
Weights are for each piece.
For tolerances, allowances and gages see paragraph 711 Specifications.
For welding see paragraph 713 Specifications.
All Fillet Welds ⅜" continuous unless otherwise noted.
Details shown on this sheet are: FMB-9 to 16 inclusive.

REFERENCES

General Arrangement, Sheet 1, N-2-102.
For Rollers & Brg. Details " 4, "

SCALE 3" = 1'-0" EXCEPT AS NOTED
0 3 6 9 12
SCALE IN INCHES

BONNEVILLE POWER NAVIGATION PROJECT
(36-TH) CONTRACT W 694 ENG-47
LOCK OPERATING EQUIPMENT
FLOATING MOORING BITT
DETAILS OF YOKE
SCALES AS SHOWN

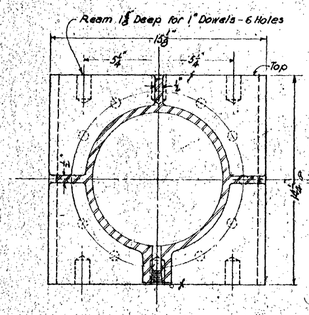
U. S. ENGINEER OFFICE, SECOND PORTLAND DISTRICT (OREGON)

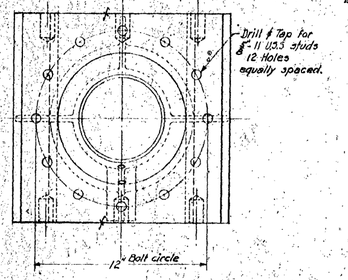
NO.	REVISION	DATE	BY	APP'D
1	Added chamfer FMB 13 Increased clearance FMB 15 Revised FMB 14, Altered dimensions FMB 9 & 10	1-15-35	FATH & ACD	
	ISSUED FOR CONSTRUCTION	3-10-34		

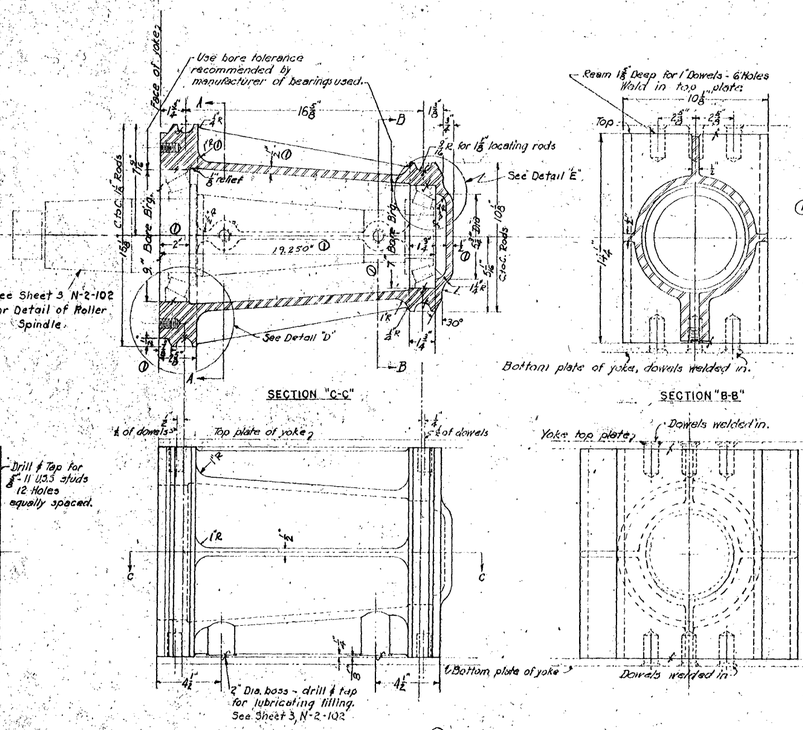
SUBMITTED: R.M. Mahoney, ENGINEER
APPROVED: Eq. Williams, LT. COL. CORPS OF ENGINEERS
RECOMMENDED: Senior Engineer
DESIGNED BY A.A.O. & E.E.D. DATE 8-9-33
DRAWN BY J.M.O. TRACED BY T.M.O. CHECKED BY F.T.O.

SHEET 3 OF 4 N-2-102

THIS DRAWING SUPERSEDES DRAWING NO. N-2-86 NOT BEARING THIS CAPTION







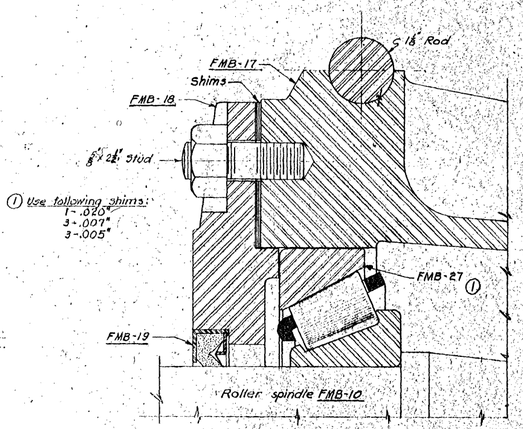
① SPINDLE HOUSING

NICKEL STEEL CASTING WT. 245 LB.

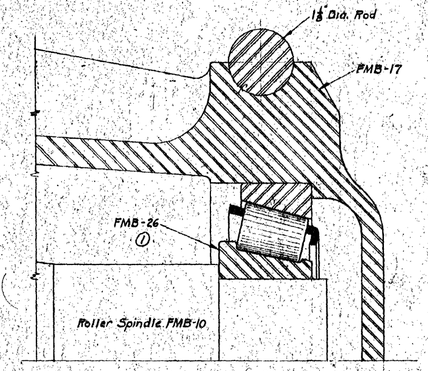
MARK FMB-17 MAKE 12

SCALE 3"=1'-0"

Scale - Inches

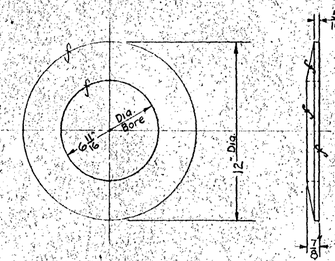


DETAIL "D"



DETAIL "E"

Scale in Inches

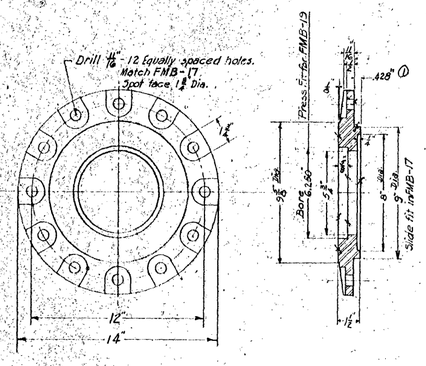


COVER COLLAR

STRUCTURAL CARBON STEEL WEIGHT 20 LBS.

MARK FMB-28 MAKE 6

SCALE 3"=1'-0"

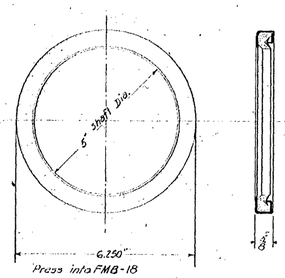


BEARING COVER PLATE

NICKEL STEEL CASTING WT. 28 LB.

MARK FMB-18 MAKE 12

SCALE 3"=1'-0"

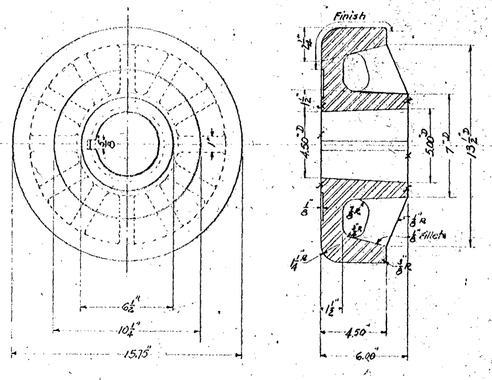


OIL SEAL

GARLOCK "KLOZURE" OR EQUAL WT. 0.5 LB.

MARK FMB-19 MAKE 12

Scale - Inches

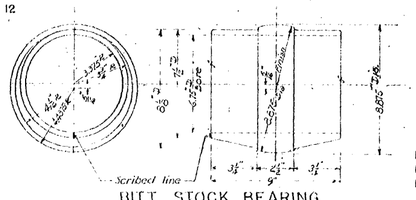


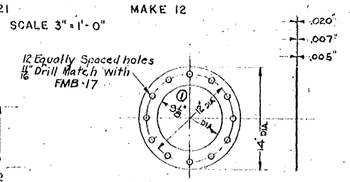
ROLLER

NICKEL STEEL CASTING WT. 168 LB.

MARK FMB-21 MAKE 12

SCALE 3"=1'-0"





SHIMS

BRASS SHIM STOCK SCALE 1½"=1'-0"

MARK FMB-23	.020" THICK	MAKE 12	WT. .51 LB.
MARK FMB-24	.007" THICK	MAKE 38	WT. .18 LB.
MARK FMB-25	.005" THICK	MAKE 36	WT. .13 LB.

NOTES

Quantities shown are for six Mooring Bitts.
Weights given are for each piece.
For tolerances, allowances & gages see paragraph 711 Specifications.
Details shown on this Sheet are: FMB-17 to 27 Inclusive.

REFERENCES

See Sh. 3-N-2-102 for location of spindle bearing housing & bitt stock bearing yoke.
See Sh. 2-N-2-102 for detail of bitt stock.

NO.	REVISION	DATE	BY	APP'D
①	Changed Dim. FMB-17 & 18 / Changed Symbols Detail D & E / Changed Mat. Qnant. & Dimen. FMB-23-24-25	11/15/44 / 11/15/44 / 11/5/44	ACD / ACD / ACD	
	ISSUED FOR CONSTRUCTION	9-10-35	RDM	

BONNEVILLE POWER NAVIGATION PROJECT

(36 TH) CONTRACT W 694 ENG. 47

LOCK OPERATING EQUIPMENT

FLOATING MOORING BITT

BEARING DETAILS

SCALES AS SHOWN

U. S. ENGINEER OFFICE, SECOND PORTLAND DISTRICT OREGON

SUBMITTED K.F. Mackenzie ENGINEER

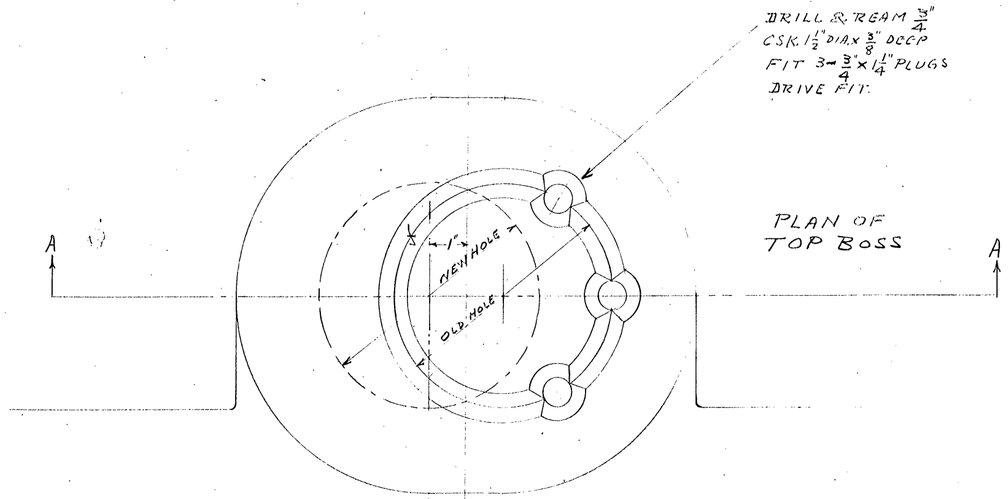
RECOMMENDED E. Grunsky SENIOR ENGINEER

APPROVED O.W. Williams LT. COL. CORPS OF ENGINEERS

DESIGNED BY A.C.D. & F.T.D. DATE 8-9-35

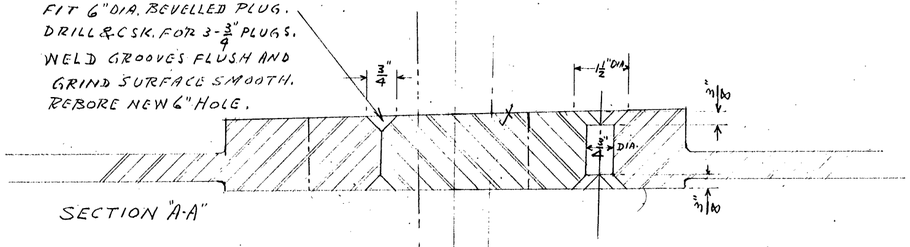
DRAWN BY A.C.D. TRACED BY A.C.D. CHECKED BY F.T.D.

SHEET 4 OF 4 N-2-102



PLAN OF
TOP BOSS

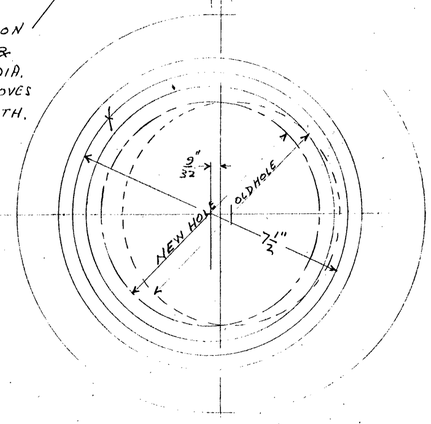
BEVEL OLD HOLE AS SHOWN.
FIT 6" DIA. BEVELLED PLUG.
DRILL & CSK. FOR 3 - 3/4" PLUGS.
WELD GROOVES FLUSH AND
GRIND SURFACE SMOOTH.
REBORE NEW 6" HOLE.



SECTION "A-A"

SECTION "B-B"

REBORE BOTTOM BOSS ON
NEW 2" 3/32 CENTER, TO 7 1/2" DIA. &
BEVEL AS SHOWN. FIT 7 1/2" DIA.
BEVELLED PLUG. WELD GROOVES
FLUSH & GRIND SURFACE SMOOTH.
REBORE NEW 6" HOLE.



PLAN OF
BOTTOM BOSS

NOTE —
ANNEAL AFTER WELDING.
CHECK FINISHED SURFACES
FOR ALIGNMENT.

SCALE 6" = 1 FT.

REFERENCE —

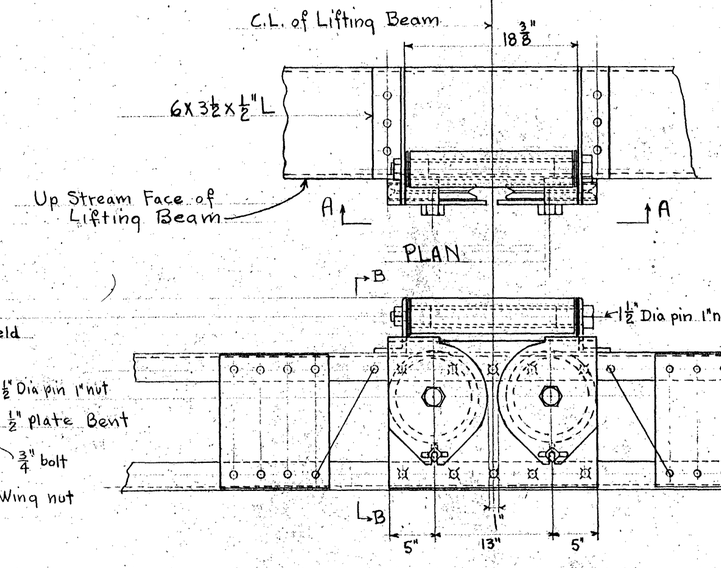
PACIFIC CAR & FOUNDRY CO.
SKETCH No. 4657-I-A
AND LETTER OF JULY 25, 1935

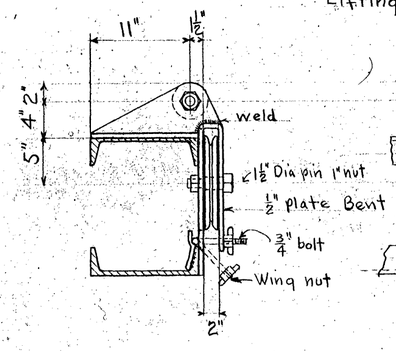
BONNEVILLE POWER NAVIGATION PROJECT
33RD CONTRACT
SHIP LOCK - EMERGENCY DAM
SUGGESTED CORRECTIONS TO
ROLLER HOUSING ER-1-R

U. S. ENGINEER OFFICE, SECOND PORTLAND DISTRICT (OREGON)

SUBMITTED: ENGINEER	APPROVED MAJOR, CORPS OF ENGINEERS
RECOMMENDED HEAD ENGINEER	DRAWN BY C.W.S. DATE 8-2-35
	TRACED BY ..... CHECKED BY .....

N-2-104



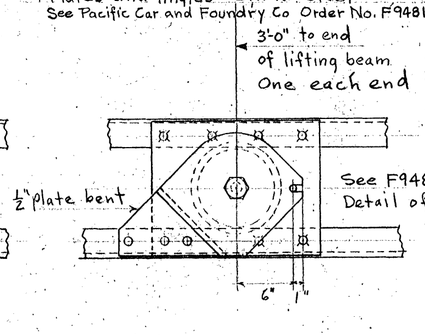


SEC. B-B

VIEW A-A.

	Schedule I, Item Nos.
1 Roller - Cast Steel - 4" Dia. 18" long	8
2 Phosphor Bronze Bushings 2" long for 1 1/2" Dia Pin.	10
2 - Washers 3/8" Thick. Machine Steel	3
4 Sheaves - Cast Steel 10" Dia x 1 5/8" Thick Hub	8
Bushing - Phosphor Bronze	10
Washers - 3/8" Thick. machine steel	3
Pins. - 1 1/2" Dia. 1" nut. " "	3
Plates and Angles Str. Ni. Steel	1

See Pacific Car and Foundry Co Order No. F9481 Sh.No CF2



BONNEVILLE POWER NAVIGATION PROJECT

33 CONTRACT

SHIP LOCK - EMERGENCY DAM

ARRANGEMENT OF LIFTING BEAM SHEAVES

U.S. ENGINEER OFFICE, SECOND PORTLAND DISTRICT (OREGON)

SUBMITTED: R.A. Mackenzie, ENGINEER — APPROVED: MAJOR CORPS OF ENGINEERS

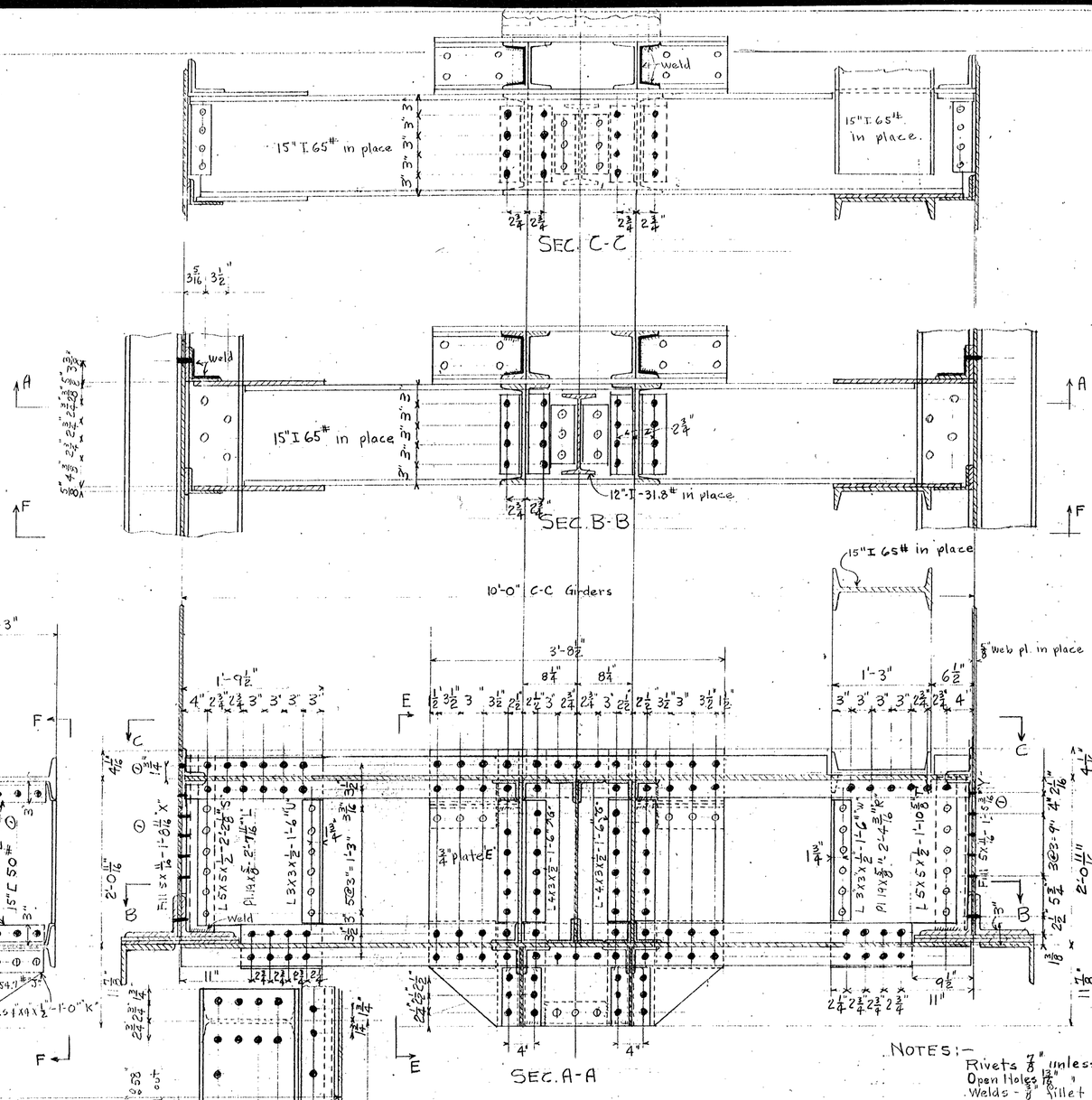
RECOMMENDED: [illegible], SUPERVISING ENGINEER

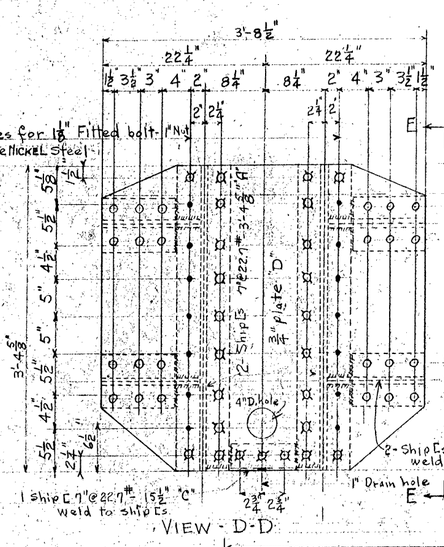
DRAWN BY G.S.D. DATE 8-12-35 TRACED BY ..... CHECKED BY [illegible]

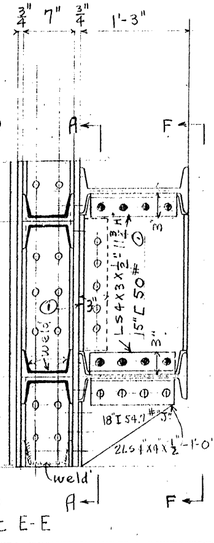
N-2-105

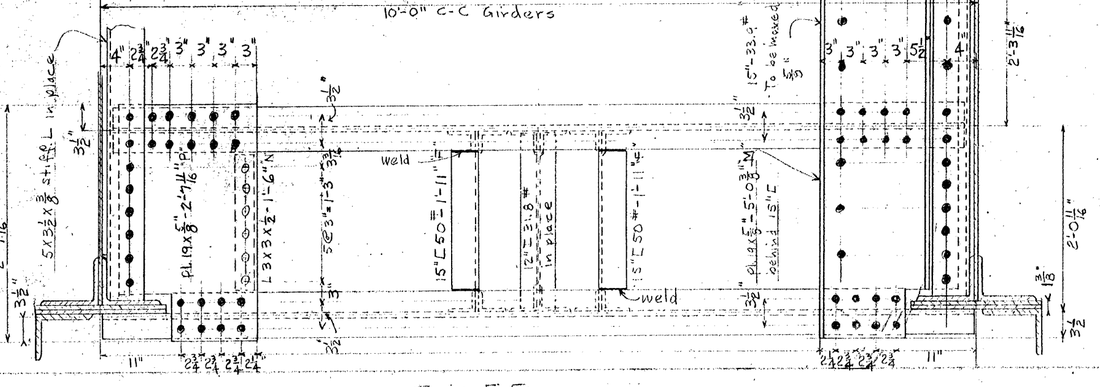
MATERIAL LIST- Reqd.

Mark	Description	No Reqd	Length	Wt/Ft	Total Wt	Remarks
A	7" Ship C. 22.7#	4	3'-4⅜"	22.7	312	
B	"	8	13½"	"	205	
C	"	1	15½"	"	29	
D+E	PH. ¾"x44"	2	3'-4⅜"	113.5	413	Cut corners 170-57#
F	15" L- 50#	2	1'-11"	50.	192	
G	L - 4x3x½	2	1'-6"	11.1	33	
H	L "	8	11⅜" ①	"	89	
J	18"I-54.7#	2	1'-0"	54.7	55	Cut from one
K	L 4x4x½	4	1'-0"	12.8	52	
L	Pl. ⅝ x 19"	1	2'-7 11/16"	40.4	99	Cut corners 101-8#
M	Pl. " "	1	5'-0⅝"	"	195	" " 263-8#
N	L 3x3x½	1	1'-6"	9.4	14	
P	Pl. ⅝ x 19"	1	2'-7 11/16"	40.4	99	Cut corners 101-8#
R	Pl. ⅝ x 19	1	2'-4 11/16"	"	89	" " 95-8#
S	L 5x5x½	1	2'-2⅜"	16.7	35	
T	L "	1	1'-10⅜"	"	31	
U	L 3x3x½	1	1'-6"	9.4	14	
W	L "	1	1'-6" ②	"	14	
X	Pl. 11/16" x 5"	1	1'-8 13/16"	11.5	19	
Y	Pl "	1	1'-5 13/16" ①	"	16	
					2305# total	









NOTES:-
Rivets ⅞" unless noted
Open Holes ¾" " " ream to 15/16"
Welds - ⅜" fillet

Payment will be made on the basis of scale weights
Materials to be Structural Carbon Steel A.S.T.M. A-7-33
Paint - One Coat-Quick Drying Red Lead and Oil.

BONNEVILLE POWER NAVIGATION PROJECT

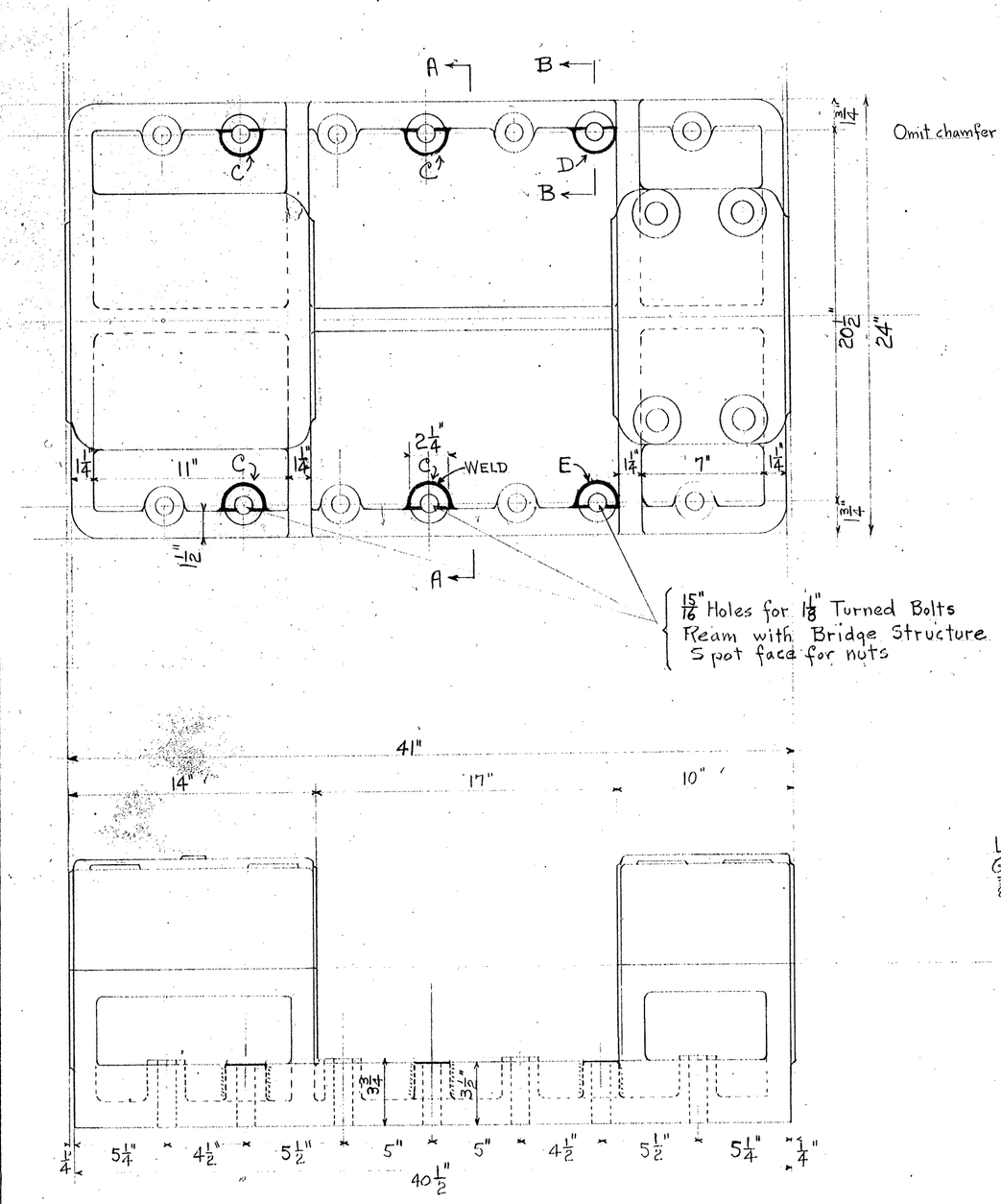
BRIDGE ACROSS NAVIGATION CANAL
SWING SPAN
MAIN PINION BRACKET (CHANGES)

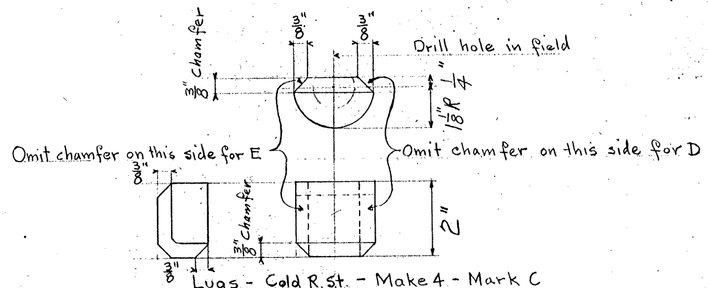
U.S. ENGINEER OFFICE, SECOND PORTLAND DISTRICT, OREGON

SUBMITTED R.M. Mackenzie, DISTRICT ENGINEER
APPROVED G.W. Williams, MAJOR, CORPS OF ENGRS.
REC. AMENDED Stentenmark, ASSISTANT ENGINEER
DRAWN BY G.S.D. DATE 8-11-35
TRACED BY CHECKED BY C.W.R.

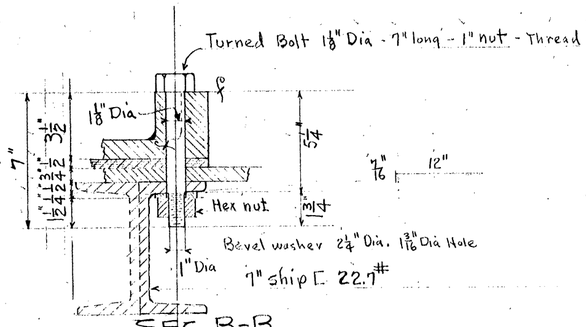
NO.	REVISION	DATE	BY	APP'D
1	Dimensions Corrected	8/23/50		

N-2-106





Lugs - Cold R.St. - Make 4 - Mark C
Lug - " " " - Make 1 - " D
Lug - " " " - Make 1 - " E



SEC. B-B.

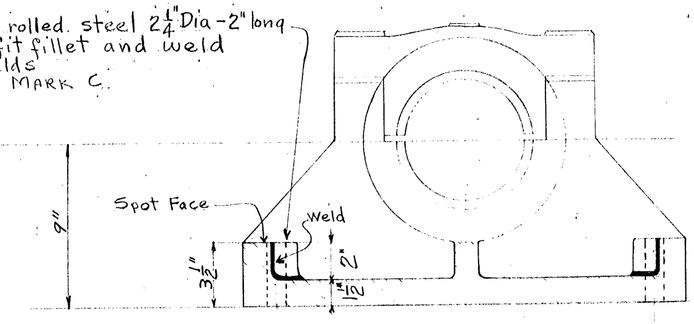
Turned bolts - Nickel Steel — MAKE 14 MARK A
Bevel washers - Machine steel — MAKE 14 " B

Bill of Material

Mark	Description	Number Required	Material	Weight
A	Turned bolts	14	Ni. Steel	45#
B	Bevel washers	14	Machine "	3#
C	Lugs	4	Cold R St.	7#
D	"	1	" "	
E	"	1	" "	

5 lin. ft. of ⅜" fillet weld

Lugs - Cold rolled steel 2¼" Dia - 2" long
Grind to fit fillet and weld
⅜" fillet welds
MAKE 6 MARK C.



SEC. A-A

NOTES:-
For Detail of Bearing See Pac. I & S. Works Dwg. No. S.D. 3504

NO.		DATE	BY	APP'D
1	Detail of lugs added	8-1935	G.S.D.	R.C.M.

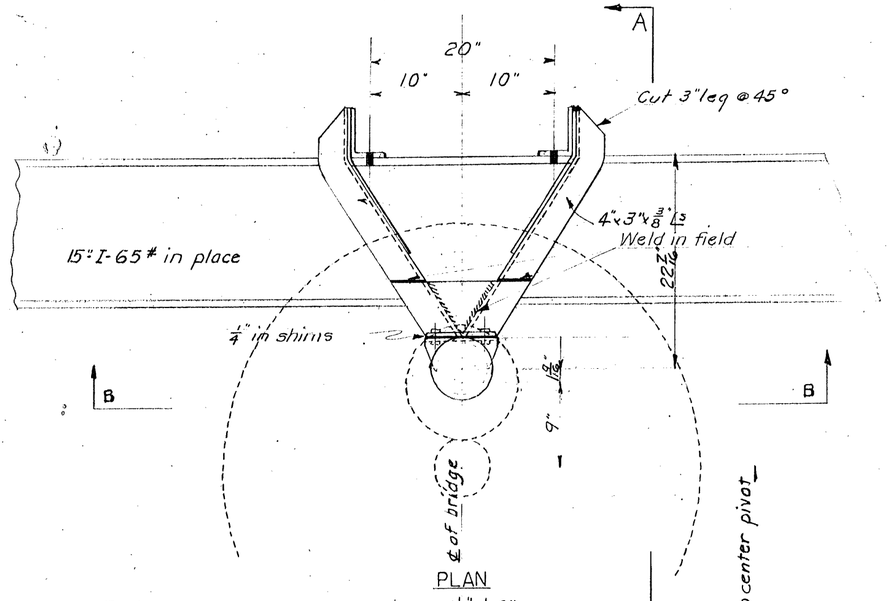
BONNEVILLE POWER NAVIGATION PROJECT

BRIDGE ACROSS NAVIGATION CANAL
SWING SPAN
PIVOT SHAFT BEARING (CHANGES)

U. S. ENGINEER OFFICE, SECOND PORTLAND DISTRICT (OREGON)

SUBMITTED: R.C. Mackenzie, ENGINEER
RECOMMENDED: [illegible], CAPTAIN, ENGINEERS
APPROVED: [illegible], MAJOR, CORPS OF ENGINEERS
DRAWN BY G.S.D. DATE 8-22-35
TRACED BY CHECKED BY C.H.R.

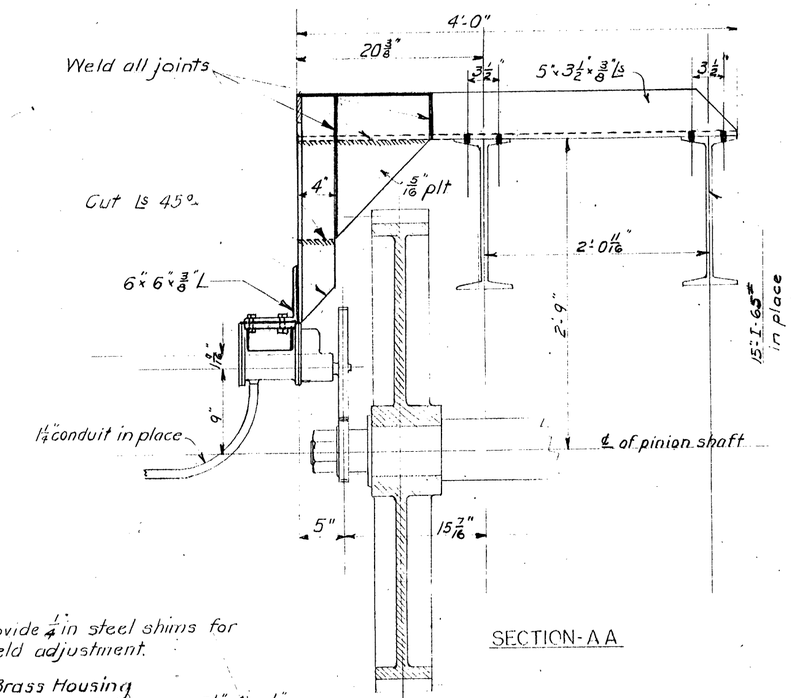
N-2-107



PLAN

SCALE 1½"=1'-0"

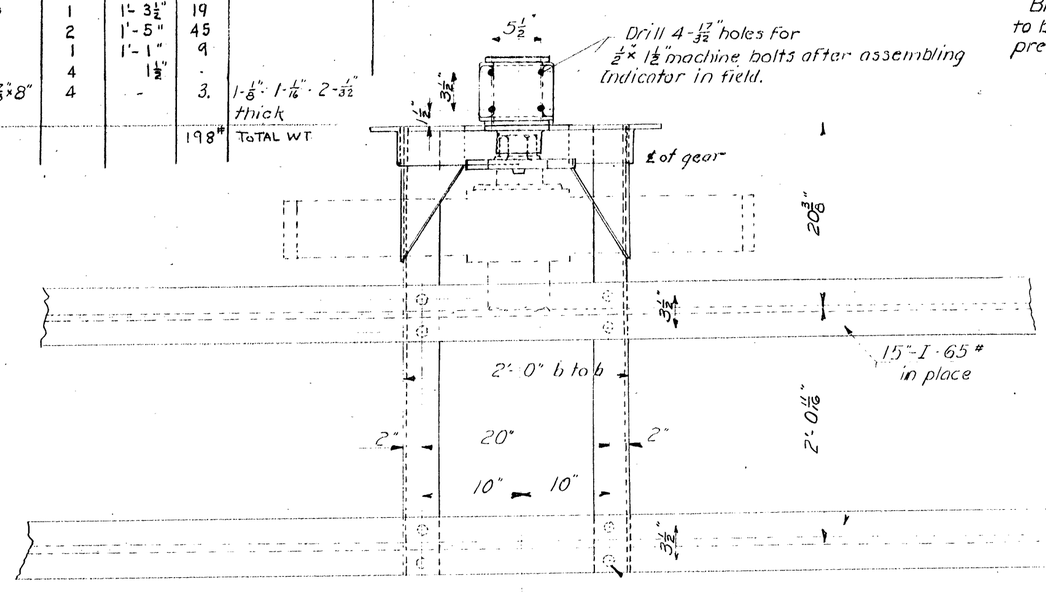
SCALE IN FEET



SECTION-A A

MATERIAL LIST Req'd

Description	No Req'd	Length	Wt	
5x3½x⅜" Ls	2	4'-0"	82	
4"x3"x⅜" Ls	2	2'-4"	40	
6"x6"x⅜" Ls	1	1'-3½"	19	
14"x⅜" plt	2	1'-5"	45	
8"x5/16" plt	1	1'-1"	9	
½" bolts	4	1½"	-	
Shims. 5⅞"x8"	4	-	3.	1-⅛" · 1-1/16" · 2-3/32" thick
			198#	TOTAL WT

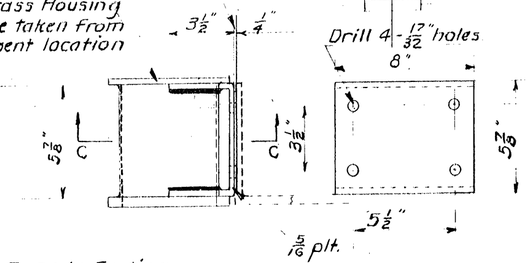


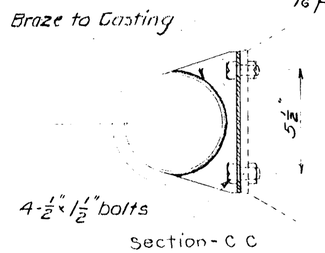
SECTION-B B

(View looking North)

Provide ¼" in steel shims for field adjustment.

Brass Housing to be taken from present location





Section-C C

DETAIL OF BASE

Scale 3"=1'-0"

NOTES

Payments will be made on basis of scale weights.

Material to be Structural Carbon Steel A.S.T.M. A-7-33.

Paint - One shop coat of Quick Drying Red Lead and Oil.

REFERENCES

For Present Location see N-2-91.
For Cross beams " N-2-106.
For Assembly of Turning Machinery see sheet 7 N-2-61.

NO	REVISION	DATE	BY	APV'D
2	Shims added.	8/24	C.H.R.	R.G.M.
1	Dimension changed.	8/23	C.H.R.	R.G.M.

BONNEVILLE POWER NAVIGATION PROJECT

BRIDGE ACROSS NAVIGABLE CANAL

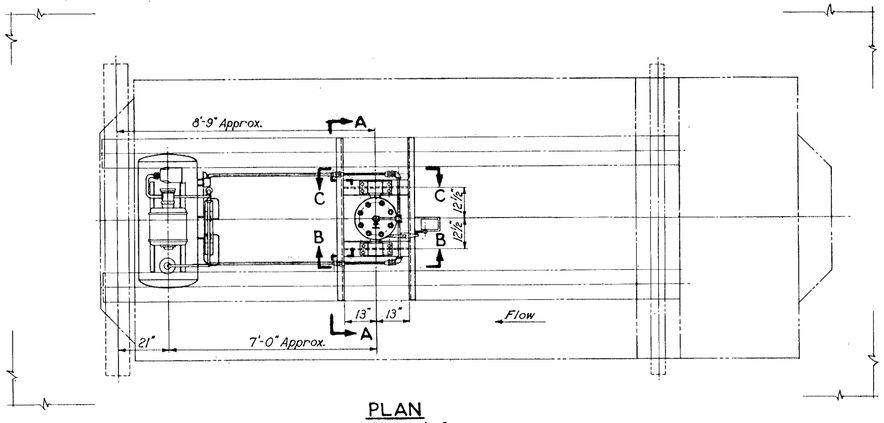
SWING SPAN

INDICATOR BRACKET CHANGES

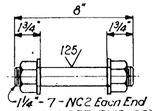
R.G. Mackenzie H.D. Williams

C.H.E. Aug 8-20-35

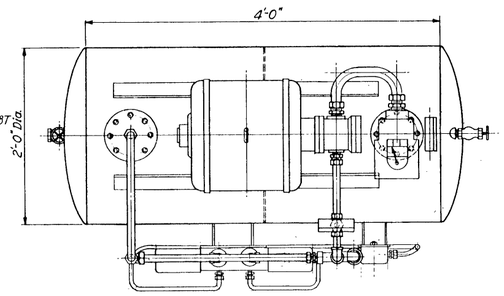
N-2-106



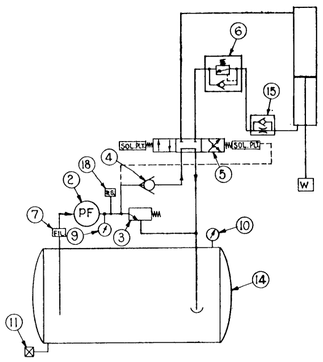
PLAN
Scale: ½"=1'-0"



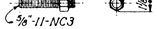
CYLINDER END COVERS
16 Required-Stud Bolt Stl. ASTM A-325-58T
32 " -Nuts
32 " -Washers Hardened



PLAN
Scale: 1½"=1'-0"

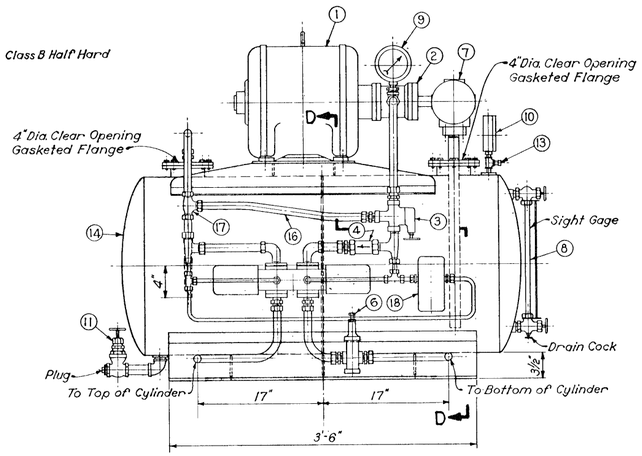


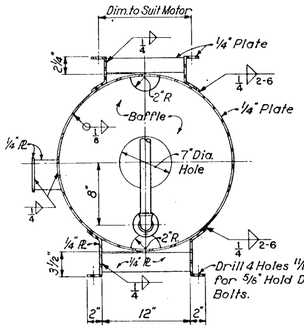
SCHEMATIC PIPING DIAGRAM
No Scale



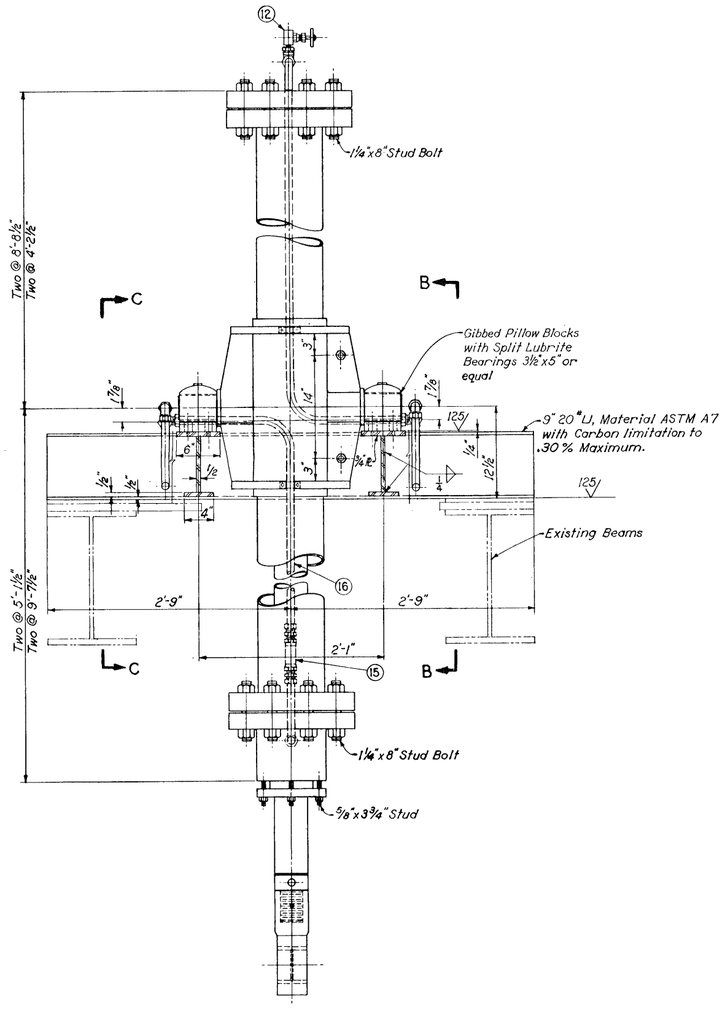
PACKING GLAND
6 Required-Bronze QQ-M-80 Class B Half Hard

BOLTS & NUTS
Scale: 3"=1'-0"

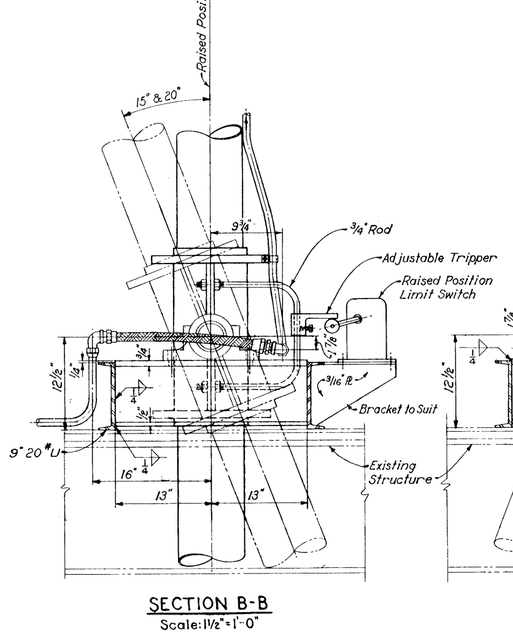




SECTION D-D
Scale: 1½"=1'-0"

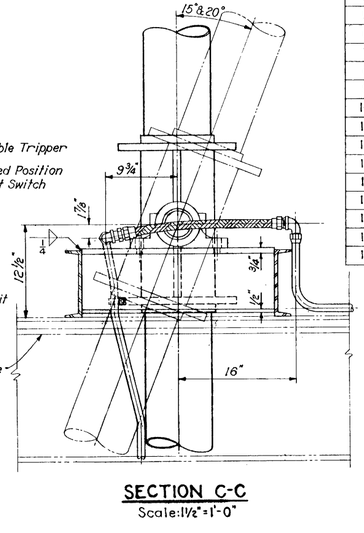


SECTION A-A
Scale: 1½"=1'-0"



SECTION B-B
Scale: 1½"=1'-0"

ELEVATION
Scale: 1½"=1'-0"



SECTION C-C
Scale: 1½"=1'-0"

PART NO.	NO. REQ'D.	ITEM	REMARKS
1	1	Induction Motor	Totally Enclosed, 1200 RPM
2	1	Rotary Vane Pump	6-8 GPM @ 1200 RPM & 1250 PSI Working Pressure
3	1	½" Pressure Relief Valve	Adjustable 1000-1500 PSI Range, 6-8 GPM Capacity
4	1	½" Check Valve	1500 PSI Body-50° Cracking Pressure
5	1	½" Four-way Valve, Spring Centered	Pilot Operated, Solenoid Controlled
6	1	½" Counterbalance Valve	1000-1500 PSI Range
7	1	Oil Filter Element	Indicating Type
8	1	Sight Gage	18"
9	1	4½" Pressure Gauge 0-2000 PSI	Fed. Spec. GG-G-76a, Class 2, Type B
10	1	4½" " " 0-30 PSI	" " " " " " " "
11	1	1" Gate Valve	Brass
12	1	Air Bleeder Valve	¼" Bar Stock Valve 1500 PSI
13	1	Tire Valve & Cap	
14	1	Oil Storage Tank	Fed. Spec. QQ-S-741a, Type II
15	1	Fixed Flow Valve	15 GPM With Free Reverse Flow Check Valve
16	As Req'd.	Hydraulic Lines	¾" O.D. Tubing & ¼" O.D. Tubing
17	" "	Fittings	Swagelok
18	1	Pressure Switch	110 Volts

Note: All items shown are for one system-four complete systems are required.

THIS PRINT REDUCED TO ONE-HALF SCALE

REVISION	DATE	DESCRIPTION	BY

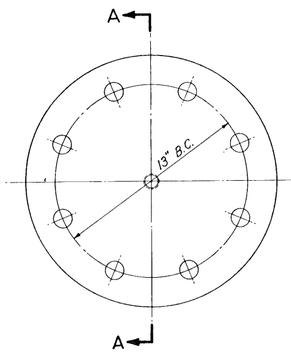
U. S. ARMY ENGINEER DISTRICT, PORTLAND
CORPS OF ENGINEERS
OFFICE OF THE DISTRICT ENGINEER, PORTLAND, OREGON

DESIGNED: O.H.T.
DRAWN: R.J.S.
CHECKED: H.W.M.
REVIEWED: CHIEF, SAFETY BRANCH
SUPERVISED: CHIEF, MECHANICAL SECTION
SUBMITTED: CHIEF, DESIGN BRANCH
RECOMMENDED: CHIEF, ENGINEERING DIVISION
APPROVED: COLONEL, C. E., DISTRICT ENGINEER
DATE: 10 Nov 1960

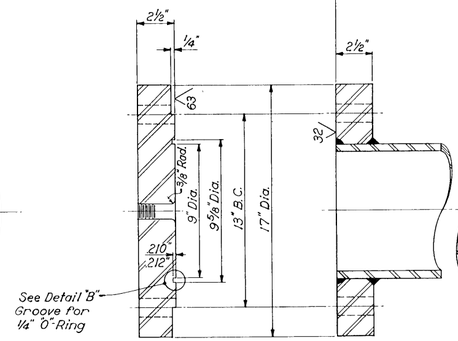
BONNEVILLE DAM
COLUMBIA RIVER OREGON-WASHINGTON
TAINTER VALVE OPERATOR
PLANS, SECTIONS AND HYDRAULIC SYSTEM

SCALE AS SHOWN SPEC. NO.
N-2-109/1
SHEET OF

CORPS OF ENGINEERS 4 3 2 1 U. S. ARMY

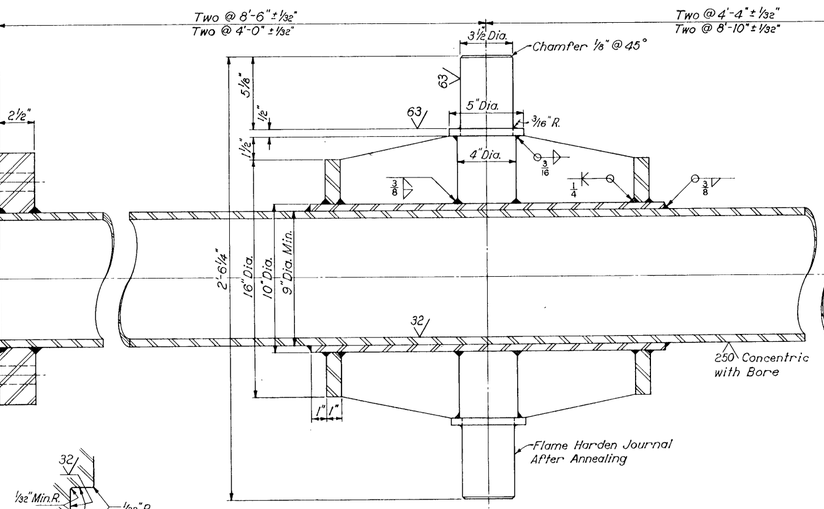


PLAN

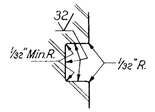


SECTION A-A

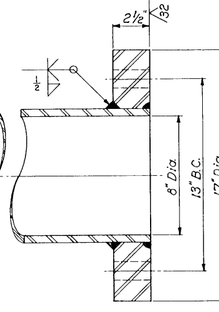
HEAD END COVER
Scale: 3"=1'-0"

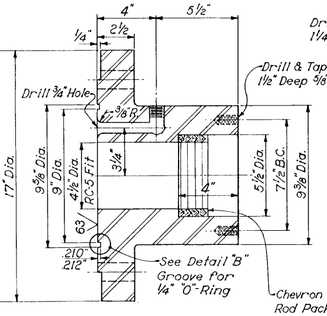


CYLINDER & TRUNNION
Scale: 3"=1'-0"

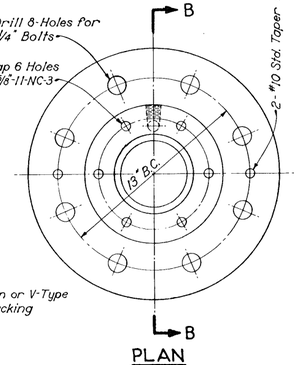


DETAIL "B"
No Scale



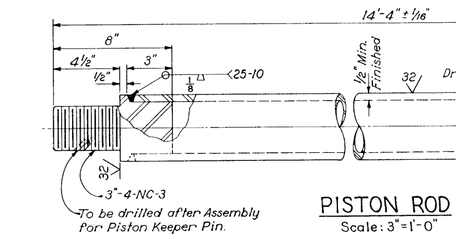


SECTION B-B

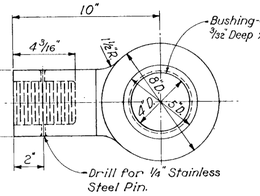


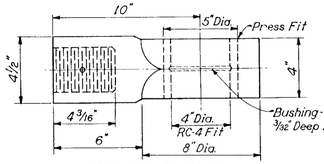
PLAN

ROD END COVER
Scale: 3"=1'-0"

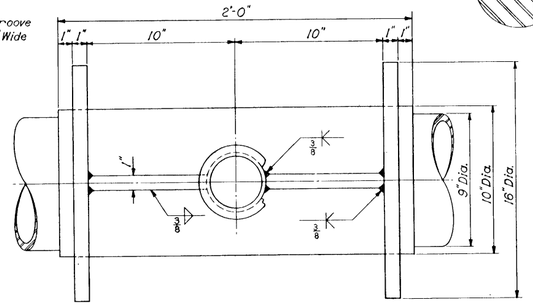


PISTON ROD
Scale: 3"=1'-0"

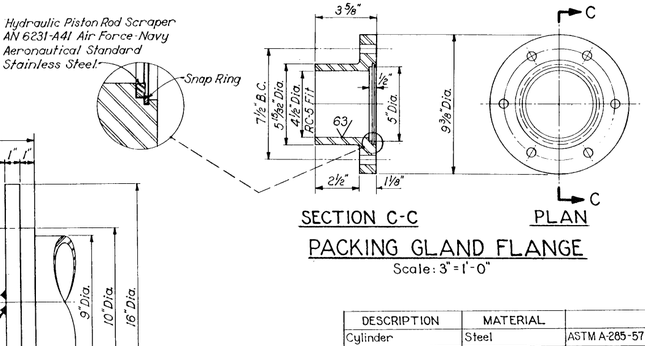




FEMALE EYE
Scale: 3"=1'-0"



TRUNNION
Scale: 3"=1'-0"



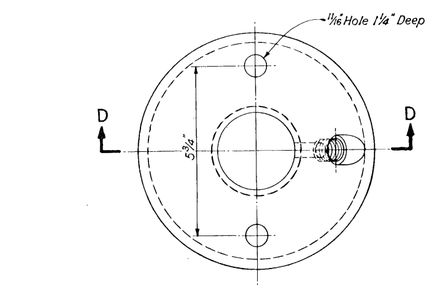
SECTION C-C

PLAN

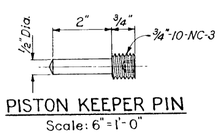
PACKING GLAND FLANGE
Scale: 3"=1'-0"

DESCRIPTION	MATERIAL	REMARKS
Cylinder	Steel	ASTM A-285-57 T, Firebox, Grade C
Piston Rod	Stainless Steel	" A-269-60, TP304
Flanges	Forged Steel or	" A-181-59 T, Grade I
	Cast Steel	Fed. Spec. QQ-S-681b, Class I
Trunnion	Steel	" " " - 741a, Type II
Piston	Cast Iron	" " "-I-652a, Class 30
Piston End Socket	Steel	" " "-S-741a, Type II
Female Eye "	Stainless Steel	ASTM-A-314-58 Type 304
" "	" "	" " " "
" " Bushing	Leaded Bronze	Fed. Spec. QQ-L-225, Comp. 7
Packing Gland Flange	Cast Steel	" " " -S-681b, Class 2
Spanner Wrenches	Steel	" " " - 633a, FS-1030
Rod Packing	Teflon	Chevron or V Type
Trunnion Shaft	Steel	Fed. Spec. QQ-S-633a, FS-1030

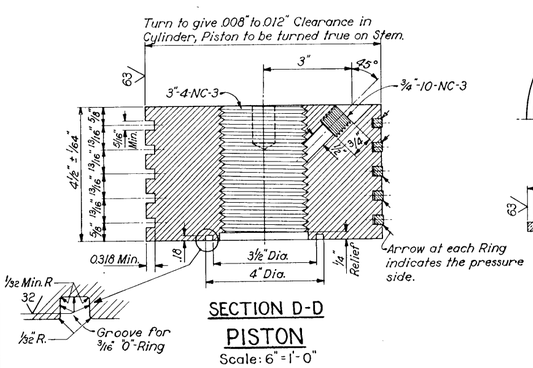
Notes:
1. All items shown are for one system - four complete systems are required.
2. Fits shall be in accordance with American Standard "Preferred Limits and Fits for Cylindrical Parts" ASA B4.1-1955.



PLAN

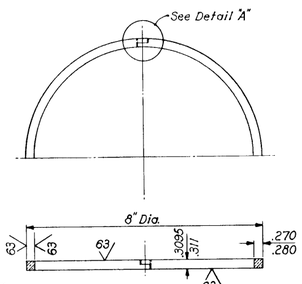


PISTON KEEPER PIN
Scale: 6"=1'-0"

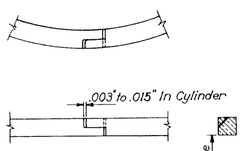


SECTION D-D

PISTON
Scale: 6"=1'-0"



PISTON RING
Scale: 6"=1'-0"



DETAIL "A"
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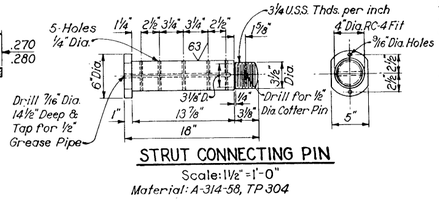
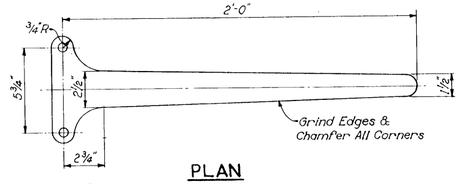
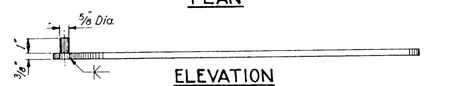


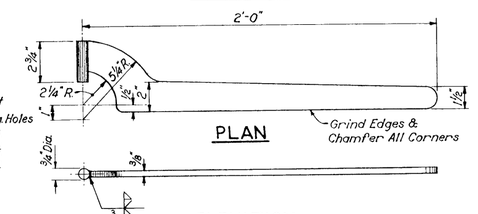
STRUT CONNECTING PIN
Scale: 1½"=1'-0"
Material: A-314-58, TP 304



PLAN



ELEVATION



PLAN

ELEVATION

SPANNER WRENCHES
Scale: 3"=1'-0"

THIS PRINT REDUCED TO ONE-HALF SCALE

REVISION	DATE	DESCRIPTION	BY

U. S. ARMY ENGINEER DISTRICT, PORTLAND
CORPS OF ENGINEERS
OFFICE OF THE DISTRICT ENGINEER, PORTLAND, OREGON

DESIGNED: O.H.T.
DRAWN: R.I.S.
CHECKED: H.W.M.
REVIEWED: W. F. Swindler, Chief, Safety Branch
SUPERVISED: L. F. Shellin, Chief, Mechanical Section
SUBMITTED: Chief, Design Branch
RECOMMENDED: Chief, Engineering Division

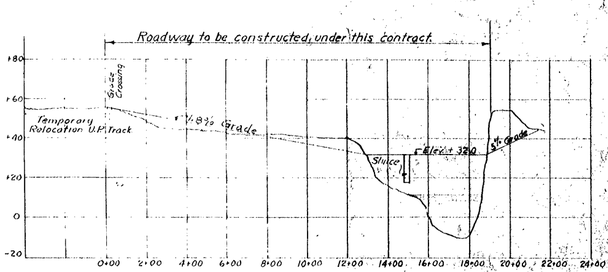
BONNEVILLE DAM
COLUMBIA RIVER OREGON-WASHINGTON
TAINTER VALVE OPERATOR

DETAILS

APPROVED: Colonel, C. E., District Engineer
DATE: 10 Jan. 58
SCALE AS SHOWN
SPEC. NO.
SHEET OF
N-2-109/2

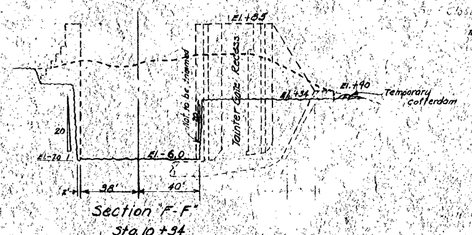
4 3 2 1

WAR DEPARTMENT — CORPS OF ENGINEERS, U.S. ARMY.

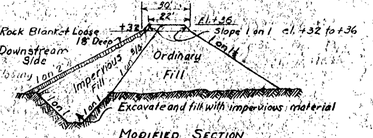


ROADWAY PROFILE

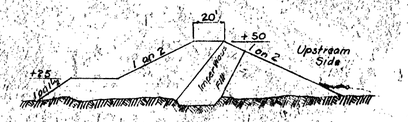
Scale: 1"=30' Vertical
1"=300' Horizontal



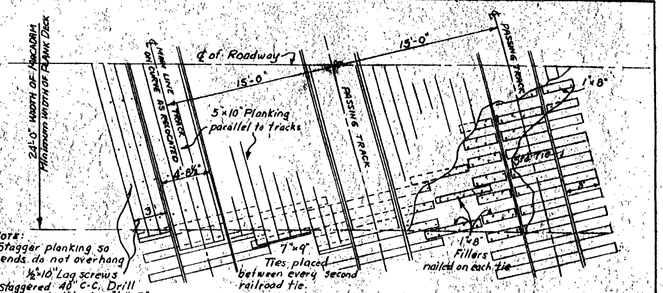
Section "F-F"
Sta. 10+94



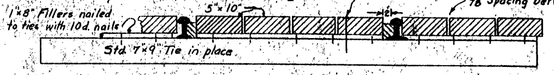
MODIFIED SECTION
LOWER COFFERDAM
Scale: 1"=40'



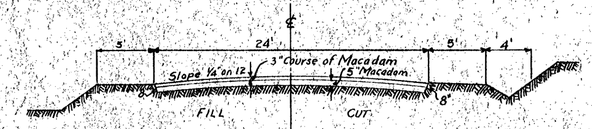
MODIFIED SECTION
UPPER COFFERDAM
Scale: 1"=40'



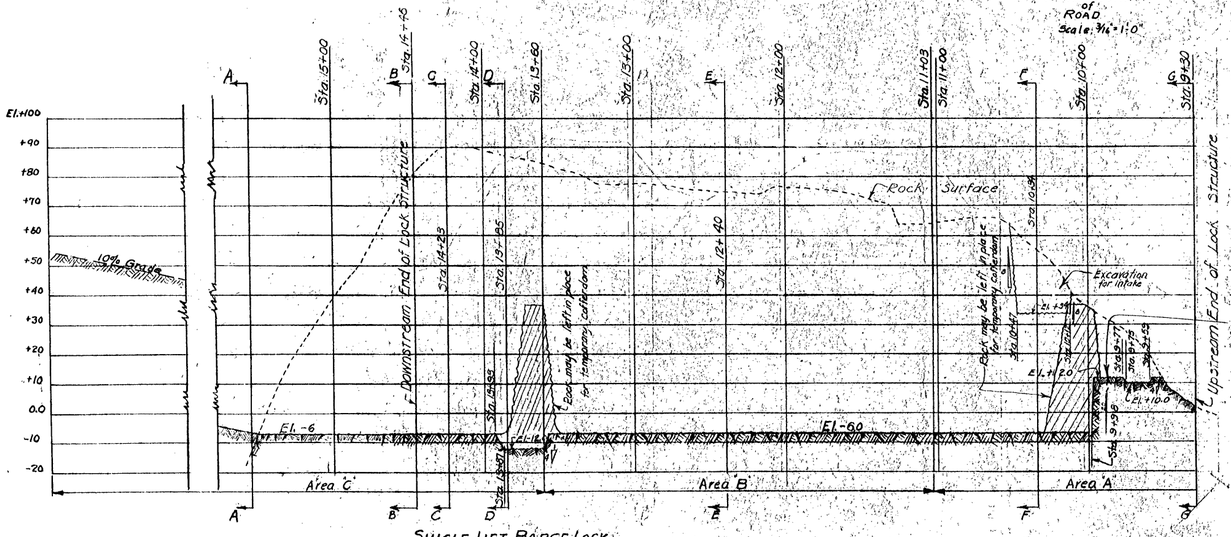
HALF PLAN OF GRADE CROSSING
Scale: ⅜"=1'-0"



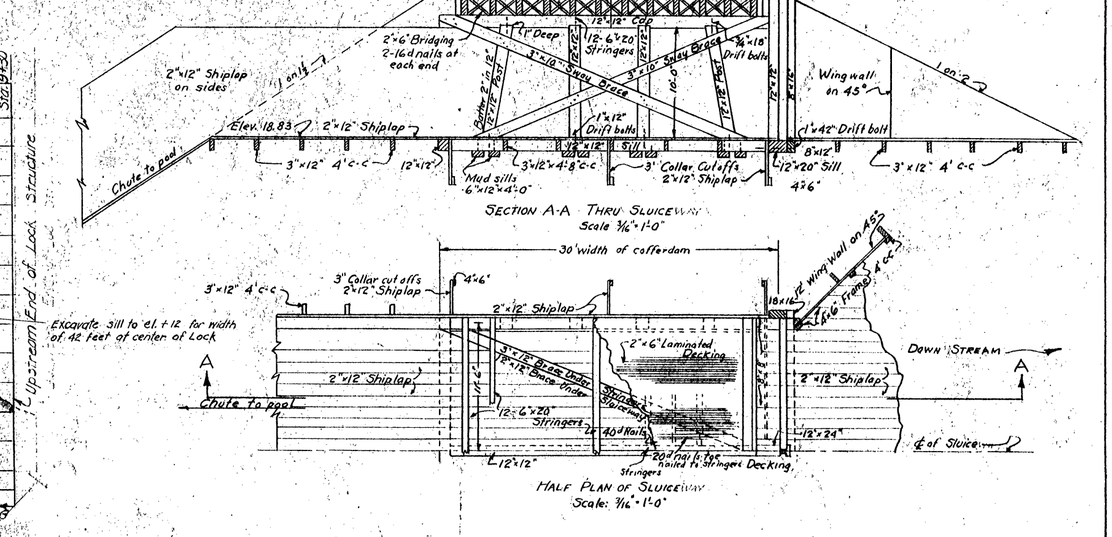
TYPICAL SECTION THRU GRADE CROSSING
Scale: ¾"=1'-0"



TYPICAL SECTION OF ROAD
Scale: ¾"=1'-0"

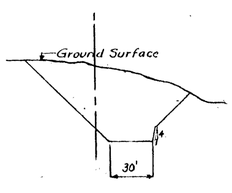


SINGLE LIFT BARGE LOCK
Longitudinal Section on ℄ of Lock
Scale: 1"=20' Vertical
1"=40' Horizontal

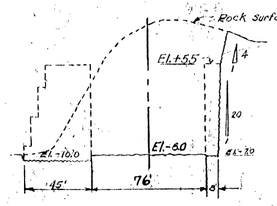


SECTION A-A THRU SLUICEWAY
Scale ⅜"=1'-0"

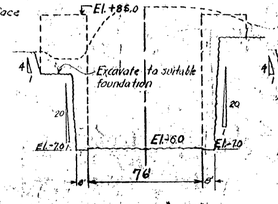
HALF PLAN OF SLUICEWAY
Scale: ⅜"=1'-0"



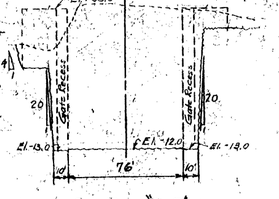
Section "A-A"
Scale: 1"=40'



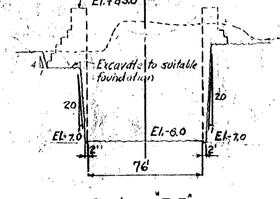
Section "B-B"
Sta. 14+46



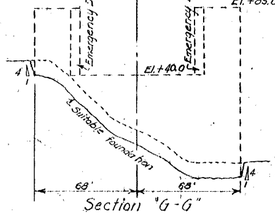
Section "C-C"
Sta. 14+29



Section "D-D"
Sta. 13+85

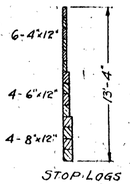


Section "E-E"
Sta. 12+40



Section "G-G"
Sta. 9+30

Note: Stringers dapped to make 1" crown in deck.



STOP-LOGS

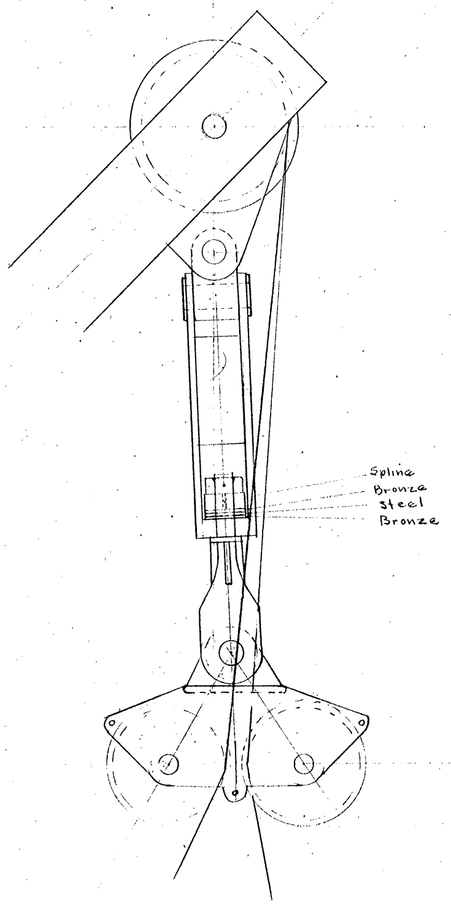
Note: This drawing supersedes No. N-2-5

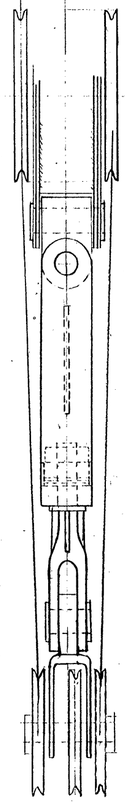
BONNEVILLE POWER-NAVIGATION PROJECT
COFFERDAMS, EXCAVATION, AND ROADWAY FOR POWER HOUSE AND LOCK
LOCK EXCAVATION, COFFERDAM & ROADWAY DETAILS
5TH CONTRACT
US ENGINEER OFFICE, PORTLAND OREGON DISTRICT

CHANGE	REVISION	CHECKED	
2	Changed Cofferdams Longitudinal Sec. Sta. 9 Section A-A & G-G Also Sta. 9+73	R.E.M.	4-9-31
1	Removed: Slopes & Dimension for Impervious Fill in Typical Sections of Lower & Upper Cofferdams (Y Cut off Items)	R.E.M.	

SUBMITTED: K.D. Mackenzie, ENGINEER
APPROVED: H. Williams, MAJOR CORPS OF ENGINEERS U.S.A.
RECOMMENDED: [illegible], PRINCIPAL ENGINEER
SCALE AS SHOWN DATE JAN 22 1931
DRAWN BY R.S.D. CHECKED BY R.E.M.

SHEET 3 OF 3 N-2-10





BONNEVILLE POWER NAVIGATION PROJECT

33RD CONTRACT

SHIP LOCK EMERGENCY DAM

DERRICK BOOM POINT

STUDY

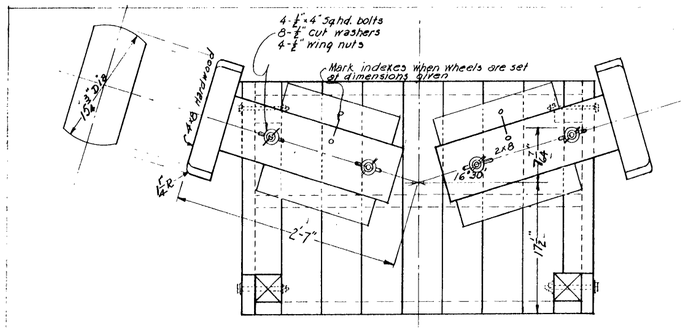
U. S. ENGINEER OFFICE, SECOND PORTLAND DISTRICT (OREGON)

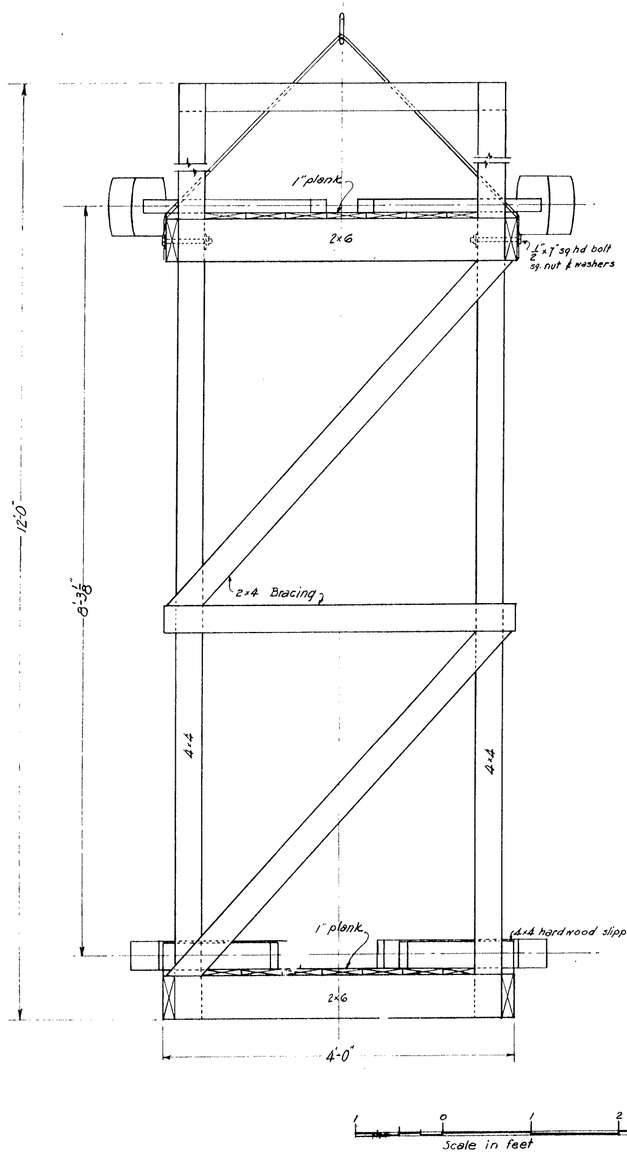
SUBMITTED: ENGINEER	APPROVED: LT. COL. CORPS OF ENGINEERS
RECOMMENDED: SENIOR ENGINEER	DESIGNED BY ... DATE 9-4-35
	DR. BY G.S.D TR. BY ... CHECKED BY ...

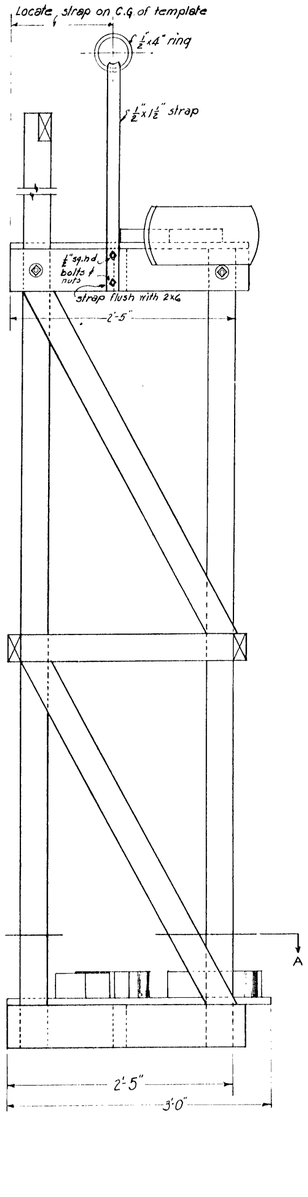
N-2-112

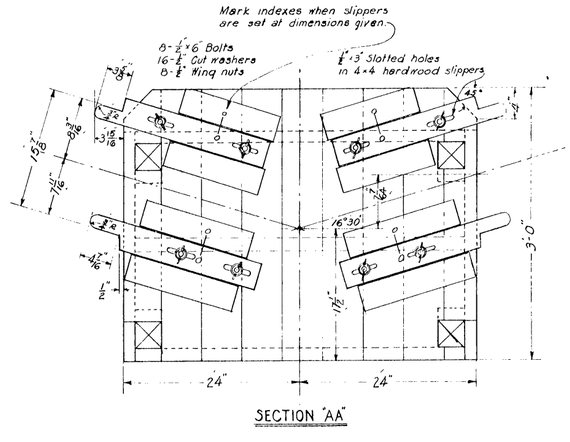
WAR DEPARTMENT

CORPS OF ENGINEERS U.S. ARMY









SECTION "AA"

MATERIAL FOR MOORING BITT TEMPLATE

No	Size	Location.		
2	4×4×12'-0"	Corner Posts Front.		
2	4×4×8'-10"	" " Back.		
4	2×6×3'-9"	Top & Bottom horizontal front & back.		
4	2×6×2'-7"	" " " Sides.		
1	2×4×4'-0"	Hand rail.	Structural No 1 Dimension Douglas Fir S4S.	
2	2×4×4'-0"	Hor. brace.		
2	2×4×2'-3"	" "		
4	2×4×5'-6"	Diag brace.		
4	2×4×4'-6"	" "		160 Ft. BM.
4	2×4×1'-6"	Wheel guide.		
8	4×4×1'-3"	Slipper guide.		
2	2×8×2'-0"	Wheel support.		
22 Sq.Ft	1" planking	Top & bottom decks.		
4	4×4×2'-0"	Slippers.	Hard wood	17 Ft. B.M.
2	4×8×1'-4	Wheel template.		
12	½"×6" Sq. hd bolts	Slippers & Top hor. 2×6's to 4×4 cor. posts.		
4	½"×4" " " "	Wheels.		
4	½"×3" " " "	Lifting bridle.		
12	½" Wing Nuts			
8	½" Sq. Nuts			
36	½" Cut washers.			
1	½"×1½"×6'-6" Str. Steel strap.	Lifting bridle.		
1	1"×4" Dia Wrot. ring		40# Hdw & Steel	

Total est. Wt = 565 Lb.

Reference:
See Drawings Sheets 1, 2, 3 & 4 N-2-102.
for details Floating Mooring Bitt.

BONNEVILLE POWER NAVIGATION PROJECT

FLOATING MOORING BITT RECESS MEASURING TEMPLATE

Scale ½" = 1 foot.

U. S. ENGINEER OFFICE, SECOND PORTLAND DISTRICT, OREGON.

SUBMITTED: ..... DISTRICT ENGINEER

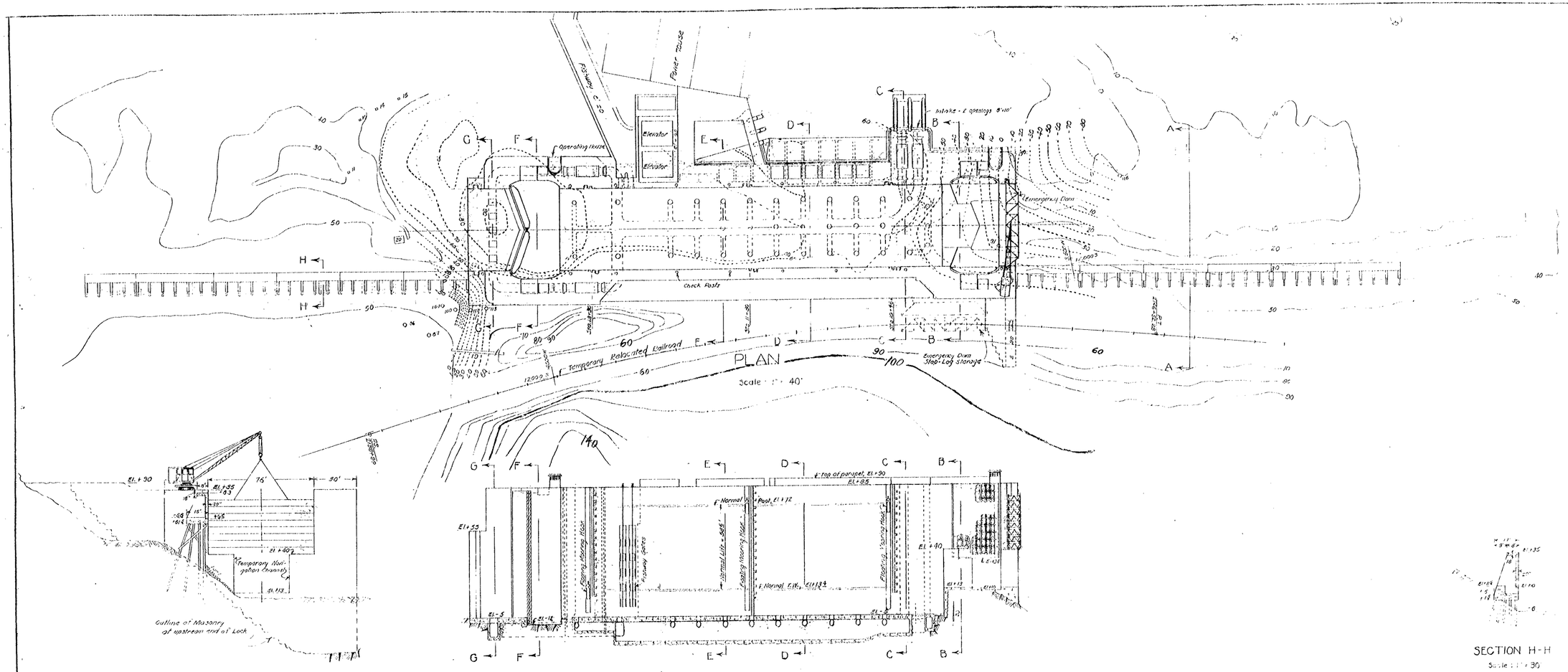
APPROVED: ..... CHIEF, CORPS OF ENGINEERS

RECOMMENDED: ..... Section Engineer

DESIGNED BY A.C.P. DATE 10-5-35.

DR. BY ..... TR. BY ..... CHECKED BY .....

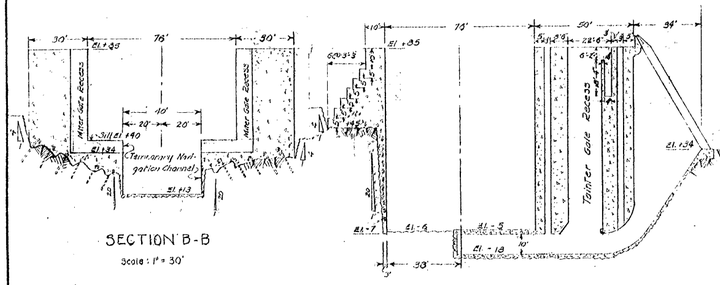
N-2-113



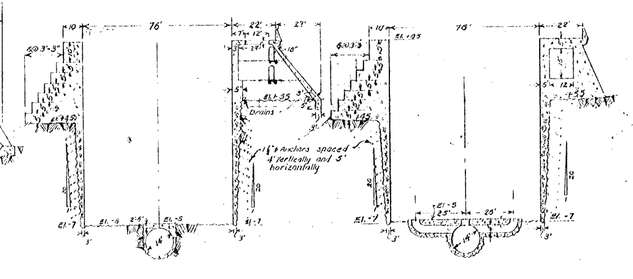
SECTION A-A
Scale: 1" = 30'

LONGITUDINAL SECTION ON ℄ OF LOCK
Scale: 1" = 40' Horiz.
1" = 30' Vert.

SECTION H-H
Scale: 1" = 30'



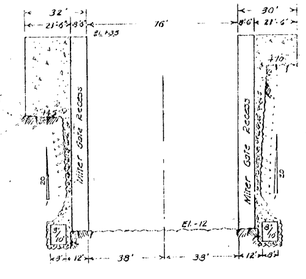
SECTION B-B
Scale: 1" = 30'



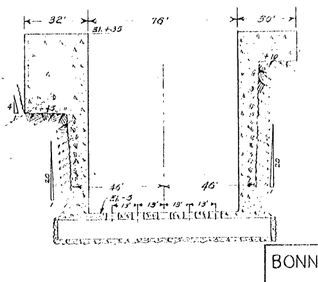
SECTION C-C
Scale: 1" = 30'

SECTION D-D
Scale: 1" = 30'

SECTION E-E
Scale: 1" = 30'



SECTION F-F
Scale: 1" = 30'



SECTION G-G
Scale: 1" = 30'

Test Pit No.	Elev.	Material	Elev. Bottom
5	+19	Loose Gravel	+19
10	+36	Andesite	+36
11	+32	"	+32
14	+35	"	+35
15	+41	"	+41
19	+40	"	+40
20	+28	"	+28
Drill Hole No.			
6		Q.G. Sand, Gravel, Clay	-28
8A		Sand, Gravel, Boulders, Clay	-30
9A	-16	Andesite	
	-37	Intense Ash	
	-53	Eagle Creek	-69
9	+12	Andesite	-3
12		Sand, Gravel, Clay	+2.3
100		Clay, Andesite	
11	+3	Andesite	
	-10	Eagle Creek	-52
113	+10	Andesite	
	-52	Eagle Creek	-92
116	+5	Eagle Creek	
	-89	Andesite	-92

BONNEVILLE POWER-NAVIGATION PROJECT

GENERAL PLAN OF NAVIGATION LOCK

U. S. ENGINEER OFFICE, PORTLAND, OREGON DISTRICT

SUBMITTED	APPROVED
ENGINEER	MAJOR CORPS OF ENGINEERS U.S.A.
RECOMMENDED	SCALE AS NOTED — APR 16 1934
HEAD ENGINEER	DRAWN BY: A.R.B. — CHECKED BY:

N-2-26

TOP OF COPING EL. 85.00

19"

℄ OF ANCHOR PIN

EL. 82.5625 (1)

EL. 81.9375 (1)

7½"

8¼"

12"

EL. +82.25 (1)

EL. +81.25 (1)

EL. +80.875 (1)

4½"

℄ TOP GIRDER EL. 81.25 (1)

SHIMS

℄ OF LOCK

CONTACT LINE

CANVAS & RED LEAD

SHIMS

CONTACT LINE

CANVAS & RED LEAD

GREASE PIPE

(1) 1½"

3'-4½"

1'-8½"

10"R.

16"

8"

2"

14"

16"

4½"

EL. +35.25 UPPER GATE
EL. -20.75 LOWER GATE

GROUT

℄ OF PINTLE

QUOIN END

℄ BOTTOM GIRDER - EL. +39.00 - UPPER GATE.
EL. -17.00 - LOWER GATE.

MITER END.

SECTION 'A-A'
DRWG. N-2-40

SCALE IN FEET
0 1 2 3
SCALE 1½" = 1 FOOT

NO.	REVISION	DATE	BY	APV'D
1	EL. MOVED 3" DOWNWARD	9-23-34	CWB.	

BONNEVILLE POWER NAVIGATION PROJECT

SHIP LOCK

MITER GATES

QUOIN & MITER ENDS ASSEMBLY.

U. S. ENGINEER OFFICE. PORTLAND, OREGON DISTRICT

SUBMITTED: ..... ENGINEER

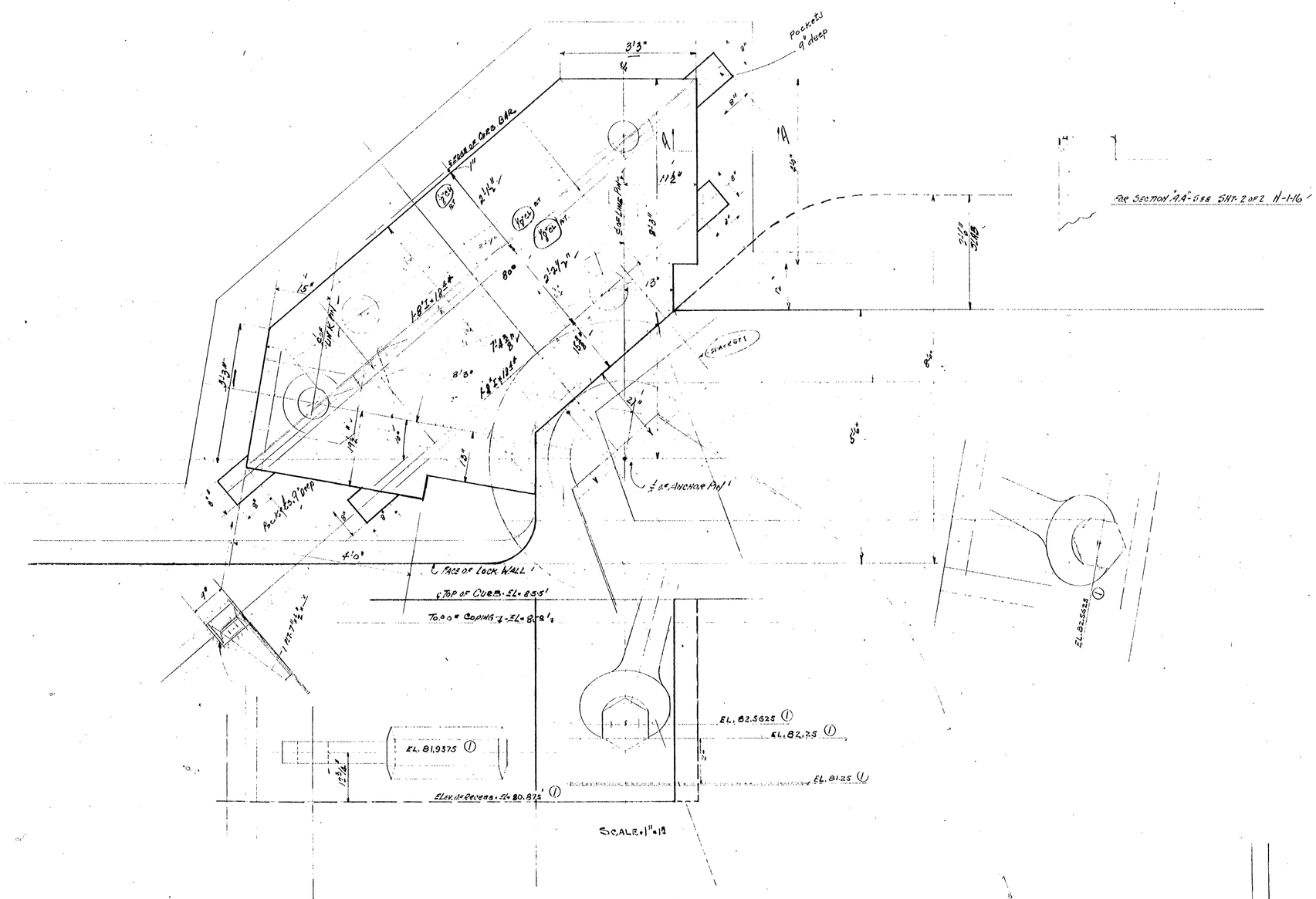
APPROVED: ..... MAJOR, CORPS OF ENGINEERS

RECOMMENDED: ..... HEAD ENGINEER

DRAWN BY C. W. B. DATE 9-10-34.

TRACED BY ..... CHECKED BY A. A. O.

N-2-41



NO	REVISION	DATE	BY	APV'D
1	EL. MOVED 3" DOWNWARD	9-25-4	CHS.	

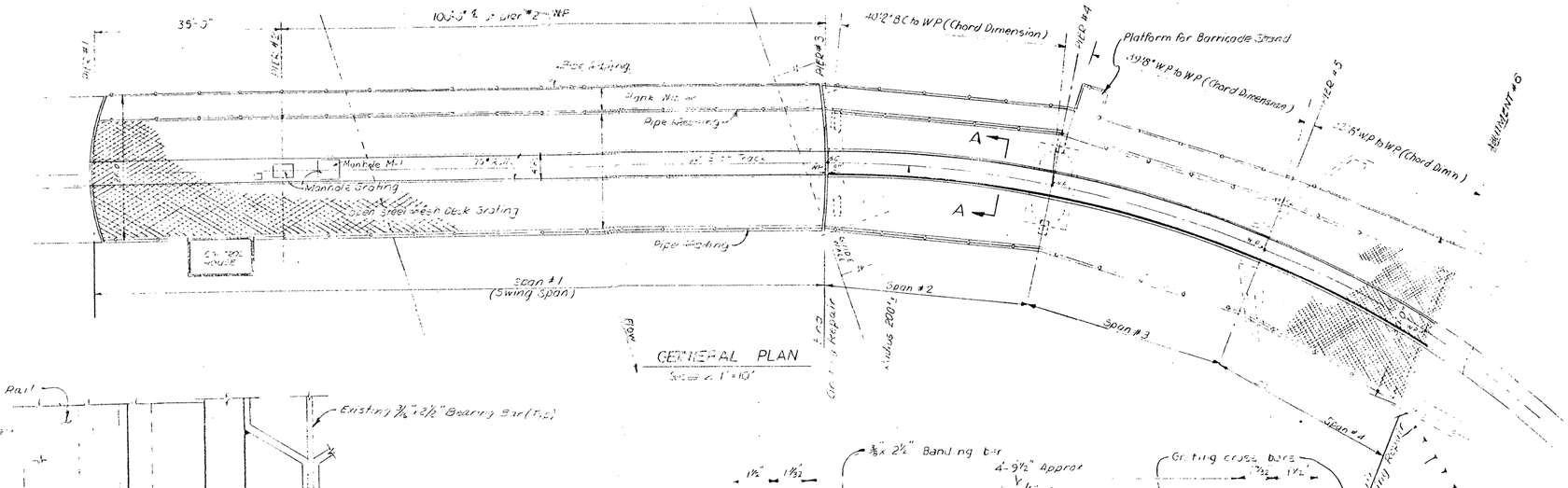
BONNEVILLE POWER NAVIGATION PROJECT

CONCRETE RECESS
FOR
MITER GATE
ANCHOR LINKAGE

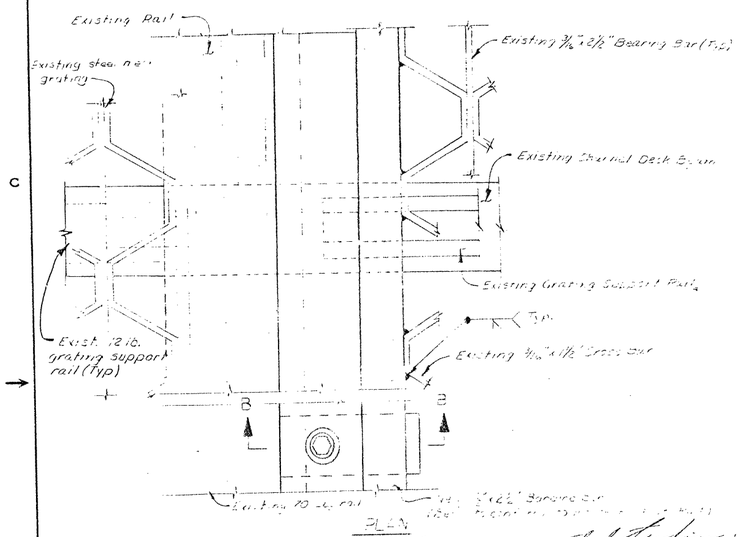
U. S. ENGINEER OFFICE, PORTLAND, OREGON, DISTRICT

SUBMITTED: ENGINEER	APPROVED: MAJOR, CORPS OF ENGINEERS
RECOMMENDED: HEAD ENGINEER	DRAWN BY: CTD DATE: 1-11-43-1
	TRACED BY: CTD CHK'D BY: A.K.D.S.

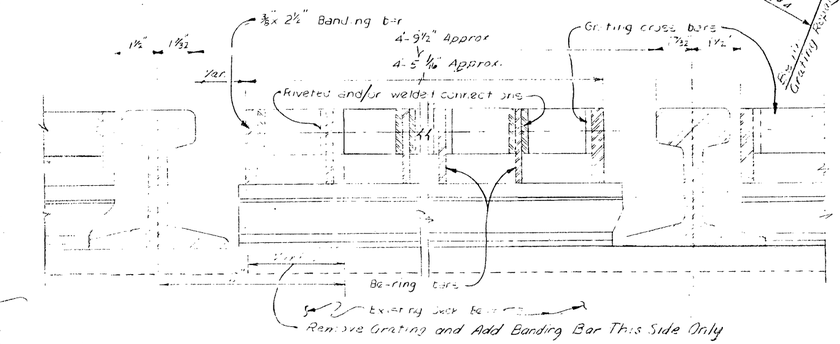
N-2-42



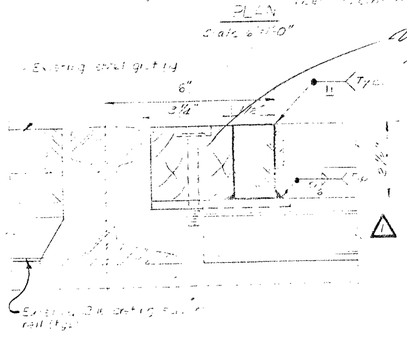
GENERAL PLAN
Scale: 1" = 10'



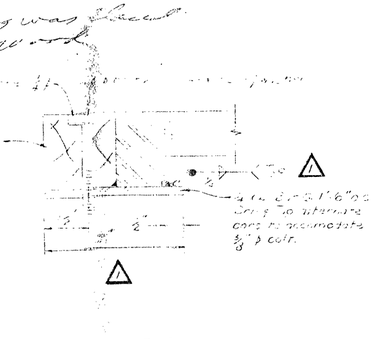
PLAN
Scale: 3"=1'-0"



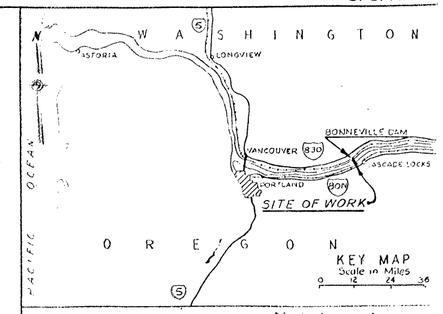
SECTION A-A
EXISTING STEEL GRATING & RAILS
Scale: 3"=1'-0"

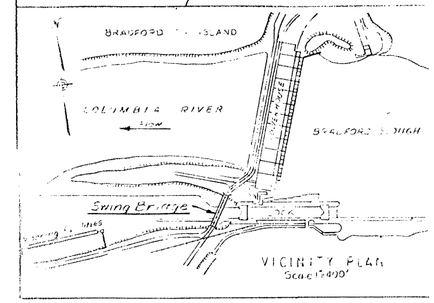


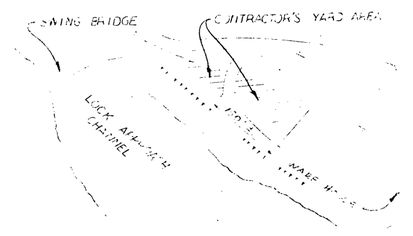
TYPICAL SECTION
Scale: 6"=1'-0"



SECTION B-B
Scale: 6"=1'-0"







CONTRACTOR'S YARD AREA
NOT TO SCALE

REVISION	DESCRIPTION

U. S. ARMY ENGINEER DISTRICT, PORTLAND

BONNEVILLE DAM PROJECT
COLUMBIA RIVER OREGON - WASHINGTON

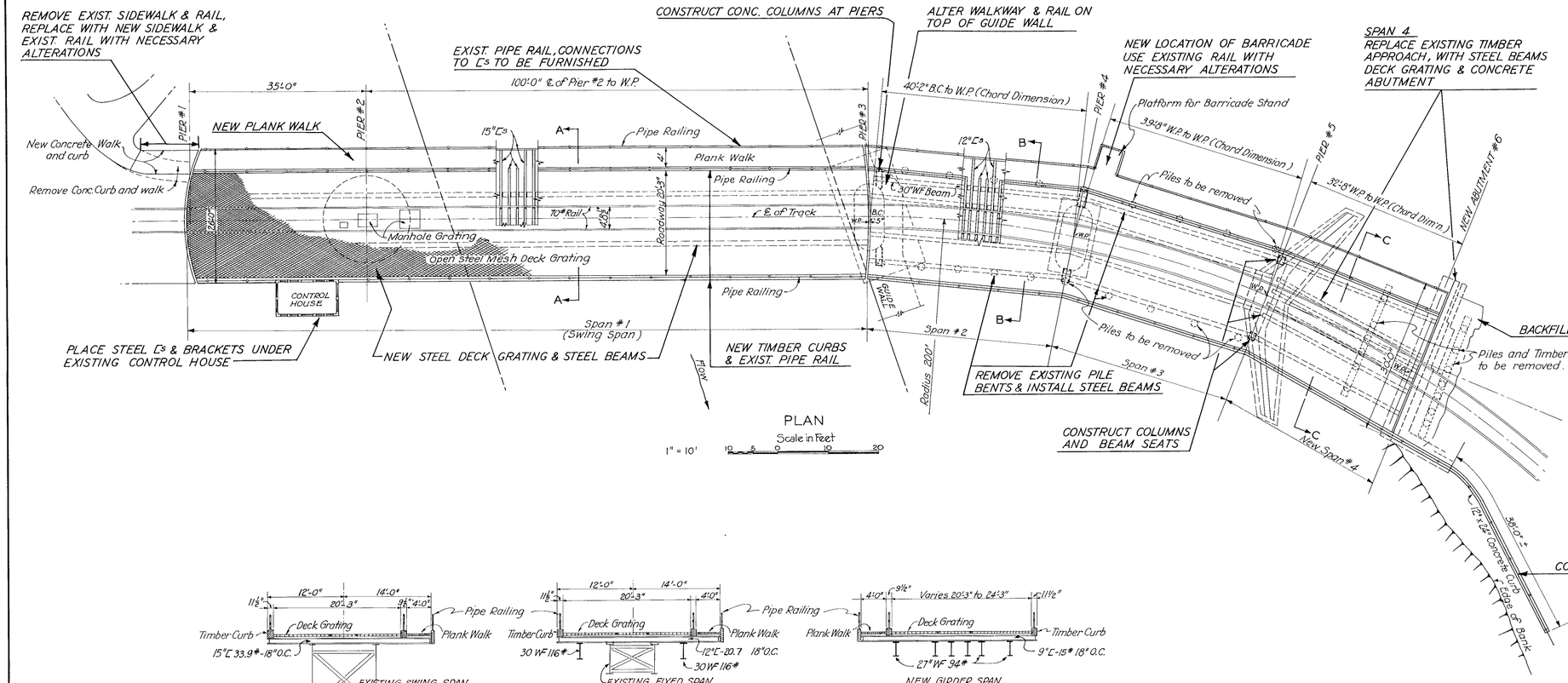
SWING BRIDGE RECONSTRUCTION

GRATING REPAIR

DESIGNED:	
DRAWN: WPB - JAC	
CHECKED:	
PREPARED: W. R. Grayvil	
SUPERVISED: Ray K. McMoore, CHIEF STRUCTURES SECTION	APPROVED: Earl D. Price, COLONEL, C. E., DISTRICT ENGINEER — DATE: 29 OCT 64
SUBMITTED: Harold A. Nisley, CHIEF DESIGN BRANCH	SCALE AS SHOWN SPEC. NO.
RECOMMENDED: CHIEF ENGINEERING DIVISION	SHEET 1 OF 1 N-2-43A1

CORPS OF ENGINEERS

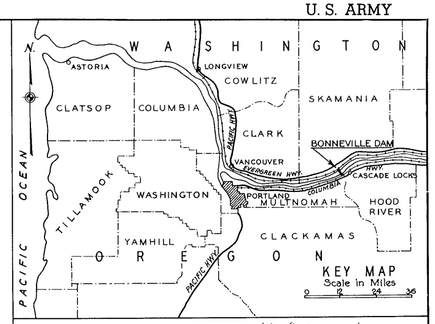
U. S. ARMY

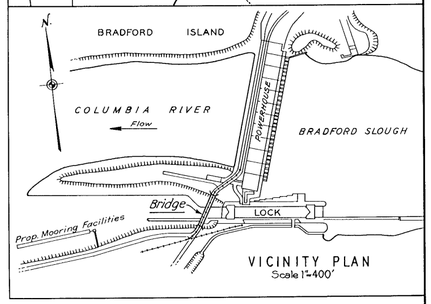


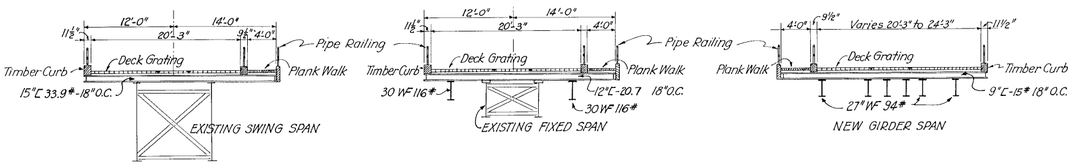
PLAN

Scale in Feet

1" = 10' 10 5 0 10 20

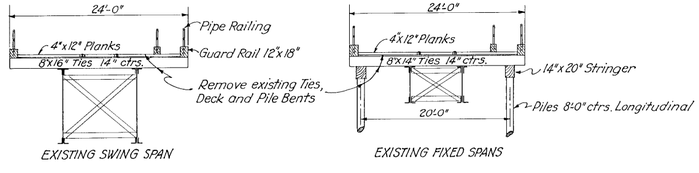






SECTION A-A SECTION B-B SECTION C-C

TYPICAL SECTIONS OF PROPOSED CONSTRUCTION



TYPICAL SECTIONS OF BRIDGE DECK
ORIGINAL CONSTRUCTION

Scale in Feet

1/8" = 1'-0" 10 5 0 10 20

NOTE:
For original construction refer to reference Dwgs. Sheet 2 of N-2-43 and Sheet 8 of N-1-11. Since construction, minor changes have been made during maintenance. The extent of these changes are to be determined in the field by the contractor.

FOR INFORMATION ONLY

THIS PRINT REDUCED TO ONE-HALF SCALE

REVISION	DATE	DESCRIPTION	BY

CORPS OF ENGINEERS, U. S. ARMY
OFFICE OF THE DISTRICT ENGINEER, PORTLAND, OREGON

DRAWN BY R.M.H.
TRACED BY C.A.S.
CHECKED BY D.W.S.
PREPARED: Design Section
SUBMITTED: R.W. Abbott, Head, Design Branch
RECOMMENDED: Chief, Engineering Division
REVIEWED BY: for Head, Safety Branch

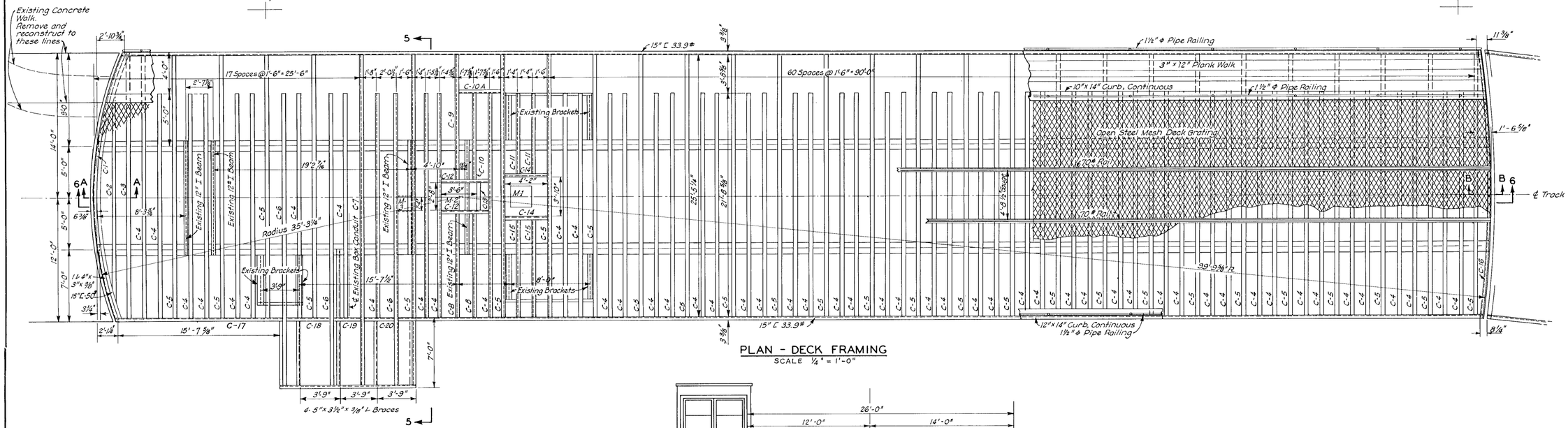
BONNEVILLE DAM PROJECT
COLUMBIA RIVER OREGON-WASHINGTON

SWING BRIDGE

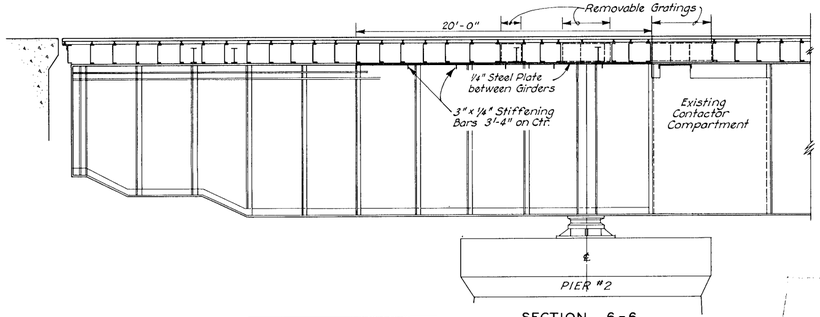
GENERAL PLAN

APPROVED: Colonel, C.E. District Engineer
DATE 1-20-76
SCALE AS SHOWN SPEC. NO.
SHEET 1 OF 6 N-2-43A

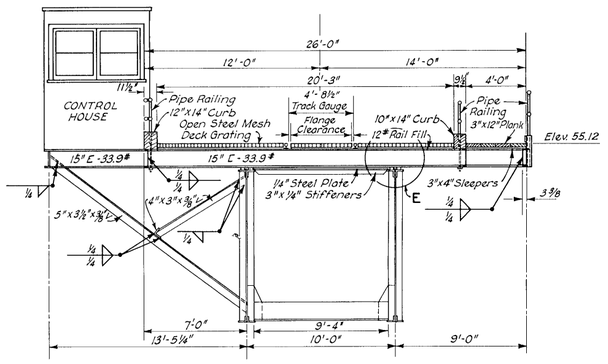
Paint New Lock Swing Bridge Bid No. 76-B-0031
C-3966



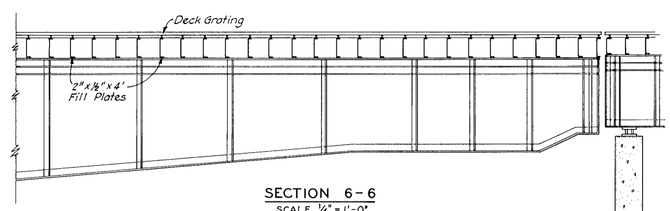
PLAN - DECK FRAMING
SCALE ¼" = 1'-0"



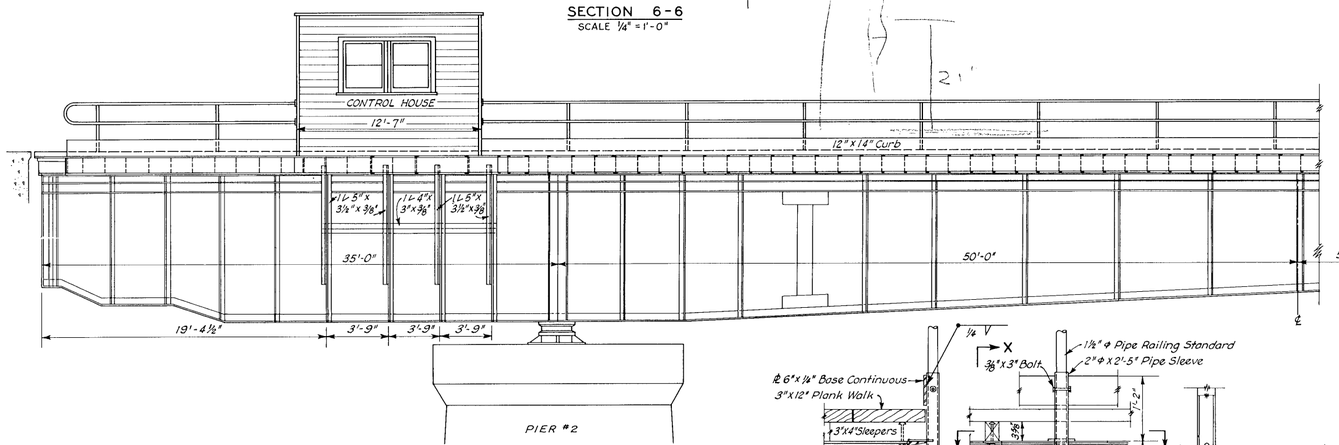
SECTION 6-6
SCALE ¼" = 1'-0"



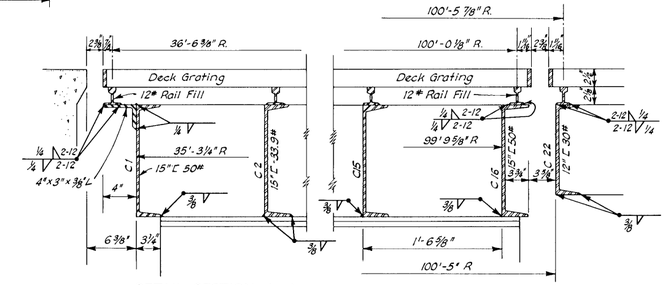
SECTION 5-5
SCALE ¼" = 1'-0"



SECTION 6-6
SCALE ¼" = 1'-0"

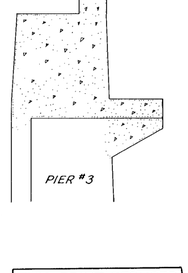


ELEVATION (WEST SIDE)
SCALE ¼" = 1'-0"



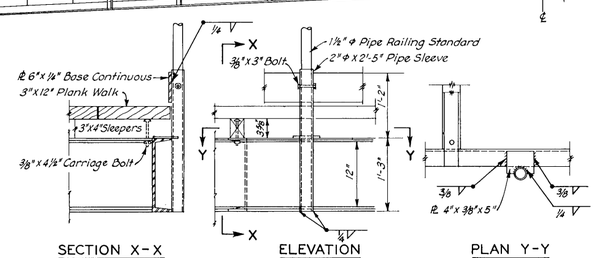
DETAIL SECTION A-A
SCALE 1½" = 1'-0"

DETAIL SECTION B-B
SCALE 1½" = 1'-0"



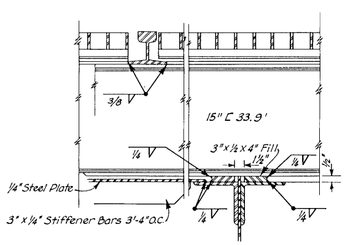
THIS PRINT REDUCED TO ONE-HALF SCALE

FOR INFORMATION ONLY



SECTION X-X | ELEVATION | PLAN Y-Y

DETAIL OF RAILING SUPPORT ON OUTSIDE OF WALK
SCALE 1" = 1'-0"



DETAIL E
SCALE 1½" = 1'-0"

GRAPHIC SCALES
¼" = 1'-0"
1" = 1'-0"
1½" = 1'-0"

REVISION	DATE	DESCRIPTION	BY

CORPS OF ENGINEERS, U. S. ARMY
OFFICE OF THE DISTRICT ENGINEER, PORTLAND, OREGON

BONNEVILLE DAM PROJECT
COLUMBIA RIVER OREGON-WASHINGTON

SWING BRIDGE

SWING SPAN (Span No. 1)

DRAWN BY R.M.H.
TRACED BY M.F.B.
CHECKED BY D.W.S.
PREPARED: Hilyard, HEAD, STRUCTURES DESIGN SECTION
SUBMITTED: ..... HEAD, DESIGN BRANCH
RECOMMENDED: Frances S. Moore For R.R. Hanson, CHIEF, ENGINEERING DIVISION
REVIEWED BY: For C.A. Stanton, HEAD, SAFETY BRANCH
APPROVED: W.A. Ediger, COLONEL, C.E. DISTRICT ENGINEER
DATE 1-20-50.
SCALE AS SHOWN
SPEC. NO.
SHEET 2 OF 6 N-2-43A

SPAN NO. 2

SPAN NO. 3

SPAN NO. 4

PLAN OF DECK FRAMING
SCALE 1/4" = 1'-0"

SECTION 8-8

SECTION 7-7
SCALE 1/4" = 1'-0"

ELEVATION (WEST SIDE)
SCALE 1/4" = 1'-0"

DETAIL D
SCALE 1 1/2" = 1'-0"

DETAIL SECTION C-C
SCALE 1 1/2" = 1'-0"

THIS PRINT REDUCED TO ONE-HALF SCALE

GRAPHIC SCALES
1/4" = 1'-0" 5 0 5 10 15 FT.
1 1/2" = 1'-0" 1 0 1 2 FT.

FOR INFORMATION ONLY

REVISION	DATE	DESCRIPTION	BY

CORPS OF ENGINEERS, U. S. ARMY
OFFICE OF THE DISTRICT ENGINEER, PORTLAND, OREGON

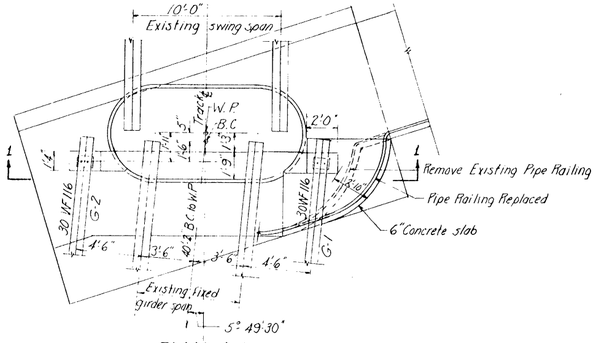
DRAWN BY A.N.H.
TRACED BY M.F.B.
CHECKED BY D.W.S.
PREPARED: Head, Structures Design Section
SUBMITTED: Head, Design Branch
RECOMMENDED: Chief, Engineering Division
REVIEWED BY: Chief, Safety Branch

BONNEVILLE DAM PROJECT
COLUMBIA RIVER OREGON-WASHINGTON

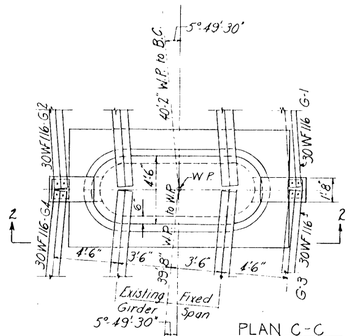
SWING BRIDGE

FIXED SPANS (Spans 2, 3 & 4)

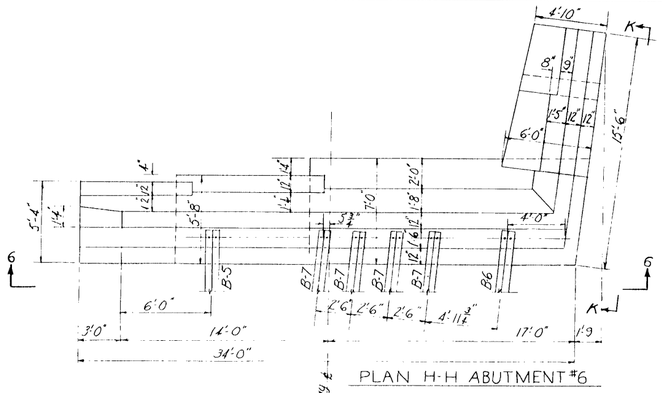
APPROVED: Colonel, C.E. District Engineer
DATE:
SCALE AS SHOWN SPEC. NO.
SHEET 3 OF 6 N-2-43A



PLAN A-A



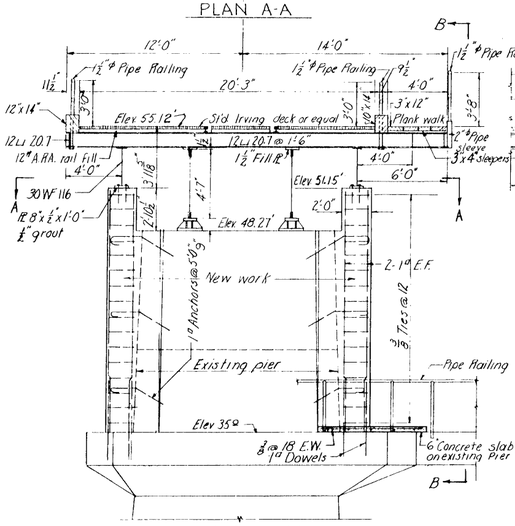
PLAN C-C



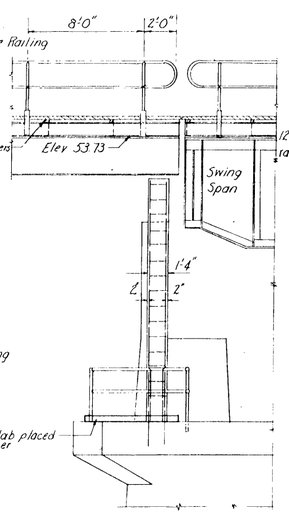
PLAN H-H ABUTMENT #6

SECTION G-G

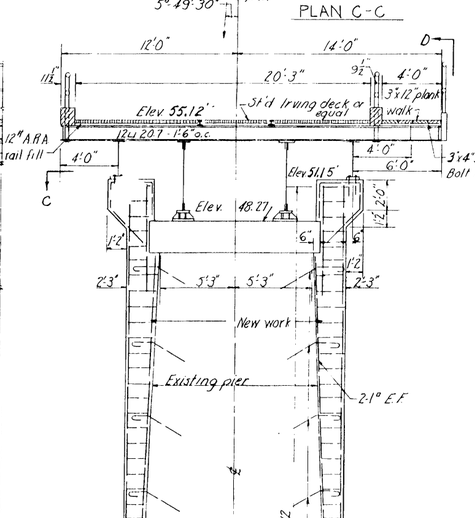
SECTION J-J



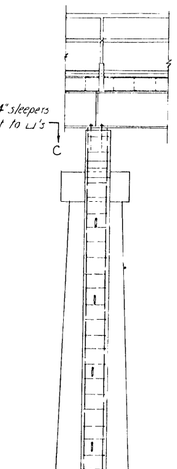
SECTION 1-1



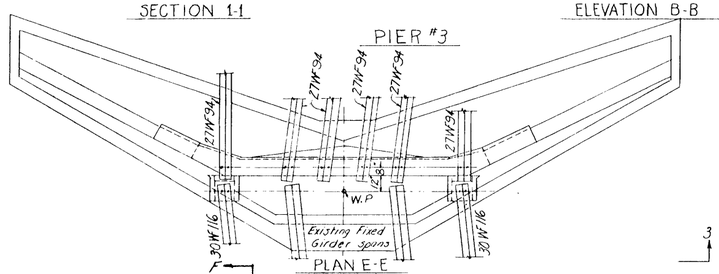
ELEVATION B-B



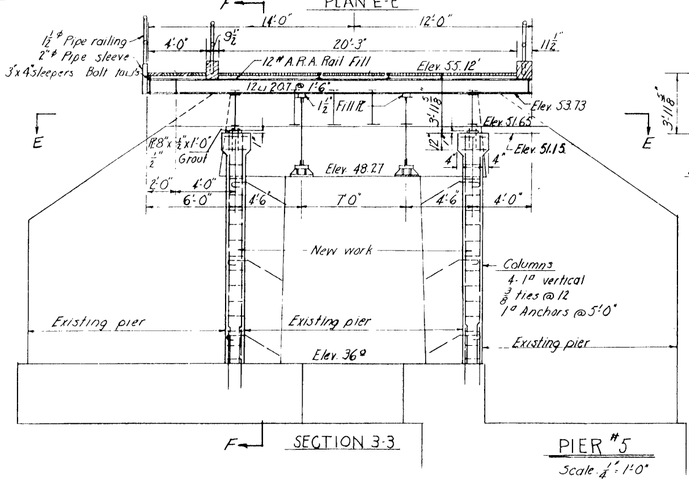
SECTION 2-2



ELEVATION D-D



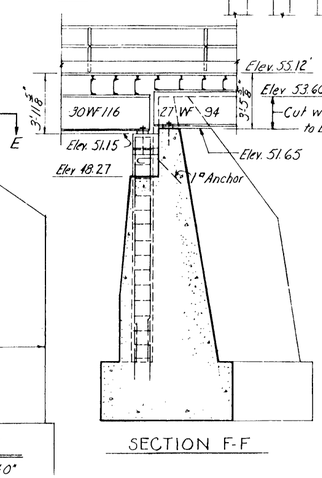
PLAN E-E



SECTION 3-3

PIER #5

Scale 1/4" = 1'-0"



SECTION F-F

PIER # 4

Scale 1/4" = 1'-0"

Note:
1. New work consists of
   (a) Entire Abutment #6
   (b) Columns indicated as "New work"
2. For existing concrete piers refer to Sheet 8 of Dwg. N-1-11

REVISION	DATE	DESCRIPTION	BY

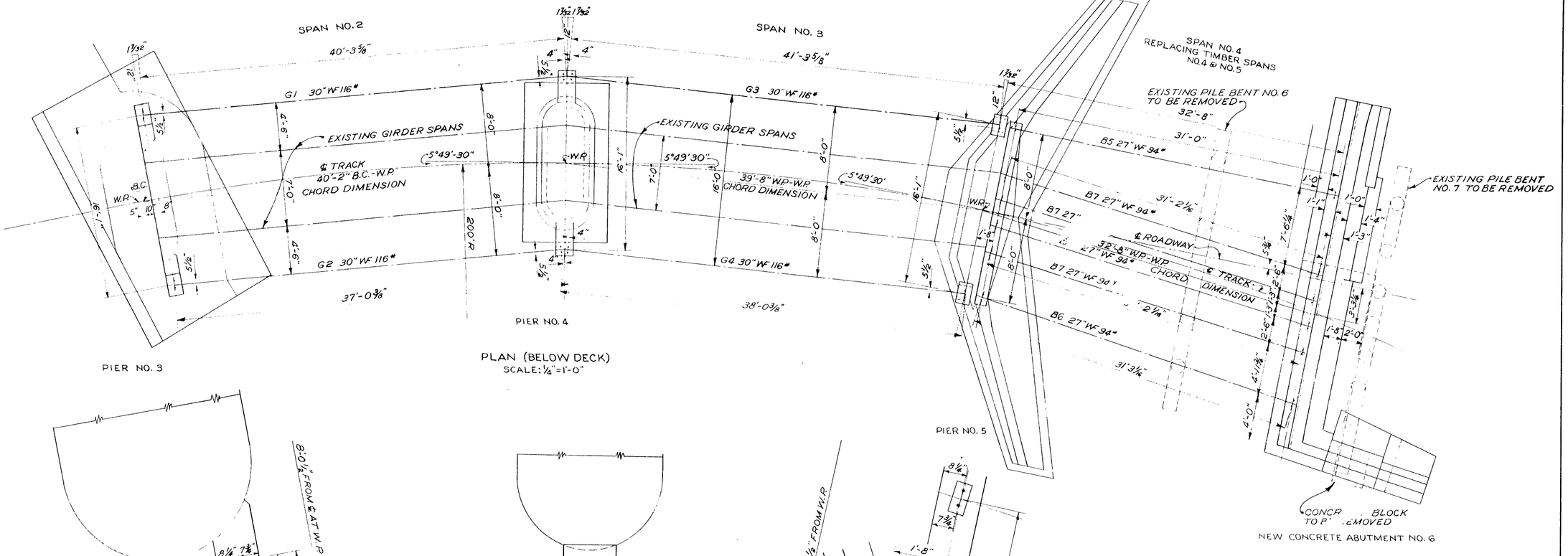
CORPS OF ENGINEERS, U. S. ARMY
OFFICE OF THE DISTRICT ENGINEER, PORTLAND, OREGON

DESIGNED BY R.M.H.
DRAWN BY E.J.K.
CHECKED BY D.W.S.
PREPARED: for BRIDGE & STRUCTURES DESIGN SECTION
REVIEWED BY: for Chief, SAFETY BRANCH
SUBMITTED: HEAD, DESIGN BRANCH
RECOMMENDED: CHIEF, ENGINEERING DIVISION

BONNEVILLE DAM PROJECT
COLUMBIA RIVER OREGON-WASHINGTON

SWING BRIDGE RECONSTRUCTION
ABUTMENT, PIER ALTERATION & SECTIONS

APPROVED: DATE 1-20-50
COLONEL, C.E. DISTRICT ENGINEER
SCALE AS SHOWN | SPEC. NO.
SHEET 4 OF N-2-43A

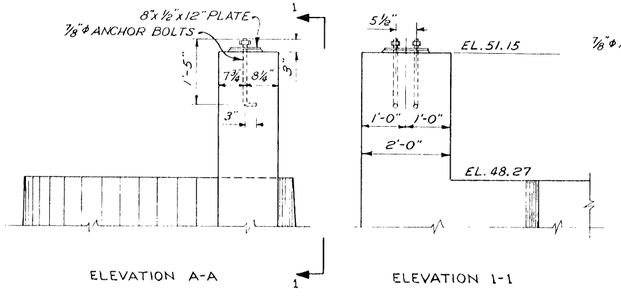


PLAN (BELOW DECK)
SCALE: 1/4"=1'-0"

PLAN - BEAM SEAT
PIER NO. 3

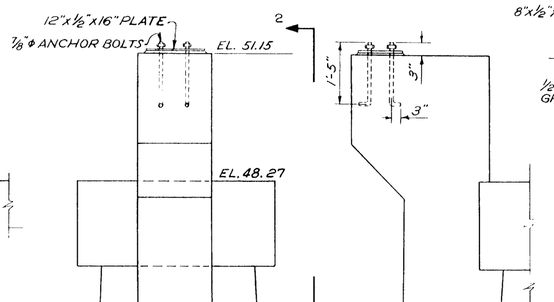
PLAN - BEAM SEAT
PIER NO. 4

PLAN - BEAM SEAT
PIER NO. 5



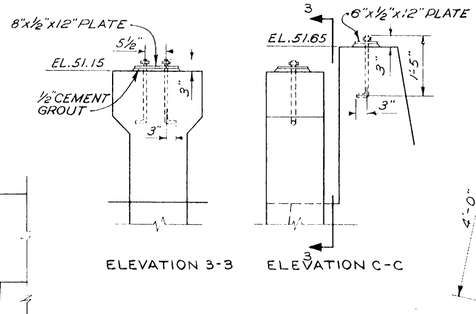
ELEVATION A-A

ELEVATION 1-1



ELEVATION B-B

ELEVATION 2-2

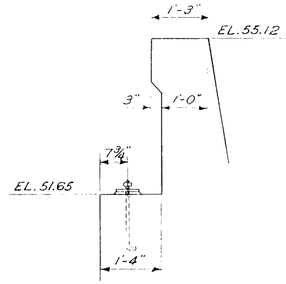


ELEVATION 3-3

ELEVATION C-C

DETAILS - TOP OF P: :
SCALE: 3/4"=1'-0"

PLAN - BEAM SEATS
ABUTMENT NO. 6



SECTION D-D

GRAPHIC SCALES
1/4" = 1'-0" 5 0 5 10
3/4" = 1'-0" 1 0 1 2 3 4

REVISION	DATE	DESCRIPTION	BY

CORPS OF ENGINEERS, U.S. ARMY
OFFICE OF THE DISTRICT ENGINEER, PORTLAND, OREGON

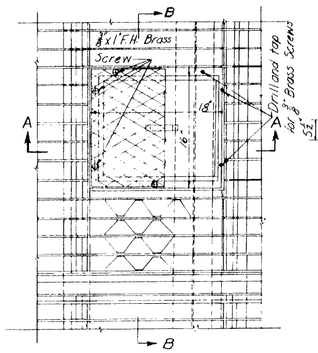
DESIGNED BY R.M.H.
DRAWN BY H.E.B.
CHECKED BY D.W.S.
PREPARED: A. Warakin, HEAD, STRUCTURAL DESIGN SECTION

BONNEVILLE DAM PROJECT
COLUMBIA RIVER OREGON-WASHINGTON

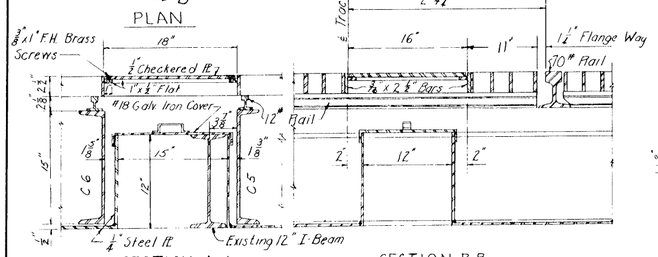
SWING BRIDGE RECONSTRUCTION

BEAM SEATS

SUBMITTED: [signature], HEAD, DESIGN BRANCH
APPROVED: [signature], COLONEL, C.E. DISTRICT ENGINEER
DATE: 1-20-50
RECOMMENDED: [signature], CHIEF, ENGINEERING DIVISION
SCALE AS SHOWN SPEC. NO.
REVIEWED BY: [signature], HEAD, SAFETY BRANCH
SHEET 5 N-2-43A



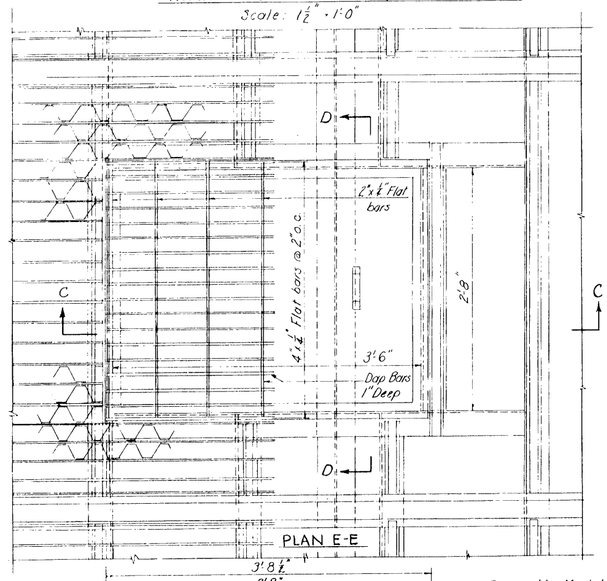
PLAN



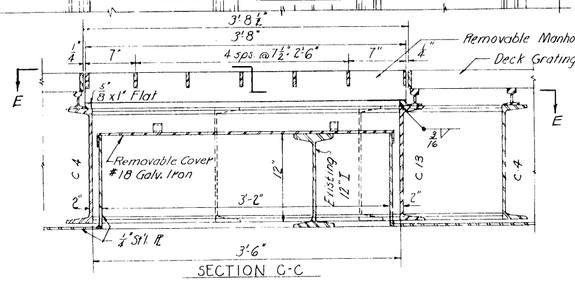
SECTION A-A SECTION B-B

MANHOLE FRAMING & COVERS-M-3

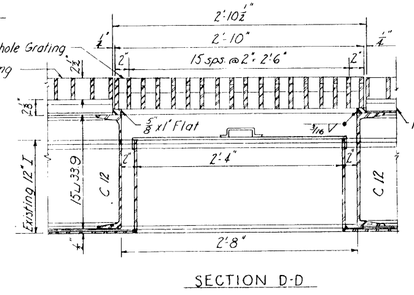
Scale: 1½" = 1'-0"



PLAN E-E



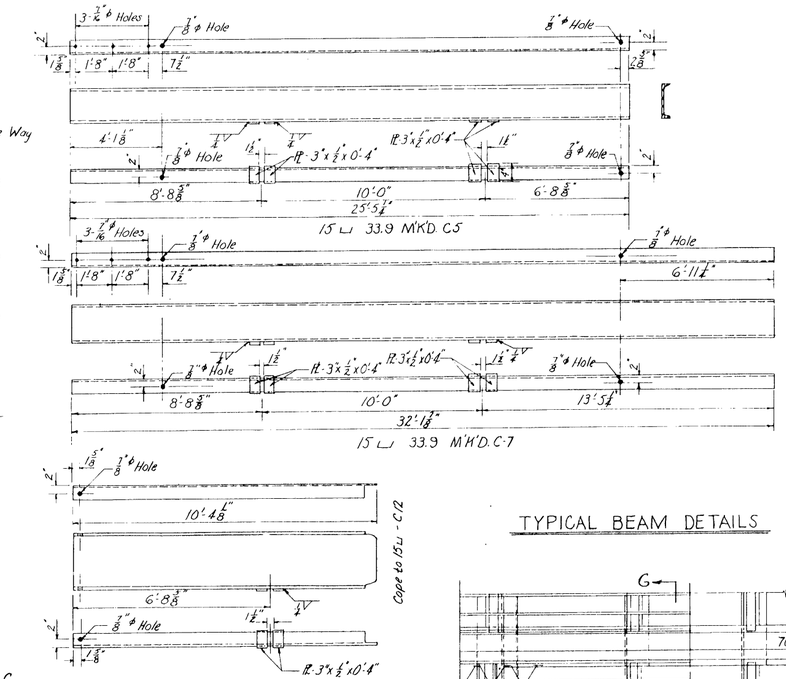
SECTION C-C



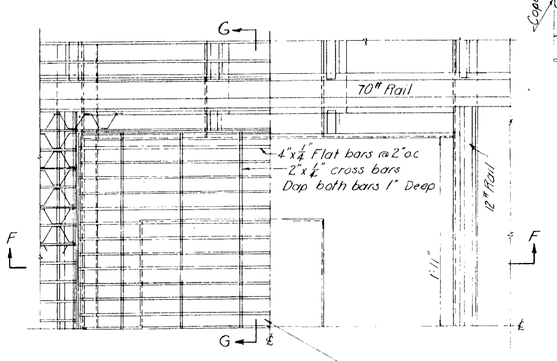
SECTION D-D

MANHOLE, DECK FRAMING, GRATING, & COVER M-2

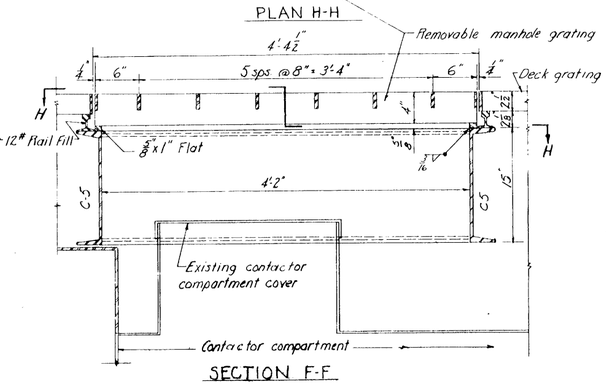
Scale: 1½" = 1'-0"



TYPICAL BEAM DETAILS



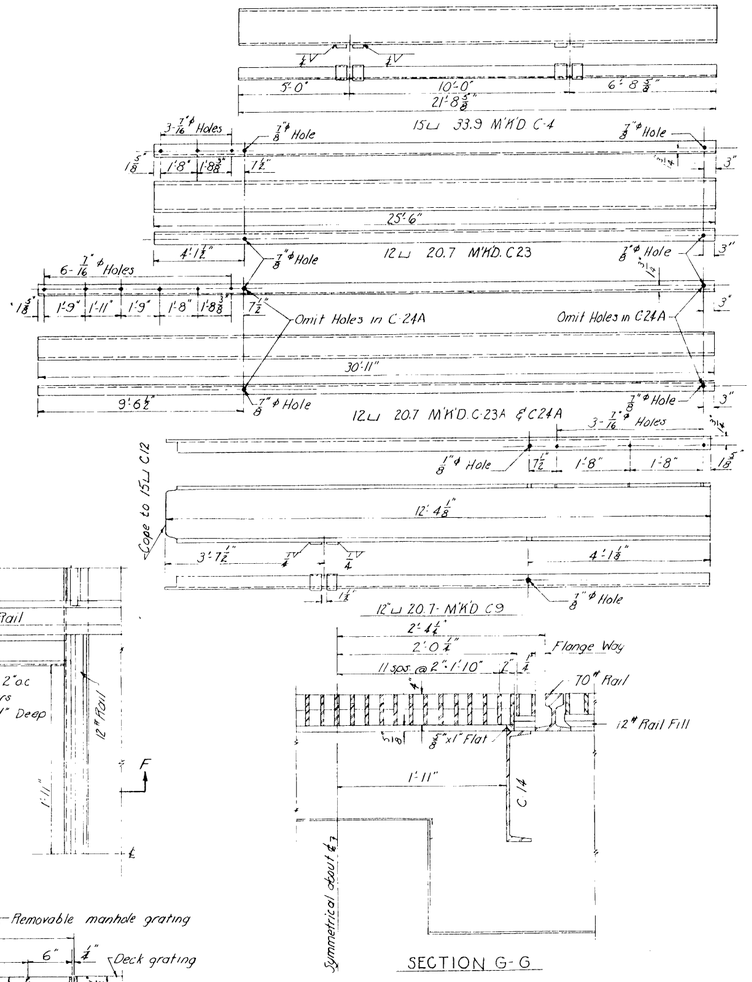
PLAN H-H



SECTION F-F

MANHOLE, DECK FRAMING, & GRATING - M1

Scale: 1½" = 1'-0"



REVISION	DATE	DESCRIPTION	BY

CORPS OF ENGINEERS, U. S. ARMY
OFFICE OF THE DISTRICT ENGINEER, PORTLAND, OREGON

DESIGNED BY A.M.H.
DRAWN BY E.J.K.
CHECKED BY O.H.S.
PREPARED: H.W. Walker

BONNEVILLE DAM PROJECT
COLUMBIA RIVER OREGON—WASHINGTON

SWING BRIDGE RECONSTRUCTION

MISCELLANEOUS DETAILS

REVIEWED BY: [signature]
HEAD, DESIGN BRANCH

SUBMITTED: [signature]
HEAD, DESIGN SECTION

RECOMMENDED: [signature] For M.R. Hickson
CHIEF, ENGINEERING DIVISION

APPROVED: [signature] DATE 1-20-50
COLONEL, C. E. DISTRICT ENGINEER

SCALE AS SHOWN SPEC. NO.

SHEET 6 OF N-2-43A

WAR DEPARTMENT

CORPS OF ENGINEERS U.S. ARMY

KEY MAP

WASHINGTON

OREGON

COLUMBIA RIVER

ASTORIA

LONGVIEW

COWLITZ

SKAMANIA

CLATSOP

COLUMBIA

CLARK

BONNEVILLE DAM

VANCOUVER

CASCADE LOCKS

PORTLAND

MULTNOMAH

FOOD

RIVER

TILLAMOOK

WASHINGTON

CLACKAMAS

SALEM

SCALE

MILES

EAST LINE B.B.BISHOP D.L.C.#39

WEST LINE F.A.CHENOWITH D.L.C.#108

PRESENT LOCATION SPOKANE, PORTLAND & SEATTLE R.R. MAIN LINE

EVERGREEN HIGHWAY

NORTH BONNEVILLE

FORMERLY CASCADE

YARD AND DISPOSAL AREA "B"

RESERVED FOR GATE CONTRACTOR AFTER JULY 1, 1936

AREA "C"

PROPOSED RELOCATION OF SPOKANE, PORTLAND & SEATTLE R.R.

EL. 188

TOP OF DIKE EL. +92

Cutoff wall

Concrete Monolith

39S

40S

COLUMBIA RIVER

SPILLWAY DAM

BOAT ROCK

TRUE NORTH

BRADFORD ISLAND

PRESENT ACCESS ROAD

RECEIVING AREA "A"

YARD AND DISPOSAL AREA "A"

LEVEE

future extension of Power House

Cofferdam "B"

Rock Rip Rap
Pervious Material from Cofferdam "B"
Impervious Material from Cofferdam "A"
(For Section See Sheet 7; P-5-1)

15000 Cu. Yards Rock Rip Rap for Embankment in Stage Dike

15000 Cu. Yards Rock Rip Rap for Embankment in Stage Dike

POWER HOUSE

Bridge in misc. contract

Intake Valves

Cofferdam "A"

YARD AREA

LOCK

UNION PACIFIC SYSTEM

SLOUGH

BONNEVILLE RESIDENCES UNDER CONSTRUCTION

Temporary Buildings

MATCH LINE FOR INSET #1

BONNEVILLE

FEDERAL ROAD

ROAD TO CASCADE LOCKS & COLUMBIA RIVER HIGHWAY

TO PORTLAND

OREGON

Eagle Creek

PROPOSED UNION PACIFIC RELOCATION

BLOCK

BONNEVILLE

CAMP AREA NO 1

CAPACITY 450 MEN

CAMP AREA 119 2

CAMP AREA 119 3

CAPACITY 450 MEN

MATCH LINE

STATE FISH HATCHERY

NO.	REVISION	DATE	BY	APV'D

BONNEVILLE POWER NAVIGATION PROJECT

28TH CONTRACT

BRIDGE ACROSS NAVIGATION CANAL

GENERAL SITE MAP

SCALE IN FEET

0 50 100 200 300 400 500 600

U.S. ENGINEER OFFICE PORTLAND, OREGON

SUBM. R.A. Mackenzie

SHEET 1 OF 4 N-2-43

WAR DEPARTMENT

CORPS OF ENGINEERS U.S. ARMY

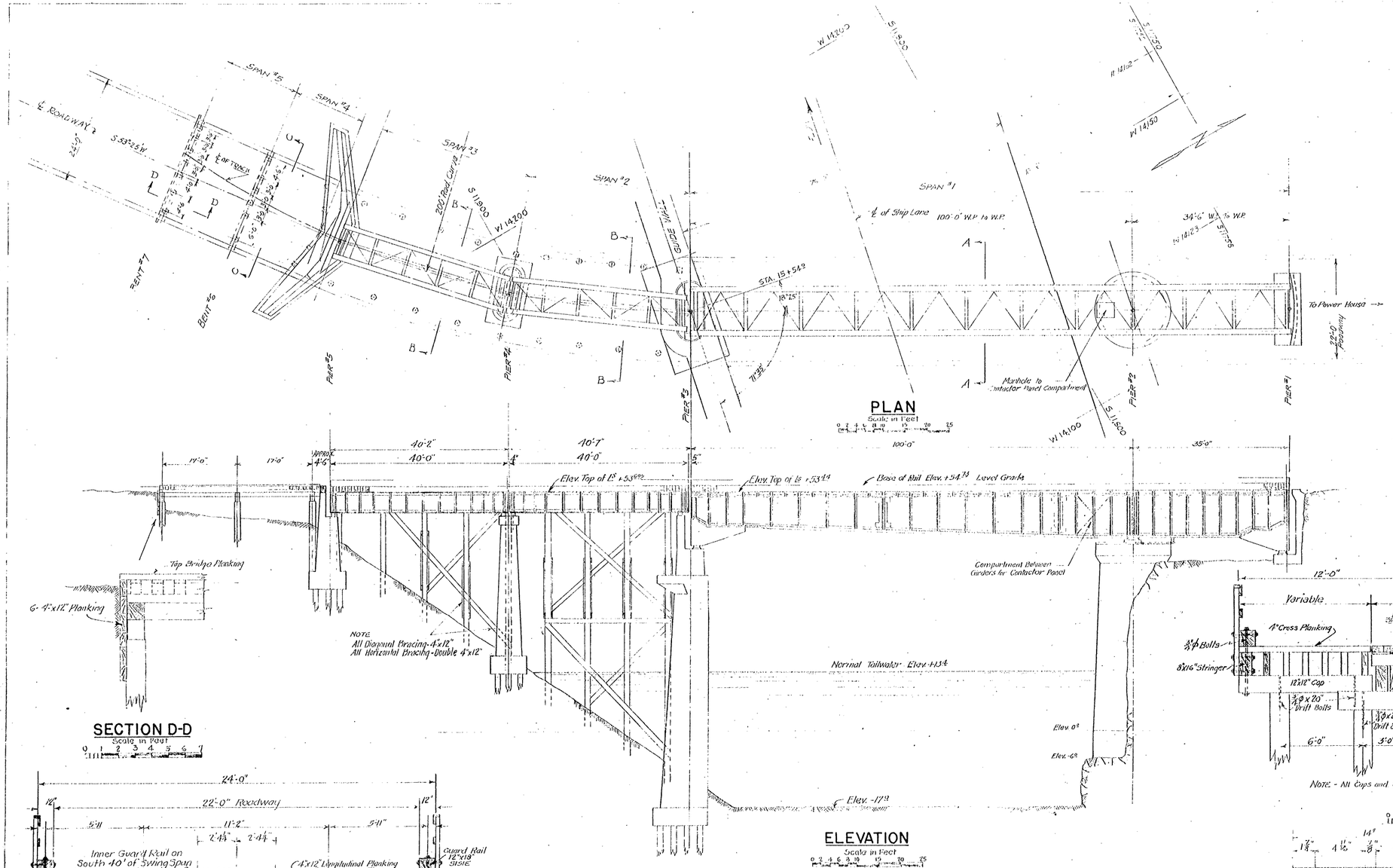
GENERAL NOTES

LOADING - 3000# per foot of girder plus 40% Impact

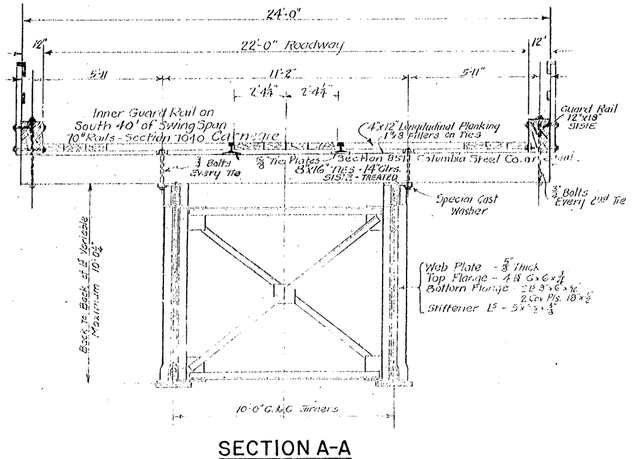
RIVETING - Rivets ⅞" dia. except in Cross Frames and Laterals where ¾" dia. are to be used. All rivet holes for field rivets to be sub-punched and reamed while assembled in shop. All other holes may be punched or drilled full size.

DRIFT BOLTS - Drift bolts for timber not to have heads or points. Holes for drift bolts to be bored 1/16" less in diameter than nominal diameter of bolts.

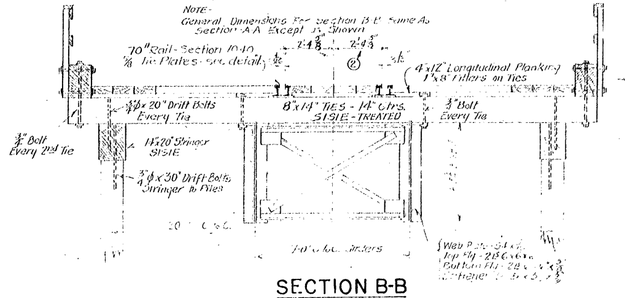
TIMBER WORK - 3"x18" Stringers to be drift bolted at each end with one ⅝"ϕ x 28" long drift bolt. 4"x16" Stringers to be toe nailed each side at each cap with 60d nails. 2" fills on track ties to be spiked with 20d nails. 4" deck planking to be spiked with one ¼"ϕ x 8" long wire spike at each intermediate stringer and 2 spikes at the ends. Spikes in intermediate stringers to be staggered opposite sides of planks. All bracing to be fastened at ends with ¾"ϕ machine bolts and at intermediate piles with 3 - ¾"ϕ x 8" long square head boat spikes. 2"x6" Rails to be securely fastened with 30d nails.



SECTION D-D
Scale in Feet
0 1 2 3 4 5 6 7

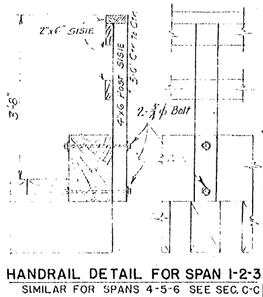


SECTION A-A
Scale in Feet
0 1 2 3 4 5 6 7

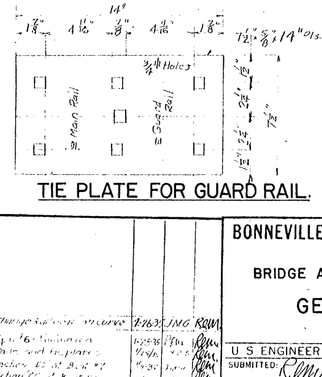


SECTION B-B
Scale in Feet

ELEVATION
Scale in Feet
0 2 4 6 8 10 15 20 25



HANDRAIL DETAIL FOR SPAN 1-2-3
SIMILAR FOR SPANS 4-5-6 SEE SEC. C-C



TIE PLATE FOR GUARD RAIL.

NO.	REVISION	DATE	BY	APV'D
2	Change Railway Curve	7-16-34	JNG	RAM
1	Shown Sec. B-B	10-26-34	JNG	RAM
1	Note and Tie Plates	10-26-34	JNG	RAM
1	Section B-B & A-A	10-26-34	JNG	RAM
1	Railway Curve	11-10-34	JNG	RAM

BONNEVILLE POWER NAVIGATION PROJECT
28TH CONTRACT
BRIDGE ACROSS NAVIGATION CANAL

GENERAL LAYOUT

SCALES AS SHOWN

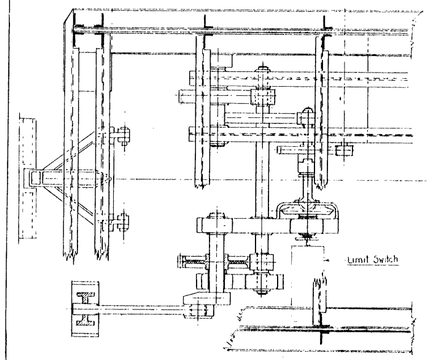
U S ENGINEER OFFICE, PORTLAND, OREGON DISTR

SUBMITTED: R.L. Mackenzie, ENGINEER — APPROVED: Chas. H. Braun, MAJOR, CORPS OF ENGINEERS

RECOMMENDED: [illegible], HEAD ENGINEER

DRAWN BY: H.D. Palmer DATE 12-10-34

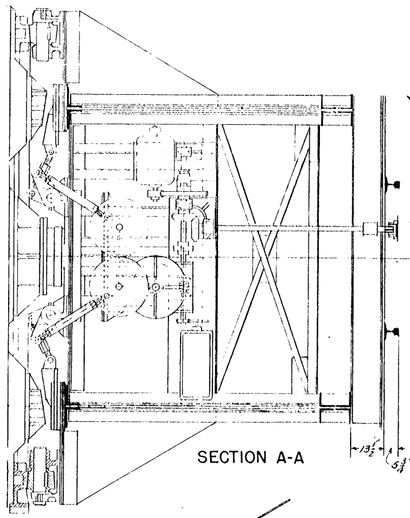
TRACED BY: M.V.P. CHECKED BY: [illegible]



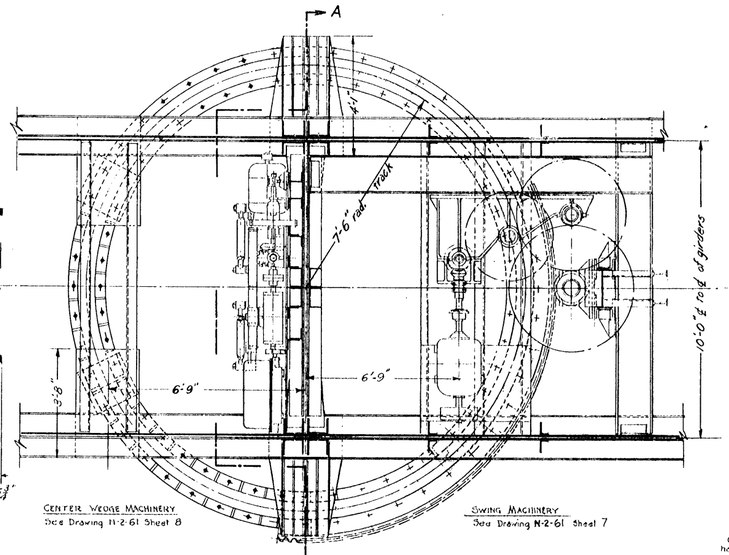
SECTIONAL PLAN

END JACK MACHINERY
See Drawing N-2-61 Sheet 9

CENTERING LATCH
See Drawing N-2-61 Sheet 10



SECTION A-A

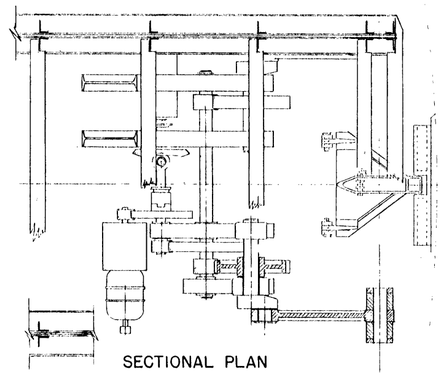


CENTER WEDGE MACHINERY
See Drawing N-2-61 Sheet 8

SWING MACHINERY
See Drawing N-2-61 Sheet 7

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

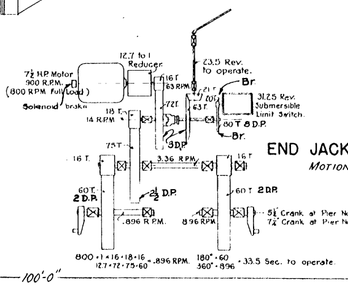
Scale in feet



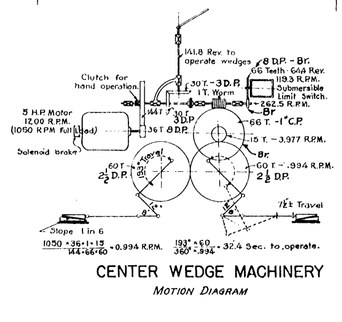
SECTIONAL PLAN

END JACK MACHINERY
See Drawing N-2-61 Sheet 9

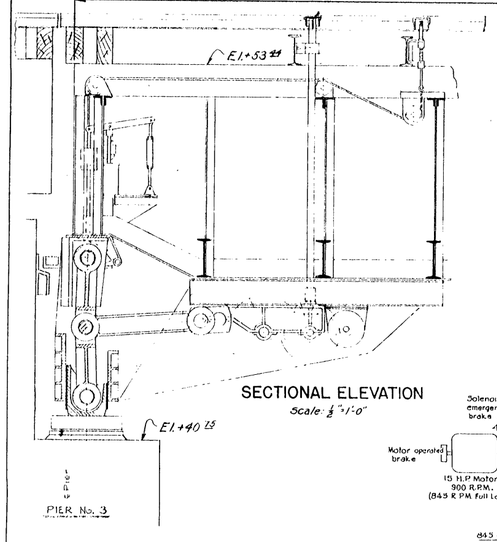
CENTERING LATCH
See Drawing N-2-61 Sheet 10



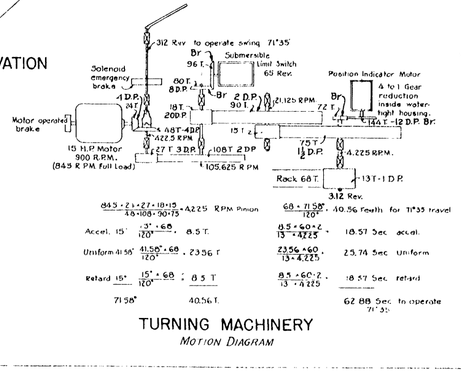
END JACK MACHINERY
MOTION DIAGRAM



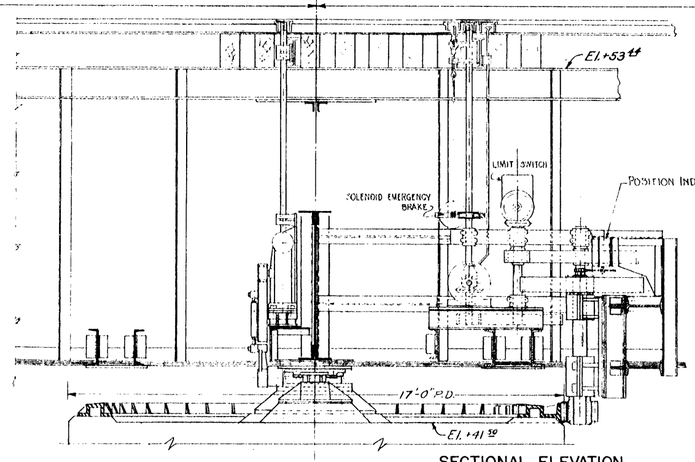
CENTER WEDGE MACHINERY
MOTION DIAGRAM



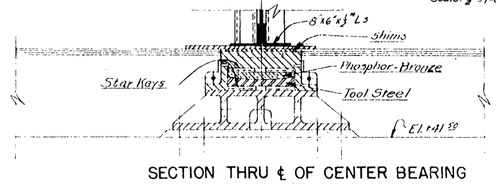
SECTIONAL ELEVATION
Scale: ¼"=1'-0"



TURNING MACHINERY
MOTION DIAGRAM

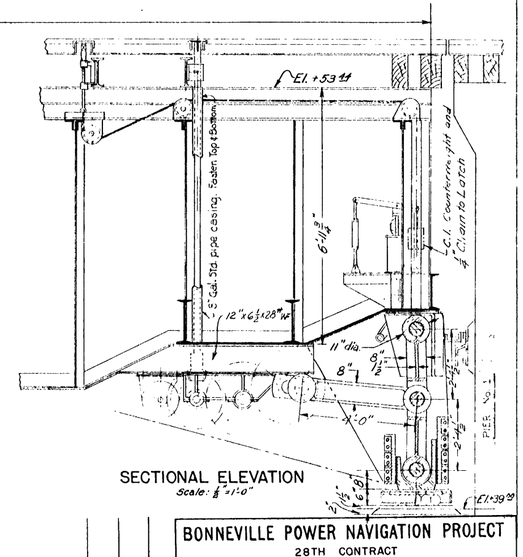


SECTIONAL ELEVATION
Scale: ¼"=1'-0"



SECTION THRU ℄ OF CENTER BEARING
Scale: ¾"=1'-0"

35'-0"



SECTIONAL ELEVATION
Scale: ¼"=1'-0"

BONNEVILLE POWER NAVIGATION PROJECT
28TH CONTRACT
BRIDGE ACROSS NAVIGATION CANAL
GENERAL ARRANGEMENT OF MACHINERY
SCALE ½" = 1 FOOT

U S ENGINEER OFFICE PORTLAND, OREGON DISTRICT

SUBMITTED: R. Mackenzie, ENGINEER
APPROVED: Williams, MAJOR, CORPS OF ENGINEERS.
RECOMMENDED: HEAD ENGINEER
DRAWN BY Dixon, Leonard & Dixon. DATE 12/19-34
TRACED BY CHECKED BY

NO	REVISION	DATE	BY	APP'D

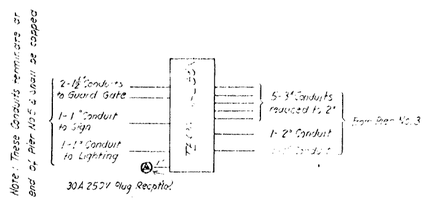
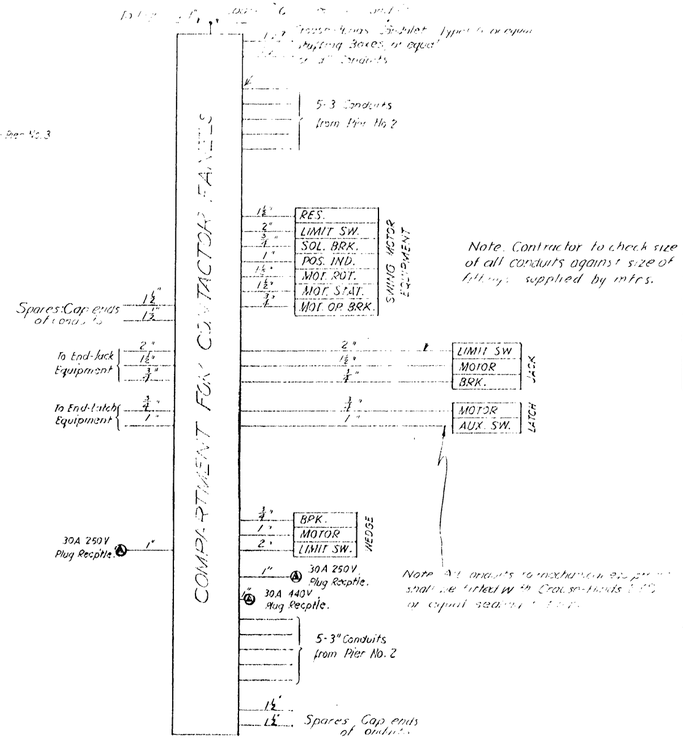


DIAGRAM OF CONDUITS FROM PIER No. 3

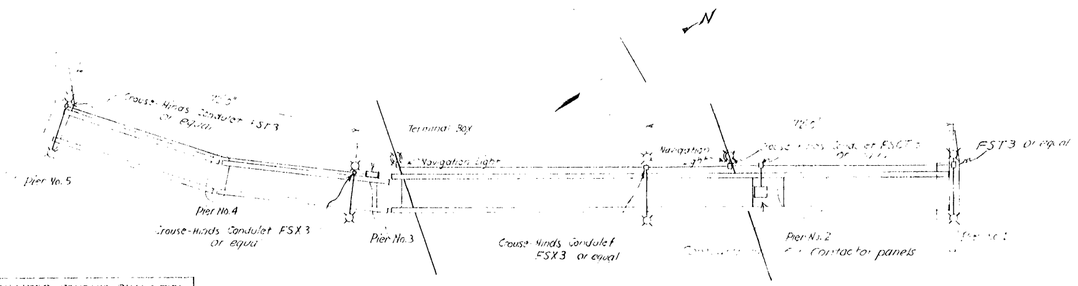
NO SCALE



Note: Contractor to check size of all conduits against size of fittings supplied by Intrs.

Note: All conduits to mechanism and panels shall be furnished with Crouse-Hinds Co. or equal seals.

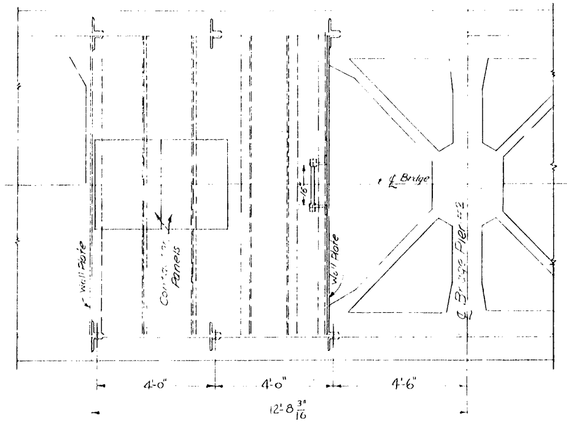
ESTIMATED CONDUIT QUANTITIES	
SIZE	TOTAL LENGTH
½	400'
1	600'
1½	200'
2"	200'
3"	120'



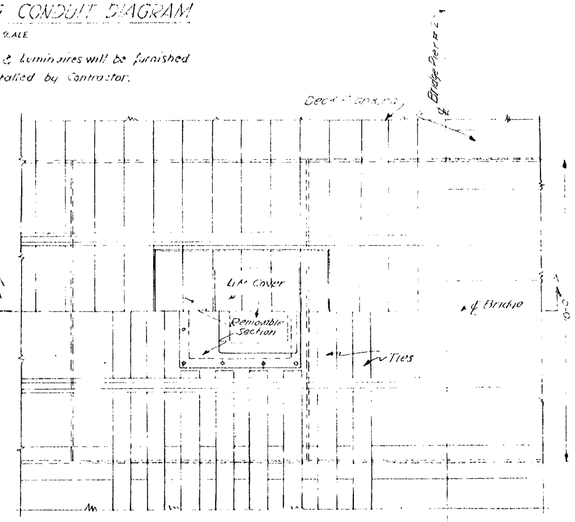
BRIDGE LIGHTING CONDUIT DIAGRAM

NO SCALE

Note: All Light Standards & Luminaires will be furnished by U.S. Government & installed by Contractor.



SECTION B-B



PLAN OF MANHOLE

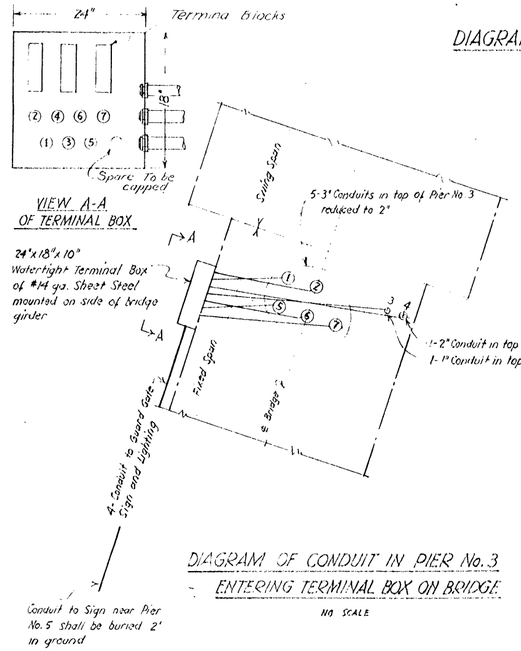
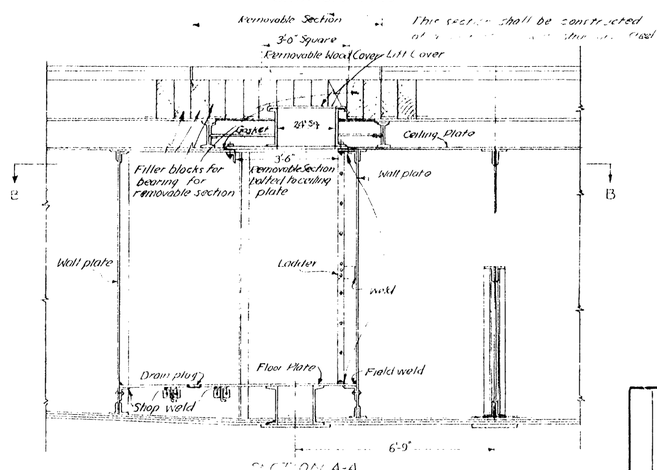


DIAGRAM OF CONDUIT IN PIER No. 3 ENTERING TERMINAL BOX ON BRIDGE

NO SCALE

DRAIN DETAIL

NO SCALE



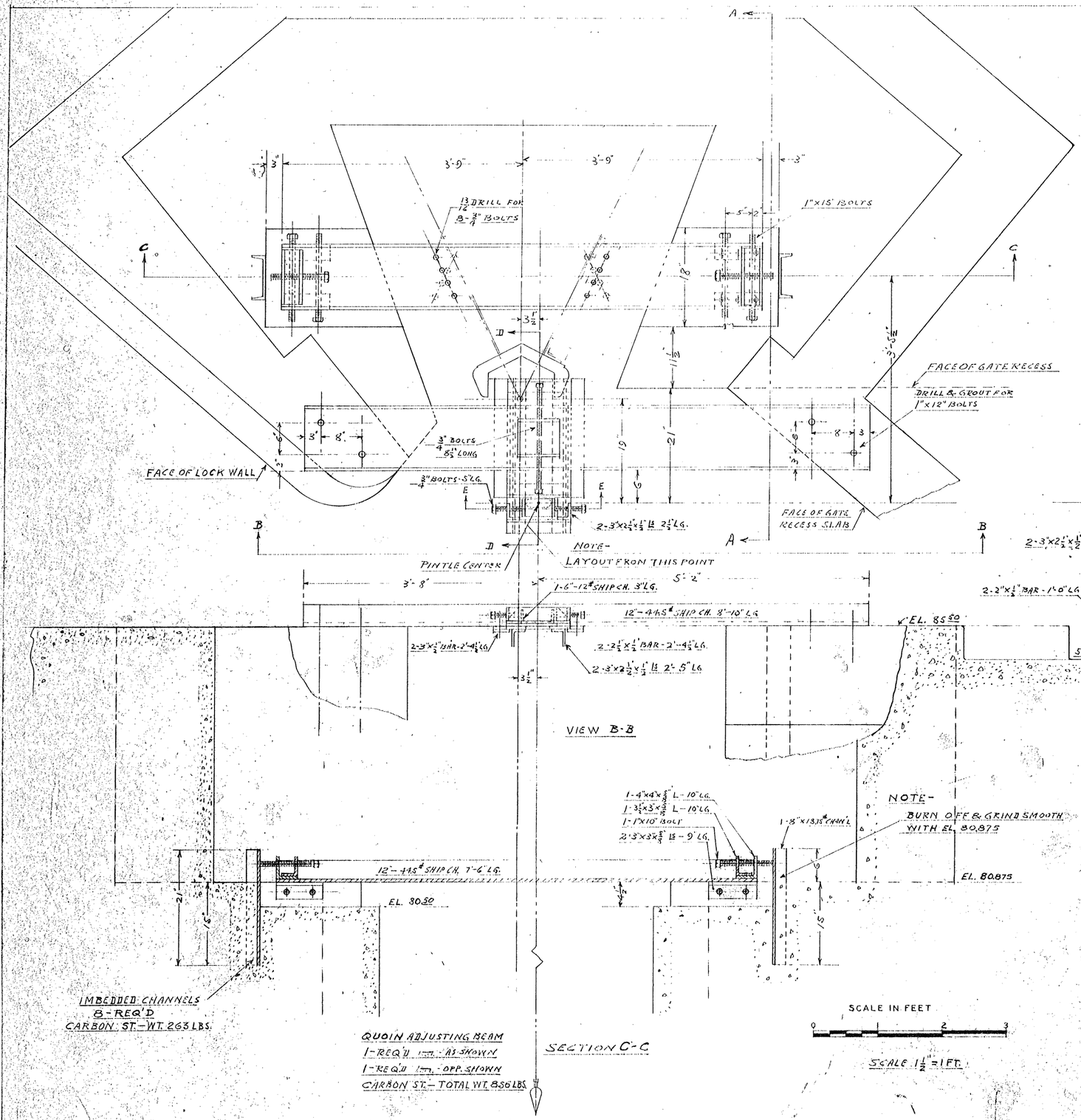
SECTION A-A

COMPARTMENT FOR CONTACTOR PANELS

SCALE IN FEET

NO.	REVISION	DATE	BY	APV'D

BONNEVILLE POWER NAVIGATION PROJECT
28TH CONTRACT
BRIDGE ACROSS NAVIGATION CANAL
ELECTRICAL DETAILS & CONDUIT DIAGRAMS
SCALES AS SHOWN
U.S. ENGINEER OFFICE, PORTLAND, OREGON DISTRICT
SUBMITTED: R.L. Mackenzie, ENGINEER
APPROVED: [illegible], MAJOR, CORPS OF ENGINEERS
RECOMMENDED: [illegible], HEAD ENGINEER
DRAWN BY: [illegible] DATE: [illegible]
TRACED BY: JMG CHECKED BY: [illegible]



REFERENCES

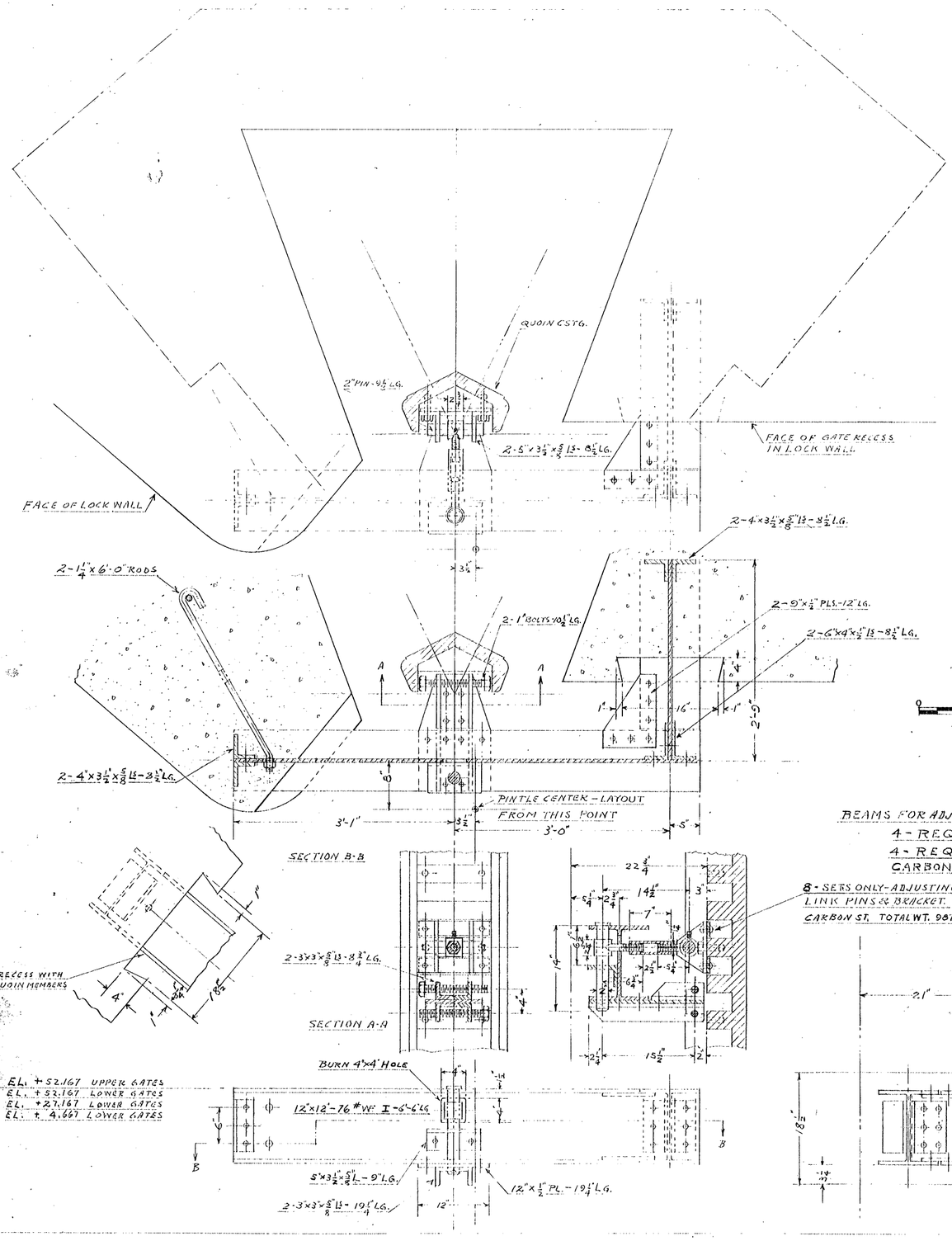
① FOR INTERMEDIATE ADJUSTING BEAMS, SEE DWG. N-2-44, SHEET 2
FOR EMBEDDED STEEL, 13TH CONTRACT, SEE DWG. N-1-37
FOR ADJUSTING EQUIPMENT, 36TH CONTR., SEE DWG. N-2-81, SHT. 10

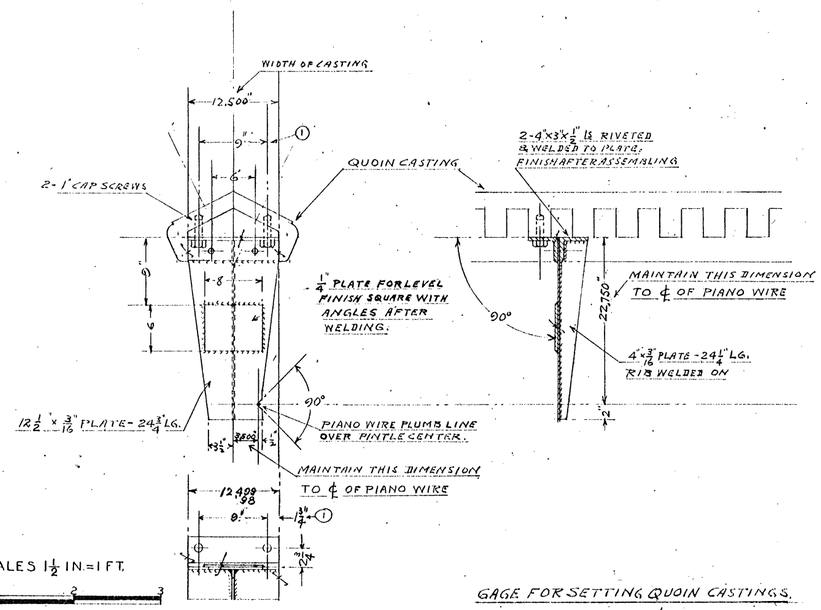
NO	REVISION	DATE	BY	APV'D
1	Added References	7-1-35	WM	Kenn

BONNEVILLE POWER NAVIGATION PROJECT
SHIP LOCK
UPPER ADJUSTING BEAMS
FOR SETTING
WALL QUOINS
U. S. ENGINEER OFFICE, PORTLAND, OREGON DISTRICT

SUBMITTED: R. L. Mackenzie, ENGINEER — APPROVED: MAJOR, CORPS OF ENGINEERS
RECOMMENDED: HEAD ENGINEER
DRAWN BY: C.W.B. DATE: 12-20-34
TRACED BY: CHECKED BY:

SHEET 1 OF N-2-44





SCALES 1½ IN. = 1 FT.

SCALE IN FEET

GAGE FOR SETTING QUOIN CASTINGS.

2 - REQ'D :— AS SHOWN

2 - REQ'D :— OPR SHOWN

CARBON ST. — TOTAL WT. 201 LBS.

BEAMS FOR ADJUSTING QUOIN CASTINGS

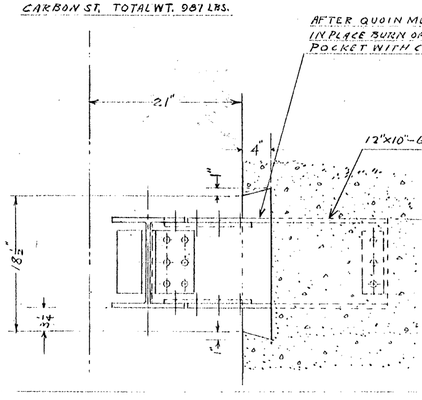
4 - REQ'D — AS SHOWN

4 - REQ'D — OPR SHOWN

CARBON ST. — TOTAL WT. 6955 LBS.

NOTE — ALL QUANTITIES REQ'D ARE FOR BOTH UPPER AND LOWER GATES.

AFTER QUOIN MEMBERS ARE FIXED IN PLACE BURN OFF BEAM & FILL POCKET WITH CONCRETE.



EL. + 52.167 UPPER GATES
EL. + 52.167 LOWER GATES
EL. + 27.167 LOWER GATES
EL. + 4.667 LOWER GATES

EL. + 52.167 - UPPER GATES
EL. + 52.167 - LOWER GATES
EL. + 27.167 - LOWER GATES
EL. + 4.667 - LOWER GATES

NO.	REVISION	DATE	BY	APV'D
1	CHANGE DIMENSIONS ON STEEL CASTING	7-18-34	WLD	RSV

BONNEVILLE POWER NAVIGATION PROJECT

SHIP LOCK

ADJUSTING BEAMS

FOR SETTING

WALL QUOINS

U. S. ENGINEER OFFICE, PORTLAND, OREGON DISTRICT

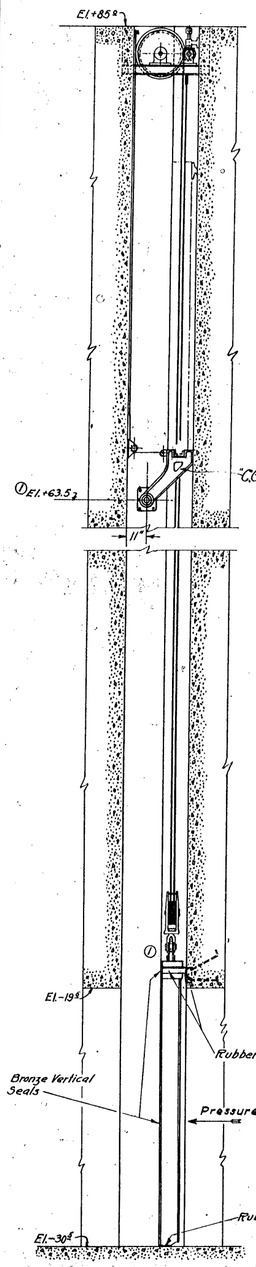
SUBMITTED: _____ ENGINEER

APPROVED: _____ MAJOR, CORPS OF ENGINEERS

RECOMMENDED: _____ HEAD ENGINEER

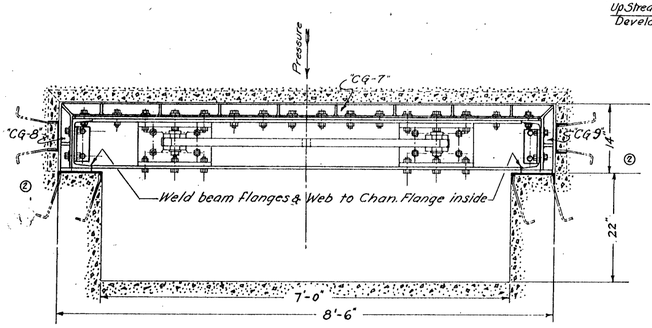
DRAWN BY: C.W.B. DATE: 9-25-34

TRACED BY: _____ CHECKED BY: _____

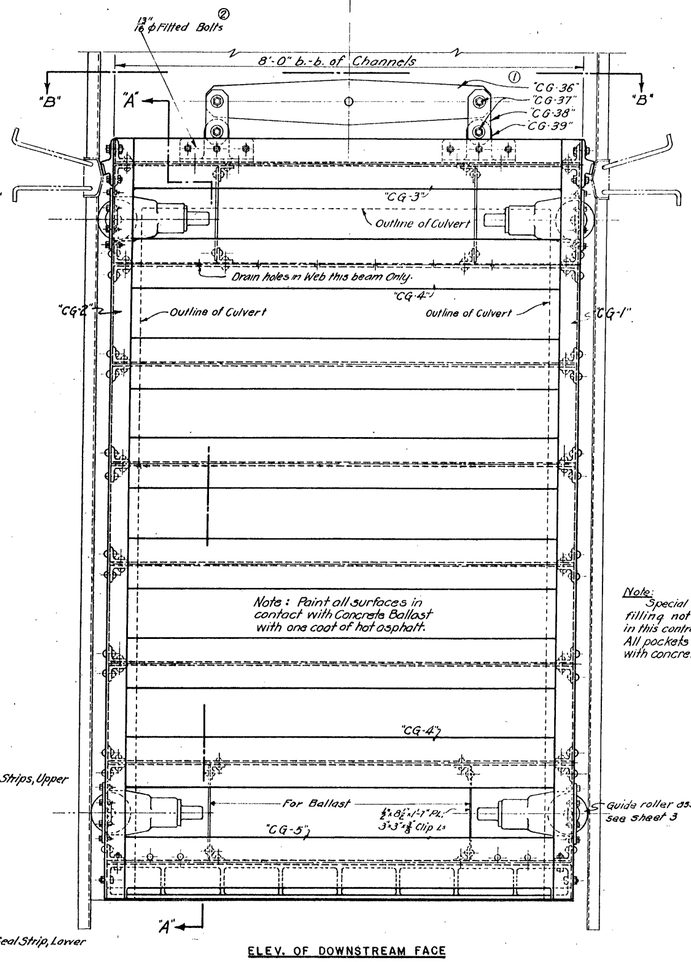


SECTION THRU STOPLOG GROOVE

Scale: 3/8" = 1'-0"

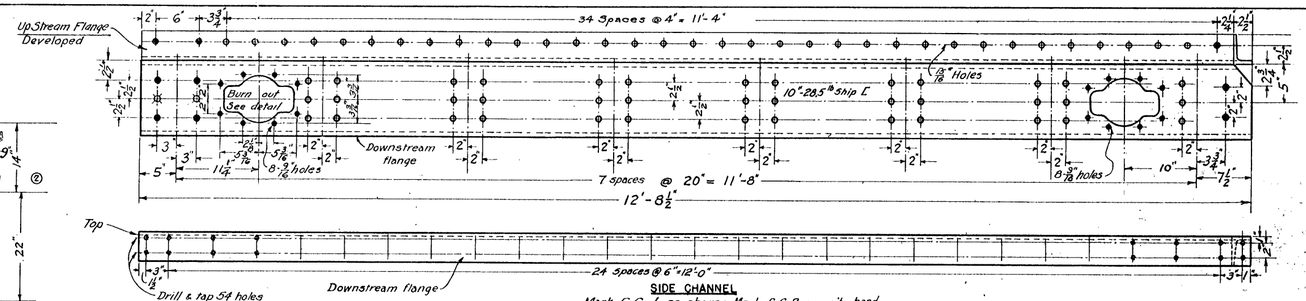


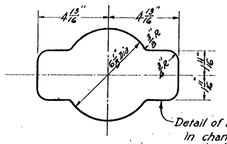
SECTION "B-B" ①

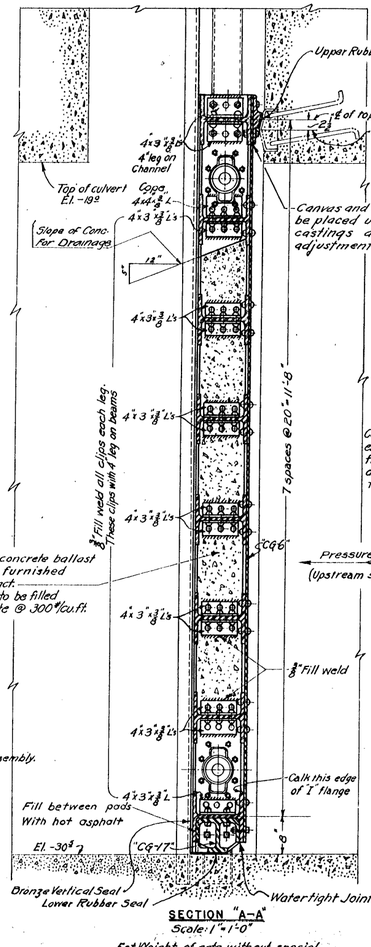


ELEV. OF DOWNSTREAM FACE

Scale: 1"=1'-0" ①







SECTION "A-A"

Scale: 1"=1'-0"

Est. Weight of gate without special concrete ballast 8580 #

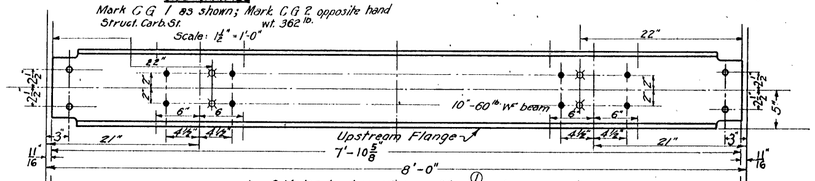
Est. Weight of gate with special concrete ballast in place 27,940 # ①

SIDE CHANNEL

Mark C.G. 1 as shown; Mark C.G. 2 opposite hand wt. 362 lb.

Struct. Carb. St.

Scale: 1/2" = 1'-0"

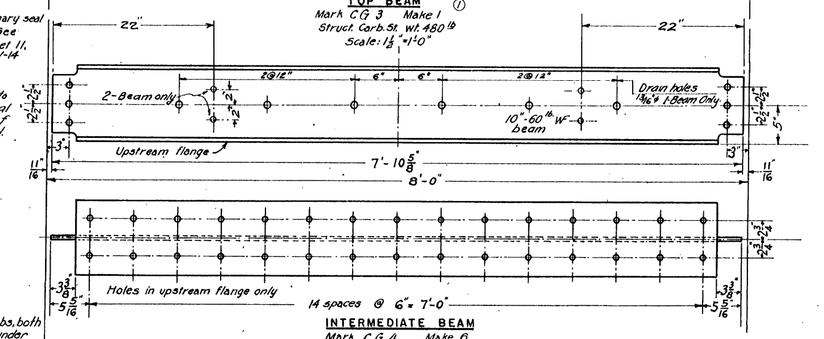


TOP BEAM ①

Mark C.G. 3 Make 1

Struct. Carb. St. Wt. 480 lb

Scale: 1/2" = 1'-0"

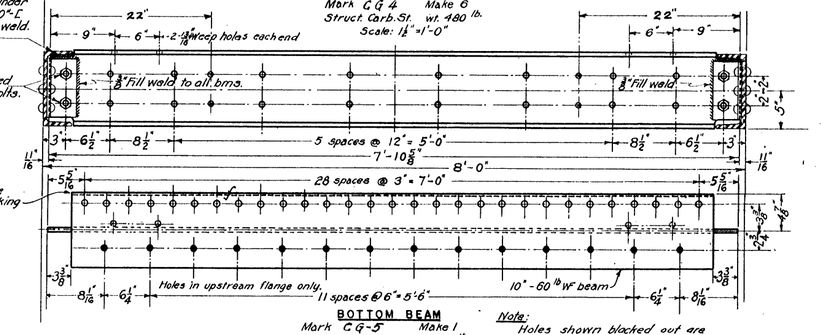


INTERMEDIATE BEAM

Mark C.G. 4 Make 0

Struct. Carb. St. wt. 480 lb

Scale: 1/2" = 1'-0"



BOTTOM BEAM

Mark C.G. 5 Make 1

Struct. Carb. St. wt. 480 lb

Scale: 1/2" = 1'-0"

Cope brn webs both ends to fit under flange of 10"-L and 3/8" fill weld. to bear.

Note: Holes shown blocked out are to be drilled for 3/4" diam. bolts, except as noted.

GENERAL NOTES:

Gate to be watertight under pressure.
All holes 13/16" unless otherwise noted.
Weights given are for one piece as shown.
Remove all scale. Paint as per specifications.
All rivets 3/4" dia. except as noted.
Special concrete ballast to be composed of cement, sand, steel punchings and water mixed in approved proportions.

REFERENCES:

Seal castings - Sheet 2
Skin plate & guide rollers - Sheet 3
Hoist, latch pawl & miscellaneous - Sheet 4.
For Tainter Valve Stop Log Grooves, see Sheet 11 of N-1-11.

NO.	REVISION	DATE	BY	APV'D
2	General Corrections	7-24-35	AAB	Rem
1	Changed Est. Wt. (Sec. A-A)	5-17-35	J.A.S.	Rem
1	Changed Bolt Holes. (Top Beam)	5-17-35	J.A.S.	Rem
1	Lifting Bar. (Elev. of U.S. Face)	5-17-35	J.A.S.	Rem
1	Changed bolt space & Sheave Lifting Bar Arrgmt. (Sec. B-B)	5-17-35	J.A.S.	Rem
1	Changed Latch Pawl Elev. & Lifting Bar: (Sec. Stop Log Gr.)	5-17-35	J.A.S.	Rem
	ISSUED FOR CONSTRUCTION	5-2-35	AAB	Rem

BONNEVILLE POWER NAVIGATION PROJECT

33RD. CONTRACT

SHIP LOCK — EMERGENCY DAM

VALVE CHAMBER GATES ASSEMBLY & STRUCTURAL DETAILS

SCALES AS SHOWN

U. S. ENGINEER OFFICE, PORTLAND, OREGON DISTRICT

SUBMITTED R. Mackenzie ENGINEER

APPROVED H. Hall Lewis MAJOR, CORPS OF ENGINEERS

RECOMMENDED C. N. Wenzell HEAD ENGINEER

DESIGNED BY J.A.Slack DATE 2-12-35

DR. BY B.A.D. TR. BY V.H.P. CHECKED BY A.A.B.

CORPS OF ENGINEERS

U. S. ARMY

PLAN & SEAL PLATE ASSEMBLY
STRUCT. STEEL REQ'D. 1
SCALE: 3" = 1'-0"

END VIEW
SCALE: 3" = 1'-0"

SIDE CHANNEL
MARK CG-1 AS SHOWN; MARK CG-2 OPP. SIDE
STRUCT. CARB. ST.
SCALE: 1½" = 1'-0"

SECTION
Scale 1½" = 1'-0"

HINGE PIN (MK. CG.37) Make 4
Scale 3" = 1'-0"

HINGE STRAP (MK. CG-38) Make 4
Scale 1½" = 1'-0"

LIFTING EYE (Mk. CG-39)
Scale 1½" = 1'-0"

SEAL GUARD
1½" Bl. STOCK
REQ'D
SCALE 6" = 1'-0"

DETAIL "A"
Scale 6" = 1'-0"

DETAIL "D"

DETAIL "C"
SCALE: 3" = 1'-0"

TOD BEAM
MARK CG-3 MAKE 1
STRUCT. CARB. ST.
SCALE: 1½" = 1'-0"

INTERMEDIATE BEAM
MARK CG-4 MAKE 6
STRUCT. CARB. ST.
SCALE: 1½" = 1'-0"

BOTTOM BEAM
MARK CG-5 MAKE 1
STRUCT. CARB. ST.
SCALE: 1½" = 1'-0"

PLAN OF DETAIL "C"
SCALE: 3" = 1'-0"

DETAIL "B"
SCALE: 3" = 1'-0"

ELEVATION OF DOWNSTREAM FACE
SCALE: 1" = 1'-0"

SECTION A-A
SCALE: 1" = 1'-0"

THIS PRINT REDUCED TO ONE-HALF SCALE

REFERENCES: FOR RELATED DETAILS AND ASSEMBLY SEE Dwgs N-2-48/11 & 12
GENERAL NOTES - SEE Dwg N-2-48/11

NOTE: FOR PAINTING SEE SPECIFICATIONS.

REVISION	DATE	DESCRIPTION	BY

U. S. ARMY ENGINEER DISTRICT, PORTLAND
CORPS OF ENGINEERS
OFFICE OF THE DISTRICT ENGINEER, PORTLAND, OREGON

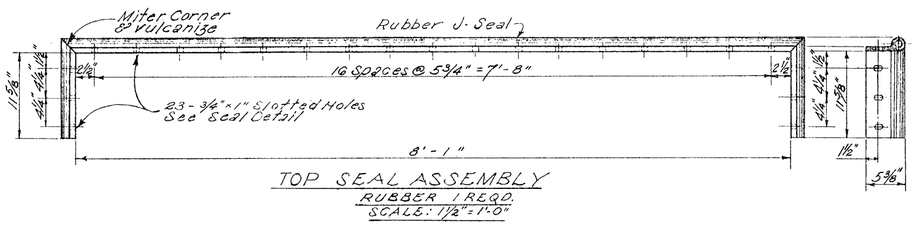
DESIGNED: N.T.D.
DRAWN: N.T. C.S.
CHECKED: C.S.F.
REVIEWED: W.P. Whitwood, Asst. Chief Engineer
SUPERVISED: Chief, Engineering Section
SUBMITTED: Chief, Design Branch
RECOMMENDED: Chief, Engineering Division

BONNEVILLE DAM
COLUMBIA RIVER OREGON-WASHINGTON
NAVIGATION LOCK
VALVE CHAMBER STOPLOG
DETAILS I

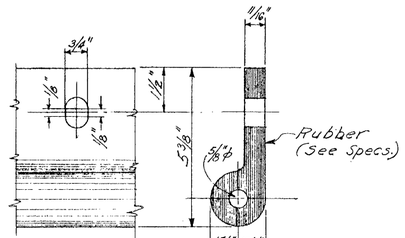
APPROVED: Paul Kitchel, COLONEL, C.E., DISTRICT ENGINEER
DATE: 19 May 50
SCALE AS SHOWN
SPEC. NO.
SHEET 1 OF 3
N-2-48/10

CORPS OF ENGINEERS

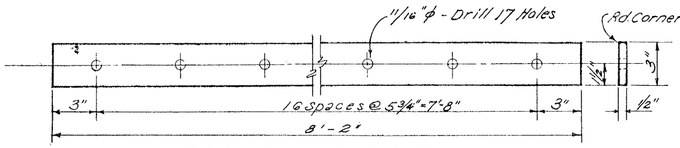
U. S. ARMY



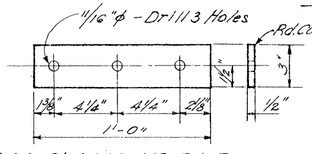
TOP SEAL ASSEMBLY
RUBBER 1 REQD.
SCALE: 1 1/2" = 1'-0"



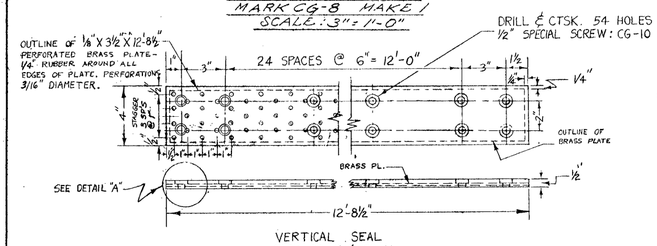
J-SEAL DETAIL
SCALE: 6" = 1'-0"



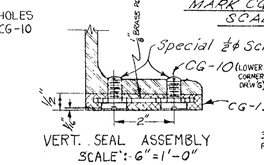
SEAL CLAMPING BAR
STRUCT. STEEL
MARK CG-8 MAKE 1
SCALE: 3" = 1'-0"



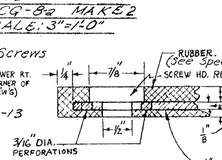
SEAL CLAMPING BAR
STRUCT. STEEL
MARK CG-8a MAKE 2
SCALE: 3" = 1'-0"



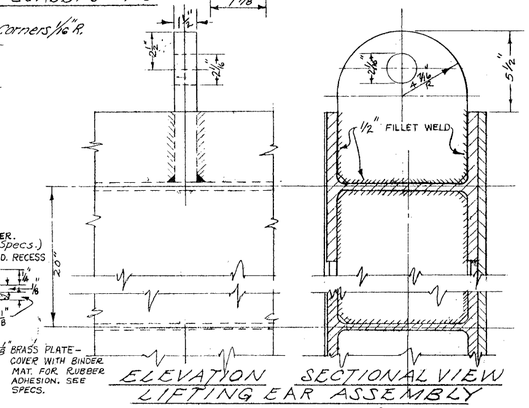
VERTICAL SEAL
MARK CG-13 & CG-14
SCALE: 3" = 1'-0"



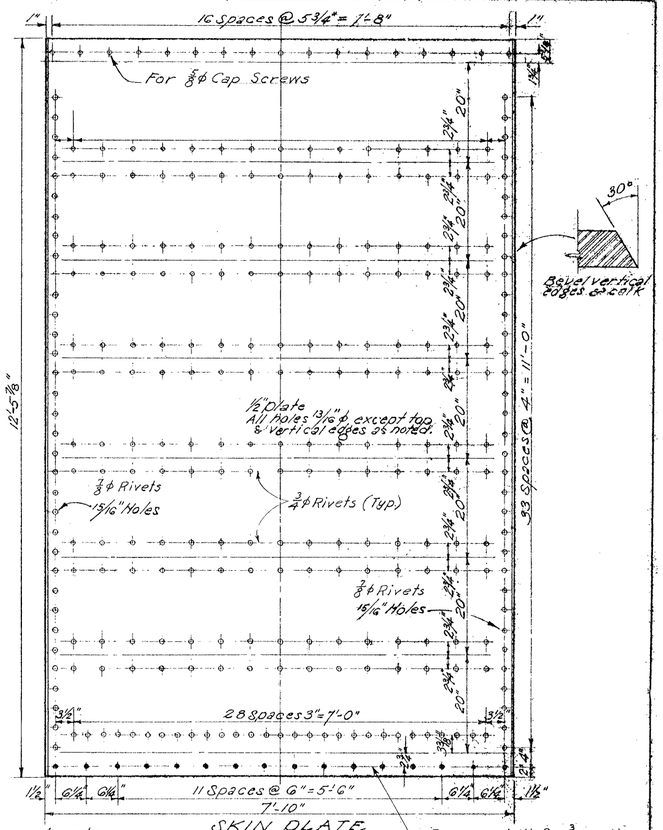
VERT. SEAL ASSEMBLY
SCALE: 6" = 1'-0"



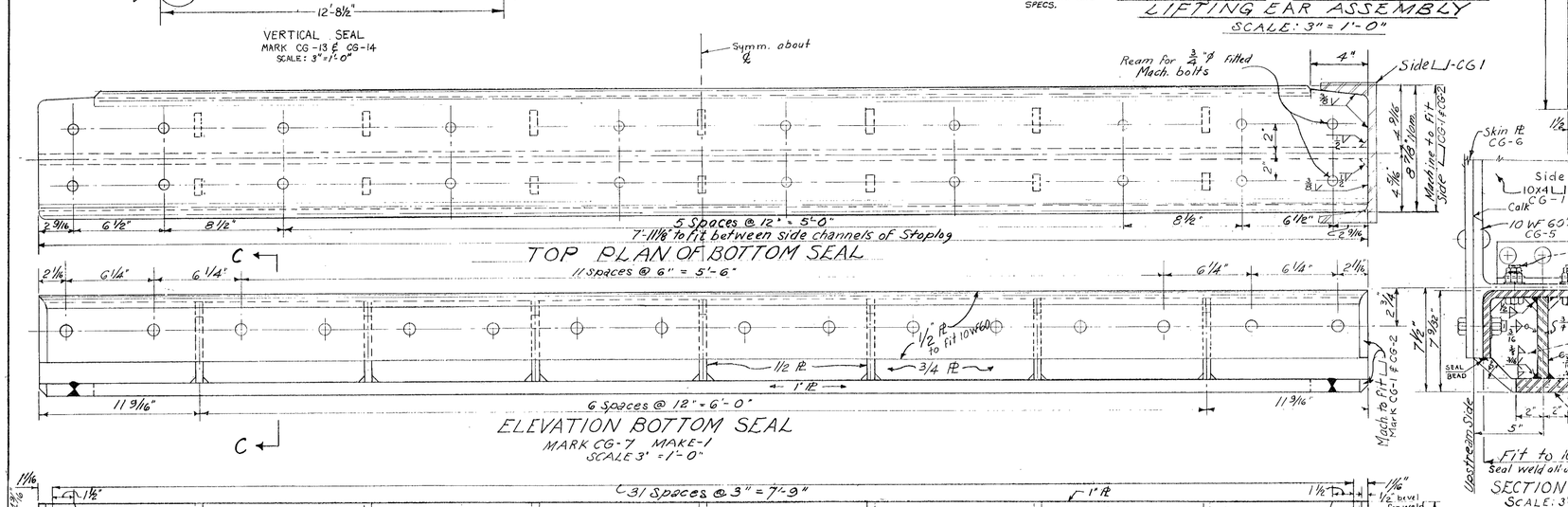
DETAIL "A"
(FULL SIZE)

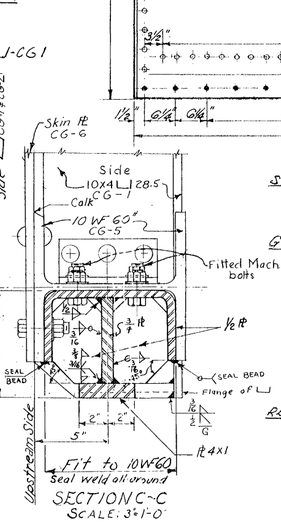


ELEVATION SECTIONAL VIEW
LIFTING EAR ASSEMBLY
SCALE: 3" = 1'-0"



SKIN PLATE
MARK CG-6 MAKE 1
STRUCTURAL CARBON STEEL
SCALE: 1" = 1'-0"

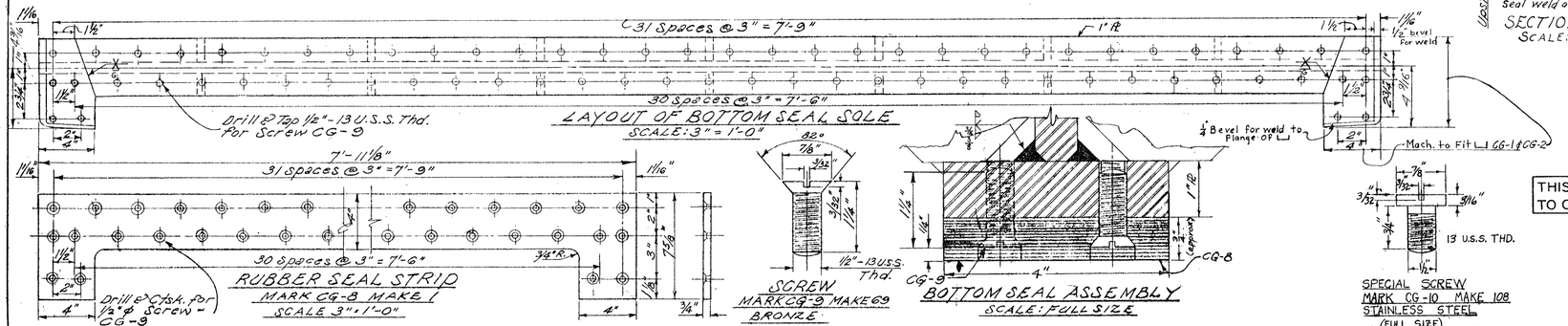




GENERAL NOTES:

1. Number of pieces shown is for one stoplog.
2. Material, structural steel unless otherwise noted.
3. Rivets 3/4ϕ, holes 13/16ϕ, subpunched and reamed unless noted otherwise.
4. Joints, connections and seams watertight. See Specifications for test.
5. Paint in shop. See Specifications for kind and number of coats.

REFERENCES: 1. FOR RELATED DETAILS & ASSEMBLY SEE DWG. N-2-48/10
2. FOR GUIDE ROLLERS DETAILS & ASSEMBLY SEE DWG. N-2-48/12



THIS PRINT REDUCED TO ONE-HALF SCALE

REVISION	DATE	DESCRIPTION	BY

U. S. ARMY ENGINEER DISTRICT, PORTLAND
CORPS OF ENGINEERS
OFFICE OF THE DISTRICT ENGINEER, PORTLAND, OREGON

DESIGNED: N.T.H.-V.O.W.
DRAWN: N.T.H.-T.R.G.P.
CHECKED: R.B.S.-V.O.W.
REVIEWED: J.M. Peterson
CHIEF, SAFETY BRANCH
SUPERVISED: Robert Blum
CHIEF, STRUCTURES DESIGN SECTION
SUBMITTED: Ernest Klum
CHIEF, DESIGN BRANCH
RECOMMENDED: John L. Crumpler
ACTING CHIEF, ENGINEERING DIVISION

BONNEVILLE DAM
COLUMBIA RIVER OREGON-WASHINGTON
NAVIGATION LOCK
VALVE CHAMBER STOPLOG
DETAILS II

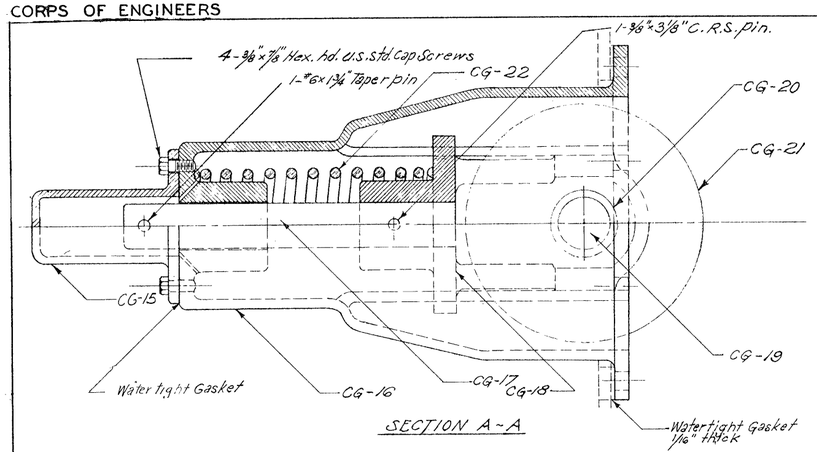
APPROVED: Jack W. Mahn
COLONEL, C.E. DISTRICT ENGINEER
DATE: 12 May 52
SCALE AS SHOWN
SPEC. NO.

SHEET 2 OF 3

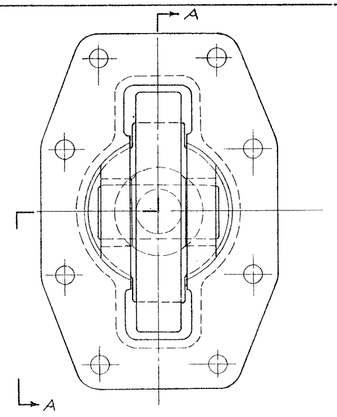
N-2-48/11

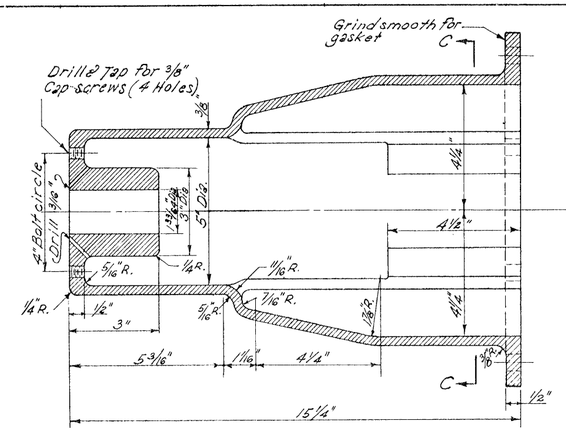
CORPS OF ENGINEERS

U. S. ARMY

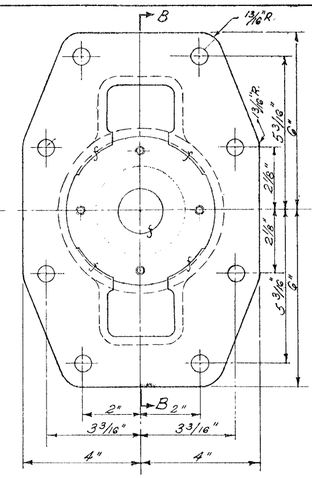


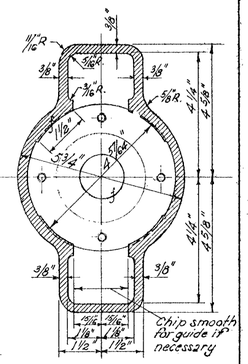
SECTION A-A





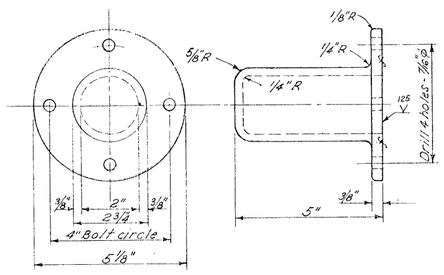
SECTION B-B



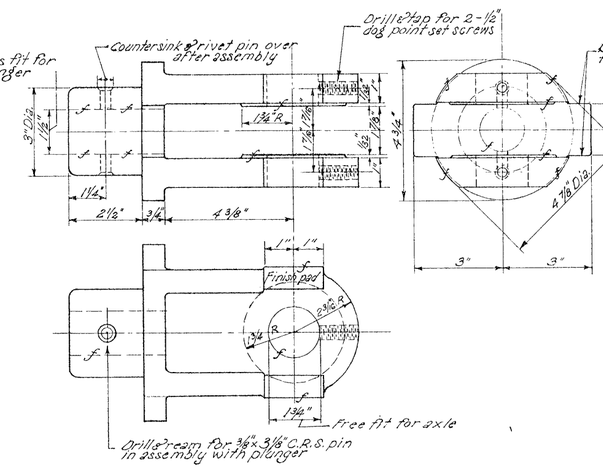


SECTION C-C

GUIDE ROLLER ASSEMBLY



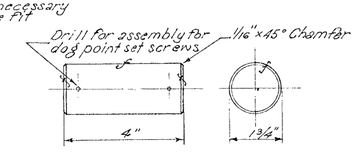
CAP
MARK CG-15 REQD. 4
CARBON STEEL CASTING



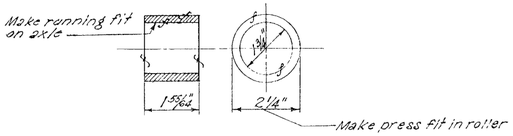
FORK
MARK CG-18 REQD. 4
CARBON STEEL CASTING

ROLLER
CARBON STEEL CASTING
MARK CG-21 REQD. 4

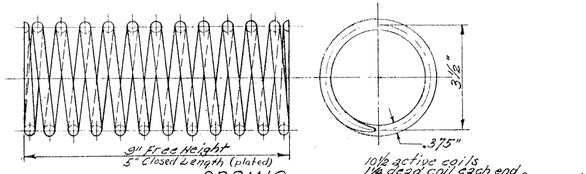
PLUNGER
MARK CG-17 REQD. 4
COLD ROLLED STEEL



ROLLER AXLE
MARK CG-19 REQD. 4
COLD ROLLED STEEL



BUSHING, SELF LUBRICATING
MARK CG-20 REQD. 4
PHOS. BRONZE



SPRING
MARK CG-22 REQD. 4
SPRING STEEL WIRE

10½ active coils
1/8 dead coil each end
Ends to be squared & ground
Cadmium plate

NOTE:

1. Quantities specified are for one complete gate assembly
2. Finished surfaces (f), 125√, unless otherwise noted.
3. For gate assembly see N-2-48/10

THIS PRINT REDUCED TO ONE-HALF SCALE

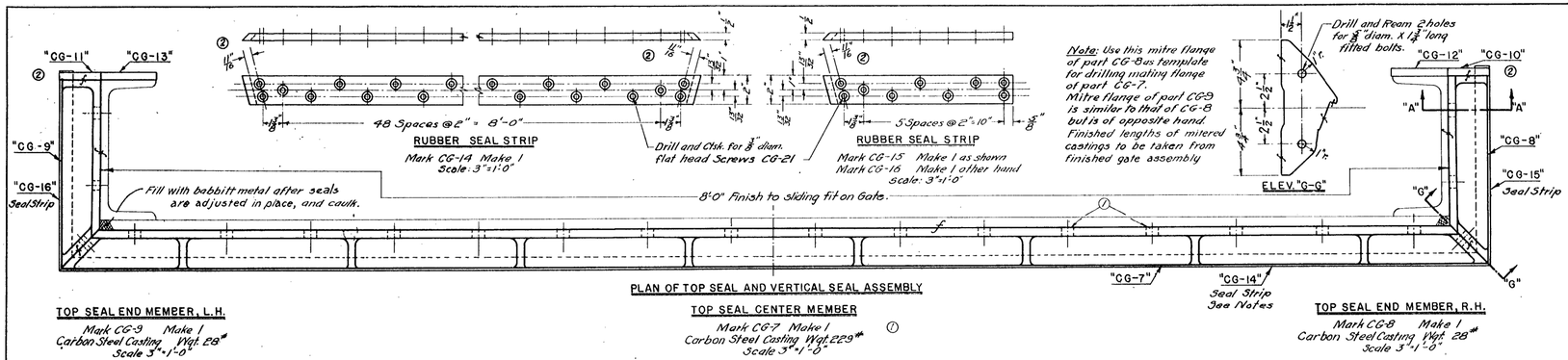
REVISION	DATE	DESCRIPTION	BY

U. S. ARMY ENGINEER DISTRICT, PORTLAND
CORPS OF ENGINEERS
OFFICE OF THE DISTRICT ENGINEER, PORTLAND, OREGON

DESIGNED: N.T.H.
DRAWN: N.T.H.
CHECKED: R.A.P. Y.U.W.
REVIEWED: Kenneth Chatwood, CHIEF, DIRECT SERVICE
SUPERVISED: CHIEF, CONSTRUCTION SERVICE DIVISION
SUBMITTED: CHIEF, DESIGN BRANCH
RECOMMENDED: Acting CHIEF, ENGINEERING DIVISION

BONNEVILLE DAM
COLUMBIA RIVER OREGON-WASHINGTON
NAVIGATION LOCK
VALVE CHAMBER STOPLOG
DETAILS III

APPROVED: Carl P. Wade, COLONEL, C. E., DISTRICT ENGINEER
DATE: 19 May 58
SCALE AS SHOWN
SPEC. NO.
SHEET 3 OF 3
N-2-48/12

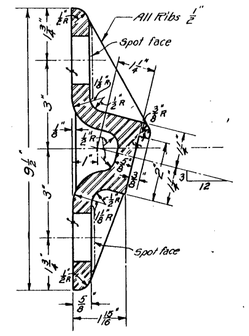


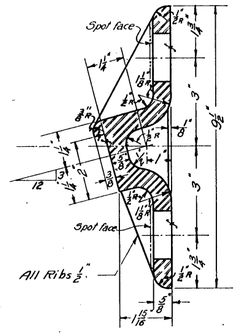
PLAN OF TOP SEAL AND VERTICAL SEAL ASSEMBLY

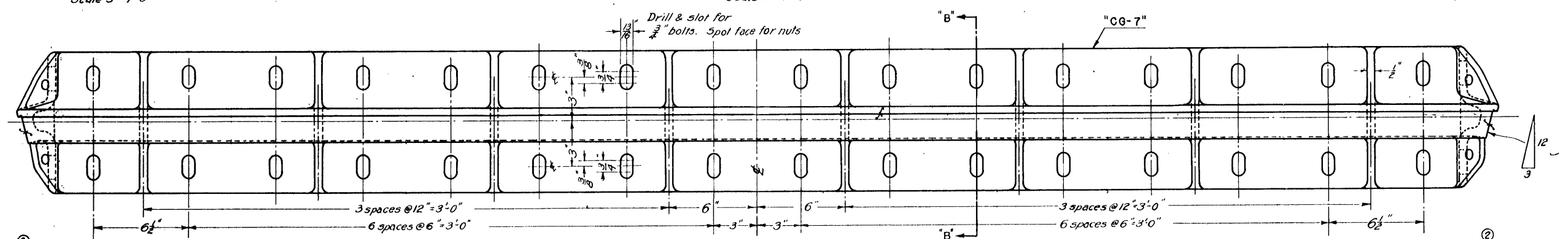
TOP SEAL END MEMBER, L.H.
Mark CG-9 Make 1
Carbon Steel Casting Wgt. 28#
Scale 3"=1'-0"

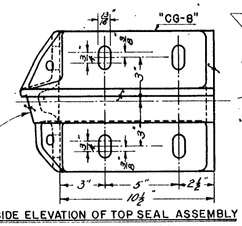
TOP SEAL CENTER MEMBER ①
Mark CG-7 Make 1
Carbon Steel Casting Wgt. 229#
Scale 3"=1'-0"

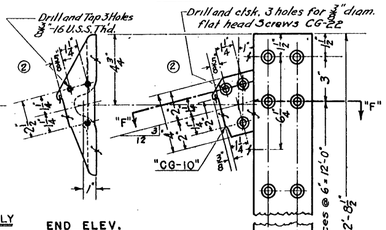
TOP SEAL END MEMBER, R.H.
Mark CG-8 Make 1
Carbon Steel Casting Wgt. 28#
Scale 3"=1'-0"

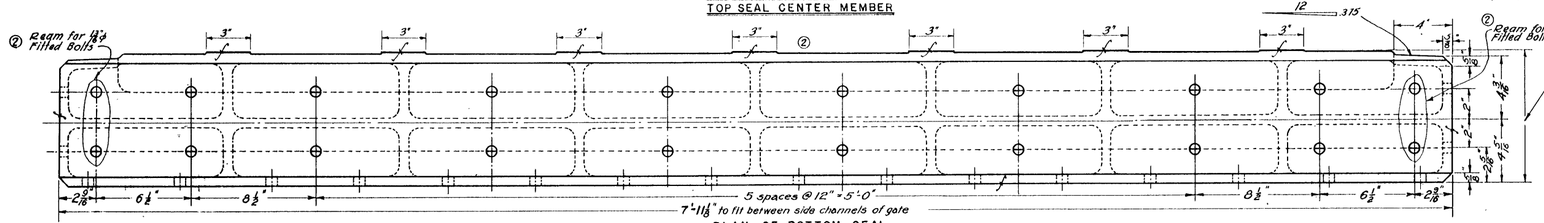


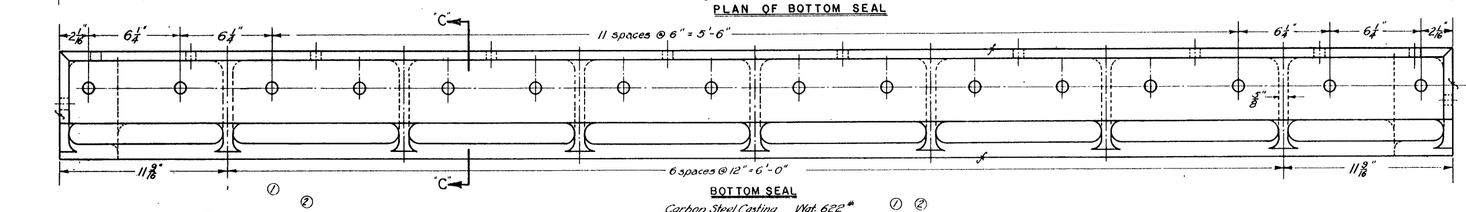


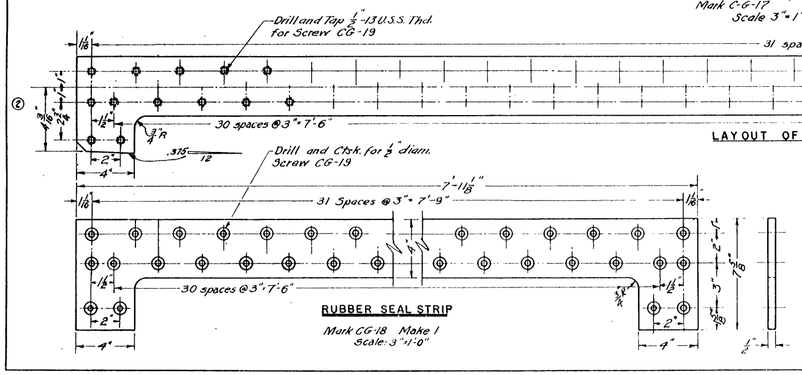


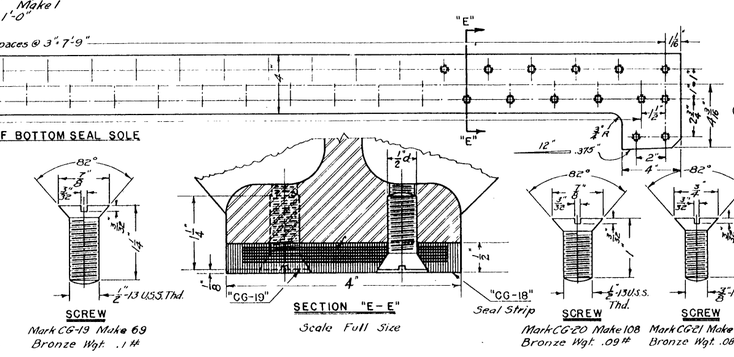


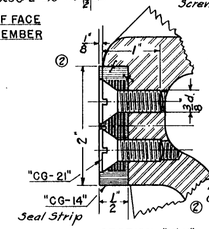


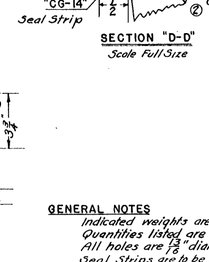


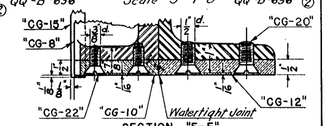












SEAL PLATE
Mark CG-10 Make 1 as shown
Mark CG-11 Make 1 other hand.
Naval Bronze Wgt. 1.4#
QQ-B-636

SEAL STRIP
Mark CG-12 Make 1 as shown
Mark CG-13 Make 1 other hand
Naval Bronze Wgt. 1.35#
Scale 3"=1'-0" QQ-B-636 ②

GENERAL NOTES

Indicated weights are for single pieces as noted.
Quantities listed are for one gate.
All holes are ⅞" diam. unless otherwise noted.
Seal Strips are to be of rubber, reinforced with 6 plys of 28 to 32 oz. cotton duck, with ⅛" rubber facing, ⅛" rubber backing and ¼" rubber capping on all sides and ends, and the whole vulcanized in a mold. Vulcanize all seal joints.

REFERENCES

For related details and assembly see Sheet 1 of Dwg. N-2-48.

NO.	REVISION	DATE	BY	APV'D
2	General Corrections	7-24-35	JAS	RSM
1	Corrected hole space (Top Seal)	5-17-35	J.A.S.	R.S.M.
1	Pawl Clearance Shown (Bot. Seal)	5-17-35	J.A.S.	R.S.M.
ISSUED FOR CONSTRUCTION		5-2-35		

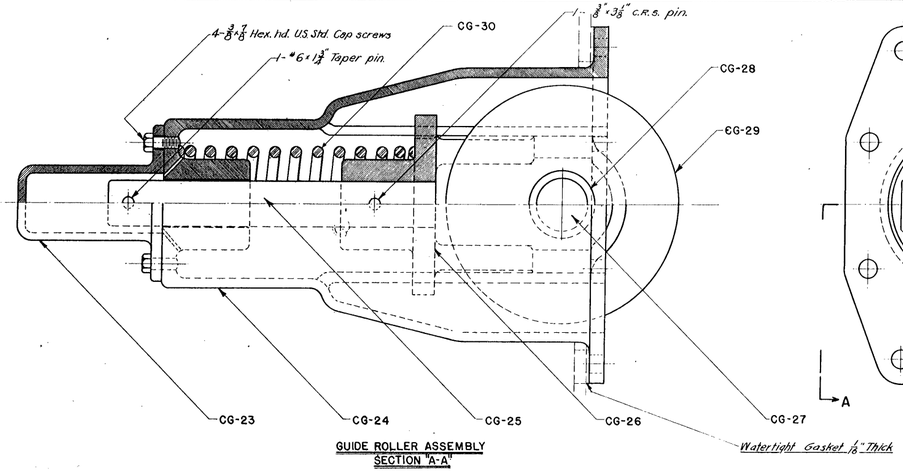
BONNEVILLE POWER NAVIGATION PROJECT
33RD CONTRACT
SHIP LOCK — EMERGENCY DAM
VALVE CHAMBER GATES SEAL DETAILS
SCALES AS SHOWN
U. S. ENGINEER OFFICE, PORTLAND, OREGON DISTRICT

SUBMITTED R. S. Mackenzie ENGINEER — APPROVED MAJOR, CORPS OF ENGINEERS
RECOMMENDED HEAD ENGINEER — DESIGNED BY H.E.L. DATE 2-12-35
DR. BY C.A.D. IN BY H.E.L. CHECKED

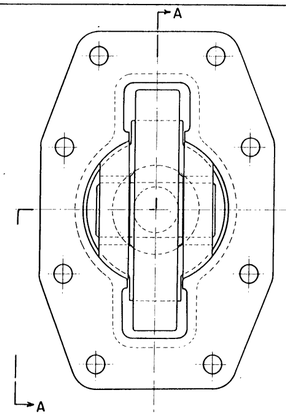
SHEET 2 OF 4 N-2-48

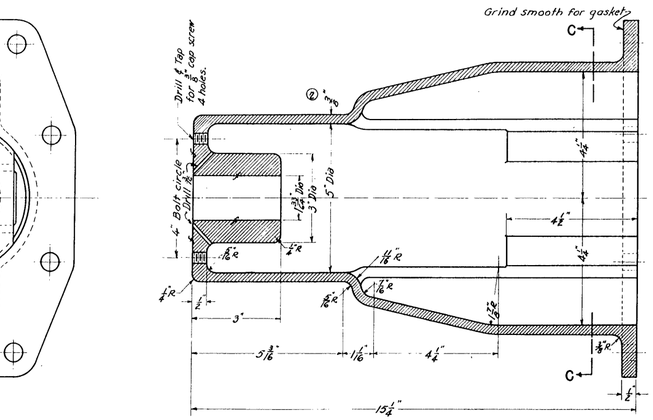
WAR DEPARTMENT

CORPS OF ENGINEERS U. S. ARMY

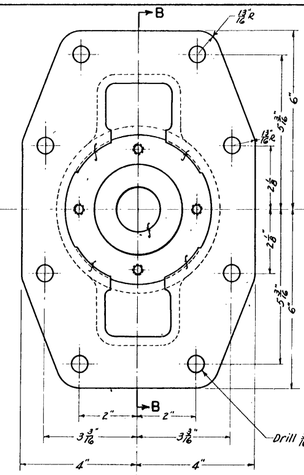


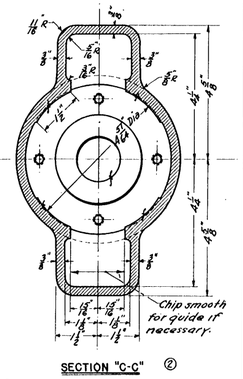
GUIDE ROLLER ASSEMBLY
SECTION "A-A"





SECTION "B-B"

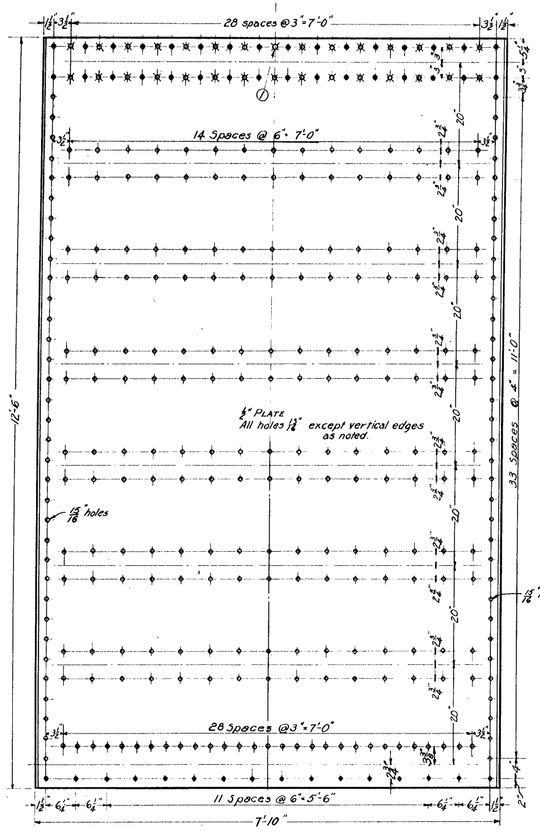




SECTION "C-C"

0 1 2 3 4 5 6
Scale – Inches
All roller details

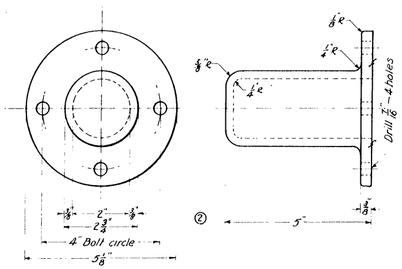
SHELL
Mark CG-24 Make 4
Carbon Steel Casting Wt. 45 lbs.



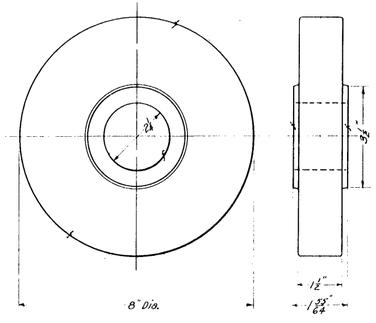
Bevel vertical edges and calk

SKIN PLATE ①
Mark CG-6 Make 1
Structural Carbon Steel Wt. 1970 lbs.

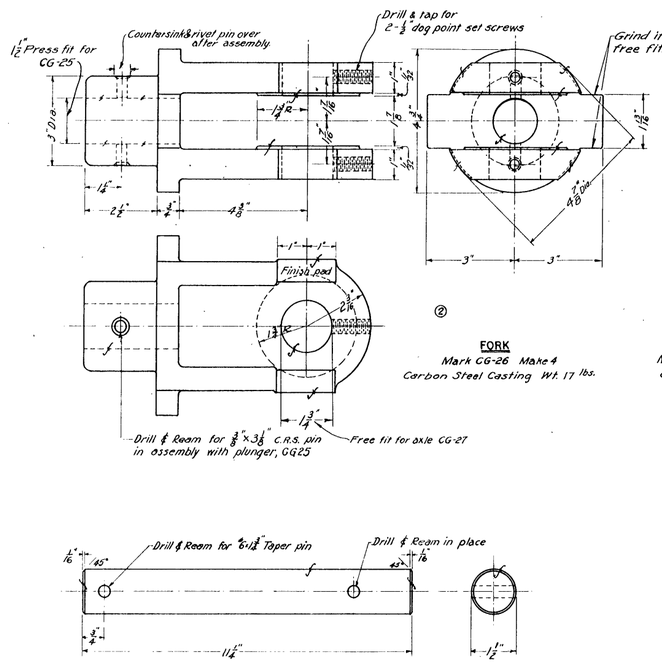
Note: All blacked out holes to be drilled for ⅜" bolts.



CAP
Mark CG-23 Make 4
Carbon Steel Casting Wt. 4 lbs.

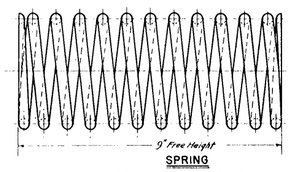


ROLLER
Mark CG-29 Make 4
Carbon Steel Casting Wt. 20 lbs.



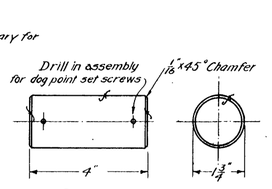
FORK
Mark CG-26 Make 4
Carbon Steel Casting Wt. 17 lbs.

PLUNGER
Mark CG-25 Make 4
Cold Rolled Steel Wt. 5.6 lb

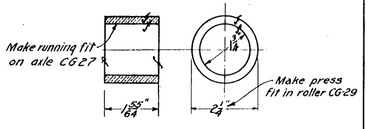


SPRING
Mark CG-30 Make 4
Spring Steel Wire Wt. 4.5 lb.

10½ active coils
½ dead coils - each end.
Ends to be squared & ground.
Cadmium plate.



② ROLLER AXLE
Mark CG-27 Make 4
Cold Rolled Steel Wt. 2.7 lb.



BUSHING, SELF LUBRICATING
Mark CG-28 Make 1
Phos. Bronze Wt. 0.9 lb.

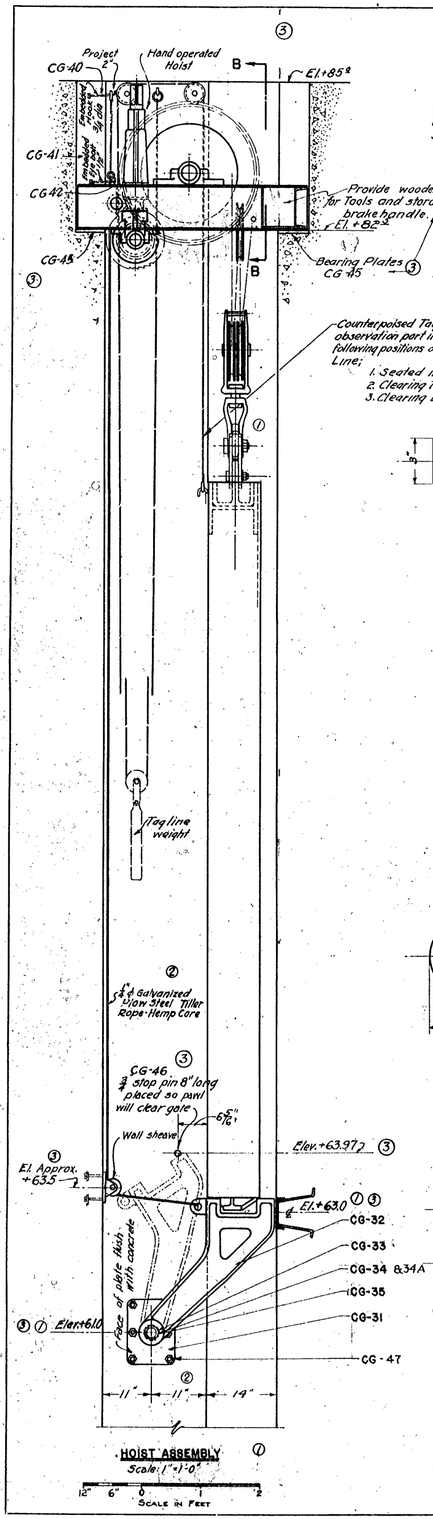
GENERAL NOTES:
Quantities specified are for one complete gate assembly.
Weights are for each piece as shown.

REFERENCES:
For Gate Assembly and associated details see sheets 1, 2 and 4 of N-2-48.

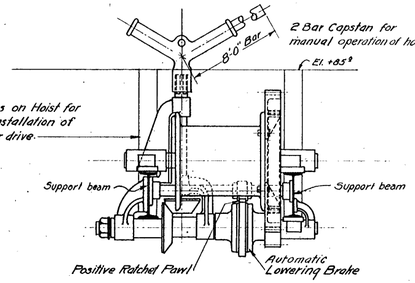
NO.	REVISION	DATE	BY	APV'D
2	General Correction & Revision	7-24-35	JAS.	KLM
1	Topped hole now Rivet (Thin Pl.)	5-11-35	JAS.	KLM
	ISSUED FOR CONSTRUCTION	5-2-35		

BONNEVILLE POWER NAVIGATION PROJECT
33RD. CONTRACT
SHIP LOCK – EMERGENCY DAM
VALVE CHAMBER GATES
SKIN PLATE & GUIDE ROLLERS
SCALES AS SHOWN
U. S. ENGINEER OFFICE, PORTLAND, OREGON DISTRICT
SUBMITTED R. L. Mackenzie, ENGINEER
APPROVED H. Williams, MAJOR, CORPS OF ENGINEERS
RECOMMENDED, HEAD ENGINEER
DESIGNED BY A.O.D. DATE 2-12-35
DR. BY A.O.D. TR. BY A.O.D. CHECKED A.O.D.

SHEET 3 OF 4 N-2-48

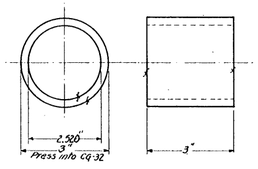


HOIST ASSEMBLY ①
Scale: 1"=1'-0"

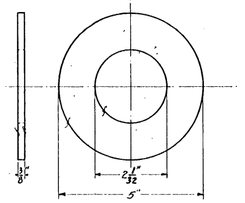


NOTE:
Provide means on Hoist for subsequent installation of electric motor drive.

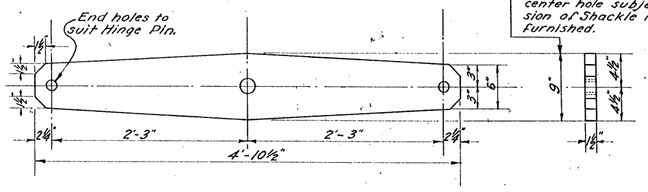
HAND OPERATED HOIST
ELEVATION "B-B"
Scale: 1"=1'-0"



BUSHING SELF LUBRICATING
Mark CG-33 Make 2
Phos. Bronze Wt. 2 lb.
Scale: Half Size

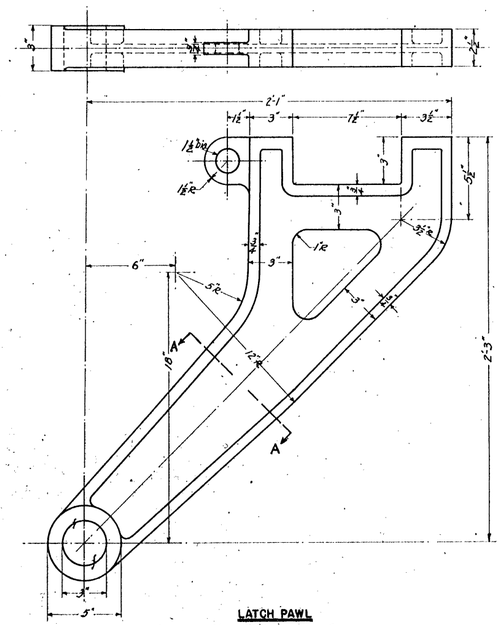


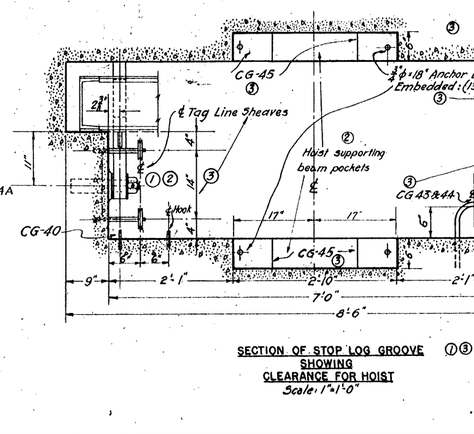
② WASHER
Mark CG-34 Make 2
Bronze-QQ-B-636 Wt. 1 lb
Scale Half Size



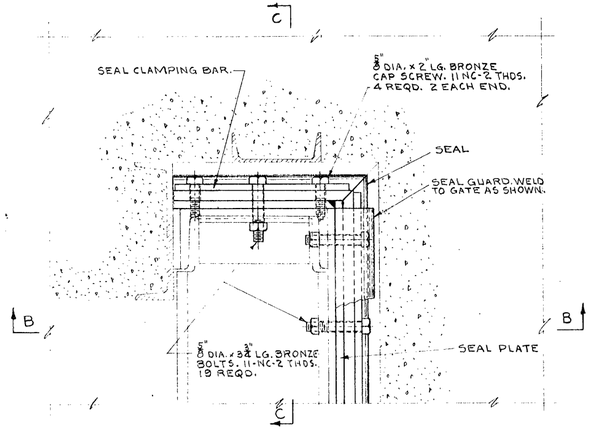
LIFTING BAR ①
Mark CG-36 Make 1
Structural Carbon Steel Wt. 180 lb.
Scale 1½"=1'-0"

0 1 2 3 4 5
Scale - Inches

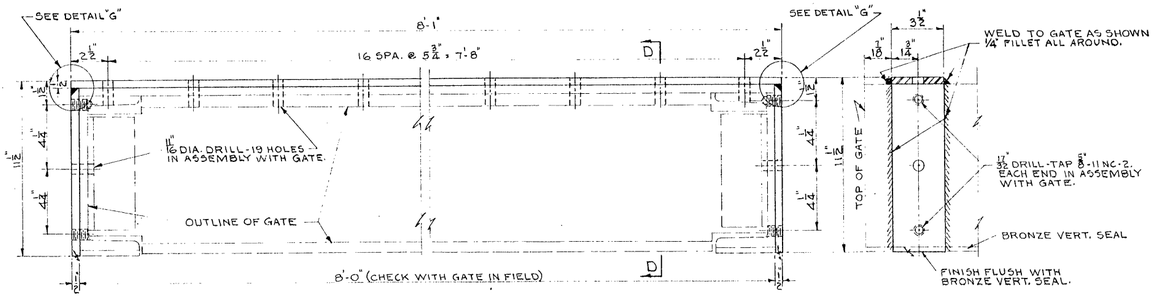




LATCH PAWL
Mark CG-32 Make 2
Carbon Cast Steel Wt. 108 lb.
Scale: 3"=1'-0"



PLAN SECTION A-A

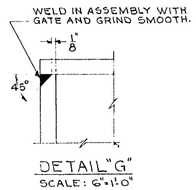


SEAL PLATE ASSEMBLY

STRUCT. STEEL 1 REQD. AS SHOWN

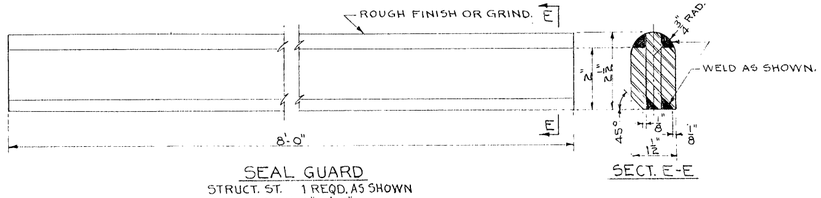
SCALE: 3"=1'-0"

SECT. D-D



DETAIL "G"

SCALE: 6"=1'-0"



NOTE:

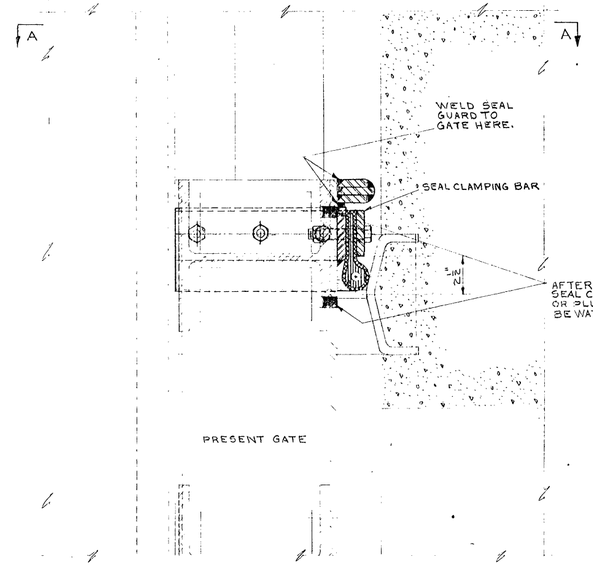
IF 1/2" BAR NOT IN STOCK MAKE UP SEAL GUARD BAR AS SHOWN.

SEAL GUARD

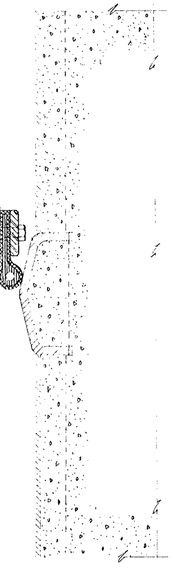
STRUCT. ST. 1 REQD. AS SHOWN

SCALE: 6"=1'-0"

SECT. E-E



SECTION B-B

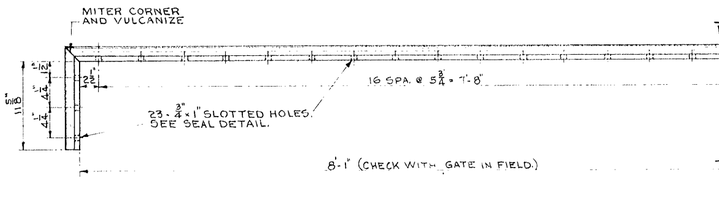


SECTION C-C

ASSEMBLY

SHOWING ALTERATION TO GATE & SEAL

SCALE: 3"=1'-0"



SEAL ASSEMBLY

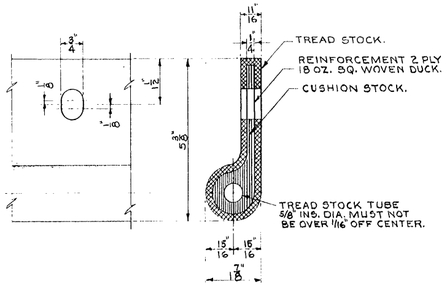
RUBBER 1 REQD. AS SHOWN

SCALE: 1 1/2"=1'-0"

SECT. F-F

NOTE:

SEAL IDENTICAL TO VERTICAL SEAL ON FISHWAY TRASH SLUICE WEIR GATES & STOP LOGS. MOLD AT BONNEVILLE. SEE ENLARGED DETAIL OF SEAL.

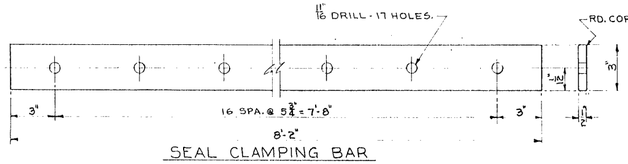


SEAL DETAIL

SCALE: 6"=1'-0"

NOTES & REFERENCES:

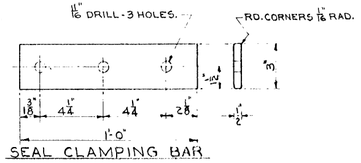
QUANTITIES SHOWN ARE FOR ONE GATE COMPLETE. ALL WELDING SHALL BE WATERTIGHT UNDER PRESSURE. FOR ASSEMBLY AND DETAILS OF PRESENT GATES SEE 4 SHEETS OF N-2-48. FOR EMBEDDED STEEL AND SEAL CASTING SEE SHEET 11 OF N-1-11.



SEAL CLAMPING BAR

STRUCT. STEEL 1 REQD.

SCALE: 3"=1'-0"



SEAL CLAMPING BAR

STRUCT. STEEL 2 REQD

SCALE: 3"=1'-0"

NO.	REVISION	DATE	BY	APP.

BONNEVILLE DAM

SHIP LOCK EMERGENCY DAM GATES

VALVE CHAMBER GATE ALTERATIONS FOR NEW TOP HORIZONTAL SEAL

U. S. ENGINEER OFFICE, PORTLAND, OREGON. DISTRICT

SUPERVISED: ENGINEER

APPROVED: Lt. Col., Corps of Engineers, District Engineer

SUBMITTED: R. G. Schuebrecht, Senior Engineer

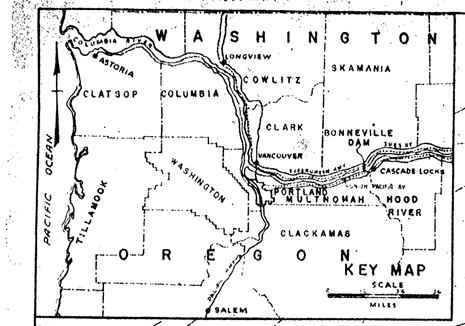
RECOMMENDED: C. B. Galbraith, Principal Engineer

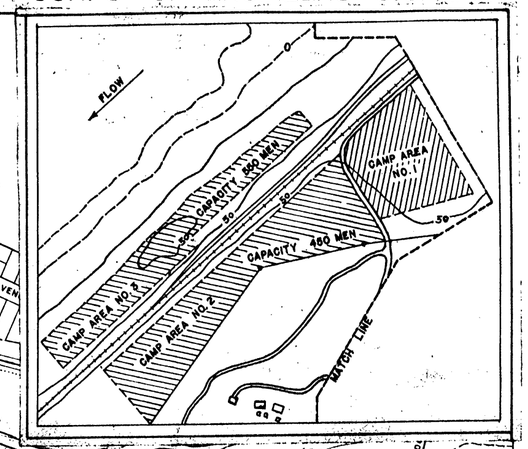
DESIGNED: N.B. MADSEN DATE: SEPT. 22-43

DRAWN BY: N.B.M. CHECKED BY: R.K.W.

WAR DEPARTMENT

CORPS OF ENGINEERS U.S. ARMY





WASHINGTON

OREGON

COLUMBIA RIVER

BRADFORD ISLAND

NORTH BONNEVILLE

HERON ST. · HURLEY ST. · ROOSEVELT AVENUE · READY ST.

SPILLWAY DAM

CONSTRUCTION ROAD

CARPENTER SHOP

FISH LADDER

AUXILIARY WATER SUPPLY

COFFER DAM "B"

APPROACH CHANNEL

RECESSES FOR VALVE CHAMBER GATES

FISHWAY STOP LOGS

FUTURE EXTENSION

POWER HOUSE

NAVIGATION LOCK

BULKHEADS · POST DERRICK

RECESSES FOR VALVE CHAMBER GATES

BULKHEADS · POST DERRICK

COFFER DAM "A"

FLOW

SEC. 21 T.1N. R.7E.W.M. · SEC. 22

USED FIELD OFFICE

COLUMBIA CONSTRUCTION CO FIELD OFFICE

BOILER HOUSE

GENERAL CONSTRUCTION CO. J.F. SHEA INC. HOUSES

COLUMBIA CONSTRUCTION CO STORE HOUSE

PRESENT O.W.R.R.&N.CO.

GOVERNMENT CAMP DEPOT

PERMANENT QUARTERS

YARD AREA

IRRIGATION

MATCH LINE

O.W.R.R.&N.CO. RELOCATION

HATCHERY

CONSTRUCTION ROAD

COLUMBIA RIVER HIGHWAY

SCHOOL

Eagle Creek

BONNEVILLE POWER, NAVIGATION PROJECT.
33RD CONTRACT
SHIP LOCK EMERGENCY DAM
GENERAL SITE MAP.
SCALE.
0 200 400 800 1200

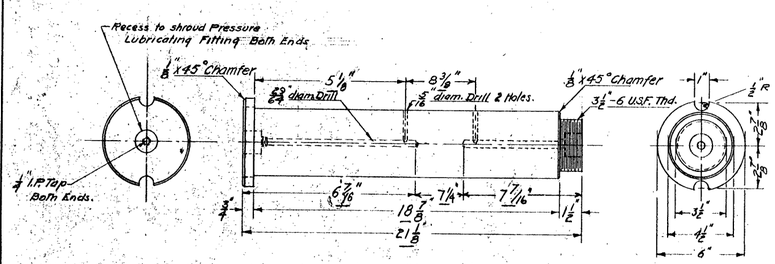
U.S. ENGINEER OFFICE, PORTLAND, OREGON DISTRICT.

SUBMITTED, R.E. Mackenzie, ENGINEER. APPROVED, C.E. Williams, MAJOR CORPS OF ENGINEERS.

RECOMMENDED, [illegible] CHIEF ENGINEER. DRAWN BY J.A.A. DATE 5-7-60

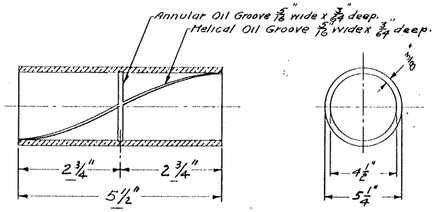
TRACED BY A.A.L. CHECKED BY [illegible]

SHEET 1 OF 15 N-2-60



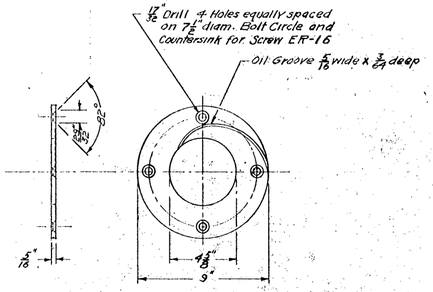
SHAFT

Nickel Steel Forging Heat Treated
Wgt. 105 #
Mark ER-8 Make 40
Finish all over



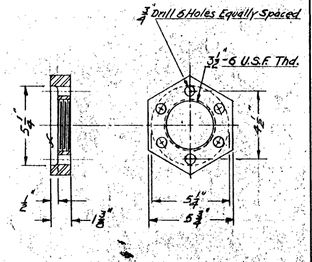
BUSHING

Phos. Bronze Wgt. 10 #
Mark ER-13 Make 80
Finish all over



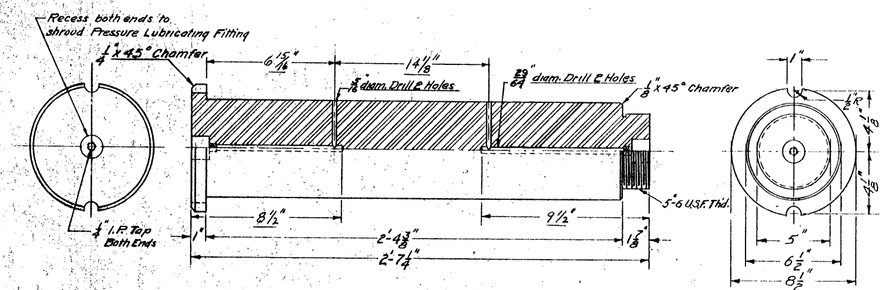
THRUST WASHER

Phos. Bronze Wgt. 4.5 #
Mark ER-15 Make 80
Finish all over



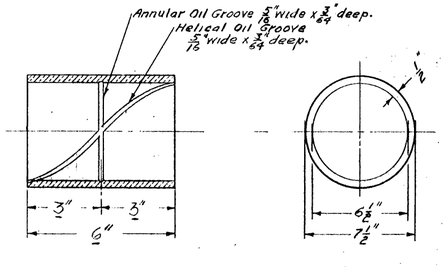
NUT

Nichel Steel Casting Wgt. 6 #
Mark ER-10 Make 40



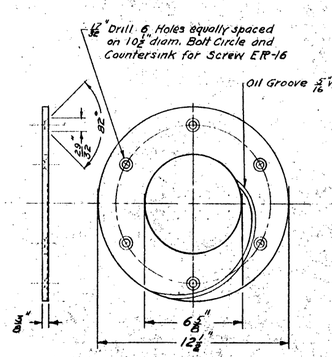
SHAFT

Nickel Steel Forging Heat Treated
Wgt. 295 #
Mark ER-7 Make 40
Finish all over



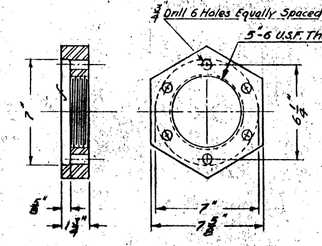
BUSHING

Phos. Bronze Wgt. 20.5 #
Mark ER-12 Make 80
Finish all over



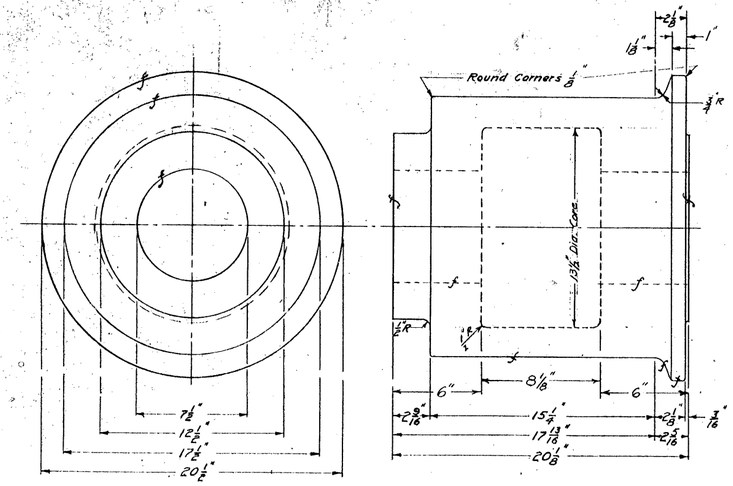
THRUST WASHER

Phos. Bronze Wgt. 10.5 #
Mark ER-14 Make 80
Finish all over



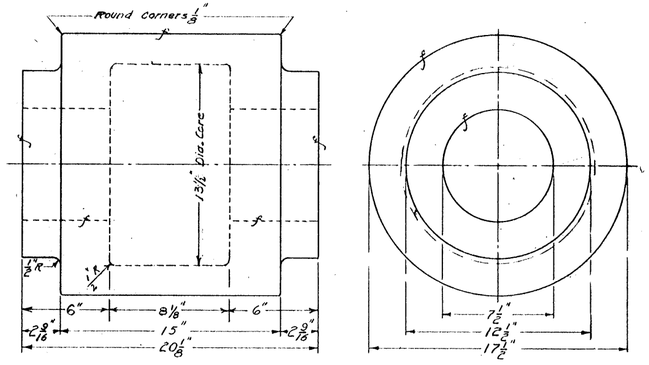
NUT

Nickel Steel Casting Wgt. 12 #
Mark ER-9 Make 40



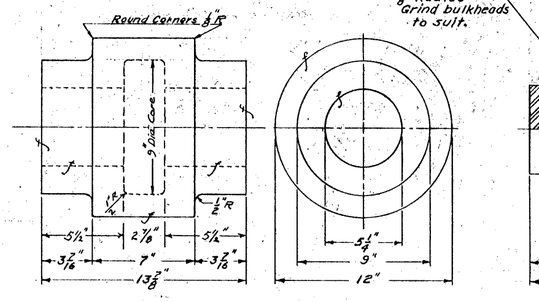
ROLLER

Nickel Steel Casting Heat Treated to Brinell 248-285
Wgt. 843 # Finish as Shown
Mark ER-5 Make 20



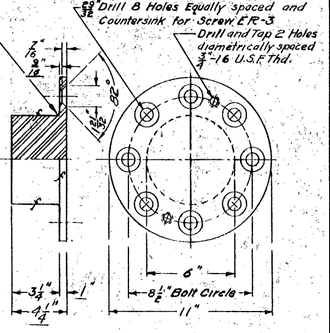
ROLLER

Nickel Steel Casting Heat Treated to Brinell 248-285
Wgt. 725 # Finish as Shown.
Mark ER-4 Make 20



ROLLER

Nickel Steel Casting Heat Treated to Brinell 248-285
Wgt. 230 # Finish as Shown.
Mark ER-6 Make 40



TRUNNION

Nickel Steel Forging Heat Treated
Wgt. 535 # Cadmium Plate
Mark ER-2 Make 40
Finish all over

0 3 6 9 12
SCALE IN INCHES

General Notes:
Indicated weights are for single pieces as noted.

References:
For Assembly and related details see Sheet 9 N-2-60

BONNEVILLE POWER NAVIGATION PROJECT
33RD CONTRACT
SHIP LOCK—EMERGENCY DAM
BULKHEADS Nº 4 TO 13 INCL.
END ROLLERS - DETAILS
SCALE 3"=1'-0"

U. S. ENGINEER OFFICE, PORTLAND, OREGON DISTRICT

SUBMITTED K.B. Mackenzie ENGINEER
APPROVED [illegible] MAJOR, CORPS OF ENGINEERS
RECOMMENDED [illegible] HEAD ENGINEER
DESIGNED BY F.T.D. DATE 2-12-1935
DR. BY H.G.L. TR. BY H.G.L. CHECKED [illegible]

NO.	REVISION	DATE	BY	APV'D
	ISSUED FOR CONSTRUCTION	5-2-35	[illegible]	[illegible]

WAR DEPARTMENT

CORPS OF ENGINEERS U. S. ARMY

UPSTREAM SECTION & ELEVATION

PLAN
Mark Top
Scale in feet

SECTION AA

SECTION BB
Scale in feet

DETAIL U_0L_1
Scale in feet

SPACE DIAGRAM
Scale in feet

STRESS DIAGRAM
Scale: 10,000 pounds

Make 1 Lifting Beam as shown & noted.

Counterweight Mats	Structural Carbon Steel.	Estimated Original Weight	20,290 lbs.
Est. Structural Nickel Steel	18,700 lbs.	Est. Weight of Revision	3,490 lbs.
Est. Rollers	1,060 lbs.	Est. Total Weight	23,780 lbs.
Est. Lifting Hooks Complete	530 lbs.		
Est. Original Weight	20,290 lbs.		

Note: B.M. at L_2 U_2 based on Friction Coefficient of 0.15 due to reaction at guides.

NOTES FOR BALANCING

1—The center of gravity for each of the bulkheads having end rollers (No.4 to No.13 incl) must be established experimentally by balancing every bulkhead when completely assembled with rollers, buffers and all other appurtenances.

2—Lifting pins must be placed symmetrically about the average location of the center of gravity for the above referred ten bulkheads, and dimensions "A" and "C" established accordingly.

3—The procedure outlined in "1" and "2" must be followed in establishing dimension "B" for bulkheads having fixed sliding shoes (No.1 to No.3 incl.)

4—Location of hooks in the lifting beam must be adjustable between dimensions "B" and "C".
(a) The front hooks (at the skin plate end) may be attached permanently to suit dimension "A".
(b) The attachment of the rear hooks (dimensions "B" and "C") must be adjustable to suit the center of gravity location for the corresponding groups of bulkheads.

5—Adjustable counterweights must be suitably provided in the lifting beam to produce a condition of balance about the center of gravity of each group of bulkheads, when these bulkheads and the lifting beam are hooked together for handling by the derrick.

REFERENCES

For roller details see Sheet No.12
For general design data see Sheet No.1
For welding specifications see Sheet No.1.
For general notes see Sheet No.3.

GENERAL NOTES

Trusses designed for cantilever action.
Camber 1" at center.
Rivet Tie Plates of Bottom Chord; Struts & Diagonals having 2½" L Legs with ⅞" ϕ Rivets.
In order to permit shipment, field connections may be made at the option of the Contractor, details to be submitted for Approval of the Contracting Officer.

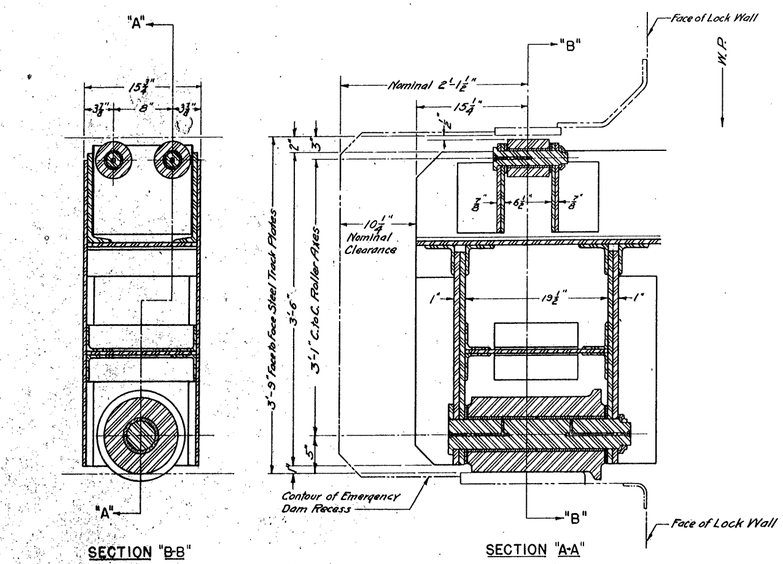
NO.	REVISION	DATE	BY	APV'D
1	Reinf. Pl. Note	7-17-35		
1	Attach L.B. Seams with ⅞" bolts	7-17-35		
1	Per Revision - See Dwg. N-2-98	7-15-36		
1	Hook Plate Dimens. Corrected	7-15-36		
1	Estimated Weights Revised	7-18-36		
	ISSUED FOR CONSTRUCTION	5-2-35		

BONNEVILLE POWER NAVIGATION PROJECT
33RD. CONTRACT
SHIP LOCK — EMERGENCY DAM
LIFTING BEAM
PLAN & ELEVATION
SCALES AS SHOWN

U.S. ENGINEER OFFICE, PORTLAND, OREGON DISTRICT
SUBMITTED — APPROVED
RECOMMENDED — DESIGNED BY Downing DATE 2-12-1935
DRAWN BY Olsen TR. BY Olsen CHECKED BY

SHEET 11 OF 15

N-2-60



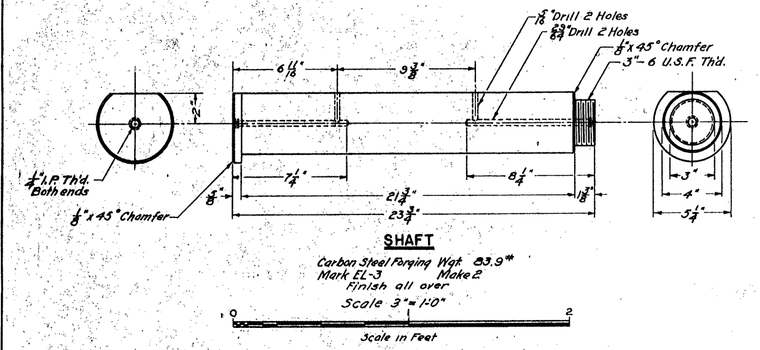
SECTION "B-B"

SECTION "A-A"

ASSEMBLY OF LIFTING BEAM END WITH ROLLERS

Section of R.H. End of Lifting Beam with Rollers and accessory parts in place.
Scale 1½"=1'-0"

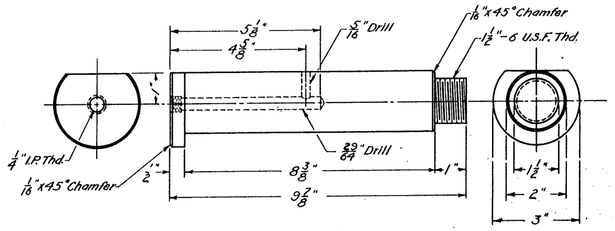
0 1 2 3
Scale in Feet



SHAFT

Carbon Steel Forging Wgt. 83.9#
Mark EL-3 Make 2
Finish all over
Scale 3"=1'-0"

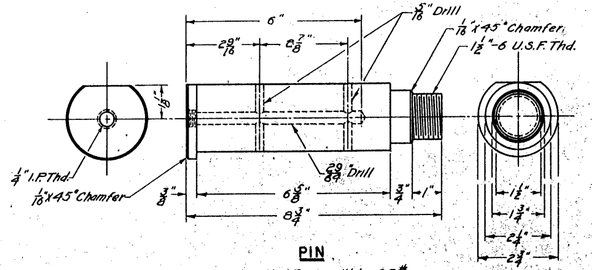
0 1 2
Scale in Feet



SHAFT

Carbon Steel Forging Wgt. 9#
Mark EL-4 Make 4
Finish all over
Scale 6"=1'0"

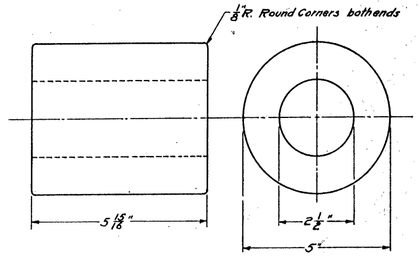
0 1 2 3 4 5 6 7 8
Scale in Inches



PIN

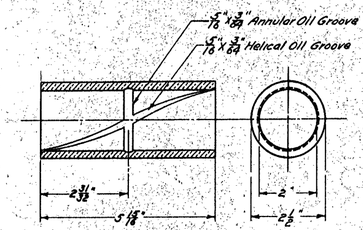
Carbon Steel Forging. Wgt. 9.2#
Mark EL-12 Make 4
Finish all over
Scale 6"=1'-0"

NOTE: This pin for attachment of Lifting Beam Hooks. See Sheets No. 13 & 14.



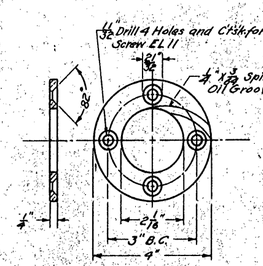
ROLLER

Carbon Steel Forging Wgt. 248#
Mark EL-2 Make 4
Heat Treat to Brinell Hardness 192-235
Finish all over
Scale 6"=1'0"



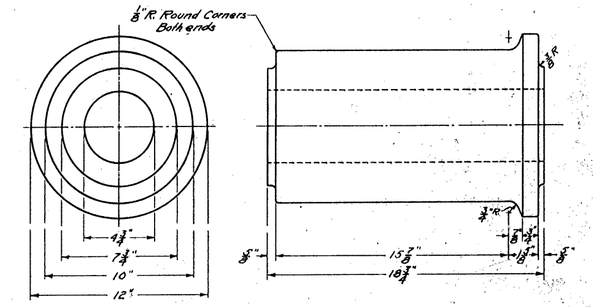
BUSHING

Phos. Bronze Wgt. 3.4#
Mark EL-8 Make 4
Finish all over
Scale 6"=1'-0"



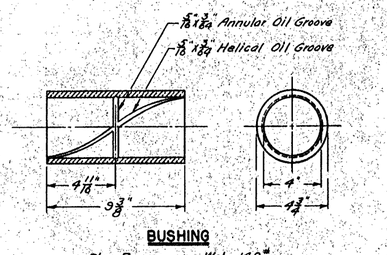
WASHER

Phos. Bronze Wgt. 0.7#
Mark EL-10 Make 8
Finish all over
Scale 6"=1'-0"



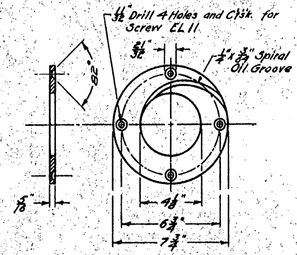
ROLLER

Carbon Steel Casting Wgt. 326#
Mark EL-1 Make 2
Heat Treat to Brinell Hardness 193-235
Finish all over
Scale 3"=1'0"



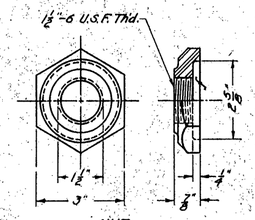
BUSHING

Phos. Bronze Wgt. 14.9#
Mark EL-7 Make 4
Finish all over
Scale 3"-1'-0"



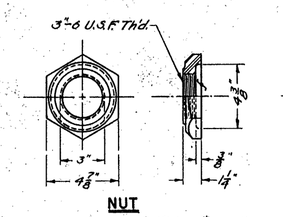
WASHER

Phos. Bronze Wgt. 3.3#
Mark EL-9 Make 4
Finish all over
Scale 3"=1'-0"



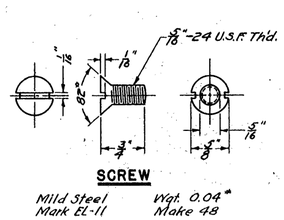
NUT

Carbon Steel Casting Wgt. 1#
Mark EL-6 Make 8
Finish as indicated. Cadmium Plate.
American Bridge Co.'s Standard or equal
Scale 6"=1'-0"



NUT

Carbon Steel Casting Wgt. 4#
Mark EL-5 Make 2
Finish as indicated. Cadmium Plate.
American Bridge Co.'s Standard or equal
Scale 3"=1'-0"



SCREW

Mild Steel Wgt. 0.04#
Mark EL-11 Make 48

Scale - Full Size

GENERAL NOTES

Indicated weights are for single pieces as noted.

REFERENCES

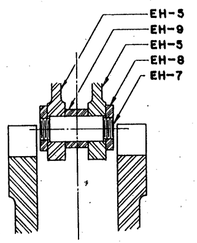
For Lifting Beam Plan see Sheet No 11 . . N-2-60.
For Lifting Beam Hook Assembly and Details see Sheets 13 and 14 N-2-60.
For Details of Emergency Dam Recess, Embedded Steel and Steel Track Plates see N-1-19.

NO.	REVISION	DATE	BY	APV'D
	ISSUED FOR CONSTRUCTION	5-2-35		

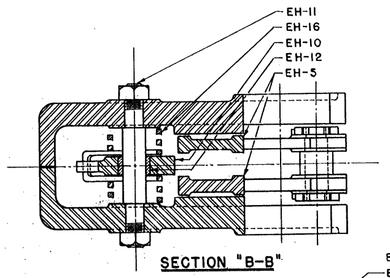
BONNEVILLE POWER NAVIGATION PROJECT
33 RD CONTRACT
SHIP LOCK-EMERGENCY DAM
LIFTING BEAM
ROLLERS AND DETAILS
SCALES AS SHOWN
U.S. ENGINEER OFFICE, PORTLAND, OREGON DISTRICT

SUBMITTED R.M. Mackenzie ENGINEER
APPROVED D. Williams MAJOR, CORPS OF ENGINEERS
RECOMMENDED HEAD ENGINEER
DESIGNED BY R.T.D. DATE 2-12-1935
DR. BY H.G.L. TR. BY H.G.L. CHECKED

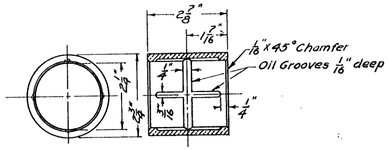
SHEET 12 OF 15 N-2-60



SECTION "E-E"

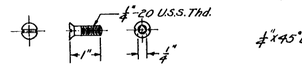


SECTION "B-B"



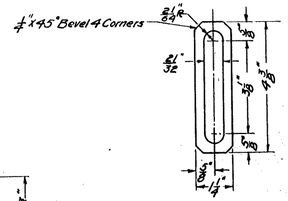
BUSHING

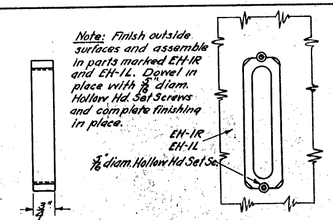
Phos. Bronze — Wgt. 1.75#
Make 2 — Mark EH-2
Finish all over.



SCREW

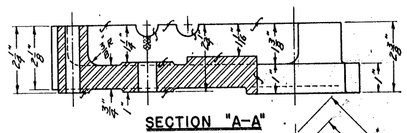
Make 1 Mark EH-17
Flat Head Brass Machine Screw



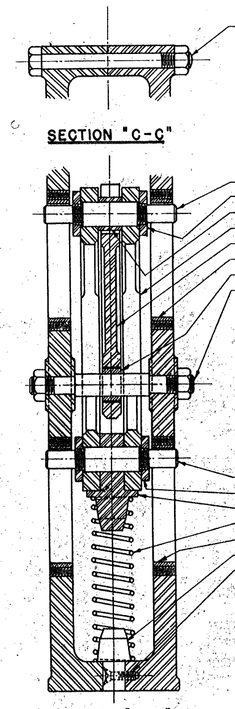


GUIDE BUSHING

Phos. Bronze — Wgt. 0.75#
Make 4 — Mark EH-3
Finish all over

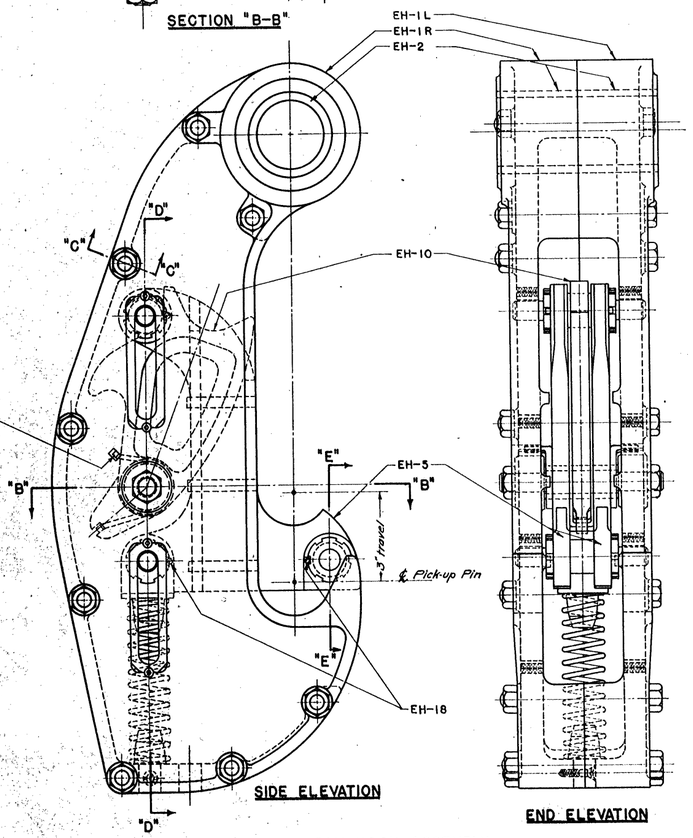


SECTION "A-A"



SECTION "C-C"

SECTION "D-D"

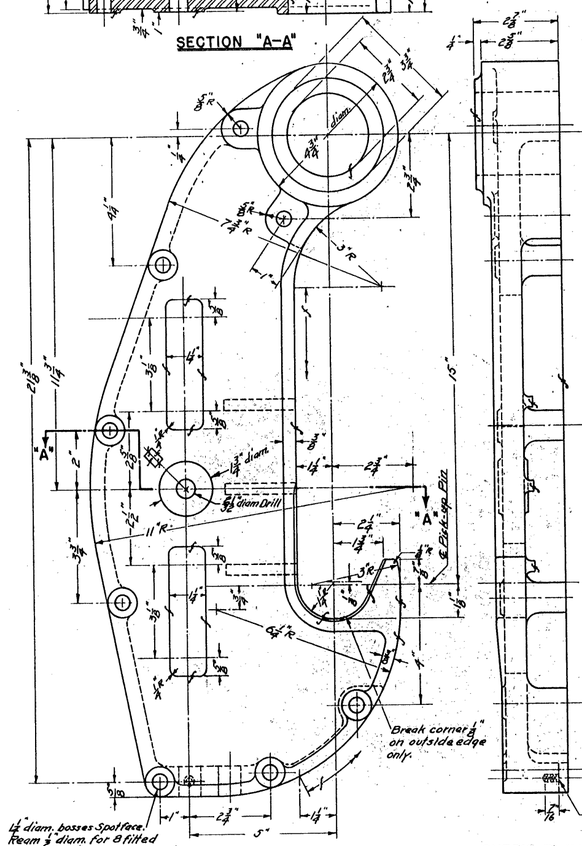


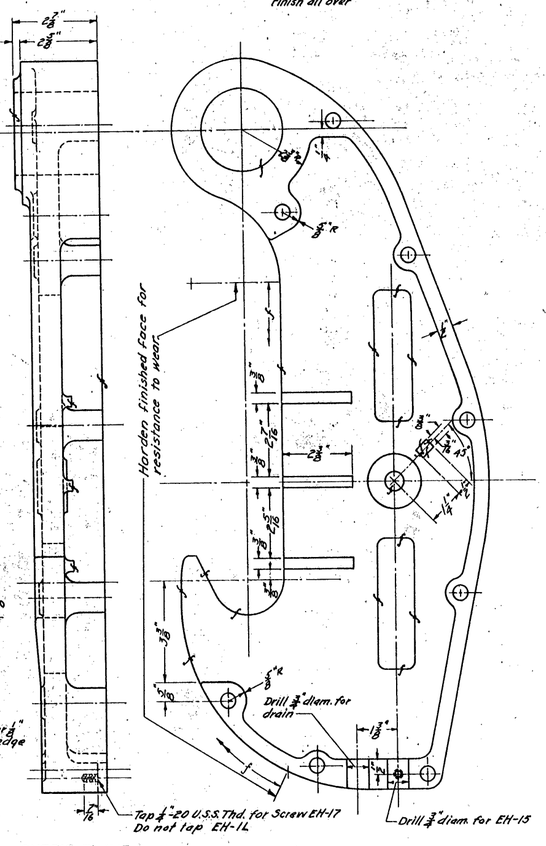
SIDE ELEVATION

END ELEVATION

LIFTING BEAM HOOK ASSEMBLY

Weight of 1 Complete Hook 183#

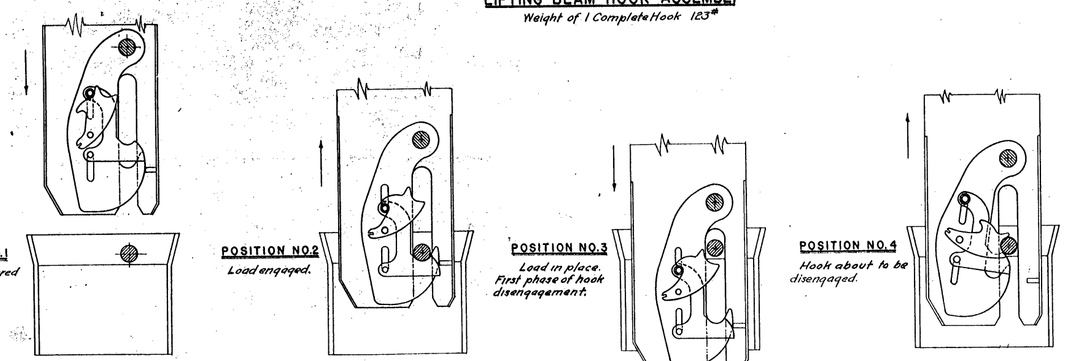




CHEEK PLATE

Nickel Steel Casting — Wgt. 48#
Make 1 as shown — Mark EH-1R
Make 1 opposite hand — Mark EH-1L
Finish as shown.

Note: Drill, ream and finish cheek plates in pairs of 1 EH-1R and 1 EH-1L.



POSITION NO.1
Hook being lowered to engage load.

POSITION NO.2
Load engaged.

POSITION NO.3
Load in place. First phase of hook disengagement.

POSITION NO.4
Hook about to be disengaged.

CYCLE OF OPERATION OF LIFTING BEAM HOOK

GENERAL NOTES:
Quantities shown are for one complete hook.
5 hooks (1 spare) to be furnished under this contract.
Weights given are for single pieces.

REFERENCES:
For details see Sheet 14
For Lifting Beam and Hook Suspension Pin see Sheets 11 & 12

0 1 2 3 4 5 6
SCALE IN INCHES

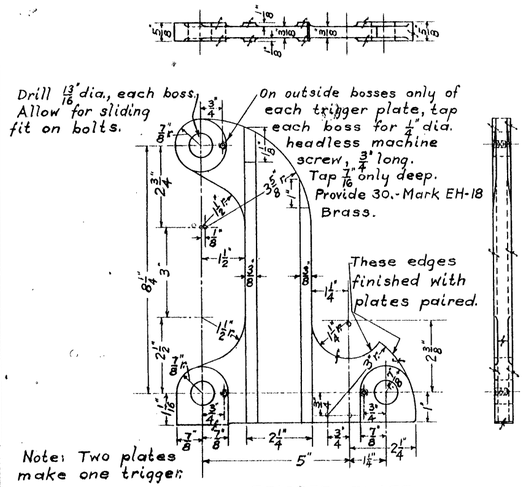
NO.	REVISION	DATE	BY	AP'V'D
1	ISSUED FOR CONSTRUCTION	5-2-35		

BONNEVILLE POWER NAVIGATION PROJECT
33RD CONTRACT
SHIP LOCK—EMERGENCY DAM
LIFTING BEAM HOOK
ASSEMBLY AND DETAILS
SCALE: 6" = 1'-0"

U.S. ENGINEER OFFICE, PORTLAND, OREGON DISTRICT

SUBMITTED: R.H. Mackenzie, ENGINEER
APPROVED: H. Williams, MAJOR, CORPS OF ENGINEERS
RECOMMENDED: E.J. Sherman, HEAD ENGINEER
DESIGNED BY A.C. Dimo DATE 2-13-35
DR. BY KHP TR. BY H&L CHECKED

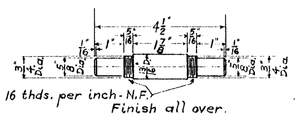
SHEET 13 OF 15 N-2-60



TRIGGER PLATE

Make 2 Mark EH-5

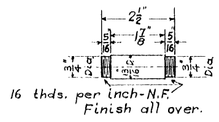
Nickel Steel Castg. Wt. - 5.1 Lbs.



TRIGGER GUIDE BOLT

Make 2 Mark EH-6

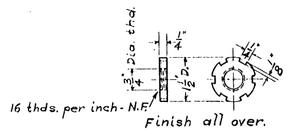
Machine Steel Wt. - .53 Lb.



TRIGGER BOLT

Make 1 Mark EH-7

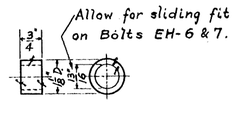
Machine Steel Wt. - .35 Lb.



SLOTTED NUT

Make 6 Mark EH-8

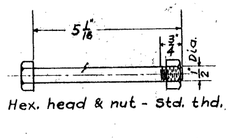
Machine Steel Wt. - .08 Lb.



TRIGGER SEPARATOR

Make 2 Mark EH-9

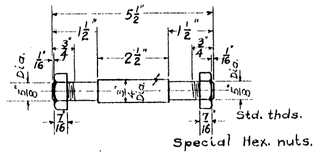
Machine Steel Wt. - .10 Lb.



FITTED BOLT

Make 8 Mark EH-4.

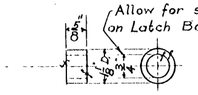
Bolt Steel Wt. - .41 Lb.



LATCH BOLT

Make 1 Mark EH-11

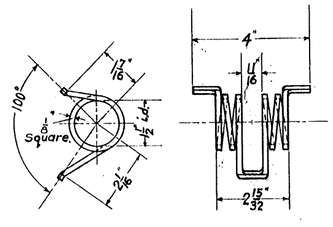
Machine Steel Wt. - .78 Lb.



LATCH BEARING BUSHING

Make 1 Mark EH-12

Bronze Wt. - .11 Lb.

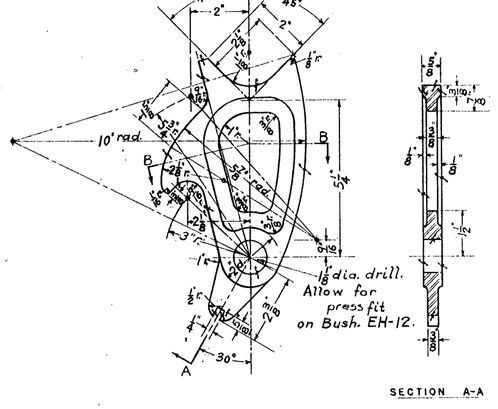


LATCH SPRING

Make 1 Mark EH-16

Spring Steel Wt. - .15 Lb.*

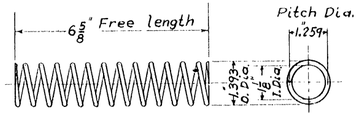
See Notes



LATCH

Make 1 Mark EH-10

Nickel Steel Castg. Wt. - 2.7 Lbs.



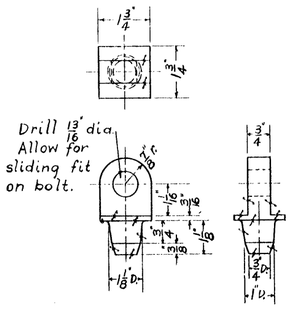
Nomenclature	
Pitch diameter	1.259
Outside diameter	1.393
Inside diameter	1.125
Diameter of wire - .134	#10 B.W.G.
Free length	6 5/8"
Number of active coils	12
Number of actual coils	13 1/2

TRIGGER SPRING

Make 1 Mark EH-13

Spring Steel Wt. - .21 Lb.

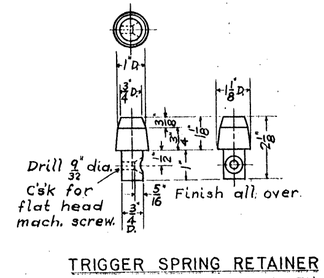
See Notes



TRIGGER SEPARATOR & SPRING BASE

Make 1 Mark EH-14

Machine Steel Wt. - 97 Lb



TRIGGER SPRING RETAINER

Make 1 Mark EH-15

Machine Steel Wt. - .38 Lb.

GENERAL NOTES

Quantities shown are for one complete hook, 5 hooks (1 spare) to be furnished under this contract.

Weights given are for single pieces.

Spring proportions to be determined experimently for satisfactory functioning in first hook.

REFERENCES

For assembly and remaining details see Sheet No. 13

NO.	REVISION	DATE	BY	APP'D
	ISSUED FOR CONSTRUCTION	5-2-35	GAPS	RDM.

BONNEVILLE POWER NAVIGATION PROJECT

33RD CONTRACT

SHIP LOCK-EMERGENCY DAM

LIFTING BEAM HOOK-DETAILS

SCALE 6" = 1'-0"

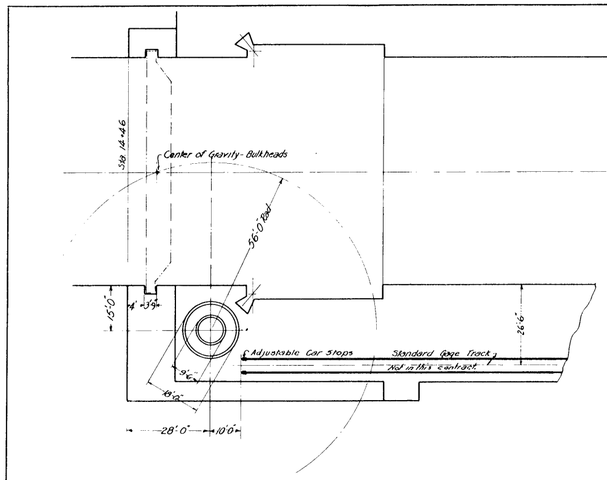
U. S. ENGINEER OFFICE, PORTLAND, OREGON DISTRICT

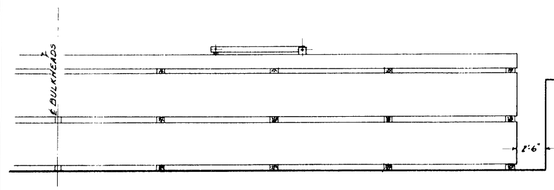
SUBMITTED: R.D. Mackenzie, ENGINEER — APPROVED: [illegible], MAJOR, CORPS OF ENGINEERS

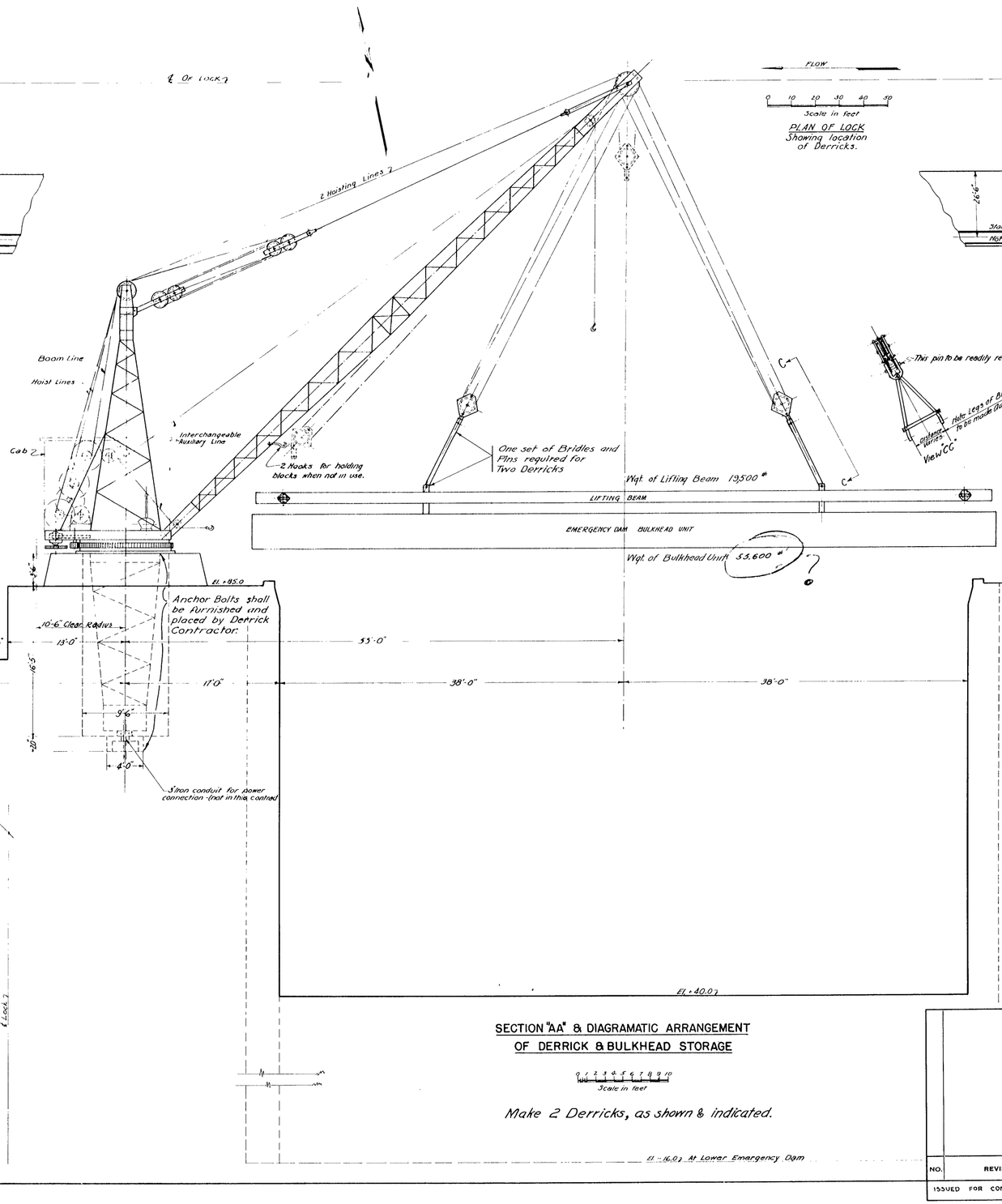
RECOMMENDED: [illegible], HEAD ENGINEER — DRAWN BY: A.C.P. + V.H.P. DATE 5-; CHECKED; TRACED BY V.H.P. CHECKED

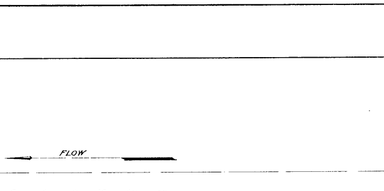
WAR DEPARTMENT

CORPS OF ENGINEERS U. S. ARMY

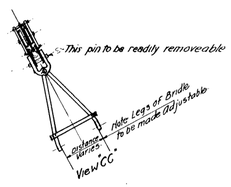


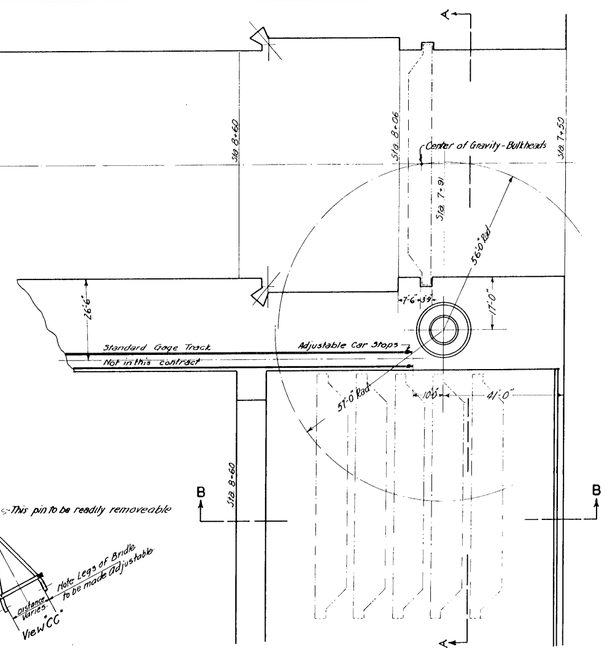




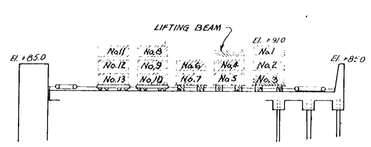


PLAN OF LOCK
Showing location of Derricks.





BULKHEAD STORAGE



SECTION "BB"

SPARES & TOOLS

a. Spare Parts:-
1. 1-Set of Friction Clutch Linings for Hoist and Boom Drums.
2. 1-Set of Brake Band Linings for Hoist and Boom Drums.
3. 2-Approved Snatch Blocks for ¾" ø Wire Rope.

b. Tools:-
4. 1-Set of Double End Drop Forged Engineer's Wrenches for all Nuts and Cap Screws used, to and including ¾" ø.
5. 1-Set of Single End Drop Forged Engineer's Wrenches for all Nuts and Cap Screws above ¾" ø to largest size used.
6. 1 Each 8"-10" and 14" "Crescent" or equal adjustable Wrenches.
7. 1-Each 8" and 12" heavy Screw Drivers.
8. 1-Each good Quality Cold Chisels; 7" Flat, 7" Cape, 7" round Nose and 7" diamond Point.
9. 1-Each ⅜" and ½" Points by 6" Punches.
10. 1-Each 1½ lbs. and 1¾ lbs. approved Machinists' Ball Peen Hammer.
11. 1-10 lbs. Double Face Sledge Hammer with Handle.
12. 1-Pair 8" Klein or equal Side Cutting Pliers.
13. 1-Each 5 Ft. Wedge Point and Pinch Point Crow Bars.
14. 2-Complete Sets of Special Tools as may be required.

SECTION "AA" & DIAGRAMATIC ARRANGEMENT
OF DERRICK & BULKHEAD STORAGE

0 1 2 3 4 5 6 7 8 9 10
Scale in feet

Make 2 Derricks, as shown & indicated.

EL. +16.0 At Lower Emergency Dam

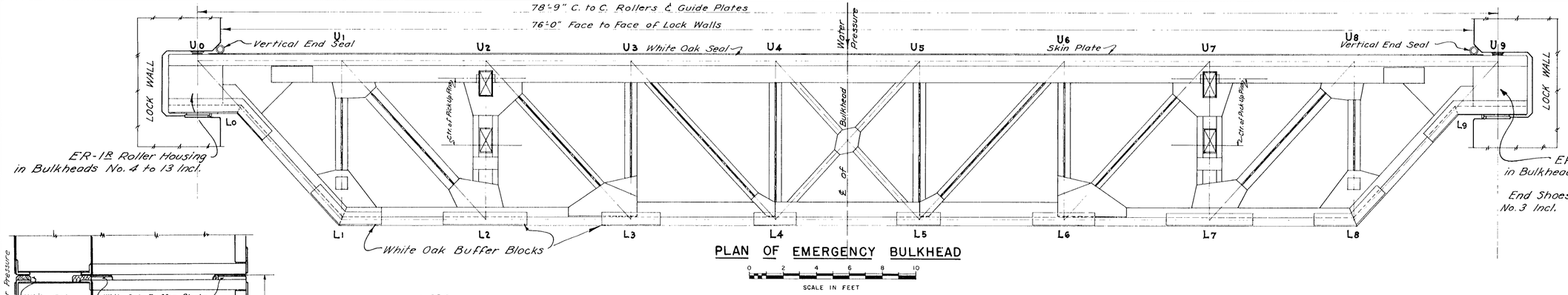
NO.	REVISION	DATE	BY	APV'D
	ISSUED FOR CONSTRUCTION	5-2-35		

BONNEVILLE POWER NAVIGATION PROJECT
33 RD. CONTRACT
SHIP LOCK—EMERGENCY DAM
DERRICKS
GENERAL ARRANGEMENT & DATA
SCALES AS SHOWN
U. S. ENGINEER OFFICE, PORTLAND, OREGON DISTRICT

SUBMITTED: K. M. Mackenzie, ENGINEER
APPROVED: H. Williams, MAJOR, CORPS OF ENGINEERS
RECOMMENDED: [illegible], HEAD ENGINEER
DESIGNED BY C-W-B DATE 2-12 1935
DR. BY Daly TR. BY DIXON CHECKED BY [illegible]

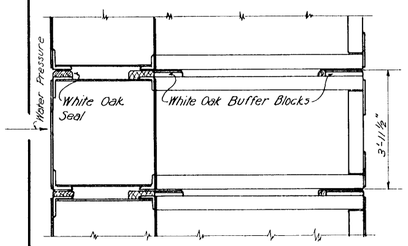
SHEET 15 OF 15

N-2-60

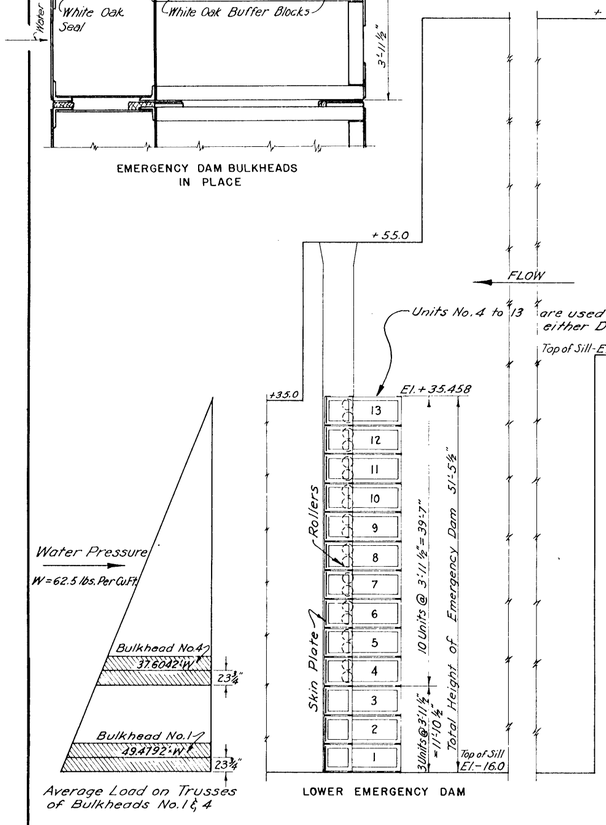


PLAN OF EMERGENCY BULKHEAD

SCALE IN FEET



EMERGENCY DAM BULKHEADS IN PLACE

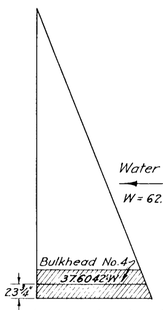


UPPER EMERGENCY DAM

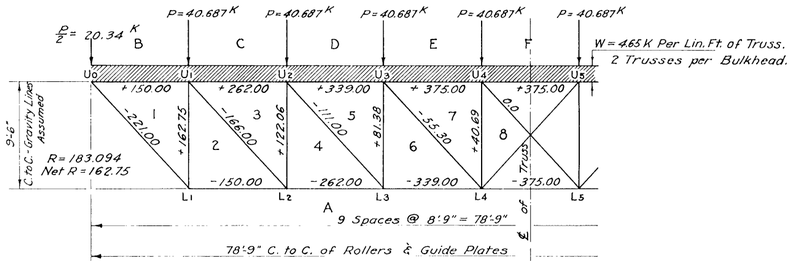
LOWER EMERGENCY DAM

LONGITUDINAL SECTION THRU LOCK AND WATER PRESSURE DIAGRAM

SCALE IN FEET

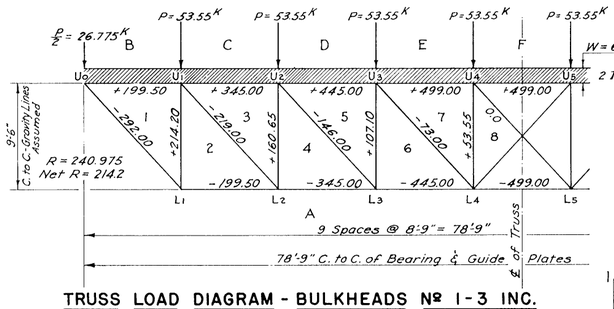


Average Load on Trusses of Bulkhead No. 4



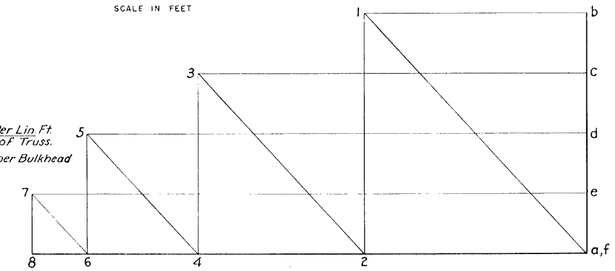
TRUSS LOAD DIAGRAM - BULKHEADS Nº 4-13 INC.

SCALE IN FEET



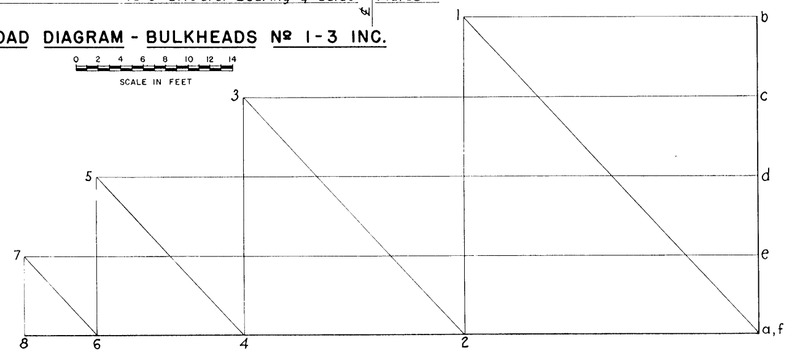
TRUSS LOAD DIAGRAM - BULKHEADS Nº 1-3 INC.

SCALE IN FEET



STRESS DIAGRAMS - BULKHEADS Nº 4-13 INC.

SCALE IN KIPS



STRESS DIAGRAM - BULKHEADS Nº 1-3 INC.

SCALE IN KIPS

DESIGN DATA

1. LOADING
   All loads in Kips (K = 1000 lbs.)
   − Denotes Tension
   + Denotes Compression

2. MATERIAL
   Material to be Structural Nickel Steel thru-out.
   Rivets to be ⅞" ϕ Nickel Steel thru out and Shop Driven except as noted.

3. WORKING VALUES
   Stresses:
   Tension and Bending = 32,000 Lbs. Per Sq. In.
   Shear - Net Section = 20,000 Lbs. Per Sq. In.
   Compression = $\frac{32{,}000}{1+\frac{l^2}{32{,}000\,r^2}}$
   Maximun 28,000 Lbs. Per Sq. In. (when $\frac{l}{r}$ = 60)
   Bearing = 36,000 Lbs. Per Sq. In.
   Single Shear on Rivets 18000 lbs. per Sq. In.
   ⅞" ϕ Rivet Values:
   Bearing on ½" Gusset Plate = 15,750 Lbs.
   Double Shear = 21,600 Lbs.
   Single Shear = 10,800 Lbs.

4. SKIN PLATES
   $t = .402\,b\sqrt{\frac{1}{1+\frac{b^2}{a^2}}} \times \frac{H}{F}$
   b" = Width
   a" = Depth
   H = Head of Water
   F = 14,000 Lbs. Per Sq. In.
   t" = Thickness

5. CASTINGS
   Nickel Cast Steel except as noted.

6. CAMBER
   Provide Camber of 2 inches.

7. TEMPERATURE
   All Measurements to be as of +50° F.

8. WEIGHT
   Weight of Bulkhead marked on assembly of each type.

9. WELDING
   All Welds to be in accordance with the Fusion Code (Structural) and conform to American Welding Society specifications.

NOTES

For General Notes & References See Sheet 3 of N-2-60.

NO.	REVISION	DATE	BY	APV'D
1	ISSUED FOR CONSTRUCTION	5-2-35		

BONNEVILLE POWER NAVIGATION PROJECT
33RD. CONTRACT.
SHIP LOCK - EMERGENCY DAM.
BULKHEADS.
GENERAL PLAN AND STRESS SHEET
SCALES AS SHOWN

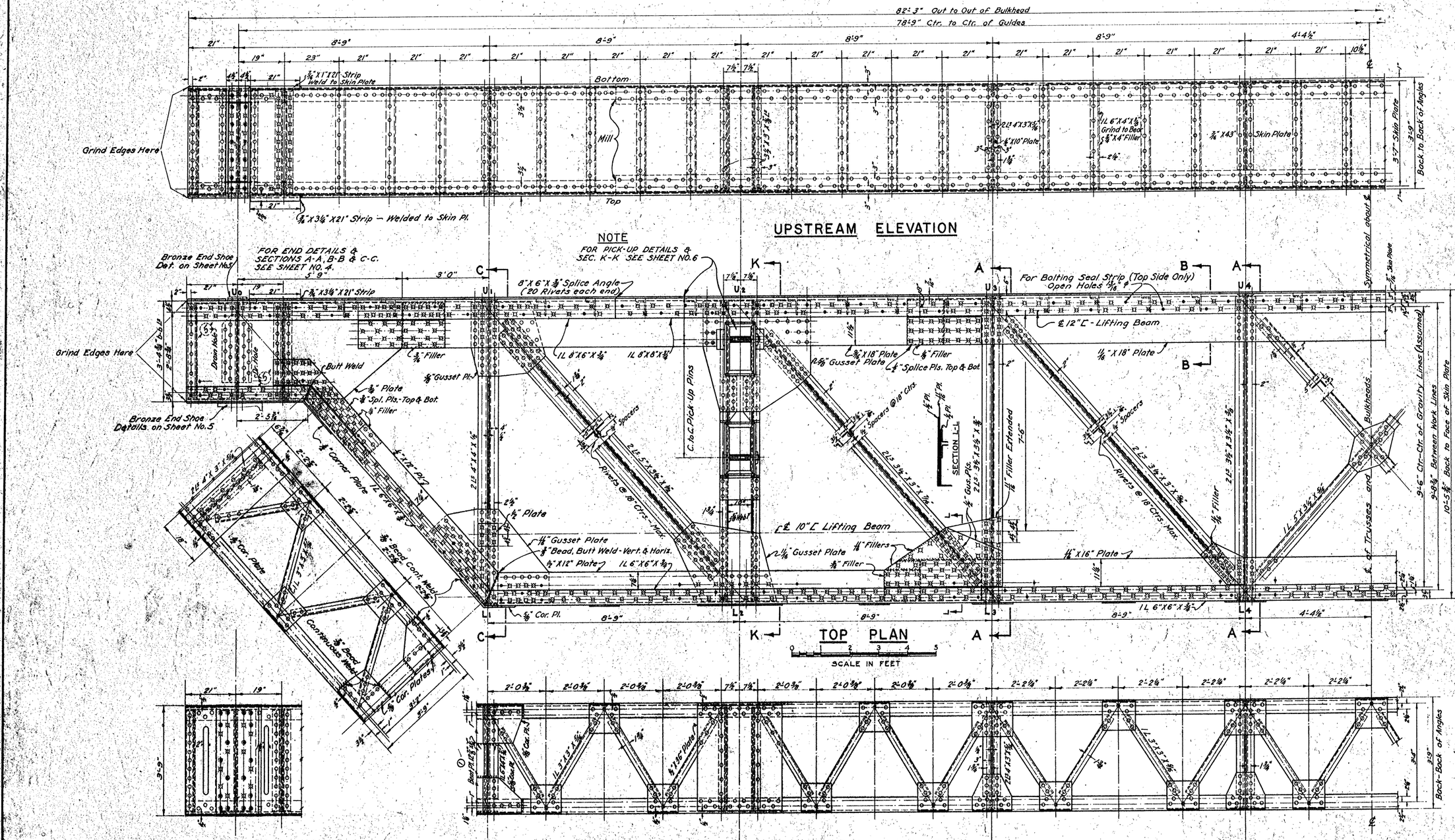
U.S. ENGINEER OFFICE PORTLAND OREGON DISTRICT

SUBMITTED R.M. Mackenzie ENGINEER — APPROVED (signature) MAJOR, CORPS OF ENGINEERS

RECOMMENDED (signature) HEAD ENGINEER — DRAWN BY M.R.L.III DATE 2-12-35 TRACED BY J.A.S. CHECKED BY

WAR DEPARTMENT

CORPS OF ENGINEERS, U.S. ARMY



GENERAL NOTES

Layout of Joints and Splices is for guidance only.
Where Rivets carrying stress pass thru Fillers, extend Fillers beyond plates and secure by additional rivets sufficient to develop Value of Filler.
Maintain Net Sections in Riveted Members.

All Gusset Plates ½" unless otherwise noted.
All Holes 13/16" ø for ⅞" ø Rivets, except as noted.
All Splices to be Riveted 100 %
All Open Holes for Seal Strips & Buffers 1⅛" ø
Edge Distances 1½", except as noted.

Paint: One Shop Coat and One Field Coat of Red Lead and Oil required when Field Assembled. Two Shop Coats of Red Lead & Oil shall be applied when completely Shop Riveted.
In order to permit shipment, field connections may be made at the option of the Contractor, details to be submitted for approval of the Contracting Officer.

REFERENCES

	Sheet No.
Design Data	" 2
Sections A-A, B-B & C-C	" 4
Details of End Shoes & Seals	" 5
Det. of Pick-Up & Sec. K-K	" 6

Mark EB-1, EB-2 & EB-3.
Make 3 Complete Units.
Material, Structural Nickel Steel.

Est. Weight of Steel in One Unit	58,760	lbs.
" " " Seal Strip & Buffers	1,010	"
" " " Bronze End Shoes	1,280	"
Est. Total Weight - Complete Unit	61,050	lbs.

NO.	REVISION	DATE	BY	APP'D
1	8"X6"Bent L Changed To Bent L Revised Est. Weights	7-15-35 7-16-35		
	ISSUED FOR CONSTRUCTION	5-2-35		

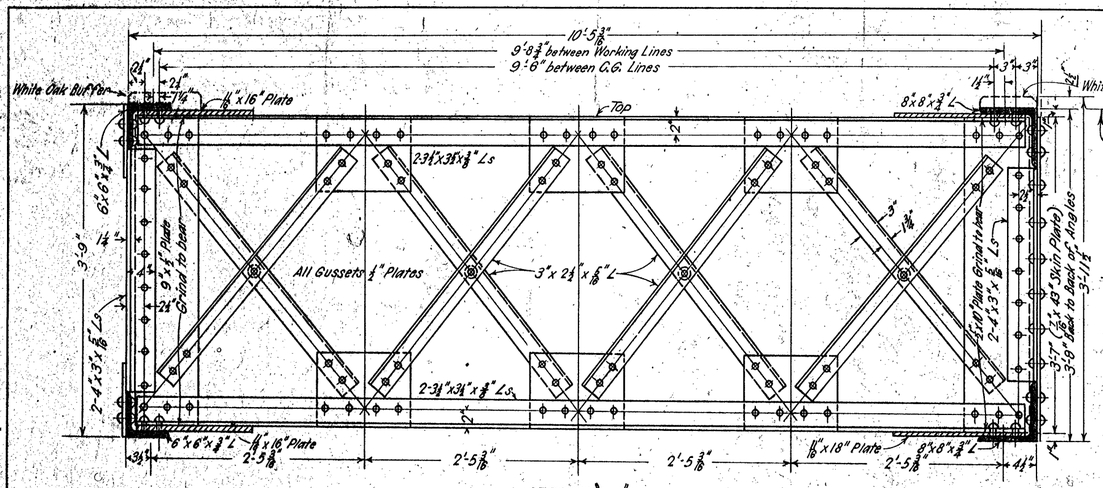
BONNEVILLE POWER NAVIGATION PROJECT
33 RD CONTRACT
SHIP LOCK-EMERGENCY DAM
BULKHEADS No 1 TO 3 INCL.
PLAN AND ELEVATIONS
SCALE AS SHOWN
U. S. ENGINEER OFFICE, PORTLAND, OREGON DISTRICT.

SUBMITTED: R.E. Mackenzie, DISTRICT ENGINEER
APPROVED: Thos. M. Williams, MAJOR, CORPS OF ENGINEERS
RECOMMENDED: HEAD ENGINEER
DRAWN BY: M.R.L. DATE 2-12-1935
TRACED BY: J.A.S. CHECKED BY:

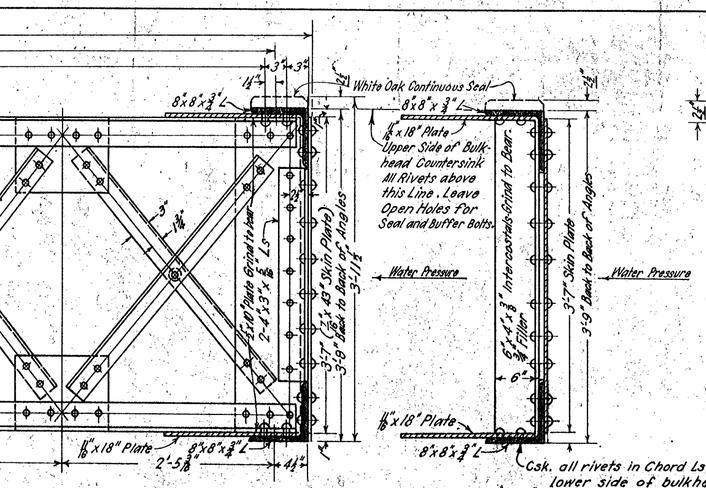
SHEET 3 OF 15 N-2-60

WAR DEPARTMENT

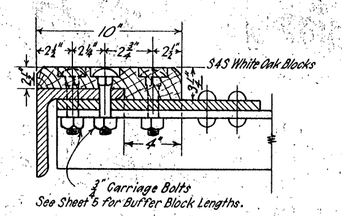
CORPS OF ENGINEERS U. S. ARMY



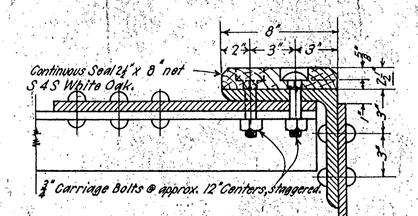
SECTION "A-A"



SECTION "B-B"



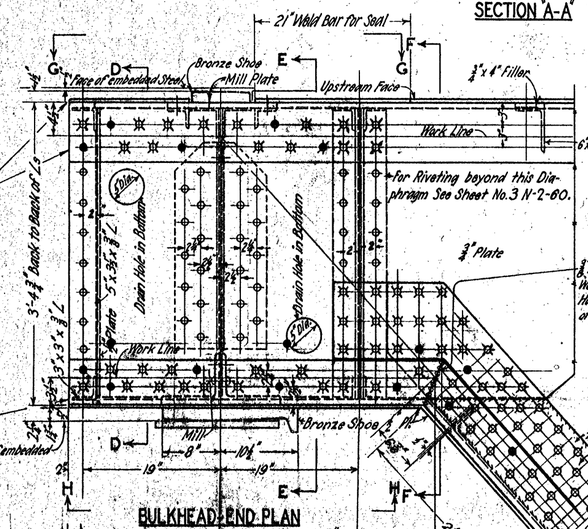
DETAIL OF BUFFER
DOWNSTREAM SIDE

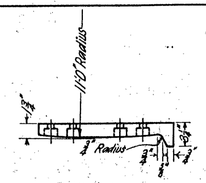


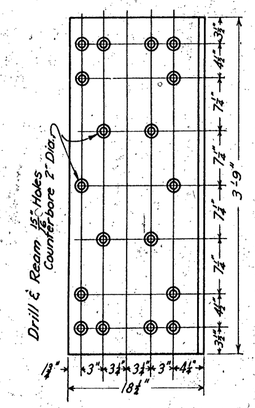
NOTE: Blocks out of dimension.

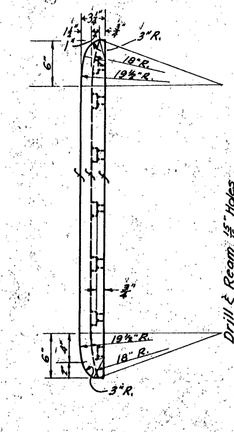
DETAIL OF SEAL
UPSTREAM SIDE

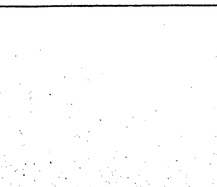
0 1 2
SCALE-FEET

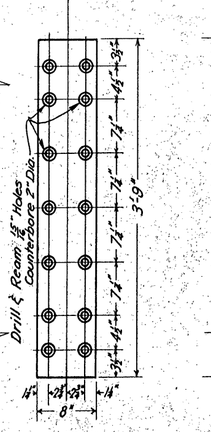

2" Weld Bar for Seal
Bronze Shoe
Mill Plate
Face of Embedded Steel
Upstream Face
3/4"x4" Filler
Work Line
6"x4"x3/8" L
for Riveting beyond this Diaphragm See Sheet No. 3 N-2-60.
3/4" Plate
3/8" Bead Butt Weld Vert. & Horiz. Legs of 6"x6"x3/4" L
Drain Hole in Bottom
Grind off Sharp Corners
3'-4 3/4" Back to Back of Ls
5"x3 1/2"x3/8" L
Work Line
Face of Embedded Steel.
Mill
8"
10 1/4"
19"
19"
1" Fill Plate
Top Spl. Pl. 3/8"
Bottom Spl. Pl. 3/4"
10"
White Oak Buffer
White Oak Seal
Top
Weld Bar for Seal. 3/8"x3 1/2"x21"
Grind to Bear.
2 Ls 6"X6"X1/2"
3/4"x16 1/8" Fill Plate
7/8" Plate
1/2" Plate
2 Ls 6"X6"X1/2" Grind Web Pl. to Bear.
2 Ls 6"X6"X1/2"
3/4"x16 1/8" Filler
Grind to Bear
2 Ls 6"X6"X1/2"
For Detail of End Shoe See Sheet No. 5 N-2-60.
Weld Bar for Seal. 3/8"x1"x21"
Open Holes for Turned Bolts
2'-5 3/8"
9'-9"
Burn Slot
2"
1 1/2"
2 1/2"
2"
2"

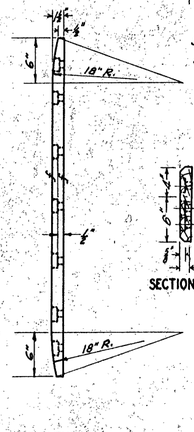








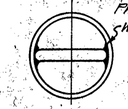


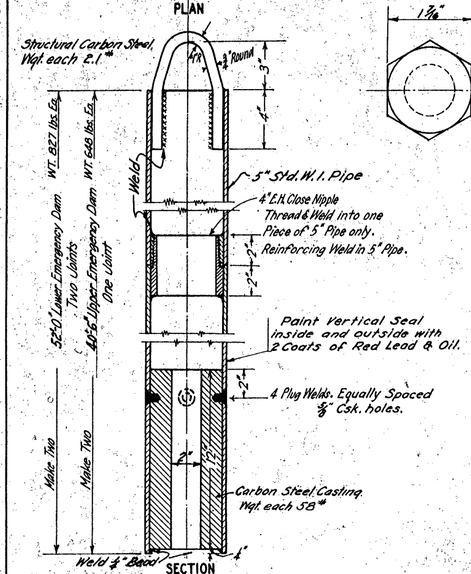


DETAIL OF BRONZE SHOE

DOWNSTREAM SIDE

6 Req'd. – WT. 460 lbs each
Total WT. 2760 lbs.
Phos. Bronze





VERTICAL SEAL – EMERGENCY DAM

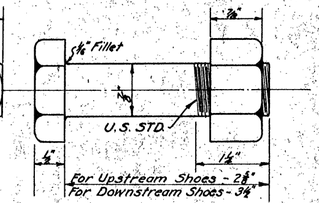
Scale: 3" = 1'

Req'd. 2 of Each
Tot. Wt. of 4 – 2950 lbs.

DETAIL OF BRONZE SHOE

UPSTREAM SIDE

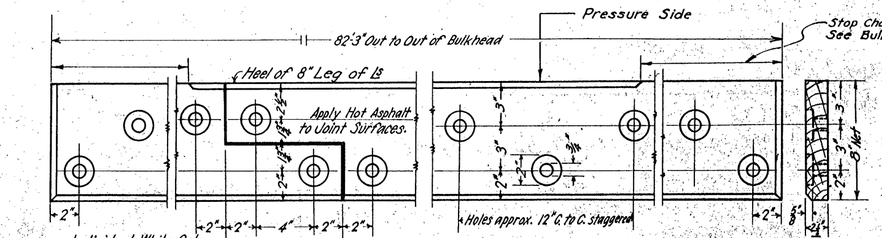
6 Req'd. – WT. 140 lbs. each
Total WT. 840 lbs.
Phos. Bronze



BRONZE BOLTS FOR END SHOES

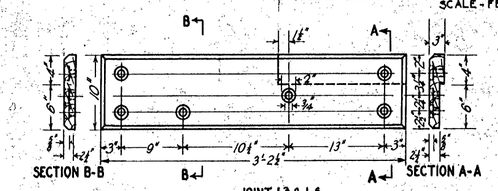
SCALE – INCHES

⅞" X 2⅜" Bolts & Nuts – Req. 84 WT. 1.068 lbs Each
⅞" X 3¼" Bolts & Nuts – Req. 108 WT. 1.255 lbs Each
Tot. Wt. 225 lbs.
Tobin Bronze



BULKHEAD SEAL DETAILS Bulkheads 1 to 13

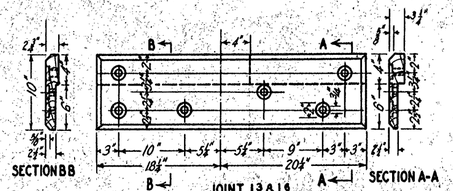
SCALE - FEET



BUFFER BLOCK DETAILS

Bulkheads 4 to 13

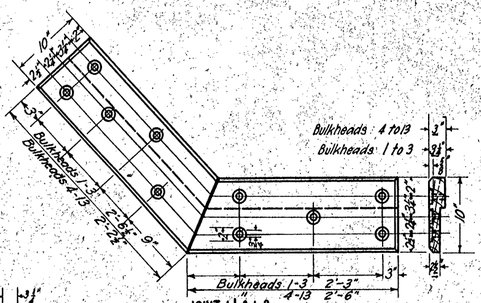
10 Req'd. as Shown L3
10 " Opposite Hand L6



BUFFER BLOCK DETAILS

Bulkheads 1 to 3

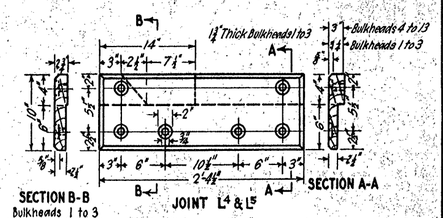
3 Req'd. as Shown L3
3 " Opp. Hand L6



BUFFER BLOCK DETAILS

Bulkheads 1 to 13

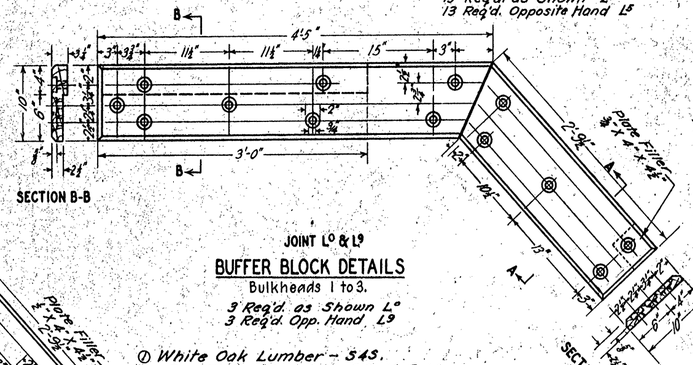
13 Req'd. as Shown L1
13 " Opp. Hand L8



BUFFER BLOCK DETAILS

Bulkheads 1 to 13

13 Req'd. as Shown L4
13 Req'd. Opposite Hand L5



BUFFER BLOCK DETAILS

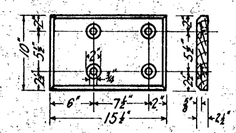
Bulkheads 1 to 13

13 Req'd. as Shown L2
13 Req'd. Opp. Hand L7

BUFFER BLOCK DETAILS

Bulkheads 1 to 3.

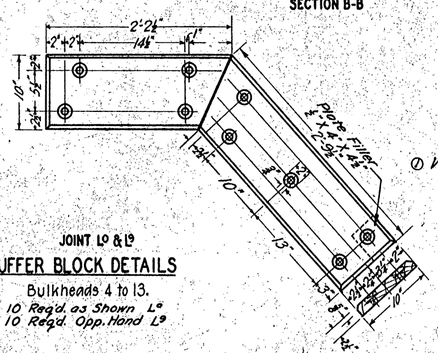
3 Req'd. as Shown L9
3 Req'd. Opp. Hand L9



BUFFER BLOCK DETAILS

Bulkheads 4 to 13.

20 Required



BUFFER BLOCK DETAILS

Bulkheads 4 to 13.

10 Req'd. as Shown L9
10 Req'd. Opp. Hand L9

SCALE – FEET

① White Oak Lumber – 543.
Est. Total Amount 3.2 M B.M.

NOTE: All bolt hole Dimensions are approximate and shall be Located from the Bulkheads.
Estimated total weight of carriage bolts for securing seal strips and buffer blocks 3280 lbs.
See sheets 4 and 8 for bolt details.

NO.	REVISION	DATE	BY	APV'D
1	Omit Kiln Dried Requirement for Oak Timber	5-27-36	J.A.S.	Rem
	ISSUED FOR CONSTRUCTION	5-2-36		

BONNEVILLE POWER NAVIGATION PROJECT

33 RD CONTRACT

SHIP LOCK – EMERGENCY DAM

BULKHEADS 1 TO 3 – END SHOES AND MISCELLANEOUS DETAILS

SCALES AS SHOWN

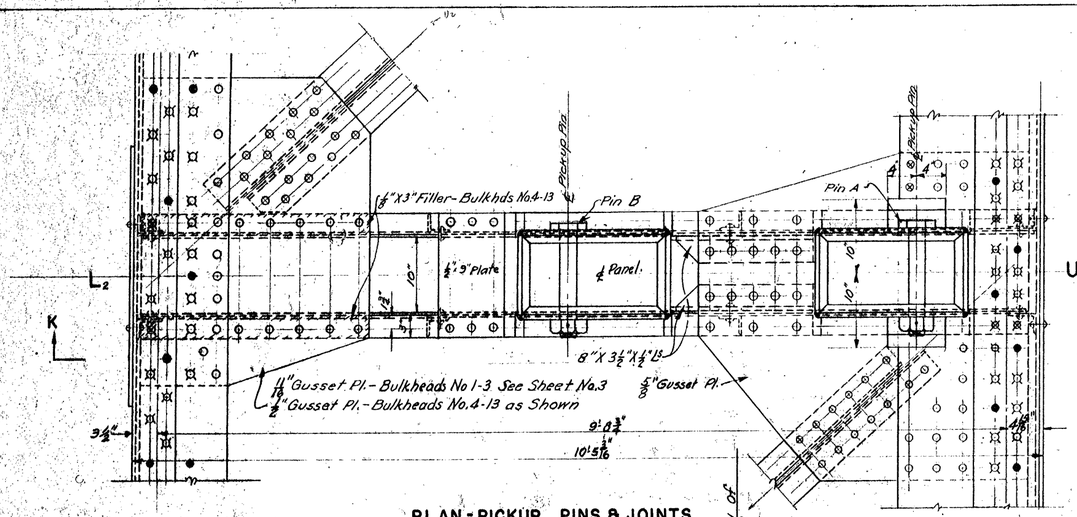
U. S. ENGINEER OFFICE, PORTLAND, OREGON DISTRICT

SUBMITTED: K.L. Mackenzie, ENGINEER — APPROVED: H. Williams, MAJOR, CORPS OF ENGINEERS

RECOMMENDED: HEAD ENGINEER — DESIGNED BY F.T.D. DATE 2-12-1936; C.W.P.; DR. BY S.S.L.; CH'D BY J.L.S.M.; CHECKED BY

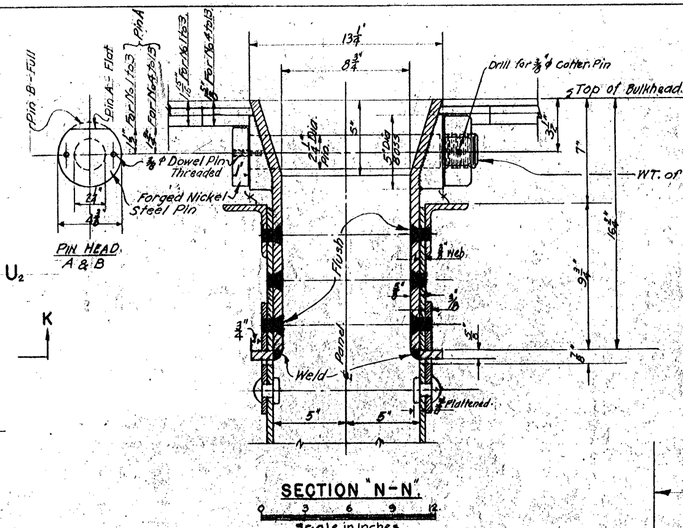
WAR DEPARTMENT

CORPS OF ENGINEERS U.S.ARMY.



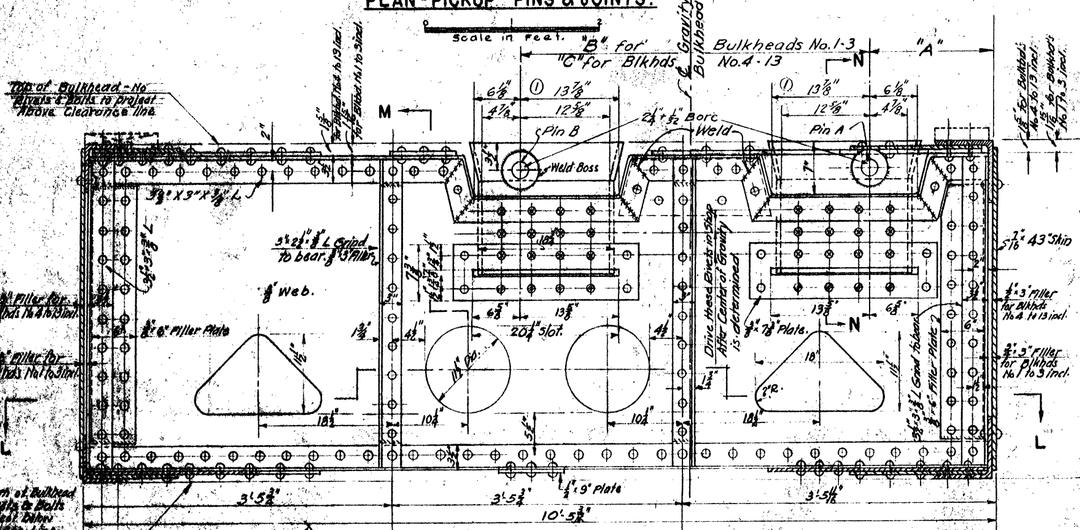
PLAN - PICKUP PINS & JOINTS.

Scale in Feet.



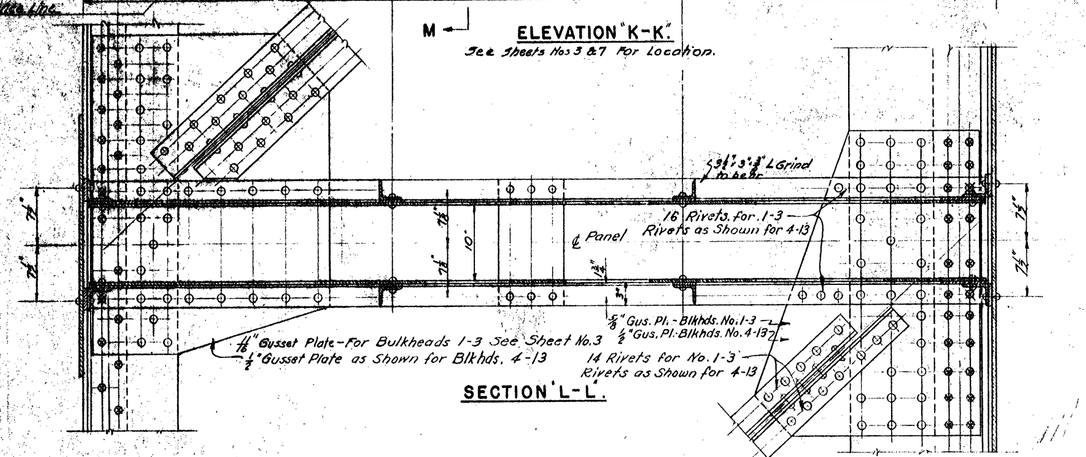
SECTION "N-N".

Scale in Inches.

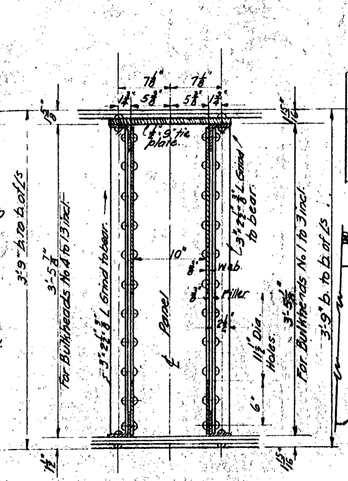


ELEVATION "K-K".

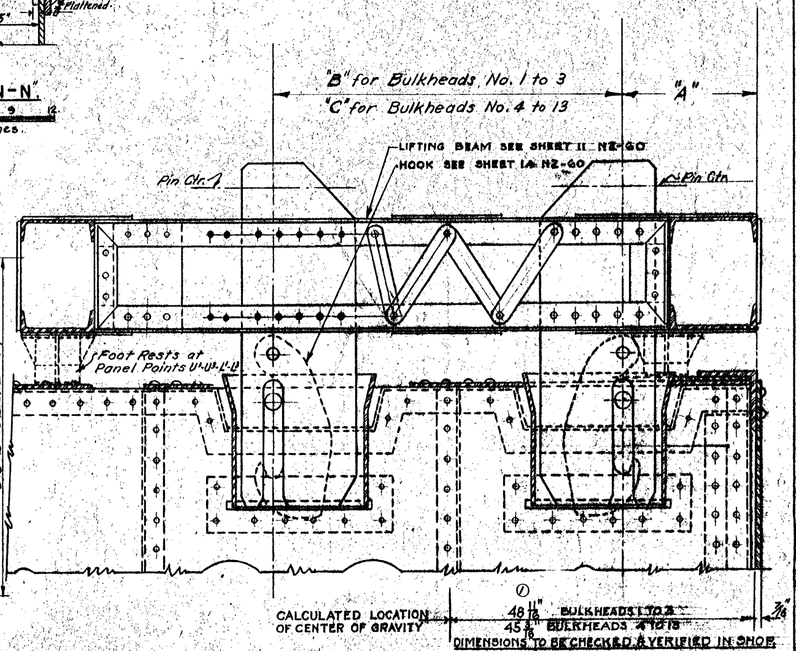
See Sheets No. 3 & 7 For Location.



SECTION "L-L".



SECTION "M-M".



ASSEMBLY OF LIFTING BEAM, HOOK, & BULKHEAD.

NOTES FOR BALANCING

1—The center of gravity for each of the bulkheads having end rollers (No. 4 to No. 13 incl.) must be established experimentally by balancing every bulkhead when completely assembled with rollers, buffers, and all other appurtenances.

2—Lifting pins must be placed symmetrically about the average location of the center of gravity for the above referred ten bulkheads and dimensions "A" and "C" established accordingly.

3—The procedure outlined in "1" and "2" must be followed in establishing dimension "B" for bulkheads having fixed sliding shoes (No. 1 to No. 3 incl.)

4—Location of hooks in the lifting beam must be adjustable between dimensions "B" and "C".
(a) The front hooks (at the skin plate end) may be attached permanently to suit dimension "A".
(b) The attachment of the rear hooks (dimensions "B" and "C") must be adjustable to suit the center of gravity location for the corresponding groups of bulkheads.

5—Adjustable counterweights must be suitably provided in the lifting beam to produce a condition of balance about the center of gravity of each group of bulkheads, when these bulkheads and the lifting beam are hooked together for handling by the derrick.

REFERENCES

For General Notes See Sheet 3.

NO.	REVISION	DATE	BY	APV'D
1	Lifting Pin Position Shifted & Changed calc. positions of "center of gravity"	7-1535 / 7-1535	WMB	Rem
	ISSUED FOR CONSTRUCTION	5-2-35	WMB	Rem

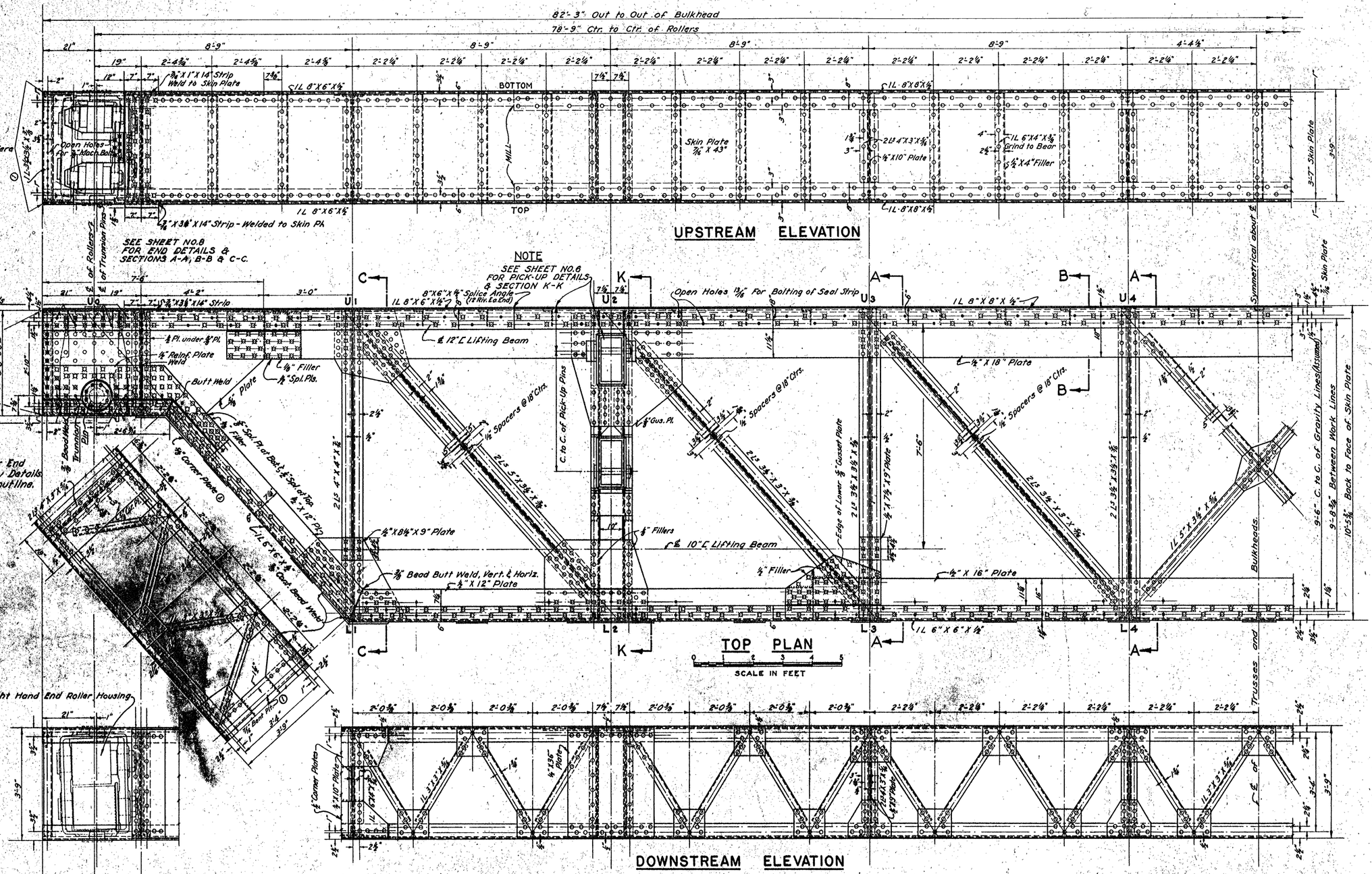
BONNEVILLE POWER NAVIGATION PROJECT
33RD. CONTRACT.
SHIP LOCK - EMERGENCY DAM.
BULKHEADS NO1 TO 13 INCL.
PICK-UP DETAILS.
SCALES AS SHOWN.
U. S. ENGINEER OFFICE, PORTLAND, OREGON DISTRICT

SUBMITTED: Kyle Mackenzie, ENGINEER
APPROVED: Thos. Williams, MAJOR, CORPS OF ENGINEERS
RECOMMENDED: HEAD ENGINEER
DRAWN BY: M.R.L. DATE 7-16-35
TRACED BY: M.R.L. CHECKED

SHEET 6 OF 15 N-2-60.

WAR DEPARTMENT

CORPS OF ENGINEERS, U.S. ARMY



NOTES

In order to permit shipment, field connections may be made at the option of the Contractor, details to be submitted for Approval of the Contracting Officer.

For additional notes see General Notes on Sheet No. 9

REFERENCES

Design Data	Sheet No. 2
Details of Pick-Up & Sec. K-K	" " 6
Sections A-A, B-B & C-C	" " 8
Details of Castings & End Rollers	9-10

Mark EB-4 to EB-13
Make 10 Complete Units
Material, Structural Nickel Steel.

Est. Weight of Steel in One Unit ①	48,620 lbs.
" " " Seal Strip & Buffers	980 "
" " " Castings & End Rollers	8,840 "
Est. Total Weight – Complete Unit	58,440 lbs.

NO.	REVISION	DATE	BY	APP'D
7	Chgd. 8"x6" Bent L. to 8x Bent Pl.	7-15-38		
6	Tapped Holes for Timber Shaft	7-16-38		
5	Changed 5"x3½"x⅜" L. to 3½"x3½" L.	7-15-38		
4	Changed ⅜ Cor. Pl. to ½ Cor. Pl.	7-15-38		
3	Revised Estimated Weights	7-14-38		
ISSUED FOR CONSTRUCTION		5-2-38		

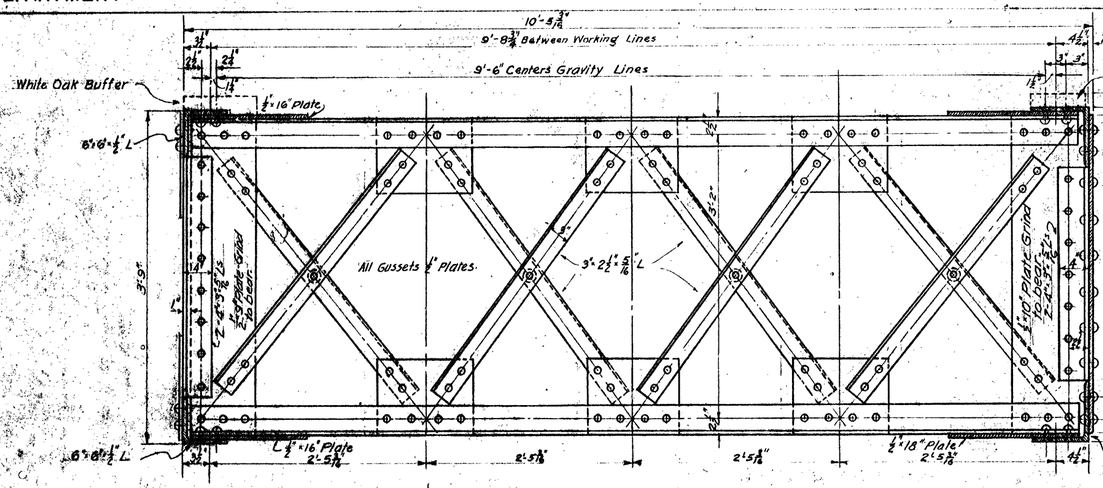
BONNEVILLE POWER NAVIGATION PROJECT
33 RD CONTRACT
SHIP LOCK – EMERGENCY DAM
BULKHEADS Nº 4 TO 13 INCL.
PLAN AND ELEVATIONS
SCALE AS SHOWN
U S ENGINEER OFFICE, PORTLAND, OREGON DISTRICT

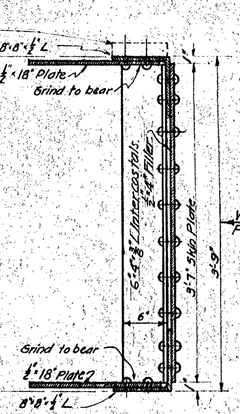
SUBMITTED: R.L. Mackenzie, ENGINEER
APPROVED: Fred Williams, MAJOR, CORPS OF ENGINEERS
RECOMMENDED: [illegible], HEAD ENGINEER
DRAWN BY: M.R.L. DATE 2-12-1935
TRACED BY: J.A.S. CHECKED BY: [illegible]

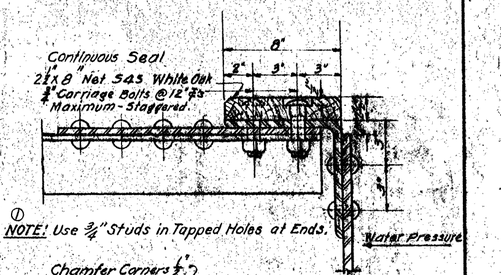
N-2-60

WAR DEPARTMENT

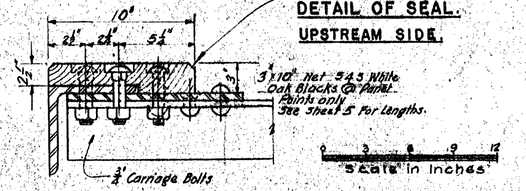
CORPS OF ENGINEERS U.S. ARMY.



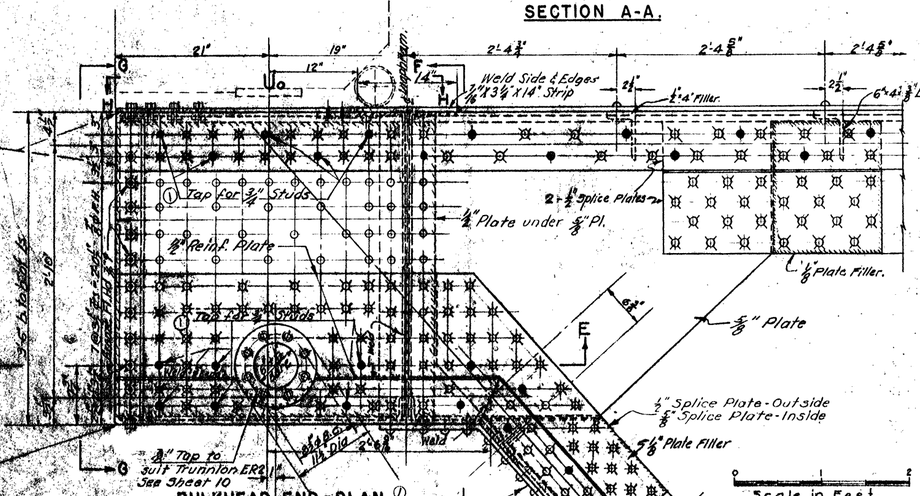


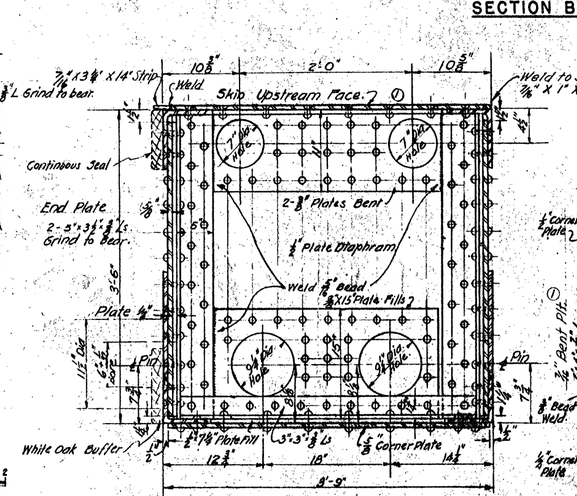


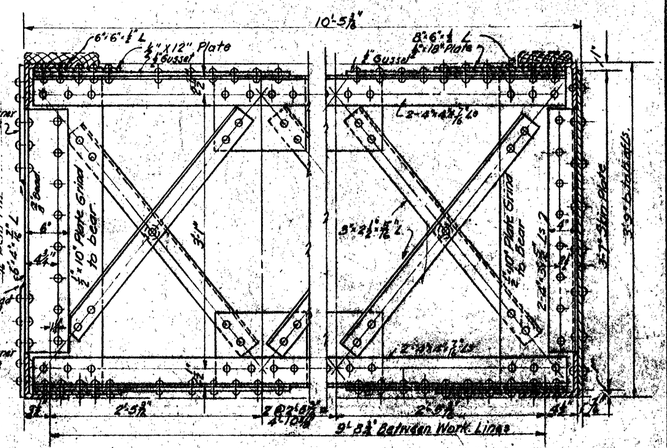
DETAIL OF SEAL.
UPSTREAM SIDE.



SECTION A-A.





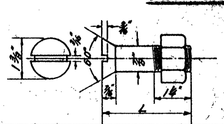


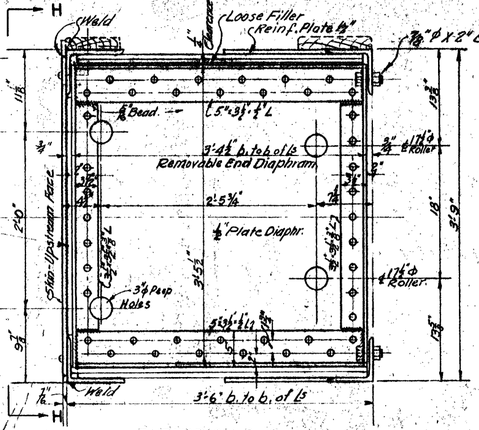
REFERENCES

For Location of Sections A-A; B-B; CC See Sheet 7 of 15-N-2-60.
For Weights - See Sheet 7
For General Notes - See Sheet 8

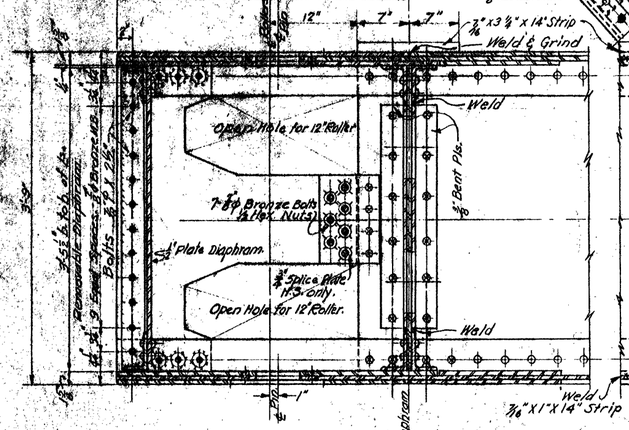
BOLTS

TYPE	MATERIAL	NUT	SIZE	QUANT.	WT. EACH	TOTAL WT.
Hex. Cap Screw	Bronze	—	7/8" X 1 1/4"	120	0.409 lb.	49 lbs.
Machine Bolts	"	Hex.	7/8" X 2"	40	0.984 lb.	40 lbs.
Machine Bolts	"	"	7/8" X 2 1/4"	240	1.060 lb.	254 lbs.
Flat Head Screws	"	1/2 Hex.	7/8" X 2"	140	0.640 lb.	90 lbs.
Flat Head Screws	"	Hex.	7/8" X 2 1/4"	160	0.950 lb.	152 lbs.
Flat Head Screws	"	Hex.	7/8" X 3 1/4"	240	1.036 lb.	249 lbs.

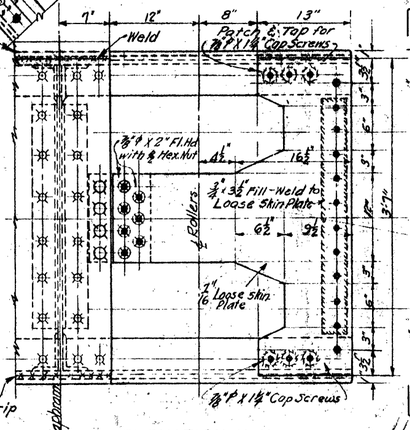




SECTION E-E.



ELEVATION H-H.



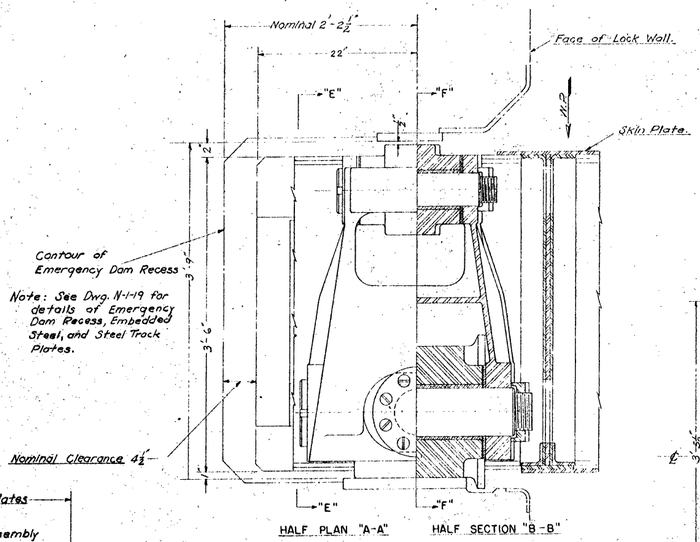
ELEVATION G-G.

NO.	REVISION	DATE	BY	APP'D
7	Rivets (F.F) Chgd. Rd. Hds. to Csk.	7-15-35		
1	Chgd. 8"x6" Bent L to 1/2" Bent Pl.	7-16-35		
1	3/4" Tapped holes for Studs, Changed 1/4" Cor. Plts. to 5/8" Plts.	7-15-35		
	ISSUED FOR CONSTRUCTION	5-2-35		

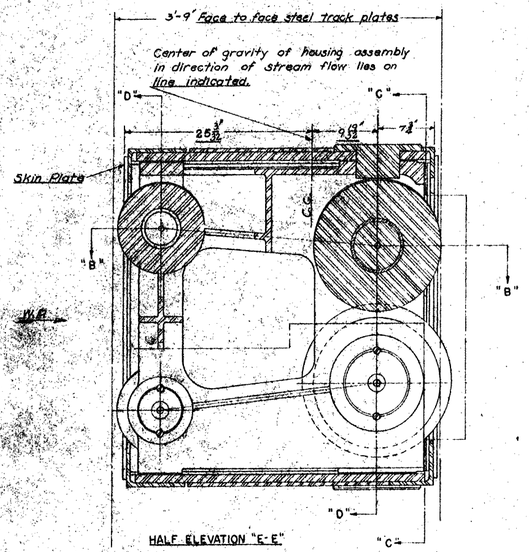
BONNEVILLE POWER NAVIGATION PROJECT
33-RD. CONTRACT.
SHIP LOCK - EMERGENCY DAM.
BULKHEADS Nos 4 TO 13 INCL.
SECTIONS & END DETAILS.
SCALES AS SHOWN
U. S. ENGINEER OFFICE, PORTLAND, OREGON DISTRICT

SUBMITTED: K. D. McKenzie, ENGINEER. APPROVED: Wm. D. Williams, MAJOR, CORPS OF ENGINEERS.
RECOMMENDED: ——, CHIEF ENGINEER.
DRAWN BY: M.R.L. DATE: 2-12-35
TRACED BY: M.R.L. DATE: 11-20-35

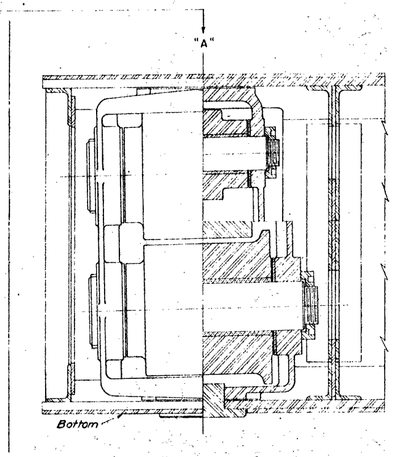
SHEET 8 OF 15 N-2-60.



HALF PLAN "A-A" HALF SECTION "B-B"



HALF ELEVATION "E-E"

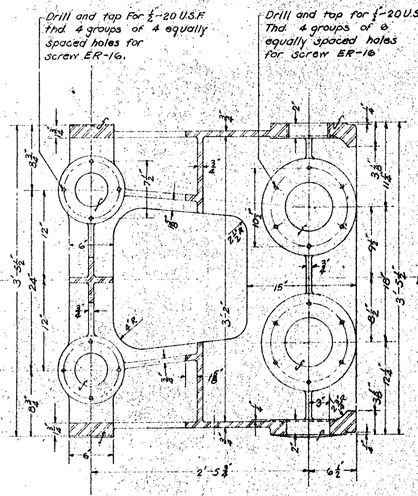


HALF ELEVATION "C-C" HALF SECTION "D-D"

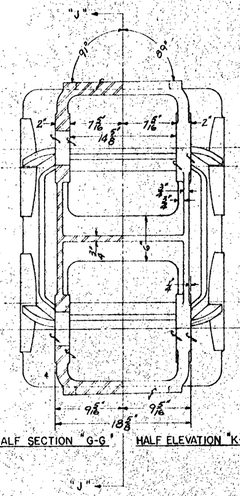
ROLLER HOUSING ASSEMBLY

Right hand assembly shown in position in bulkhead and in nominal position relative to emergency dam recess. Weight 1422 #

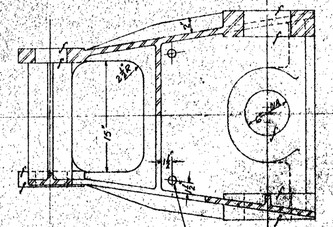
Scale in feet



SECTION "J-J"

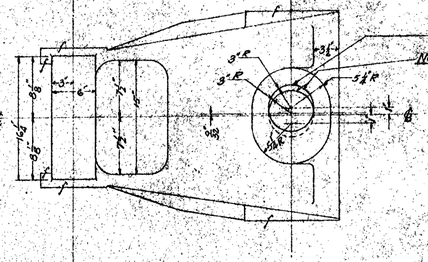


HALF SECTION "G-G" HALF ELEVATION "K-K"

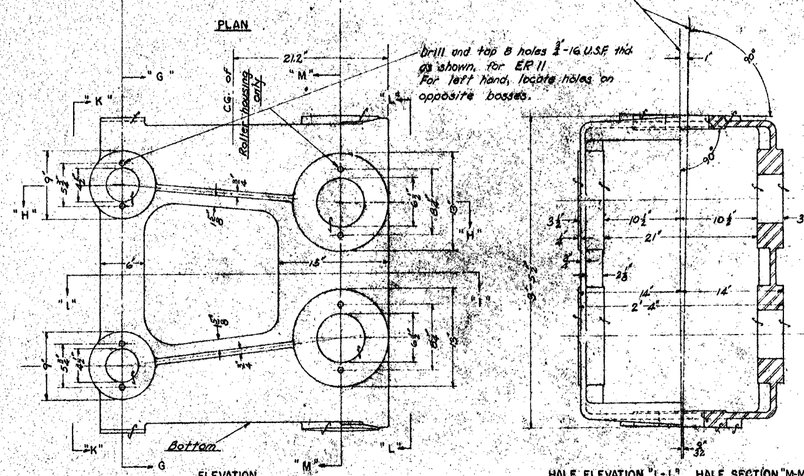


HALF SECTION "H-H"

HALF SECTION "I-I"



Note: For Left Hand, trunion ℄ is rotated 180° about vertical ℄

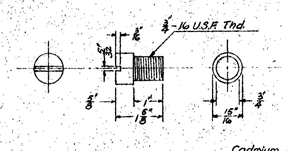


HALF ELEVATION "L-L" HALF SECTION "M-M"

ROLLER HOUSING

Nickel Steel Casting Wgt. 1633 #
Mark ER-1 R as shown Make 10
Mark ER-1L opposite Make 10

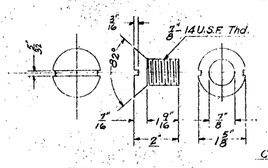
Scale in feet.



SCREW

Bolt Steel Wgt. 03 #
Mark ER-11 Make 160

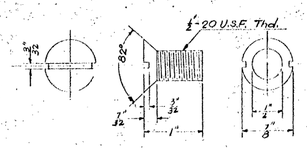
Scale in inches



SCREW

Chrome Nickel Steel Wgt. 0.46 #
Mark ER-3 Make 320

Scale in inches



SCREW

Bolt Steel Wt. 0.01 #
Mark ER-14 Make 800

Scale in inches

General Notes:
Indicated weights are for single pieces as noted.

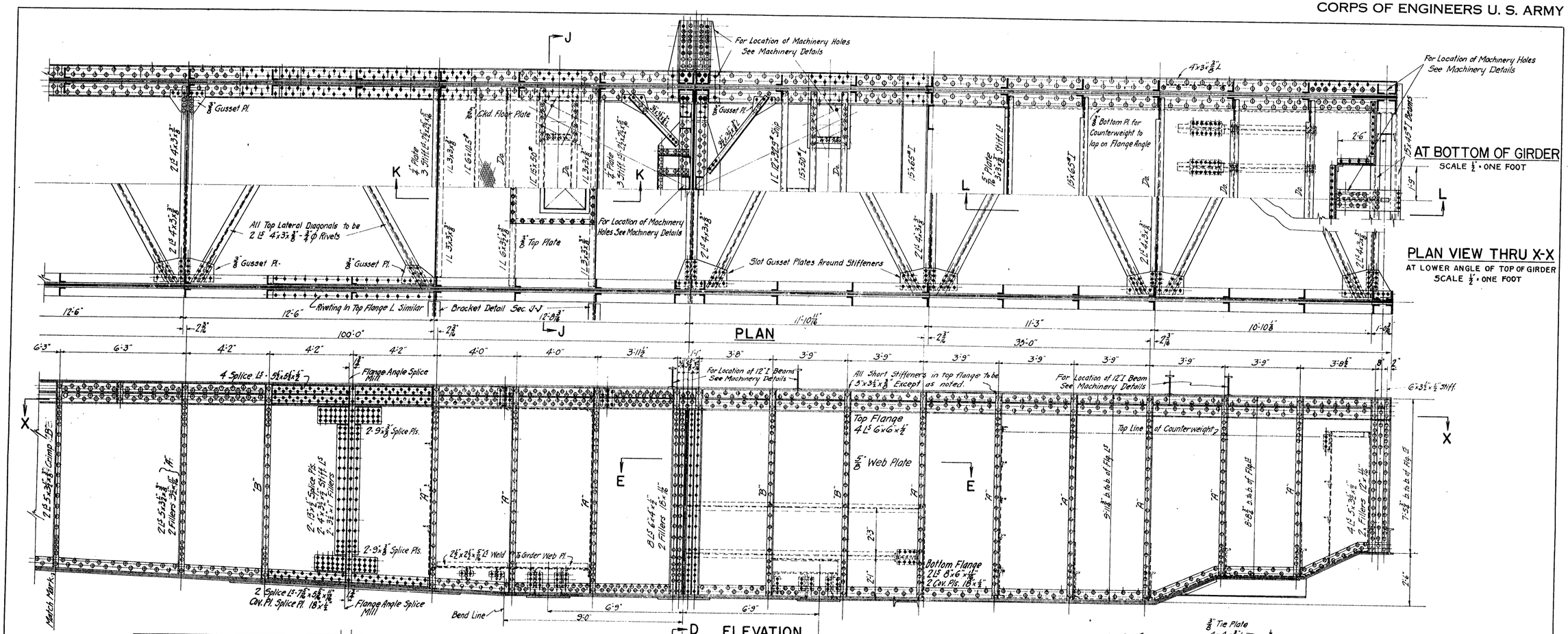
References:
For related details see Sheet 10-N-2-60
For position of Housing Assembly in Bulkhead See Sheet 7.

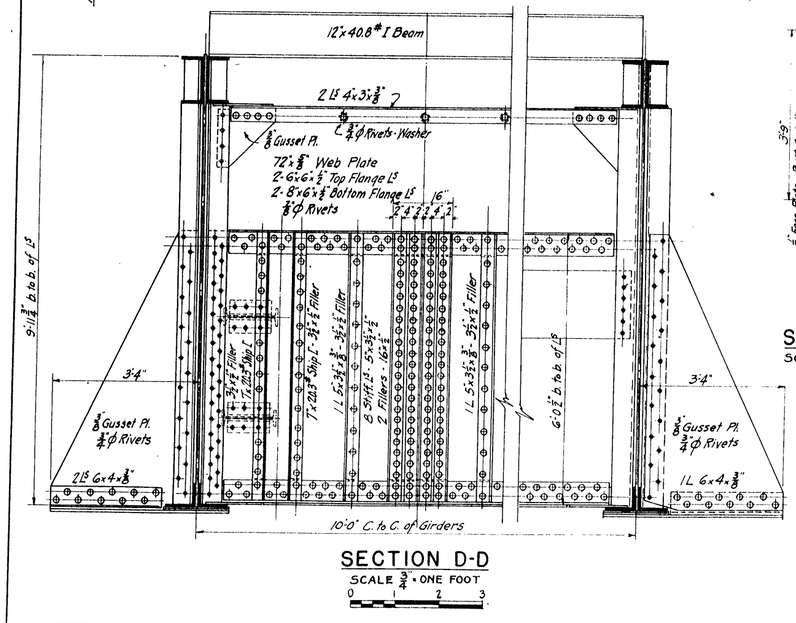
NO.	REVISION	DATE	BY	APV'D
	ISSUED FOR CONSTRUCTION	5-2-38		

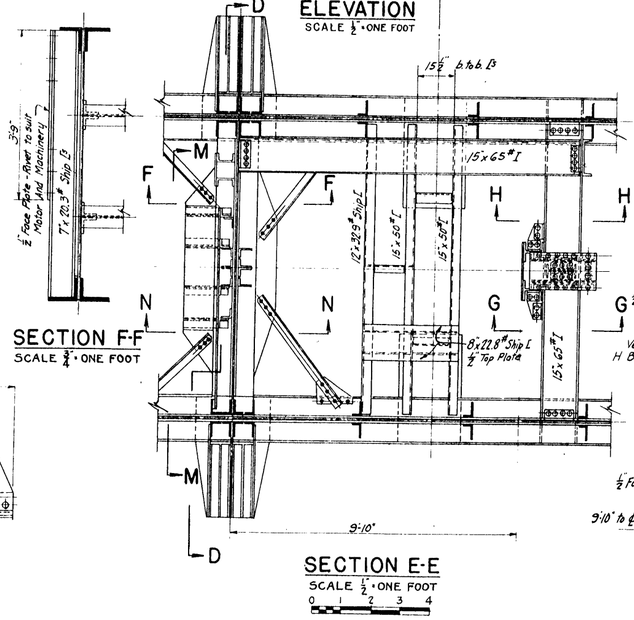
BONNEVILLE POWER NAVIGATION PROJECT
33RD CONTRACT
SHIP LOCK-EMERGENCY DAM
BULKHEADS Nº 4 TO 13 INCL.
END ROLLERS-ASSEMBLY AND DETAILS
SCALES AS SHOWN
U S ENGINEER OFFICE, PORTLAND, OREGON DISTRICT
SUBMITTED: R.F. Mackenzie ENGINEER
APPROVED: H. Williams MAJOR, CORPS OF ENGINEERS
RECOMMENDED: HEAD ENGINEER
DRAWN BY H&L-T.M.O. DATE 5-2-38
TRACED BY T.M.O. CHECKED BY

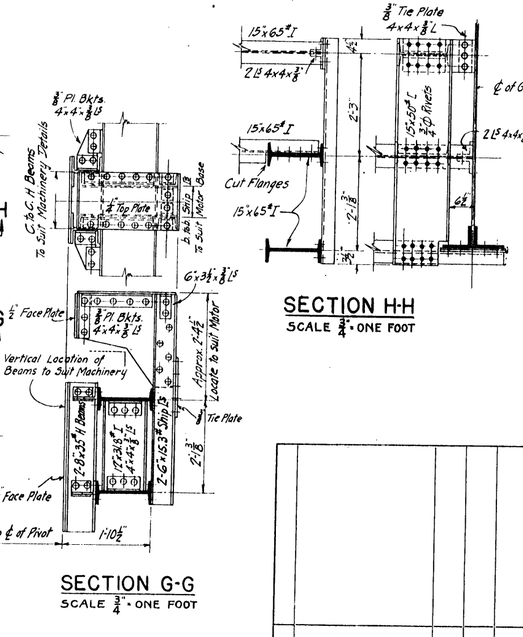
WAR DEPARTMENT

CORPS OF ENGINEERS U. S. ARMY









GENERAL NOTES

RIVETING - *All rivets to be 7/8" dia. except as noted. All rivet holes for field rivets to be sub-punched and reamed while assembled in shop. All other holes may be punched or drilled full size.*

PAINTING - *All structural steel to be painted as specified.*

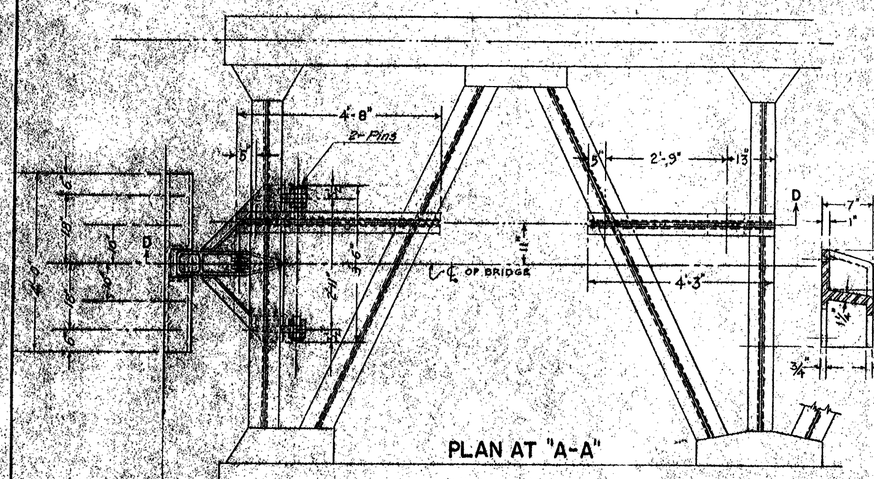
REFERENCES

For Swing End of Swing Span See SHEET 2 DRAWING N-2-61.
For Sections J-J K-K L-L M-M and N-N See SHEET 3 DRAWING N-2-61
For Machinery Details See SHEETS 7-8-9 and 10 DRAWING N-2-61.
For Anchor Bolt Plan See SHEET 11 DRAWING N-2-61.

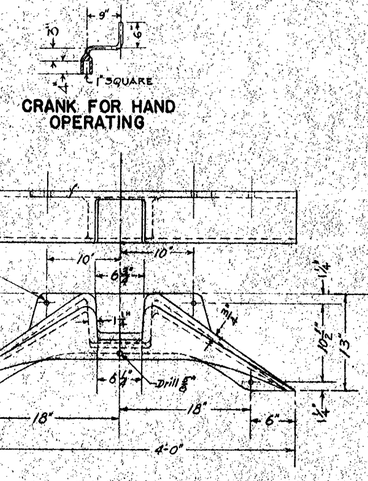
NO.	REVISION	DATE	BY	APV'D

BONNEVILLE POWER NAVIGATION PROJECT
28TH CONTRACT
BRIDGE ACROSS NAVIGATION CANAL
SWING SPAN
COUNTERWEIGHT END
SCALE AS SHOWN
U.S. ENGINEER OFFICE, PORTLAND, OREGON DISTRICT

SUBMITTED R.H. Mackenzie ENGINEER
APPROVED D.W. Williams MAJOR, CORPS OF ENGINEERS
RECOMMENDED [illegible] HEAD ENGINEER
DESIGNED BY W.O.S. DATE 1-16-'35
DR. BY R.D.P. TR. BY R.D.P. CHECKED BY W.O.S.



PLAN AT "A-A"

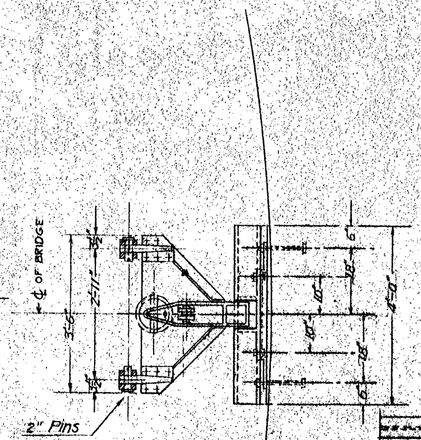


CRANK FOR HAND OPERATING

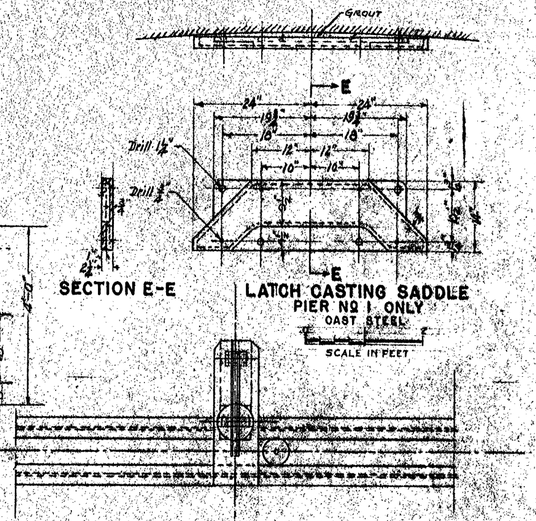
DETAILS OF LATCH CASTING

Scale: 1½" = 1'-0"

SCALE IN FEET



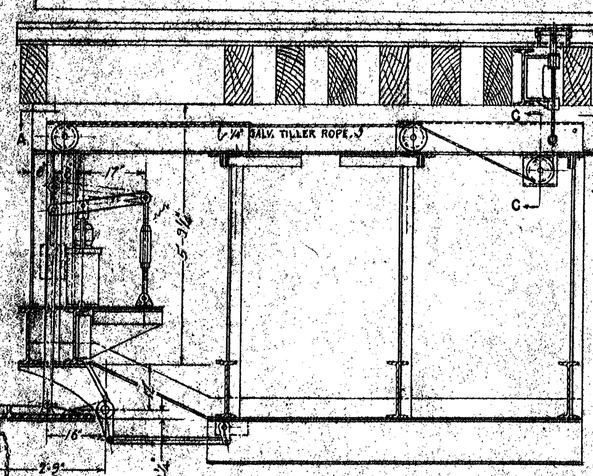
PLAN AT SECTION "B-B"



SECTION E-E

LATCH CASTING SADDLE
PIER NO 1 ONLY
CAST STEEL

SCALE IN FEET

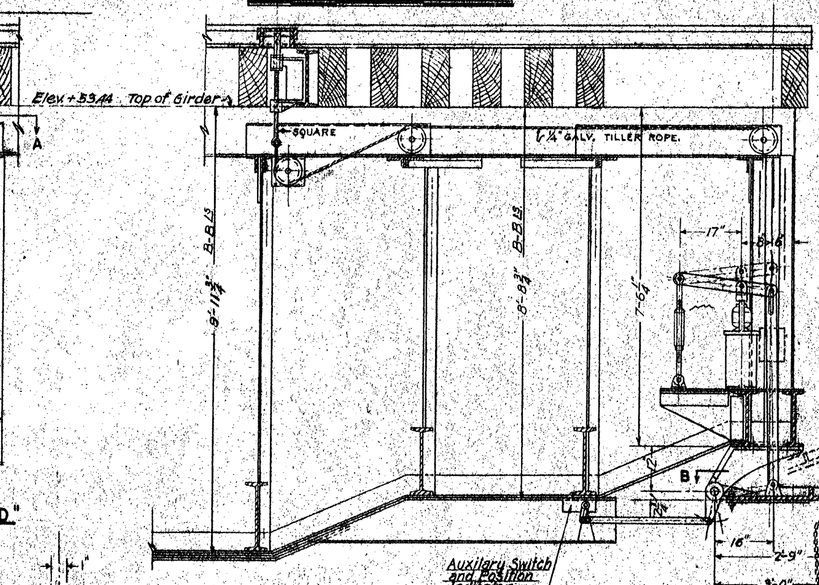


SECTIONAL ELEVATION "D-D"

Scale: ¾" = 1'-0"

Look'g Same For Both Ends Except For Elevation

Pier No. 3 Elev+ 40.75

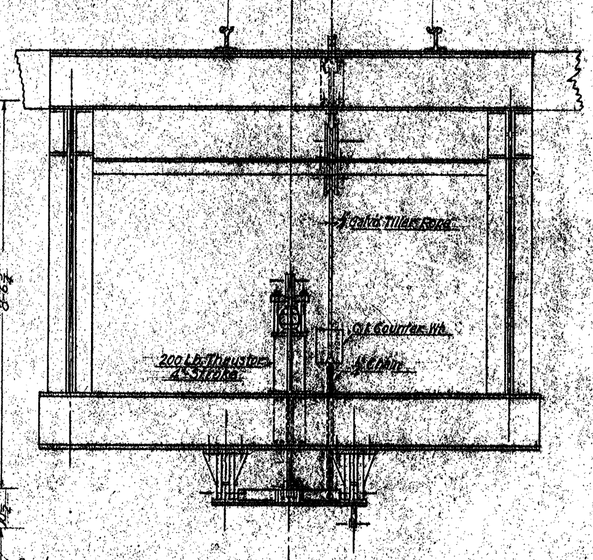


SECTIONAL ELEVATION

Scale: ¾" = 1'-0"

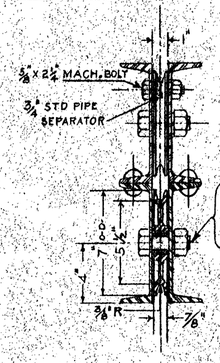
SCALE IN FEET

Elev +39.00 Pier No. 1



END VIEW

Scale: ¾" = 1'-0"



SECTION "C-C"

SCALE 3" = 1'-0"

NO.	REVISION	DATE	BY	APV'D

BONNEVILLE POWER NAVIGATION PROJECT
28TH CONTRACT
BRIDGE ACROSS NAVIGATION CANAL
SWING SPAN
CENTERING LATCH MECHANISM
SCALES AS SHOWN

U S ENGINEER OFFICE, PORTLAND, OREGON DISTRICT

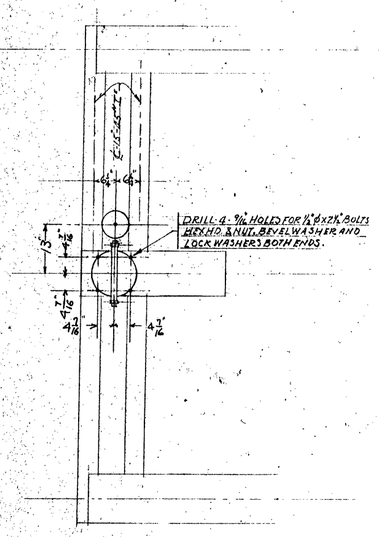
SUBMITTED: [signature] ENGINEER

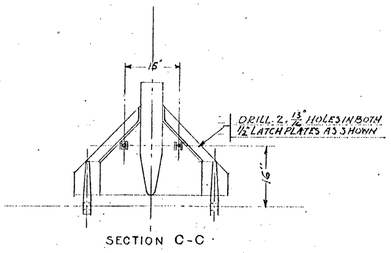
APPROVED: [signature] MAJOR, CORPS OF ENGINEERS

RECOMMENDED: [signature] HEAD ENGINEER

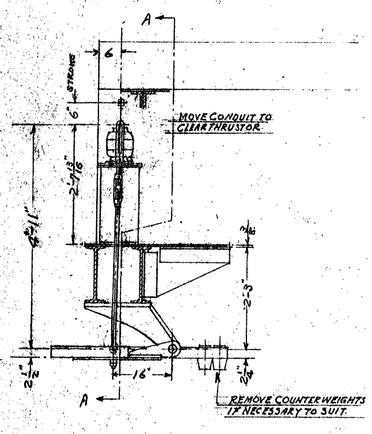
DRAWN BY: C.W.B. DATE 1-16-38

TRACED BY: W.C.T. CHECKED: [signature]

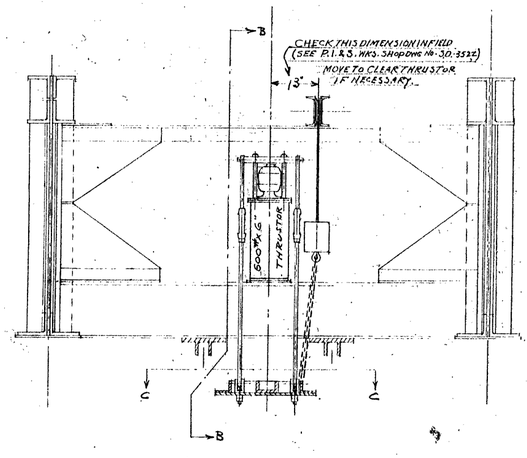




SECTION C-C

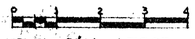


SECTION B-B

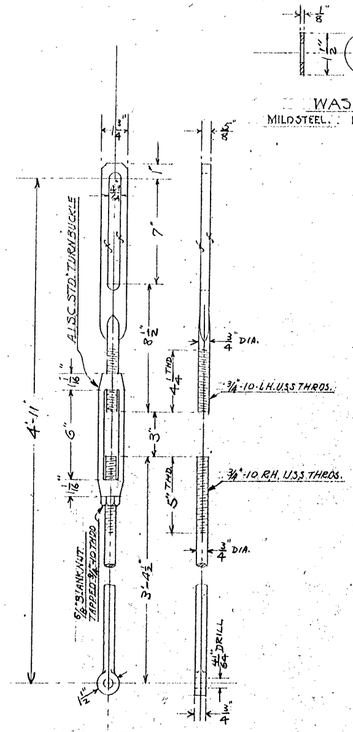


SECTION A-A

SWING END

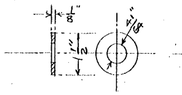


SCALE 3/4 IN = 1 FOOT

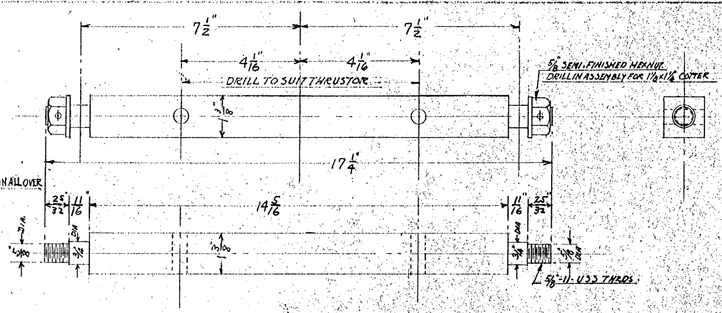


CONNECTING RODS.

MILD STEEL MAKE 4. SMOOTH FORGE

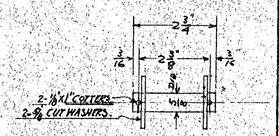


MILD STEEL. MAKE 4-FIN ALL OVER



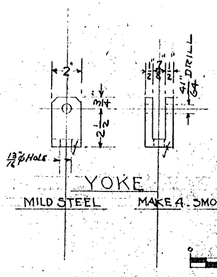
CROSS HEAD

MILD STEEL MAKE 2. FIN. ALL OVER

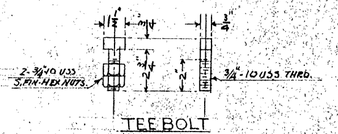


PINS

COLD ROLLED STEEL · MAKE 4

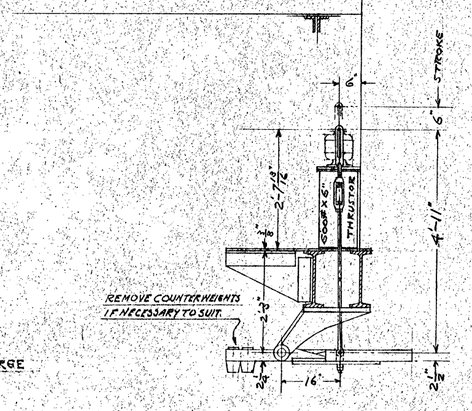


MILD STEEL MAKE 4. SMOOTH FORGE



MILD STEEL MAKE 4. SMOOTH FORGE

SCALE 3 IN. = 1 FOOT



COUNTERWEIGHT END

NOTES

IN ADDITION TO THE DETAILED PARTS SHOWN THERE WILL BE FURNISHED TWO 600 LB. BY 6" STROKE GENERAL ELECTRIC CO., OR EQUAL, THRUSTORS, LOCATED AS SHOWN TO REPLACE THE 200 LB. BY 4" STROKE G.E. THRUSTORS, NOW IN PLACE.

PAINT ALL SURFACES, EXCEPT FINISHED WORKING PARTS, TWO SHOP COATS OF RED LEAD PAINT, AFTER AUTHORIZATION BY THE INSPECTOR. FINISHED SURFACES TO BE GIVEN A PROTECTING COAT OF WHITE LEAD AND TALLOW APPLIED HOT.

NO.	REVISION	DATE	BY	APP'D

BONNEVILLE PROJECT

BRIDGE ACROSS NAVIGATION CANAL

SWING SPAN

CENTERING LATCH MECHANISM

REVISIONS TO SHEET 10. N-2-61

SCALE AS SHOWN

U. S. ENGINEER OFFICE, SECOND PORTLAND DISTRICT (OREGON)

SUBMITTED: M. H. Gleyer, ENGINEER

RECOMMENDED: Thos. E. Creigmile, PRINCIPAL ENGINEER

APPROVED: Thos. H. Williams, LT. COL. CORPS OF ENGINEERS

DESIGNED BY BAKE - DATE 4-18-36

DR. BY CWB - CHECKED BY G.S.D.

PIER No. 5

PIER No. 4

PIER No. 3

PIER No. 2

PIER No. 1

SECTION "B-B" PIER 2

SECTION "A-A" PIER 2

SECTION "A-A" PIER 1

SECTION "A-A" PIER 5

SECTION "A-A" PIER 4

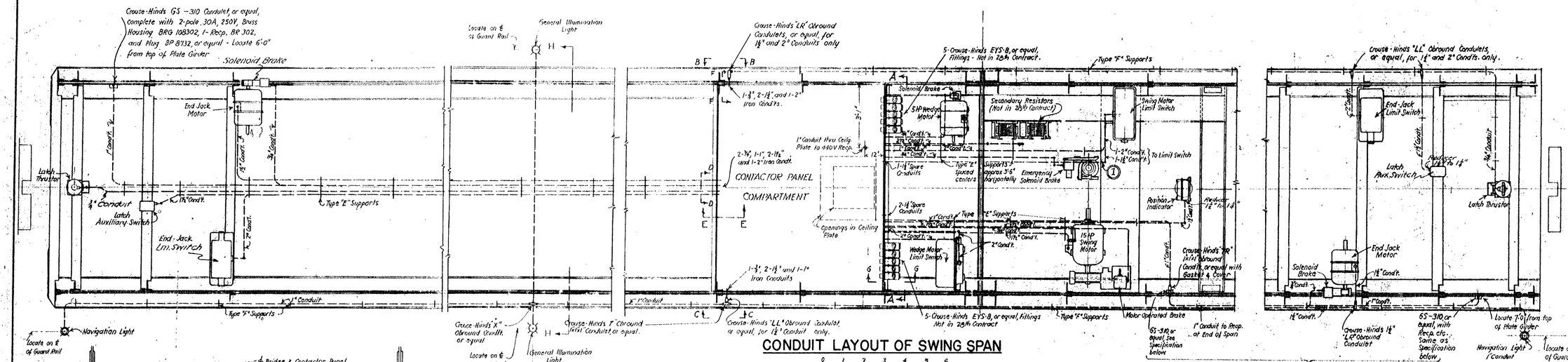
SECTION "A-A" PIER 3

General Notes.
This drawing supersedes sheets 1, 2 and 3 of Drawing N-1-32.

NO.	REVISION	DATE	BY	AP'V'D

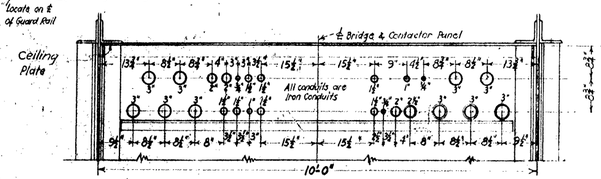
BONNEVILLE POWER NAVIGATION PROJECT
26TH CONTRACT
BRIDGE ACROSS NAVIGATION CANAL
BRIDGE PIERS
ANCHOR BOLTS PLAN
SCALE 1/2" = 1'-0"

U. S. ENGINEER OFFICE, PORTLAND, OREGON DISTRICT
SUBMITTED K.F. Mackenzie, ENGINEER
APPROVED C.H. Williams, MAJOR, CORPS OF ENGINEERS
RECOMMENDED C.J. Ells, HEAD ENGINEER
DESIGNED BY W.D. Smith DATE 1-16-35
DR. BY CKB TR. BY H.E.L. CHECKED BY [illegible]



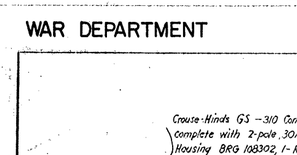
CONDUIT LAYOUT OF SWING SPAN

SCALE IN FEET



SECTION A-A

SCALE IN FEET



SECTION B-B

"LL" Obround Conduits are not indicated here.

SECTION C-C

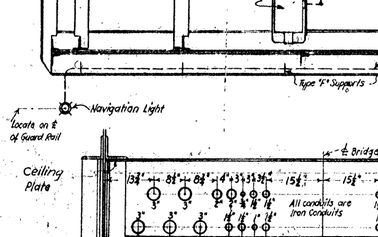
LR Obround Conduitet not indicated here.

SECTION D-D

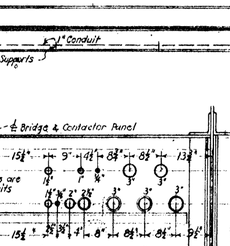
TYPICAL SUPPORT TYPE "E"

TYPICAL CONDUIT SEALING DETAIL

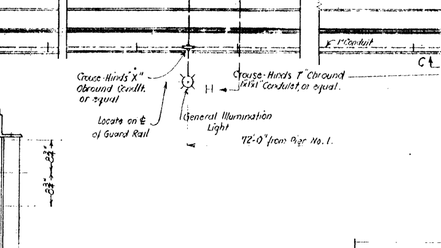
TYPICAL SUPPORT TYPE "F"



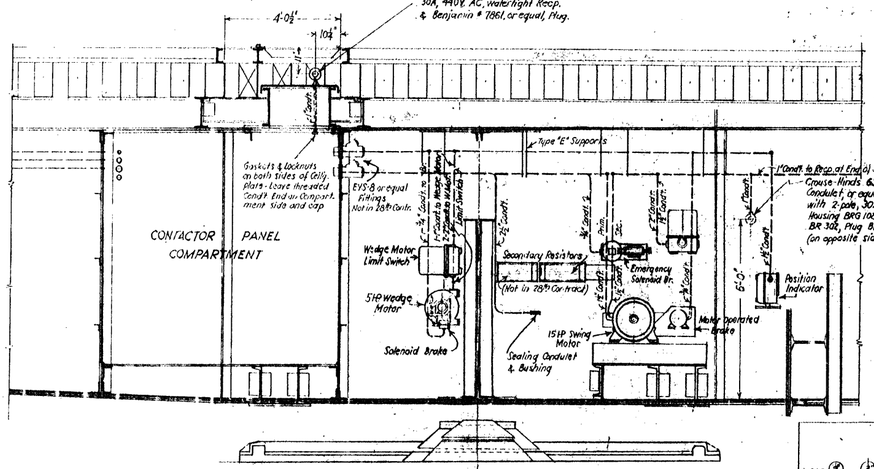
SECTION E-E



SECTION F-F



SECTION G-G



ELEVATION OF COMPARTMENT, WEDGE & SWING MACHINERY

SCALE IN FEET

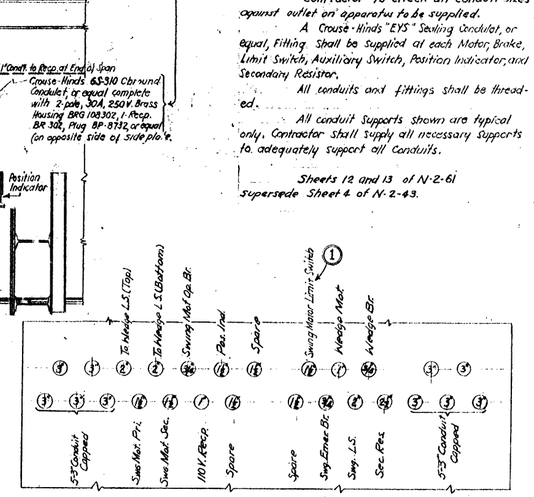
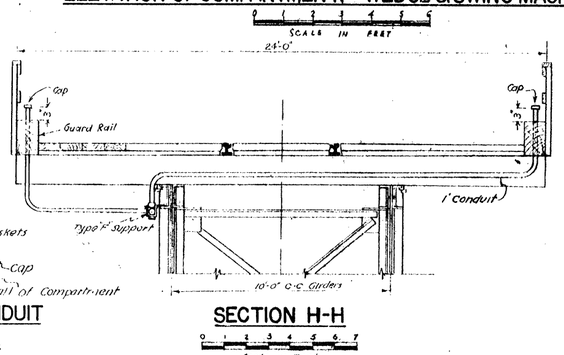


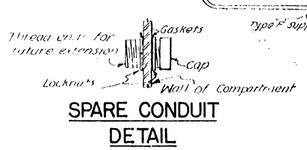
DIAGRAM OF CONDUIT AT SECTION A-A

No scale



SECTION H-H

Scale in Feet



SPARE CONDUIT DETAIL

Note:

Contractor to check all conduit sizes against outlet on apparatus to be supplied.

A Crouse-Hinds "EYS" Sealing Conduitet, or equal, Fitting shall be supplied at each Motor, Brake, Limit Switch, Auxiliary Switch, Position Indicator, and Secondary Resistor.

All conduits and fittings shall be threaded.

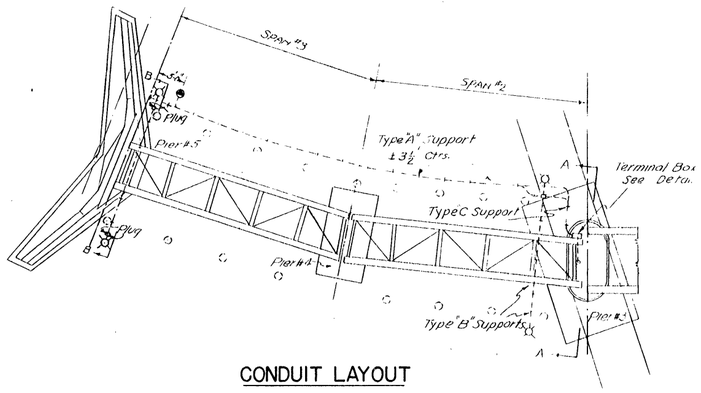
All conduit Supports shown are typical only. Contractor shall supply all necessary supports to adequately support all Conduits.

Sheets 12 and 13 of N-2-61 Supersede Sheet 4 of N-2-43.

NO.	REVISION	DATE	BY	APV'D
1	Addnl. Condt. to Swing Motor Limit Switch.	5-6-35	JWR	RLM

BONNEVILLE POWER NAVIGATION PROJECT
28TH CONTRACT
BRIDGE ACROSS NAVIGATION CANAL
ELECTRICAL DETAILS
SWING SPAN
SCALES AS SHOWN
U. S. ENGINEER OFFICE, PORTLAND, OREGON DISTRICT

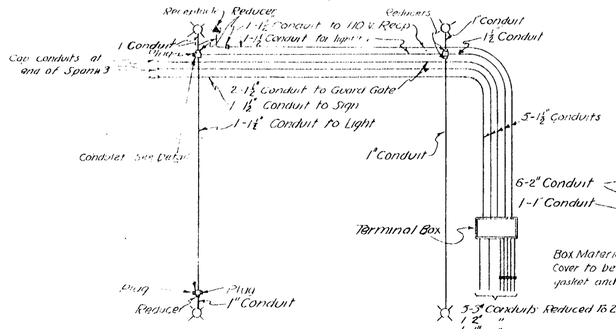
SUBMITTED: R.L. Mackenzie, ENGINEER
APPROVED: C.E. Williams, MAJOR, CORPS OF ENGINEERS
RECOMMENDED: HEAD ENGINEER
DRAWN BY: J.M.G. & J.W.H. DATE 1-26-35
TRACED BY J.M.G. & J.W.H. CHECKED BY A.P.D.

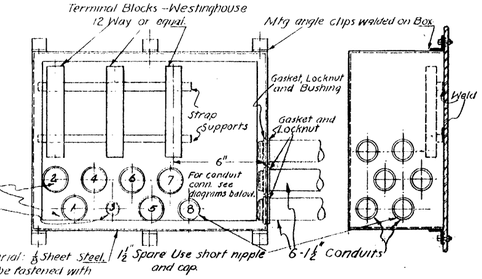


CONDUIT LAYOUT

Scale in Feet

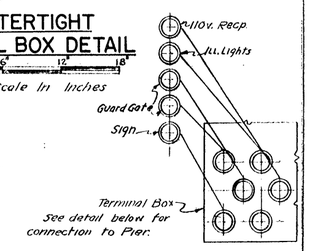
Legend:
- Ill. Light
- Receptacle





WATERTIGHT TERMINAL BOX DETAIL

Scale in Inches

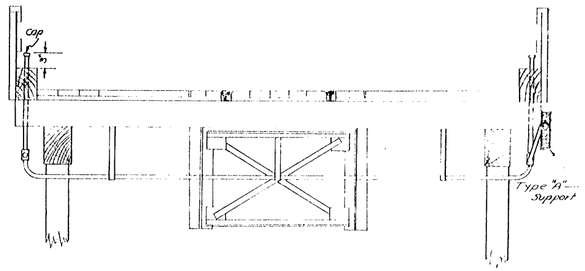


CONDUIT DIAGRAM

No Scale

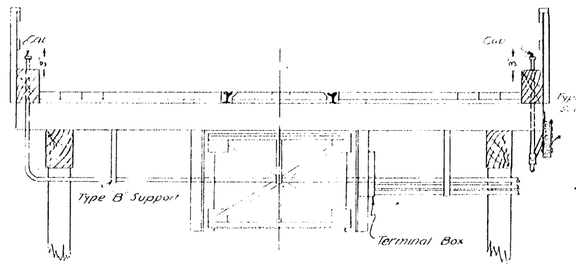
Note: All conduits and fittings to be threaded.

All conduit supports are typical only. Contractor shall supply all necessary supports to adequately support all conduit.

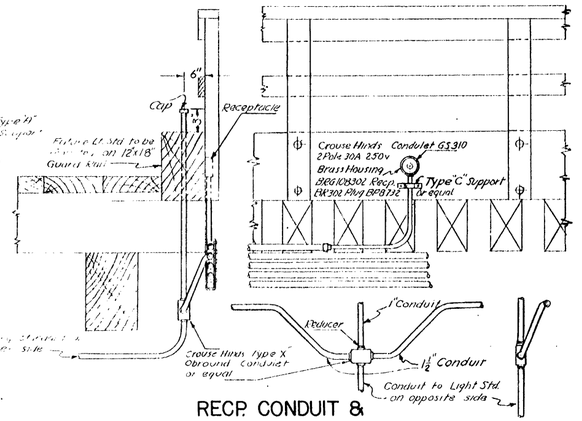


SECTION B-B

Scale in Feet



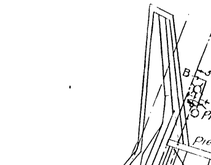
SECTION A-A



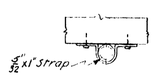
RECP. CONDUIT & LIGHT STANDARD CONDUIT DETAILS

Scale in Feet

TYPICAL SUPPORT TYPE "A"



TYPICAL SUPPORT TYPE "B"



TYPICAL SUPPORT TYPE "C"

Note: Sheet 12 of 13 of N-2-6 Supersedes Sheet 4 of N-2-43

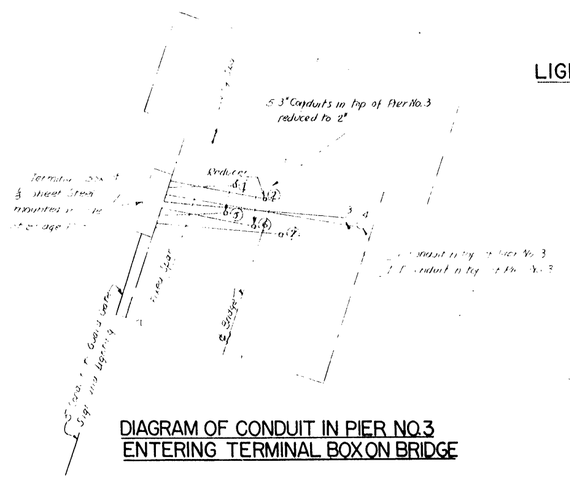


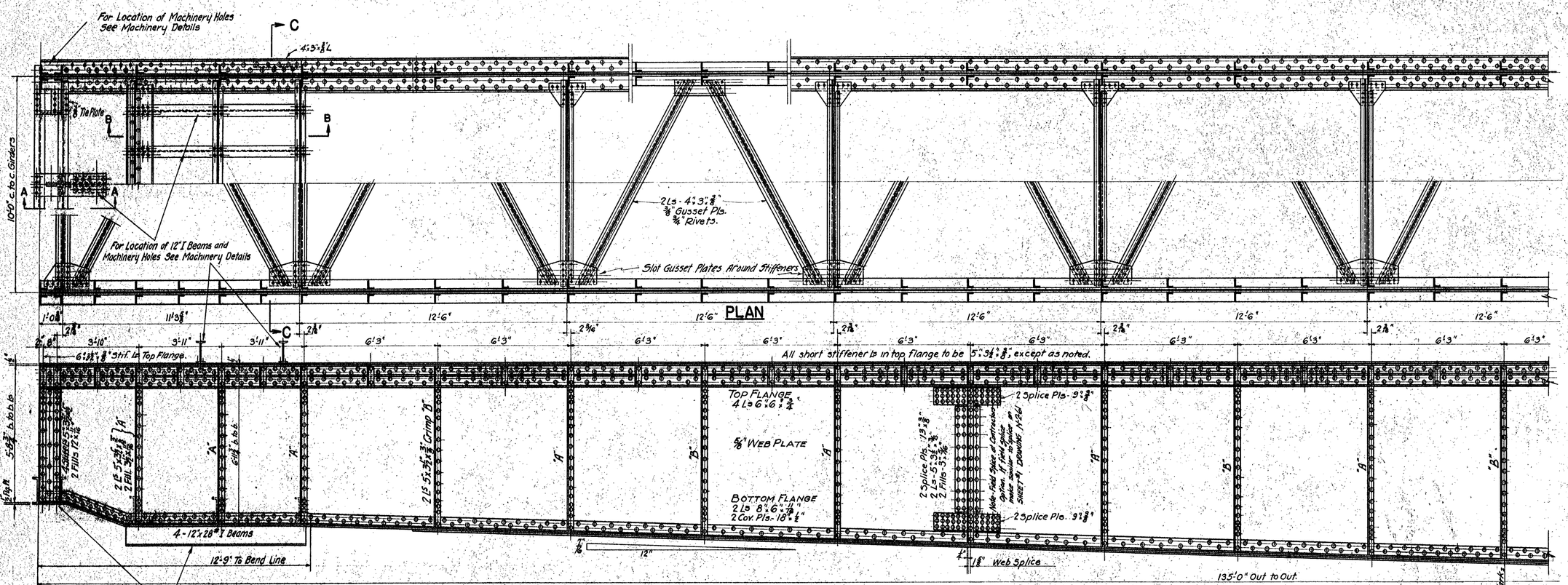
DIAGRAM OF CONDUIT IN PIER NO. 3 ENTERING TERMINAL BOX ON BRIDGE

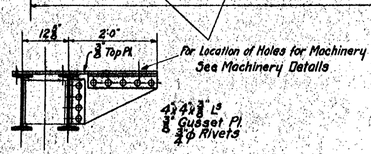
BONNEVILLE POWER NAVIGATION PROJECT
28TH CONTRACT
BRIDGE ACROSS NAVIGATION CANAL
ELECTRICAL DETAILS
FIXED SPANS
SCALES AS SHOWN

U.S. ENGINEER OFFICE PORTLAND OREGON DISTRICT

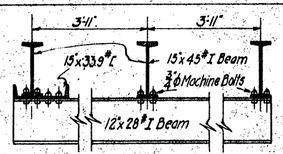
SUBMITTED R.H. Mackenzie ENGINEER
APPROVED F.A. Pickering MAJOR CORPS OF ENGRS.
RECOMMENDED ENGINEER
DRAWN BY JMG DATE 1-26-33
TRACED BY JMG CHECKED BY A.P.D.

SHEET 13 OF 13 N-2-61



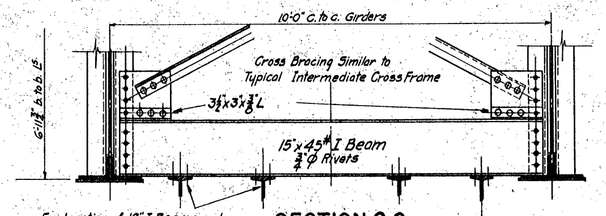


SECTION A-A
SCALE ¾" = ONE FOOT

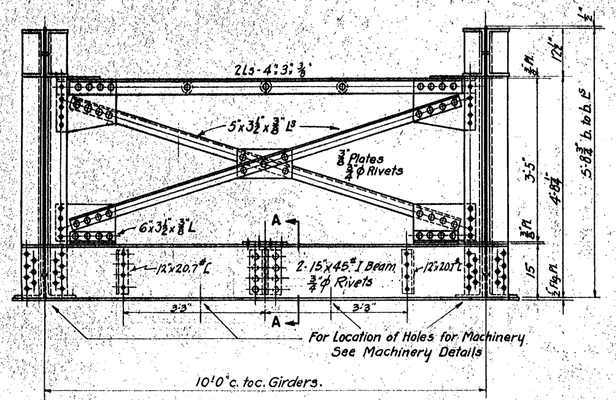


SECTION B-B
SCALE ¾" = ONE FOOT

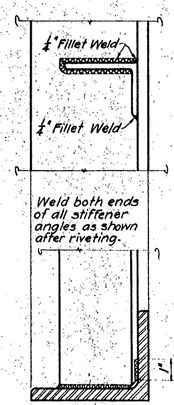
ELEVATION
SCALE ¼" = ONE FOOT
0 1 2 3 4



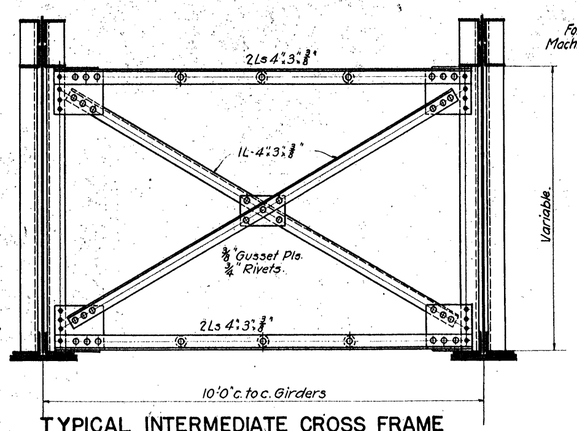
SECTION C-C
SCALE ¾" = ONE FOOT



END CROSS FRAME.
SCALE ¾" = ONE FOOT



STIFFENER ANGLE DETAIL



TYPICAL INTERMEDIATE CROSS FRAME
SCALE ¾" = ONE FOOT
0 ½ 3

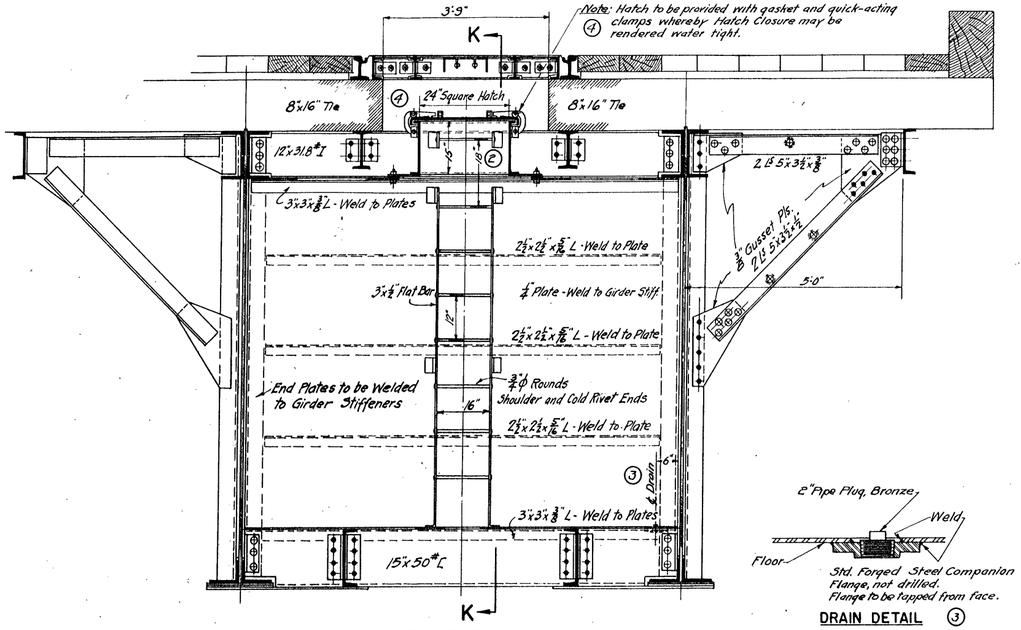
REFERENCES

For General Notes See SHEET #1 DRAWING N-2-61.
For Counterweight End See SHEET #1 DRAWING N-2-61.
For Machinery Details See SHEETS 7, 8, 9 and 10 DRAWING N-2-61.
For Anchor Bolt Plan See SHEET #11 DRAWING N-2-61

NO.	REVISION	DATE	BY	APV'D

BONNEVILLE POWER NAVIGATION PROJECT
28TH CONTRACT
BRIDGE ACROSS NAVIGATION CANAL
SWING SPAN
SWING END
SCALE AS SHOWN
U S ENGINEER OFFICE, PORTLAND, OREGON DISTRICT

SUBMITTED: R.R. Mackenzie, ENGINEER
APPROVED: E. Williams, MAJOR, CORPS OF ENGINEERS
RECOMMENDED: HEAD ENGINEER
DRAWN BY: W.D.F. R.D.P. DATE 1-16-35.
TRACED BY R.D.P. CHECKED BY W.D.F.

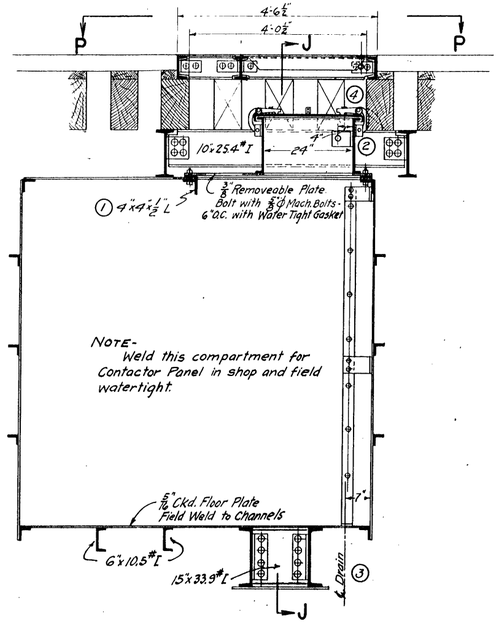


SECTION J-J

SCALE ¾" = ONE FOOT

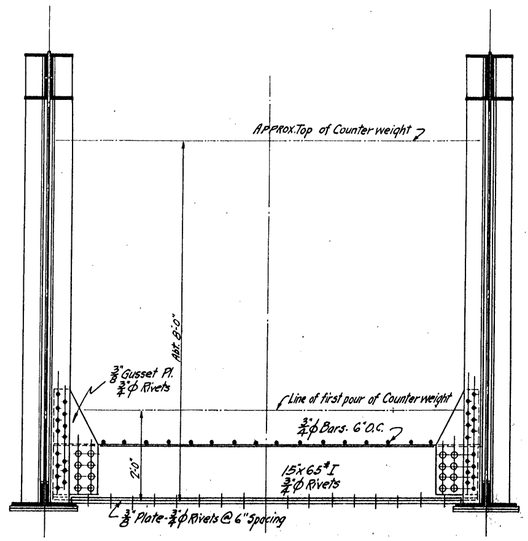
DRAIN DETAIL ③

No Scale



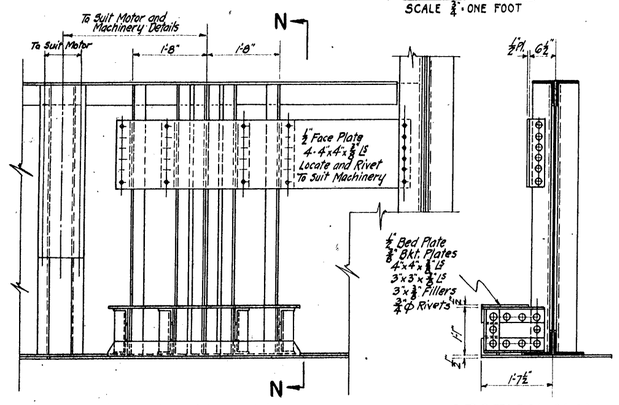
SECTION K-K

SCALE ¾" = ONE FOOT



TYPICAL SECTION THRU COUNTERWEIGHT

SCALE ¾" = ONE FOOT

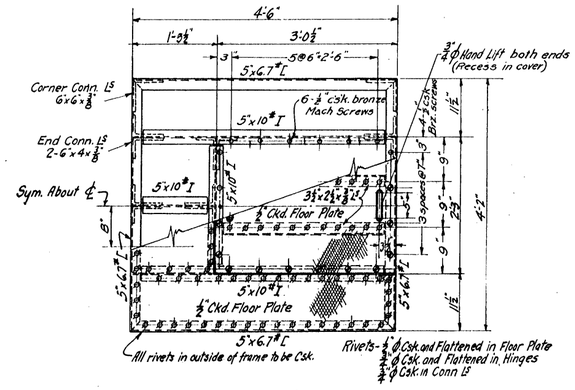


SECTION M-M

SCALE ¾" = ONE FOOT

SECTION N-N

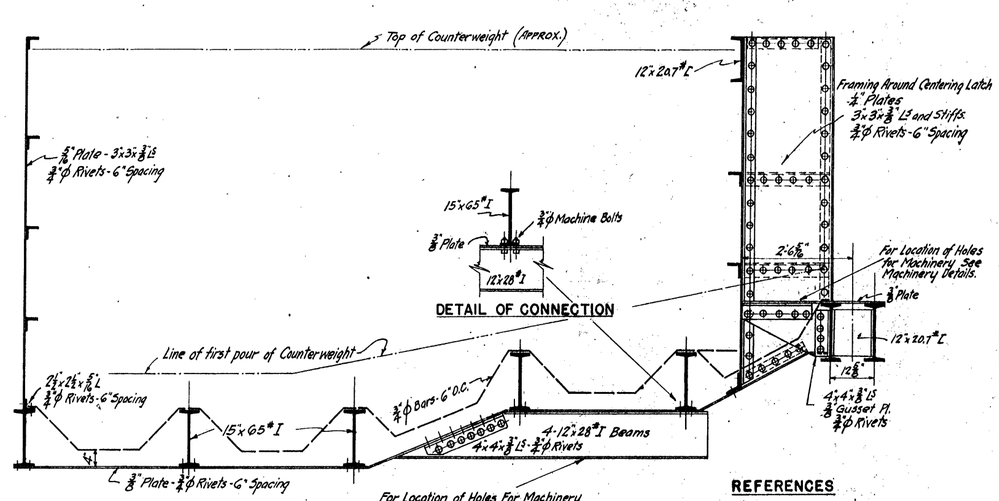
SCALE ¾" = ONE FOOT



PLAN VIEW AT P-P

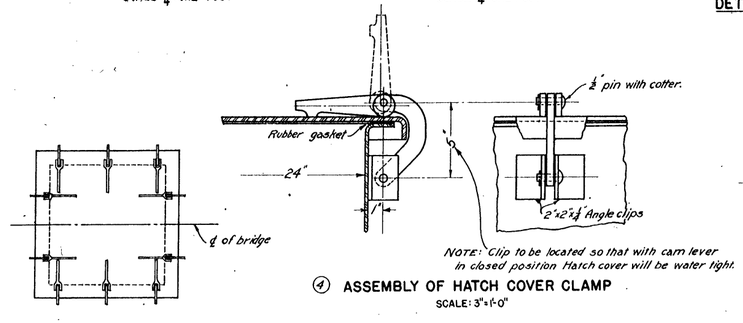
DETAIL CONTACTOR COMPARTMENT COVER

SCALE ~ 1" = ONE FOOT



SECTION L-L

SCALE ¾" = ONE FOOT



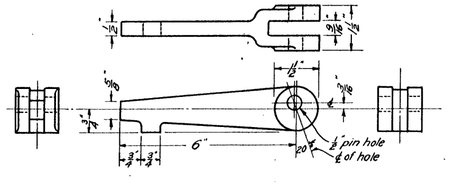
NOTE: Clip to be located so that with cam lever in closed position Hatch cover will be water tight.

④ ASSEMBLY OF HATCH COVER CLAMP

SCALE: 3" = 1'-0"

④ LAYOUT OF HATCH CLAMPS PLAN

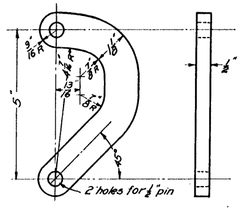
SCALE: 1" = 1'-0"



④ HATCH CLAMP LEVER

STEEL CASTING MAKE 10

SCALE HALF SIZE



④ HATCH CLAMP HOOK

STEEL FORGING MAKE 10

SCALE HALF SIZE

REFERENCES

For General Notes See SHEET 1 DRAWING N-2-61
For Counterweight End of Swing Span See SHEET 1 DRAWING N-2-61
For Swing End of Swing Span See SHEET 2 DRAWING N-2-61
For Machinery Details See SHEETS 7-8-9 and 10 DRAWING N-2-61
For Anchor Bolt Plan See SHEET 11 DRAWING N-2-61

NO.	REVISION	DATE	BY	AP'V'D
4	Hatch cover tightening details added.	1-31-35	H.G.L.	
3	Drain added.	1-31-35	H.G.L.	
2	Ladder Rung added.	1-31-35	H.G.L.	
1	Angle was 5"x3½"x⅜".	1-31-35	H.G.L.	

BONNEVILLE POWER NAVIGATION PROJECT

28TH CONTRACT

BRIDGE ACROSS NAVIGATION CANAL

SWING SPAN

DETAILS

SCALE AS SHOWN

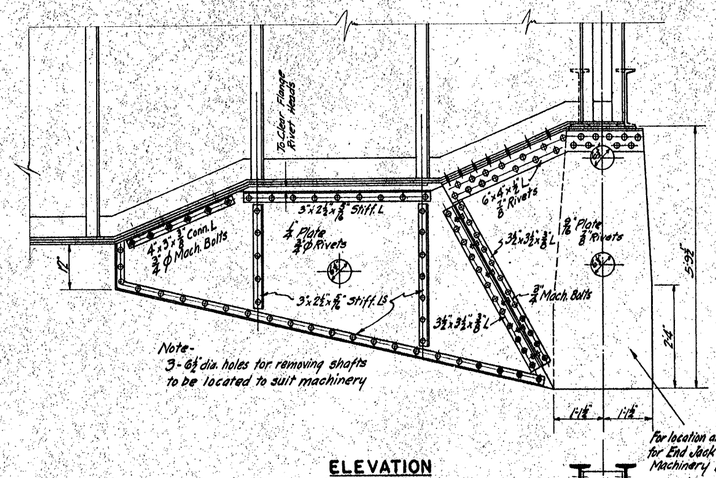
U. S. ENGINEER OFFICE, PORTLAND, OREGON DISTRICT

SUBMITTED R. D. Mackenzie ENGINEER — APPROVED C. E. Williams MAJOR, CORPS OF ENGINEERS

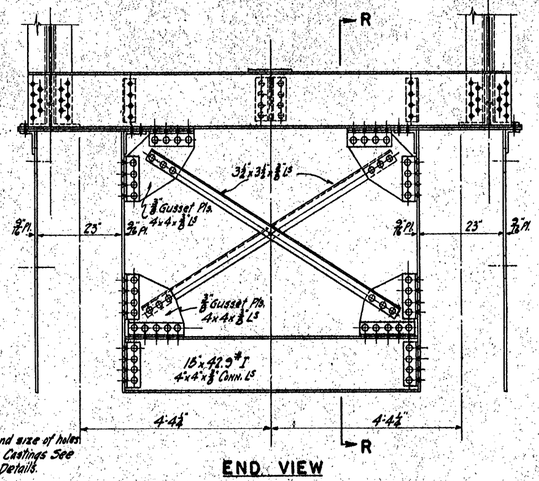
RECOMMENDED ____ HEAD ENGINEER

DESIGNED BY W.D.S. DATE 1-16-35

DR. BY R.D.P. TR. BY R.D.P. CHECKED BY W.D.S.

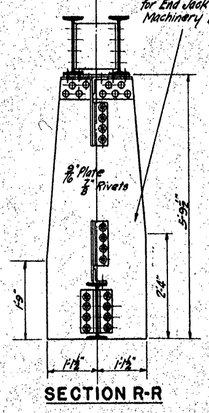


ELEVATION



END VIEW

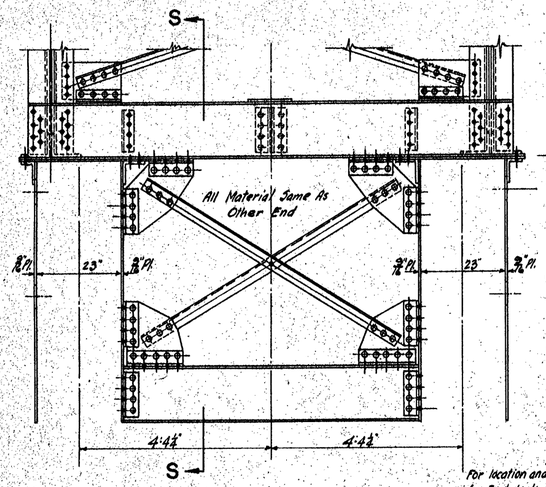
For location and size of holes for End Jack Castings See Machinery Details.



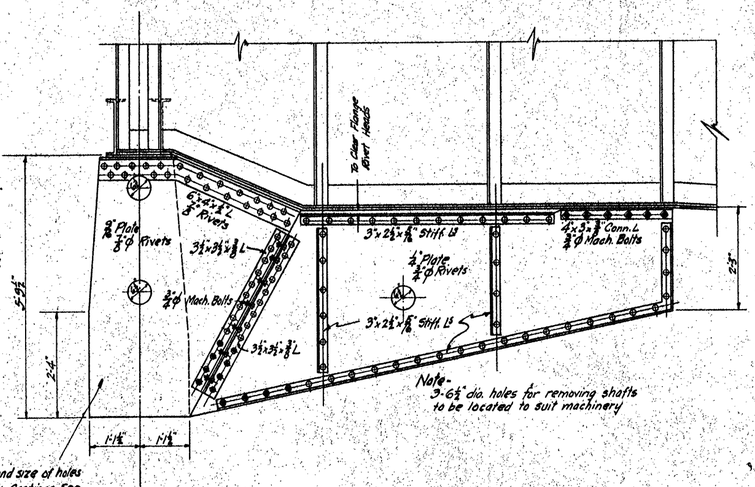
SECTION R-R

END JACK PLATES- COUNTER WEIGHT END

SCALE- ¾" = ONE FOOT

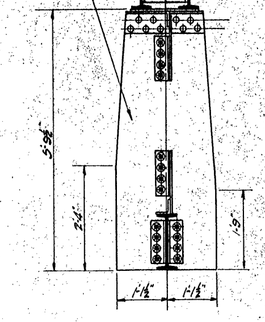


END VIEW



ELEVATION

For location and size of holes for End Jack Castings See Machinery Details



SECTION S-S

END JACK PLATES- SWING END

SCALE ¾" = ONE FOOT

0 1 2 3

REFERENCES

For General Notes See SHEET 1 DRAWING N-2-61
For Counterweight End See SHEET 1 DRAWING N-2-61
For Swing End See SHEET 2 DRAWING N-2-61
For Machinery Details See SHEET 7-8-9 and 10 DRAWING N-2-61

NO.	REVISION	DATE	BY	APV'D

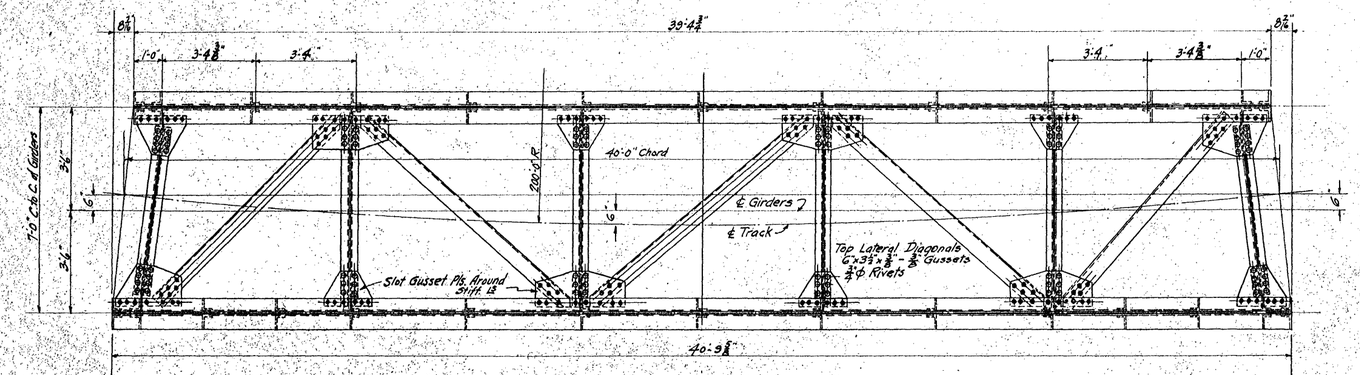
BONNEVILLE POWER NAVIGATION PROJECT
28TH CONTRACT

BRIDGE ACROSS NAVIGATION CANAL
SWING SPAN
DETAILS

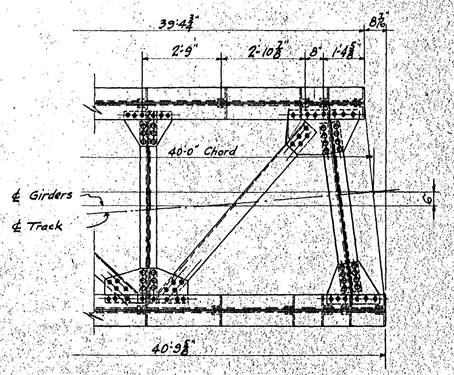
SCALE AS SHOWN

U.S. ENGINEER OFFICE, PORTLAND, OREGON DISTRICT

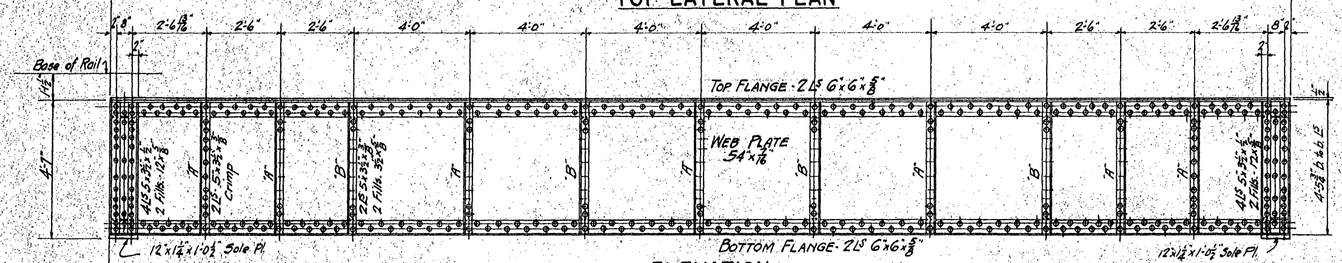
SUBMITTED K.F. Mackenzie ENGINEER
APPROVED E. Williams MAJOR, CORPS OF ENGINEERS
RECOMMENDED HEAD ENGINEER
DESIGNED BY W.D.S. DATE 1-16-35
DR. BY Palmer TR. BY R.D.P. CHECKED BY W.D.S.



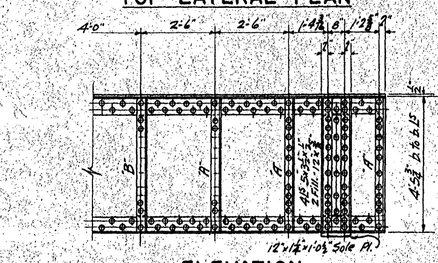
TOP LATERAL PLAN



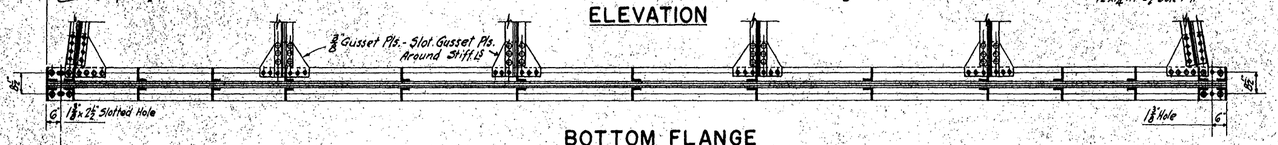
TOP LATERAL PLAN



ELEVATION



ELEVATION



BOTTOM FLANGE

MAKE 1 SPAN AS SHOWN FOR SPAN #3

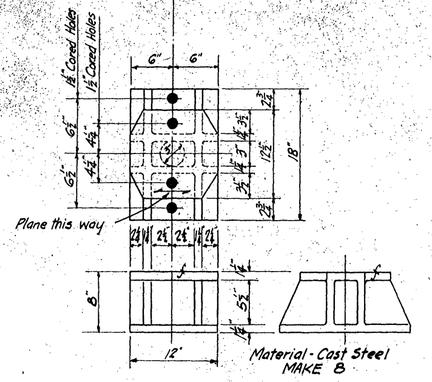
SCALE 1/2" = ONE FOOT

0 1 2 3 4

BOTTOM FLANGE

MAKE 1 SPAN SIMILAR TO SPAN #3 EXCEPT AS SHOWN FOR SPAN # 2

SCALE 1/2" = ONE FOOT

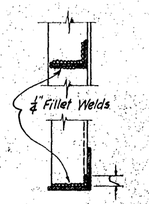


BASE PLATE

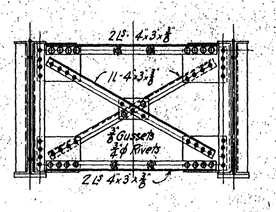
SCALE 1 1/2" = ONE FOOT

0 3 6 9 12

SCALE IN INCHES

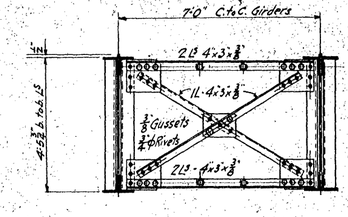


DETAIL OF STIFFENER WELDS



END CROSS FRAME

SCALE 1/2" = ONE FOOT



INTERMEDIATE CROSS FRAME

SCALE 1/2" = ONE FOOT

REFERENCES

For General Notes See SHEET 1 DRAWING N-2-61
For Anchor Bolt Plan See SHEET 11 DRAWING N-2-61

NOTE:
FIELD RIVETING OF CROSS FRAMES & DIAGONALS OPTIONAL.

NO.	REVISION	DATE	BY	APV'D

BONNEVILLE POWER NAVIGATION PROJECT
28TH CONTRACT
BRIDGE ACROSS NAVIGATION CANAL

FIXED SPANS DETAILS

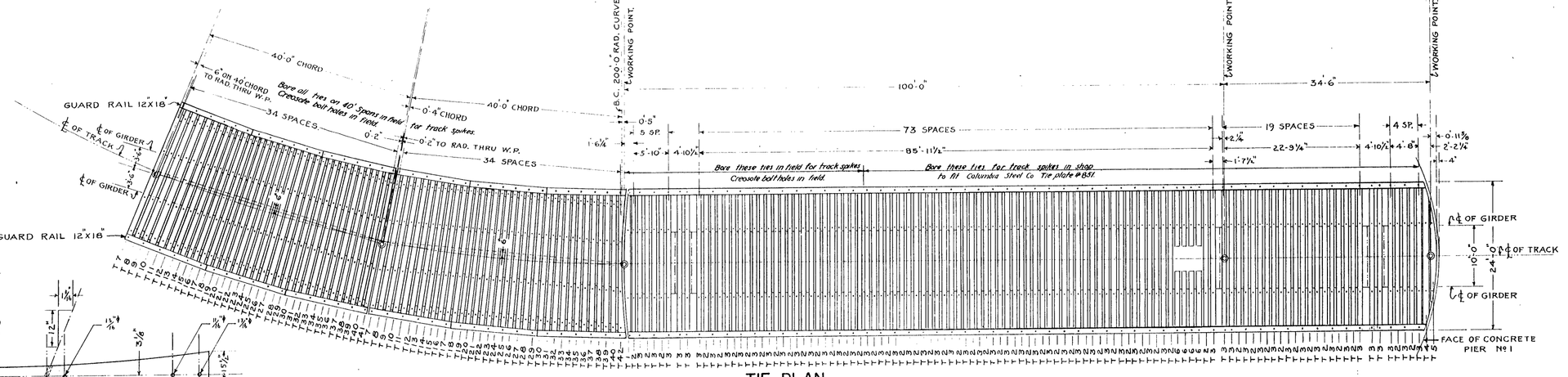
SCALE AS SHOWN

U. S. ENGINEER OFFICE, PORTLAND, OREGON DISTRICT

SUBMITTED R.R. Mackenzie ENGINEER — APPROVED E. H. Williams MAJOR, CORPS OF ENGINEERS

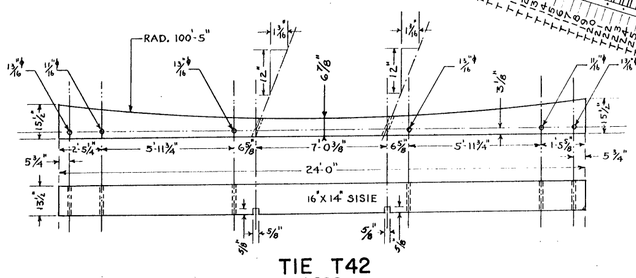
RECOMMENDED HEAD ENGINEER — DESIGNED BY W.O.S. DATE 1-16-35

DR. BY R.A.P. TR. BY R.A.P. CHECKED BY [illegible]

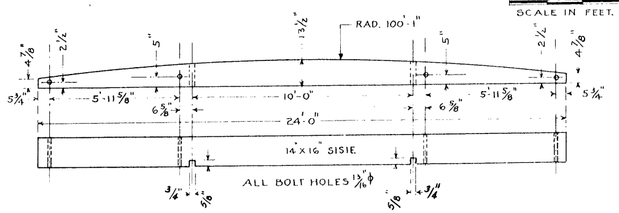


TIE PLAN

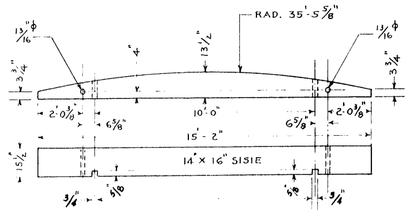
SCALE IN FEET. 0 5 10 15



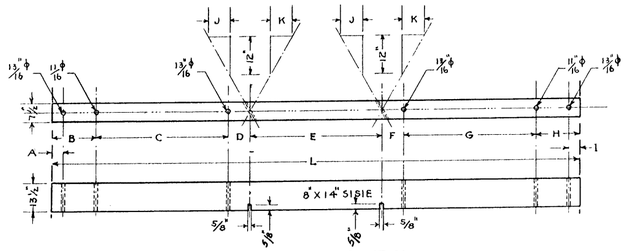
TIE T42
1-REQ.



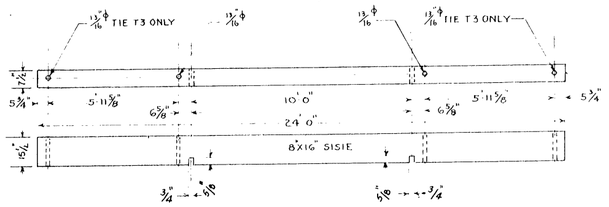
TIE TI
1 REQ.



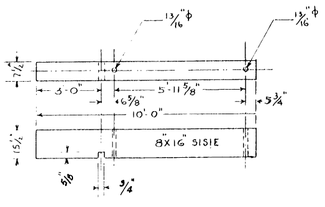
TIE T5
1 REQ.



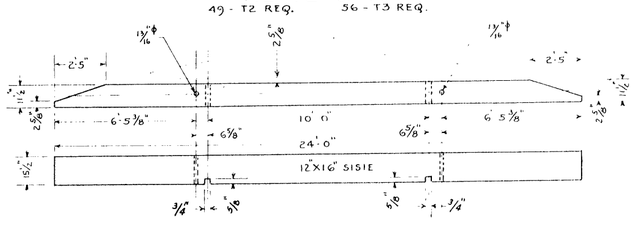
TIES T7 TO T41



TIE T2 & T3
49 - T2 REQ. 56 - T3 REQ.



TIE T6
8 REQ.



TIE T4
1 REQ.

SCALE IN FEET. 0 1 5 10

NOTES.

For Grade of Timber and Treatment see General Specifications.

Guard Rails to be framed in the field and not treated.

SCHEDULE OF TIE MEASUREMENTS

Nº	Nº REQ	L	A	B	C	D	E	F	G	H	I	J	K
T 7	2	24'-0"	5¾"	2'-5¾"	5'-11¾"	6⅝"	7'-0⅜"	6⅝"	5'-11¾"	1'-5⅜"	5¾"		1 3/16"
T 8	2	24'-0"		2'-4½"	5'-11⅝"	6⅝"	7'-0⅜"	6⅝"	5'-11⅝"	1'-6⅜"			1 1/16"
T 9	2	24'-0"	5¾"	2'-3½"	5'-11⅝"	6⅝"	7'-0¼"	6⅝"	5'-11⅝"	1'-7¾"	5¾"		1 1/16"
T 10	2	24'-0"		2'-2⅝"	5'-11⅝"	6⅝"	7'-0¼"	6⅝"	5'-11⅝"	1'-8⅝"			1"
T 11	2	24'-0"	5¾"	2'-1⅝"	5'-11⅝"	6⅝"	7'-0¼"	6⅝"	5'-11⅝"	1'-9⅝"	5¾"		0 15/16"
T 12	2	24'-0"		2'-0⅞"	5'-11½"	6⅝"	7'-0¼"	6⅝"	5'-11½"	1'-10⅝"			0 15/16"
T 13	2	24'-0"	5¾"	2'-0"	5'-11½"	6⅝"	7'-0¼"	6⅝"	5'-11½"	1'-11½"	5¾"		0 ¾"
T 14	2	24'-0"		1'-11"	5'-11½"	6⅝"	7'-0¼"	6⅝"	5'-11½"	2'-0½"			0 11/16"
T 15	2	24'-0"	5¾"	1'-10¼"	5'-11½"	6⅝"	7'-0⅛"	6⅝"	5'-11½"	2'-1⅜"	5¼"		0 5/8"
T 16	2	24'-0"		1'-9¼"	5'-11½"	6⅝"	7'-0"	6⅝"	5'-11½"	2'-2⅜"			0 5/8"
T 17	2	24'-0"	5¼"	1'-8⅜"	5'-11⅜"	6⅝"	7'-0"	6⅝"	5'-11⅜"	2'-3⅜"	5¼"		0 ½"
T 18	2	24'-0"		1'-7½"	5'-11⅜"	6⅝"	7'-0"	6⅝"	5'-11⅜"	2'-4½"			0 7/16"
T 19	2	24'-0"	5¼"	1'-7⅜"	5'-11⅜"	6⅝"	7'-0"	6⅝"	5'-11⅜"	2'-4⅝"	5¼"		0 3/8"
T 20	2	24'-0"		1'-7⅜"	5'-11⅜"	6⅝"	7'-0"	6⅝"	5'-11⅜"	2'-4⅝"			0 ¼"
T 21	2	24'-0"	5¼"	1'-7⅜"	5'-11⅜"	6⅝"	7'-0"	6⅝"	5'-11⅜"	2'-4⅝"	5¼"		0 3/16"
T 22	2	24'-0"		1'-7⅜"	5'-11⅜"	6⅝"	7'-0"	6⅝"	5'-11⅜"	2'-4⅝"			0 1/16"
T 23	2	24'-0"	5¼"	1'-7⅜"	5'-11⅜"	6⅝"	7'-0"	6⅝"	5'-11⅜"	2'-4⅝"	5¼"		0 1/16"
T 24	2	24'-0"		1'-7⅜"	5'-11⅜"	6⅝"	7'-0"	6⅝"	5'-11⅜"	2'-4⅝"		0	0
T 25	2	24'-0"	5¼"	1'-7⅜"	5'-11⅜"	6⅝"	7'-0"	6⅝"	5'-11⅜"	2'-4⅝"	5¼"		0 1/16"
T 26	2	24'-0"		1'-7⅜"	5'-11⅜"	6⅝"	7'-0"	6⅝"	5'-11⅜"	2'-4⅝"			0 1/8"
T 27	2	24'-0"	5¼"	1'-7⅜"	5'-11⅜"	6⅝"	7'-0"	6⅝"	5'-11⅜"	2'-4⅝"	5¼"		0 3/16"
T 28	2	24'-0"		1'-7⅜"	5'-11⅜"	6⅝"	7'-0"	6⅝"	5'-11⅜"	2'-4⅝"			0 ¼"
T 29	2	24'-0"	5¼"	1'-7⅜"	5'-11⅜"	6⅝"	7'-0"	6⅝"	5'-11⅜"	2'-4⅝"	5¼"		0 5/16"
T 30	2	24'-0"		1'-7½"	5'-11⅜"	6⅝"	7'-0"	6⅝"	5'-11⅜"	2'-4½"			0 7/16"
T 31	2	24'-0"	5¼"	1'-8⅜"	5'-11⅜"	6⅝"	7'-0"	6⅝"	5'-11⅜"	2'-3⅝"	5¼"		0 ½"
T 32	2	24'-0"		1'-9¼"	5'-11½"	6⅝"	7'-0"	6⅝"	5'-11½"	2'-2¾"			0 9/16"
T 33	2	24'-0"	5¼"	1'-10¼"	5'-11½"	6⅝"	7'-0⅛"	6⅝"	5'-11½"	2'-1⅜"	5¼"		0 5/8"
T 34	2	24'-0"		1'-11"	5'-11½"	6⅝"	7'-0¼"	6⅝"	5'-11½"	2'-0½"			0 11/16"
T 35	2	24'-0"	5¾"	2'-0"	5'-11½"	6⅝"	7'-0¼"	6⅝"	5'-11½"	1'-11½"	5¾"		0 ¾"
T 36	2	24'-0"		2'-0⅞"	5'-11½"	6⅝"	7'-0¼"	6⅝"	5'-11½"	1'-10⅝"			0 13/16"
T 37	2	24'-0"	5¼"	2'-1⅝"	5'-11⅝"	6⅝"	7'-0¼"	6⅝"	5'-11⅜"	1'-9⅜"	5¼"		0 7/8"
T 38	2	24'-0"		2'-2⅝"	5'-11⅝"	6⅝"	7'-0¼"	6⅝"	5'-11⅜"	1'-8⅜"			1"
T 39	2	24'-0"	5¾"	2'-3½"	5'-11⅝"	6⅝"	7'-0¼"	6⅝"	5'-11⅝"	1'-7¾"	5¾"		1 1/16"
T 40	2	24'-0"		2'-4½"	5'-11⅝"	6⅝"	7'-0⅜"	6⅝"	5'-11⅝"	1'-6⅜"			1 1/8"
T 41	1	24'-0"	5¾"	2'-5¾"	5'-11¾"	6⅝"	7'-0⅜"	6⅝"	5'-11¾"	1'-5⅜"	5¾"		1 3/16"

NO.	REVISION	DATE	BY	APV'D

BONNEVILLE POWER NAVIGATION PROJECT

28TH CONTRACT

BRIDGE ACROSS NAVIGATION CANAL

TIE PLAN AND DETAILS

SCALE AS SHOWN

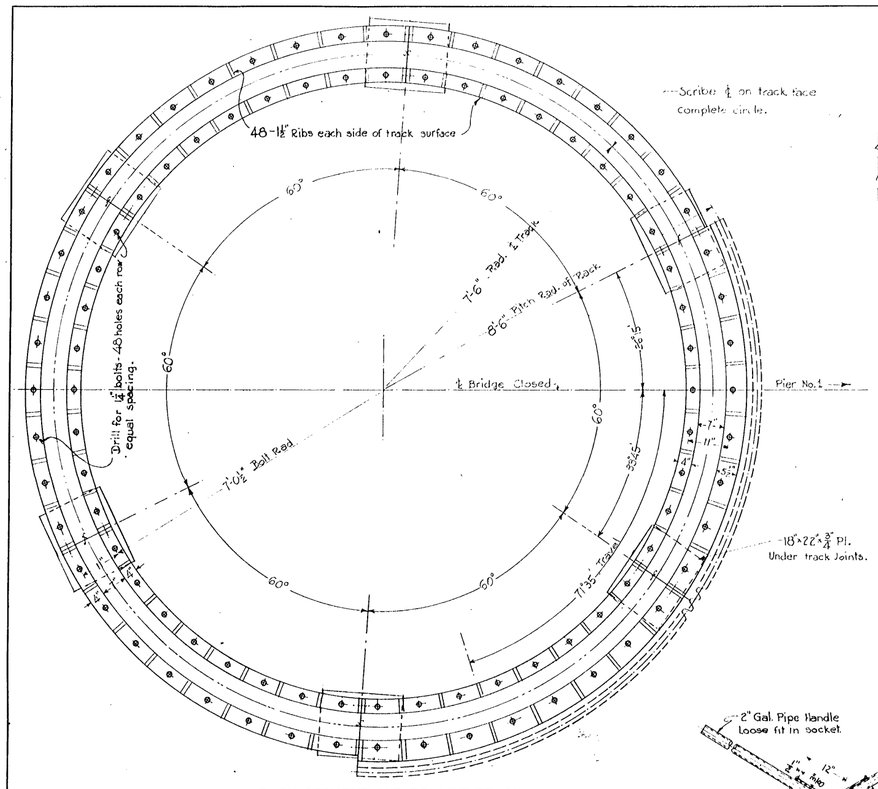
U. S. ENGINEER OFFICE, PORTLAND, OREGON DISTRICT

SUBMITTED Kb Mackenzie ENGINEER — APPROVED _____ MAJOR, CORPS OF ENGINEERS

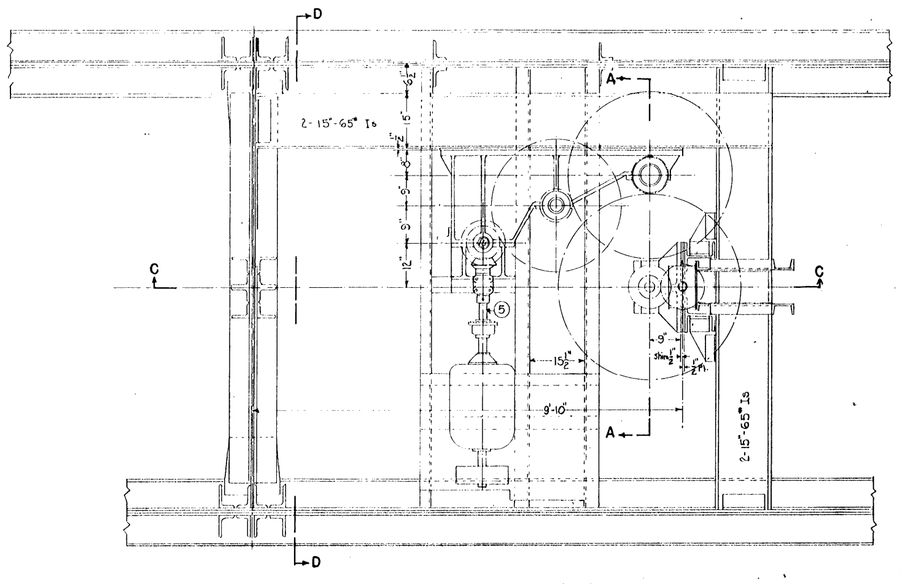
RECOMMENDED E. O. Sherman HEAD ENGINEER

DESIGNED BY W.B.J. DATE FEB 6: 1935.

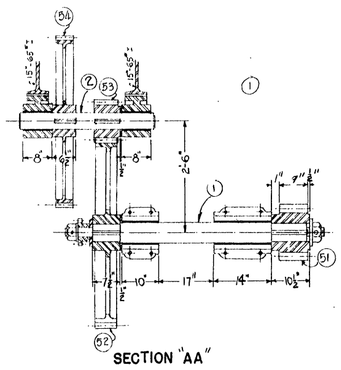
DR. BY W.C.T. TR. BY W.C.T. CHECKED BY WBJ.



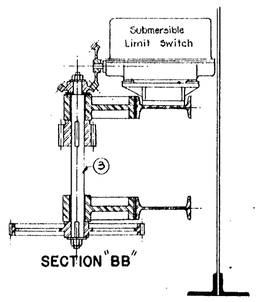
RACK SEGMENT AND ROLLER TRACK



SECTIONAL PLAN "EE"



SECTION "AA"



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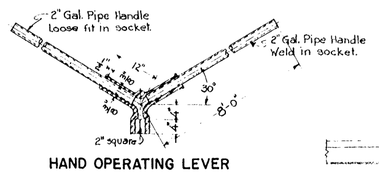
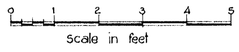
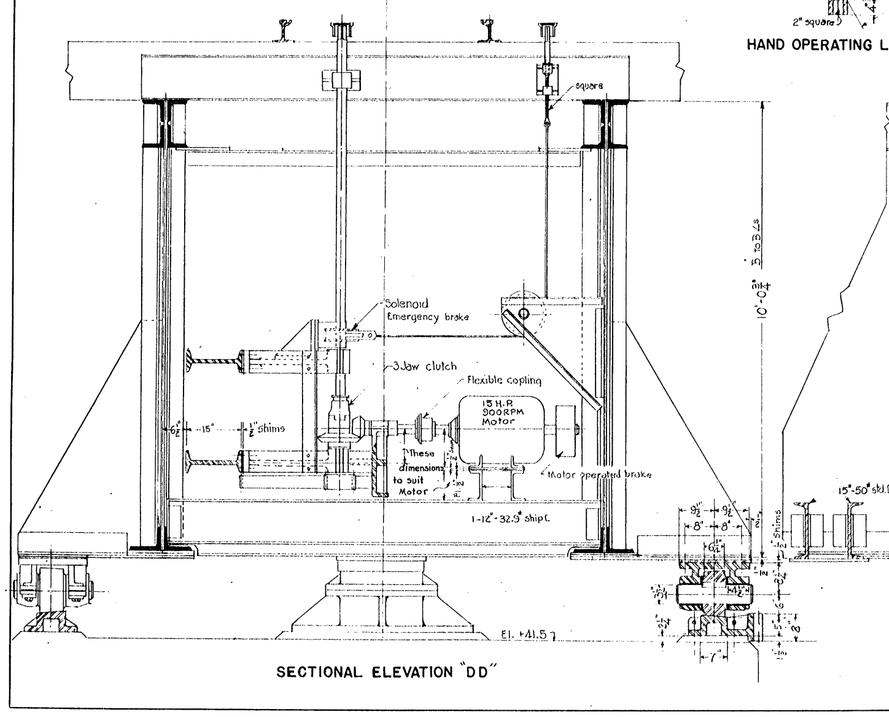


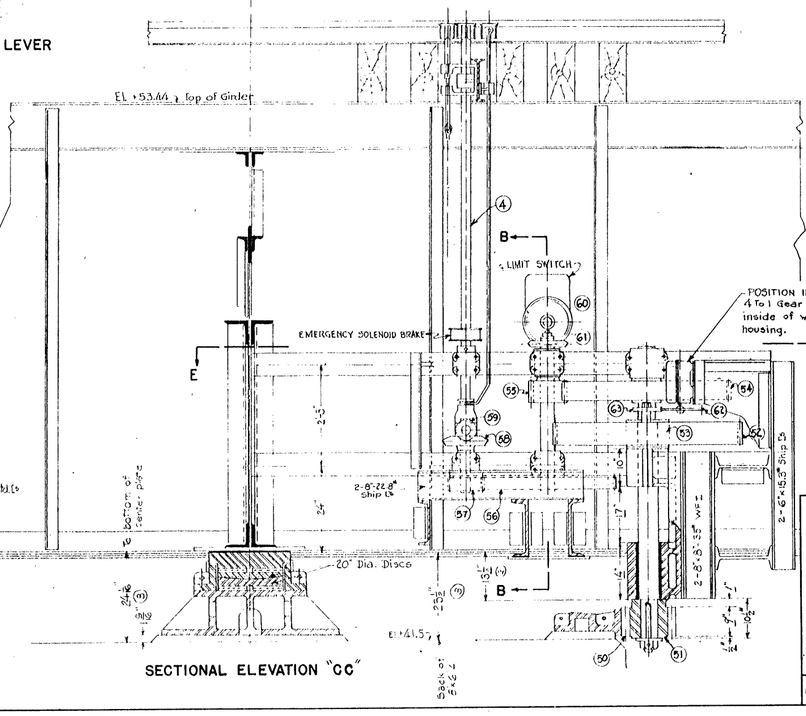
HAND OPERATING LEVER



EMERGENCY BRAKE
HAND RELEASE CRANK



SECTIONAL ELEVATION "DD"



SECTIONAL ELEVATION "GG"

GEAR TABLE - TURNING MACHINERY

All Gears to be Involute Cut Teeth.

Kind	Mark	Amount	Type	Material	Ratio	Pres. Angle	No. Teeth	Pitch	Pitch Dia.	Face	Bore	Hub Dia.	Hub Length	Remarks
Rack Seg	50	2	Spur	C.S.	19.7	20°	34	1	17'-0"	8"	1	-	-	
Pinion	51	1	"	F.S.	1	20°	13	1	13"	9"	6"	10½	10½	
Gear	52	1	"	C.S.	5	20°	75	1½	50"	6"	1"	7½	9½	
Pinion	53	1	"	F.S.	1	20°	15	1½	10"	6½	4½	6½	7½	
Gear	54	1	"	C.S.	5	20°	90	2	45"	5"	4½	8½	6½	
Pinion	55	1	"	F.S.	1	20°	18	2	9"	5½	3½	6½	6½	
Gear	56	1	"	C.S.	4	20°	108	3	36"	3"	3½	6½	4"	
Pinion	57	1	"	F.S.	1	20°	27	3	9"	3½	2½	4½	4"	
Gear	58	1	Bevel	C.S.	2	20°	48	4	12"	2½	2½	4½	Jaw clutch.	
Pinion	59	1	"	C.S.	1	20°	24	4	6"	2½	2"	3½	3½	
Gear	60	1	"	BRZ	1.2	14½°	96	8	12"	1"	1"	1½	1½	Limit Switch.
Pinion	61	1	"	"	1	14½°	80	8	10"	1"	1"	2½	2½	
Gear	62	1	Spur	"	2	14½°	144	12	12"	⅝"	To suit Pos. Indicator Motor.			
Pinion	63	1	"	"	1	14½°	72	12	6"	1"	2½	4½	5"	

SHAFTING

Mark	Amount	Material	Diameter	Approx. Length	No. Keyways	Remarks
1	1	Forged st	6½"	6'-0"	3	Reduced both ends - With nuts.
2	1	Hot rolled st	4½"	3'-0"	2	
3	1	"	3½"	3'-11"	3	Reduced both ends - With nuts.
4	1	Cold rolled st	2½"	10'-0"	4	2 Splines for jaw clutch - 1 End squared
5	1	"	2"	1'-8"	2	

NO.	REVISION	DATE	BY	APV'D
3	Dimensions added or changed	7/1-35	A.G.D	
2	Gear Table revised	7/1-35	"	
1	Gear numbers added	7/1-35	A.G.D	

BONNEVILLE POWER NAVIGATION PROJECT

28TH CONTRACT

BRIDGE ACROSS NAVIGATION CANAL

SWING SPAN

TURNING MACHINERY

SCALE 3/4"=1 FOOT

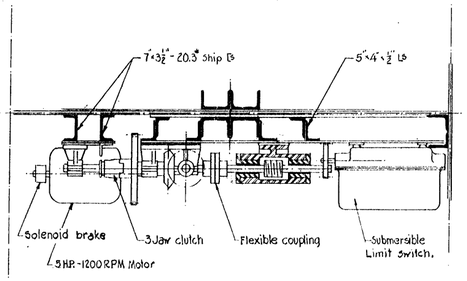
U. S. ENGINEER OFFICE, PORTLAND, OREGON DISTRICT.

SUBMITTED K.B. Mackenzie, ENGINEER — APPROVED G.R. Williams, MAJOR, CORPS OF ENGINEERS

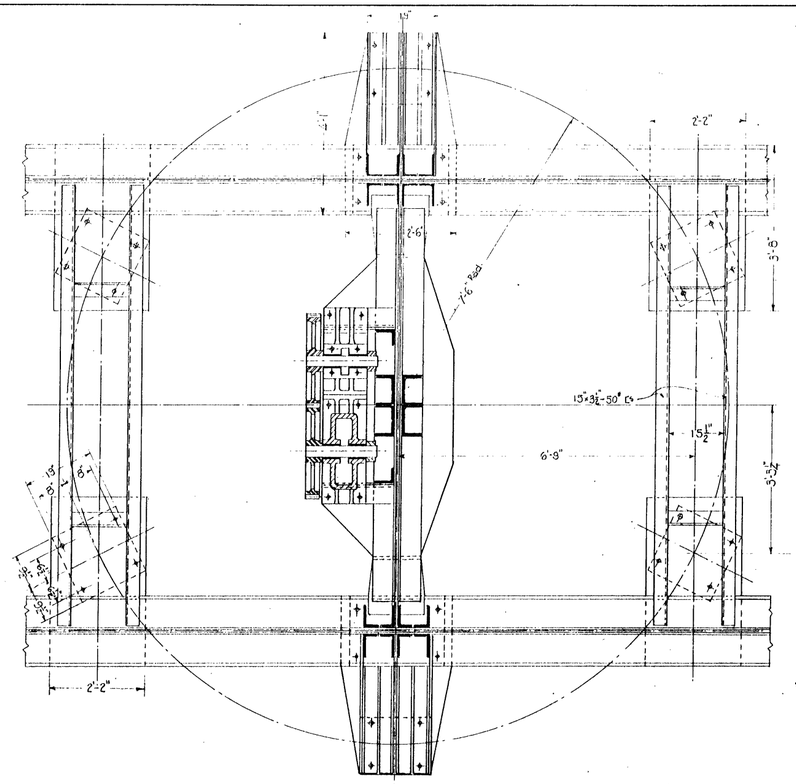
RECOMMENDED G.A.R. [illegible], DIVISION ENGINEER

DESIGNED BY C.W.B. DATE 1-16-35

DR. BY C.W.B. TR. BY A.G.D. CHECKED A.G.D.



SECTIONAL PLAN "B B"



SECTIONAL PLAN "CC"

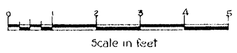
GEAR TABLE - CENTER WEDGE MACHINERY

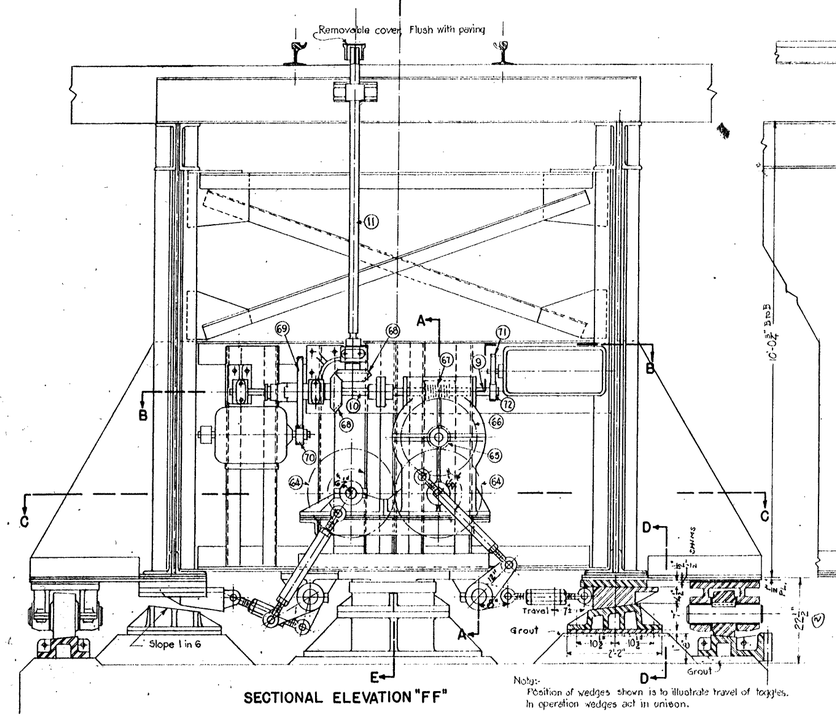
All Gears to be Involute Cut Teeth

Kind	Mark	Amount	Type	Material	Ratio	Pres. Angle	No. Teeth	Pitch	Pitch Dia.	Face	Bore	Hub Dia.	Hub Legth.	Remarks	
Gear	64	2	Spur	C.S.	4	20°	60	2½	24"	5"	4"	7½	5½		(1)
Pinion	65	1	"	F.S.	1	20°	15	2½	6"	5"	3½"	5"	5½		(1)
Gear	66	1	Worm	BRZ	66	14½°	66	1"	21.48"	3½"	3½"	4½"	4"		
Worm	67	1	"	F.S.	1	14½°	1	1"	3½"	4½"	O	2½"	5"	Integral with shaft. 9	
Gear	68	2	Bevel	C.S.	1/1	20°	30	3	10"	2½	2"	3½"	3½"		
Gear	69	1	Spur	C.S.	4	20°	144	6	18"	2"	2"			Jaw Clutch.	
Pinion	70	1	"	F.S.	1	20°	36	6	4½"	2½"				To Suit Motor.	
Gear	71	1	"	BRZ	2.2	14½°	66	6	8½"	1½"				Limit Switch.	
Pinion	72	1	"	BRZ	1	14½°	30	6	3½"	1½"	2"				

SHAFTING - CENTER WEDGE MACHINERY

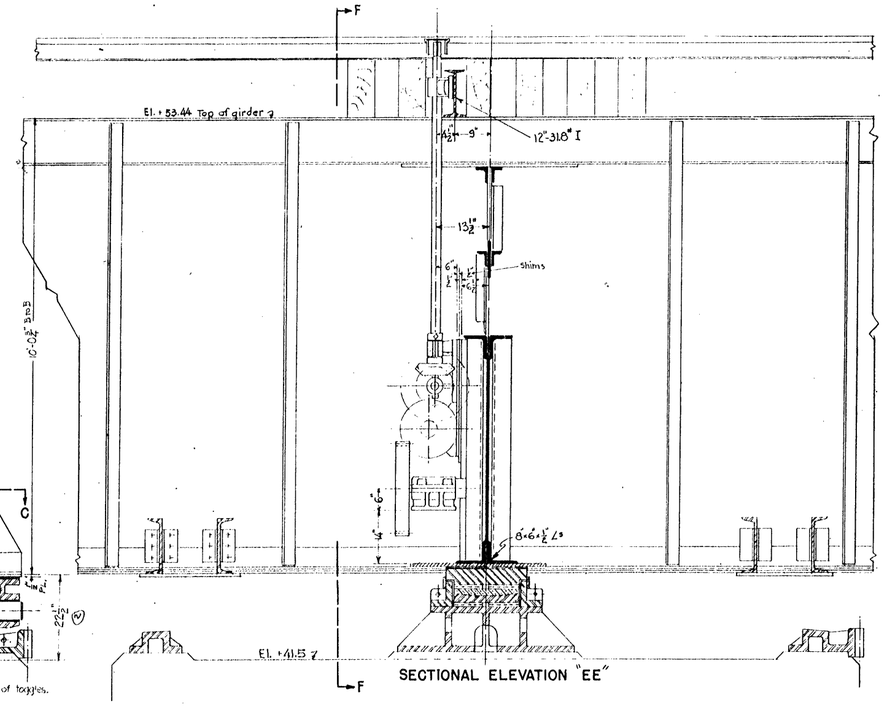
Mark	Amount	Material	Diameter	Approx. Length	No. Keyways	Remarks
6	2	Hot rolled steel	4½"	3'-0"	2	
7	2	" " "	4"	1'-8"	1	
8	1	" " "	3½"	1'-6"	2	
9	1	Forged steel	2"	2'-6"	2	Integral with worm 67.
10	1	Cold rolled steel	2"	3'-5"	3	2 Splines for jaw clutch.
11	1	" " "	2½"	7'-0"	1	One end reduced-One end squared.



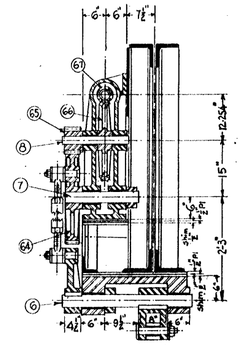


SECTIONAL ELEVATION "F F"

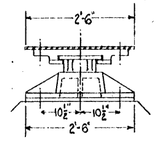
Note:
Position of wedges shown is to illustrate travel of toggles. In operation wedges act in unison.



SECTIONAL ELEVATION "E E"



SECTION "A A"



VIEW "D D"

NO.	REVISION	DATE	BY	APV'D
1	Gear Table revised	1/4-35	A.C.D.	Rev.

BONNEVILLE POWER NAVIGATION PROJECT

28 TH. CONTRACT

BRIDGE ACROSS NAVIGATION CANAL.

SWING SPAN

CENTER WEDGE MACHINERY

SCALE 3/4"=1 FOOT.

U. S. ENGINEER OFFICE, PORTLAND, OREGON DISTRICT

SUBMITTED K.L. MacKenzie ENGINEER

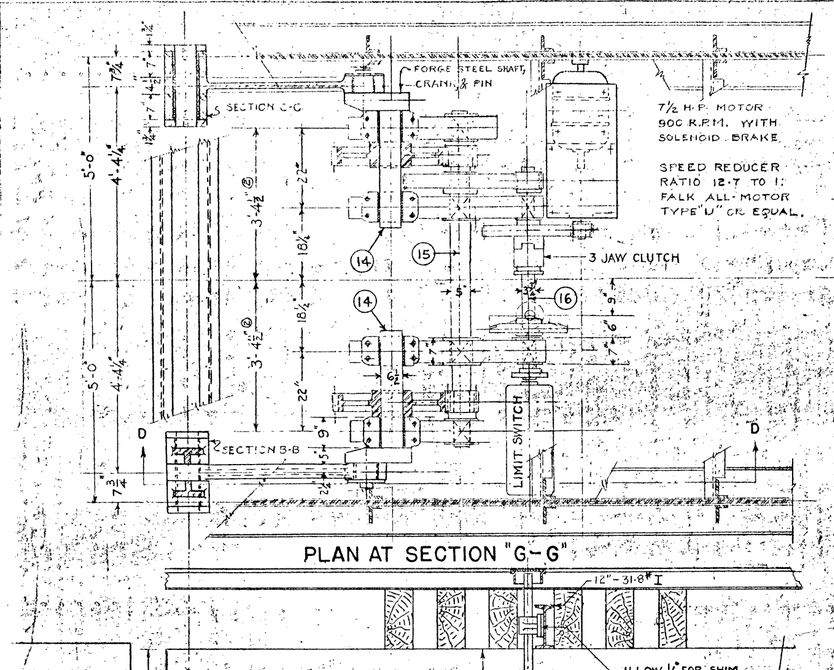
APPROVED D.D. Williams MAJOR, CORPS OF ENGINEERS

RECOMMENDED Ed Grimm HEAD ENGINEER

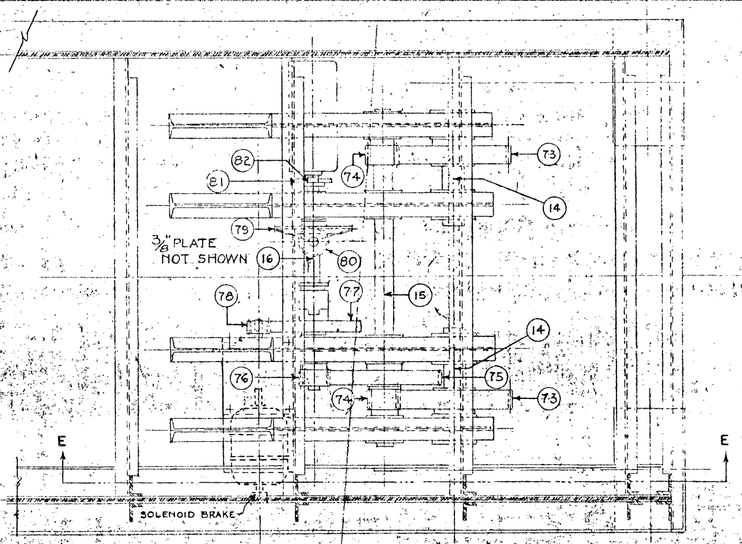
DESIGNED BY C.W.B. DATE 1-16-'35

DR. BY C.W.B. TR. BY A.C.D. CHECKED A.C.D.

PLAN AT SECTION "G-G"

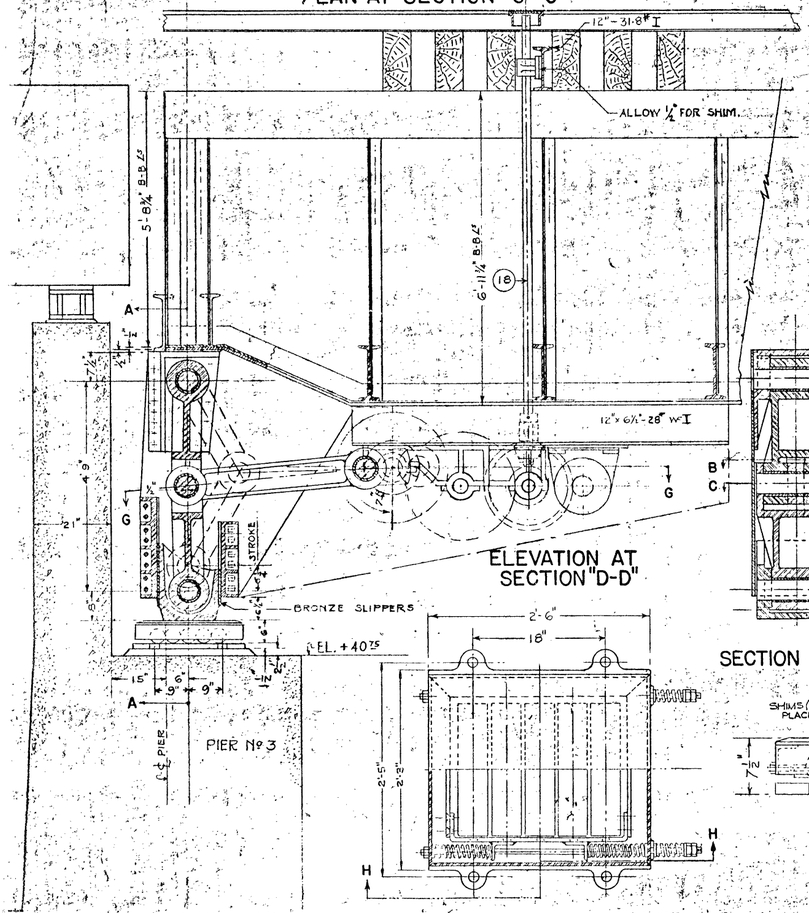


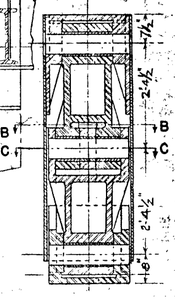
PLAN AT SECTION "F-F"

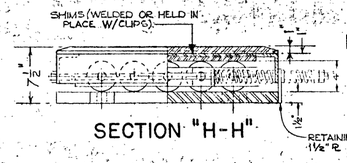


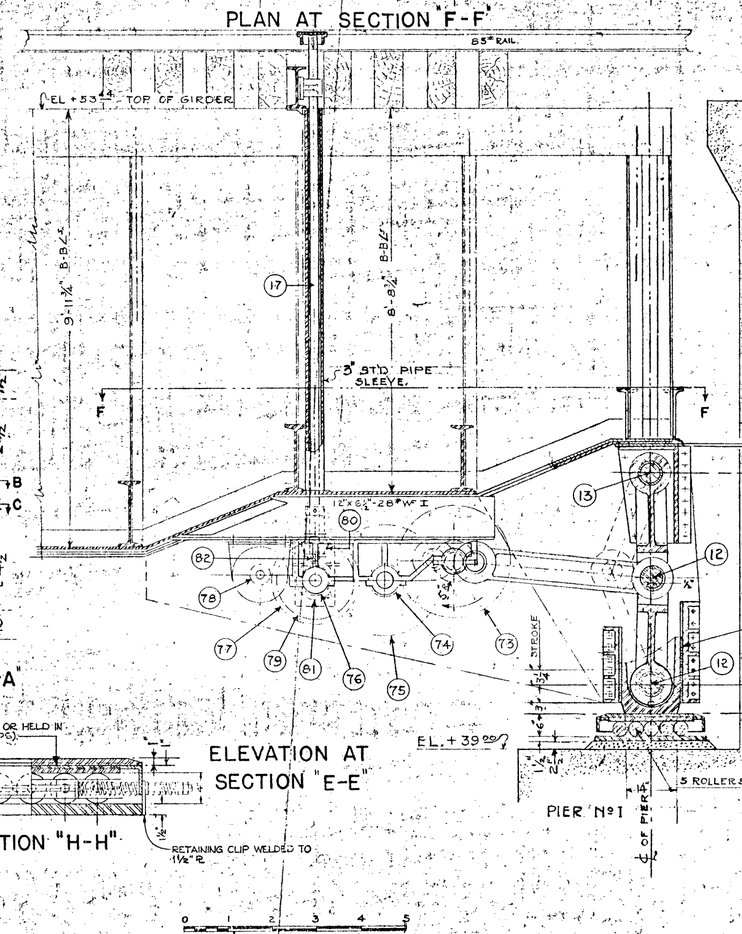
GEAR TABLE FOR END JACKS. All Gears To be Involute Cut Teeth.														
KIND	MARK	AMOUNT	PITCH	MATERIAL	RATIO	PRESS. ANGLE	NO. TEETH	P. PITCH	P. DIM.	FACE	BORE	HUB DIA.	HUB LENGTH	REMARKS.
Gear	73	4	Spur	CS	3.75	20°	60	2	30"	5"	6¼	12	7"	
Pinion	74	4	"	FS	1	20°	16	2	8"	6	4½	6¼	7¼	
Gear	75	2	"	CS	4.13	20°	75	24	30"	4.5"	9"	6"		
Pinion	76	2	"	FS	1	20°	18	24	72"	4½	3½	6¼	6¾	
Gear	77	2	"	CS	4.8	20°	72	3	24"	3"	6"	7	7½	Self Clutch
Pinion	78	2	"	FS	1	20°	16	3	5.333	3	6	7"		Self Reducer.
Gear	79	2	Bevel	CS	3	20°	45	3	2.7"	2½	7	15"		Hand operate
Pinion	80	2	"	CS	1	20°	27	3	7"	2½	4½	4"		up shaft K
Gear	81	2	Spur	BRZ	4	14½	80	8	10"	1"	3¼	5½	2"	Limit
Pinion	82	2	"	BRZ	1	14½	20	8	2.5"	1/8	T. Suit			Switch.

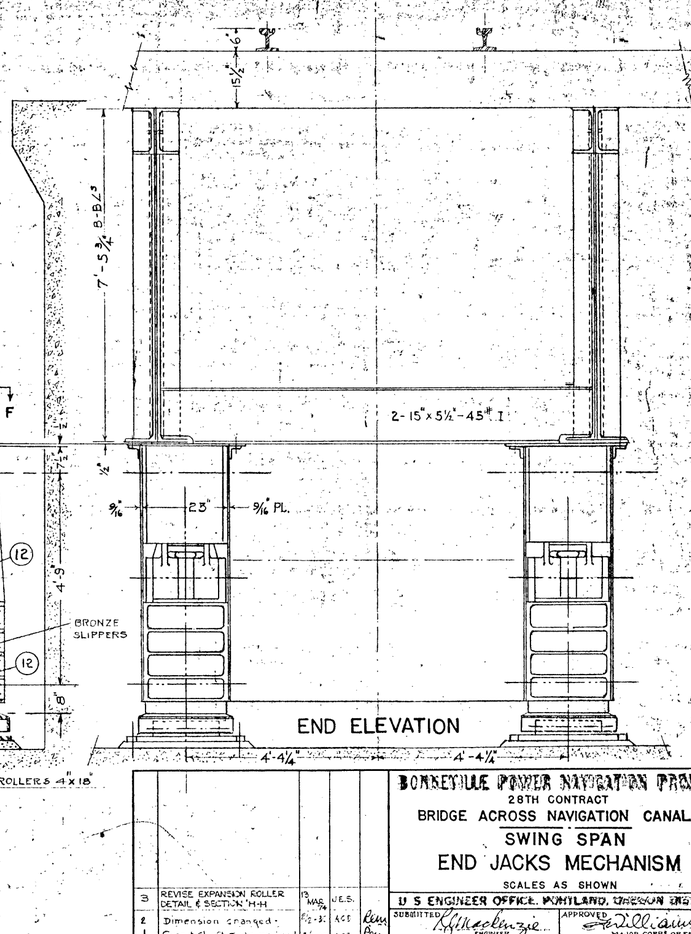
SHAFTING						
MARK.	AMOUNT.	MATERIAL	DIAMETER	APPROX. LENGTH	NUMBER KEYWAYS	REMARKS.
12	8	Hot Roll. St.	6"	1'-10"	0	Two Screw Dowels Each End.
13	4	do	6"	1'-11"	0	" " "
14	4	F.S.	6½"	3'-1"	2	Crank & Pin forged on one end.
15	2	Hot Roll. St.	5"	7'-7"	3	Both Ends Reduced.
16	2	do	3½"	4'-9"	3	Two Splines for Jaw Clutch - Ends reduced ①
17	1	Hot Roll. St.	2½"	11'-8"	1	One End Squared.
18	1	do	2½"	9'-11"	1	" " "











SCALE IN FEET

NO	REVISION	DATE	BY	APP'D
3	REVISE EXPANSION ROLLER DETAIL & SECTION "H-H"	13 MAR 36	W.E.S.	
2	Dimension changed.	6-2-36	ACS	
1	Gear & Shaft Table revised	6-15-36	ACS	

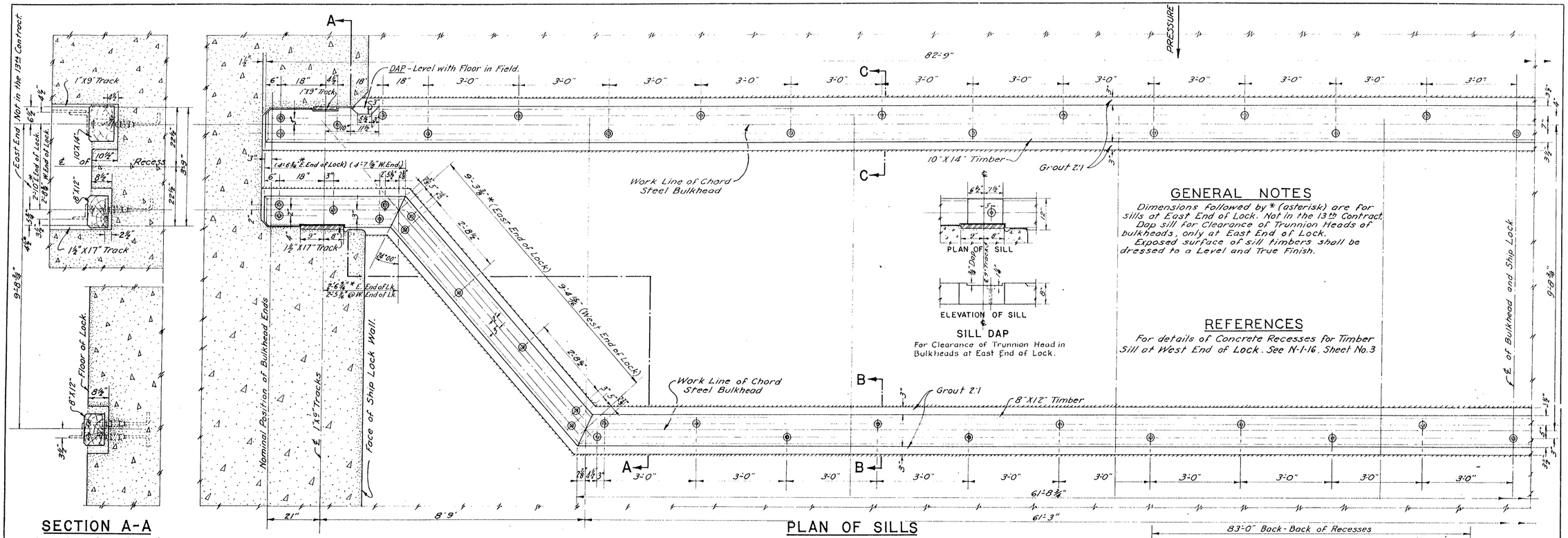
BONNEVILLE POWER NAVIGATION PROJECT
28TH CONTRACT
BRIDGE ACROSS NAVIGATION CANAL
SWING SPAN
END JACKS MECHANISM
SCALES AS SHOWN

U S ENGINEER OFFICE, PORTLAND, OREGON, JUNE 1936

SUBMITTED K.J. Mackenzie ENGINEER
APPROVED Thos. Williams MAJOR CORPS OF ENGINEERS
RECOMMENDED HEAD ENGINEER
DRAWN BY C.W.B. DATE 6-6-36
TRACED BY W.G.T. CHECKED

WAR DEPARTMENT

CORPS OF ENGINEERS U. S. ARMY

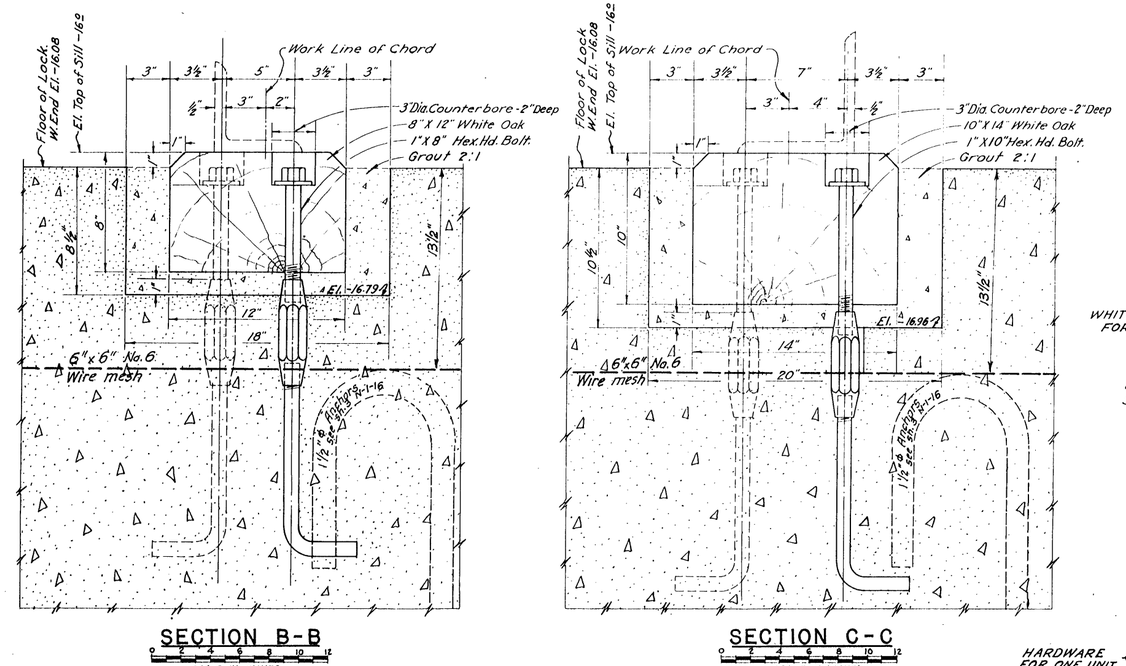


SECTION A-A

SCALE IN FEET

PLAN OF SILLS

SCALE IN FEET

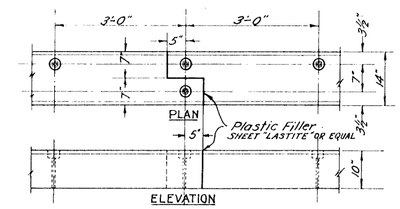


SECTION B-B

SCALE IN INCHES

SECTION C-C

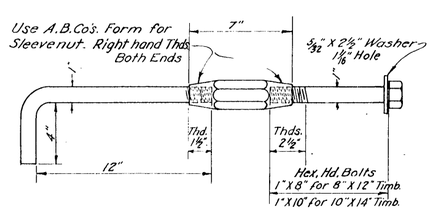
SCALE IN INCHES



TYPICAL SPLICE IN SILLS

SCALE IN FEET

WHITE OAK TIMBER FOR ONE UNIT
8"X12" - 90'9" Net 0.726 M B.M.
10"X14" - 82'9" - 0.965 M B.M.

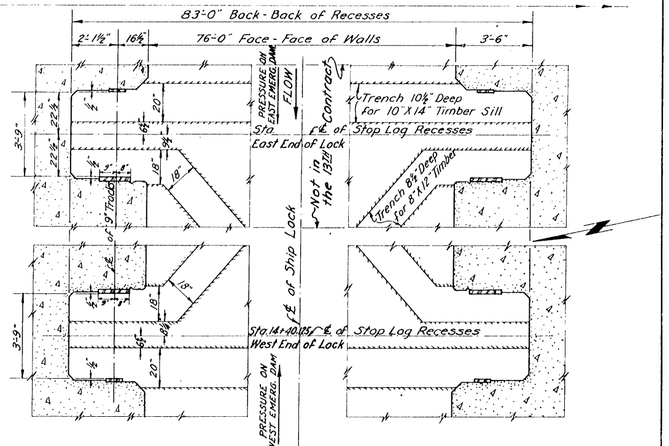


ANCHOR RODS

SCALE IN INCHES

HARDWARE FOR ONE UNIT
12 Complete Spares included.

90	Sleeve Nuts - Phos. Bronze - WT. Ea. 3.00 #	Total WT.	270 lbs.
51	1"X8" Hex. Hd. Bolts - Stl. Cord. Stl. " " 2.35 # "	"	120 lbs.
39	1"X10" " " " " " " 2.80 # "	"	109 lbs.
90	1"X16½" Rods, Thrd.& Bent " " " " 3.67 # "	"	330 lbs.
90	1" Cut Washers " " " " .16 # "	"	16 lbs.



PLAN OF STOP LOG RECESSES

SCALE IN FEET

BONNEVILLE POWER NAVIGATION PROJECT

13TH CONTRACT - CONCRETE

POWER HOUSE SUBSTRUCTURE & NAVIGATION LOCK

SHIP LOCK

TIMBER SILLS - EMERGENCY DAM

SCALES AS SHOWN

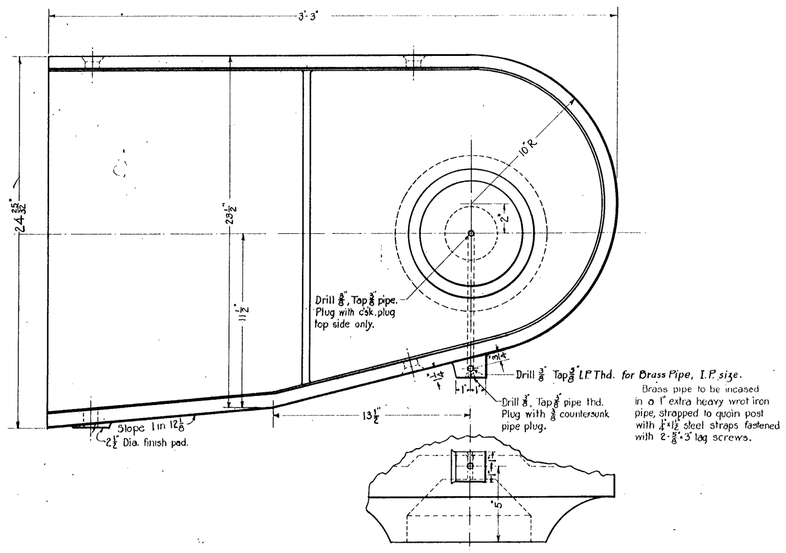
U. S. ENGINEER OFFICE, PORTLAND, OREGON DISTRICT

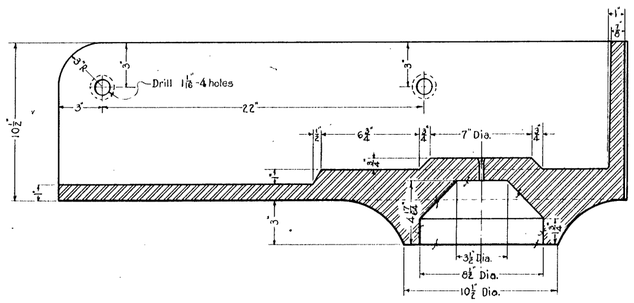
SUBMITTED R.H. Mackenzie, ENGINEER — APPROVED C.H. Williams, MAJOR, CORPS OF ENGINEERS

RECOMMENDED ____, HEAD ENGINEER — DESIGNED BY F.T.D. DATE 2-23-1935 — DR. BY J.A.S. TR. BY J.A.S. CHECKED

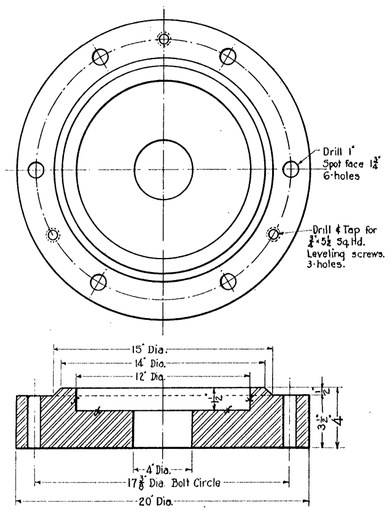
NO	REVISION	DATE	BY	APV'D

N-2-62

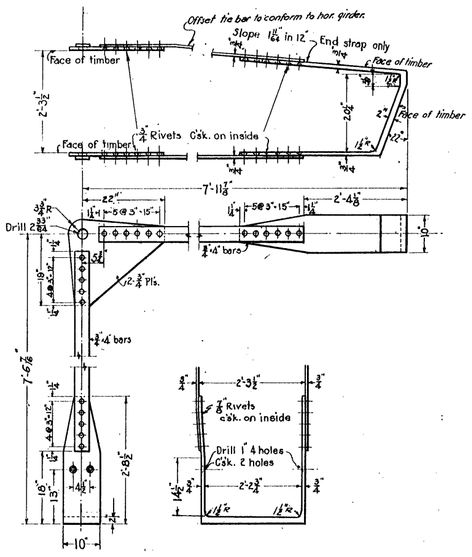




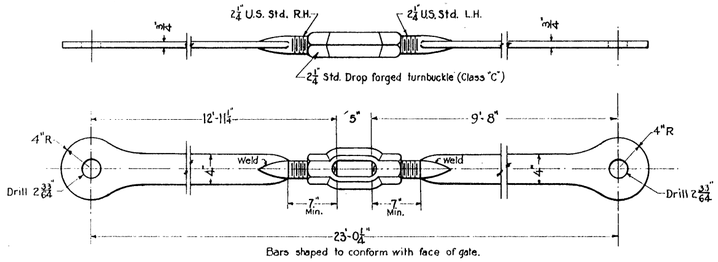
QUOIN POST SHOE
MAKE 1 AS SHOWN MARK TMG-11-R
MAKE 1 OPPOSITE MARK TMG-11-L
CAST STEEL WT=688 LB.
Scale 3"=1'-0"



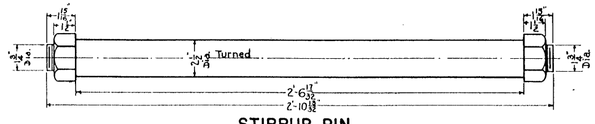
PINTLE BASE PLATE
MAKE 2 MARK TMG-15
CAST STEEL WT=295 LB.
Scale 3"=1'-0"



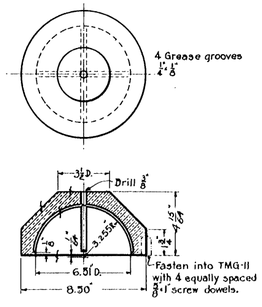
STIRRUP ①
MAKE 1 AS SHOWN MARK TMG-17-R
MAKE 1 OPPOSITE MARK TMG-17-L
STRUCT. STEEL WT.=880 LB.
Scale ¾"=1'-0"



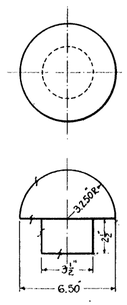
DIAGONAL EYE BAR ①
MAKE 4 MARK TMG-16
STRUCT. STEEL WT.=285 LB.
Scale 1½"=1'-0"



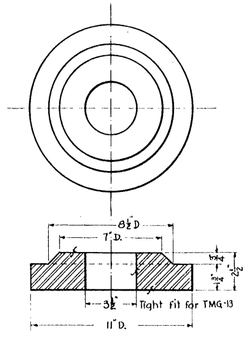
STIRRUP PIN
MAKE 2 MARK TMG-18
MACHINE STEEL WT.=52 LB.
Scale 3"=1'-0"



PINTLE BEARING
MAKE 2 MARK TMG-12
PHOS. BRONZE WT.=32 LB.
Scale 3"=1'-0"



PINTLE
MAKE 2 MARK TMG-13
FORGED STEEL WT.=29 LB.
Class "H"
Scale 3"=1'-0"



PINTLE COLLAR
MAKE 2 MARK TMG-14
CAST STEEL WT.=53 LB.
Scale 3"=1'-0"

GENERAL NOTES

Quantities specified are for complete installation on 2 Gate Leaves.
Weights are for single pieces.

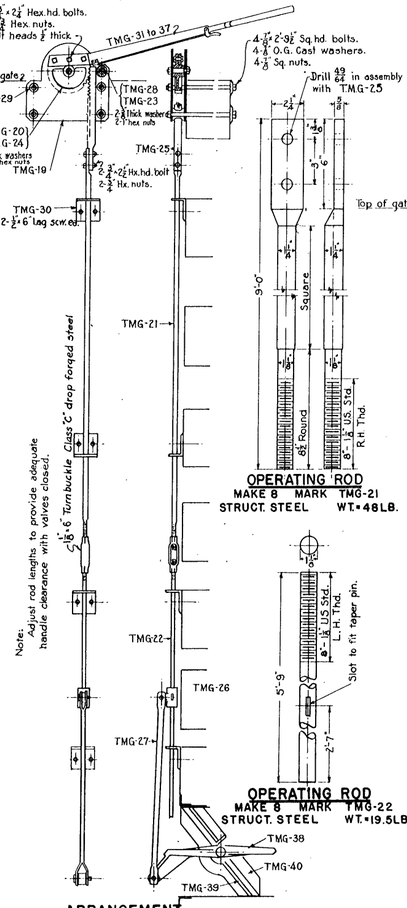
REFERENCES

For general arrangement see Sheet 3 of N-2-63.

SEE DRAWING
No. N-2-72 Sht 4
FOR CURRENT REVISIONS

NO.	REVISION	DATE	BY	APV'D
1	TMG 16 & TMG 17 Changed	3/20/35	M.R.L.	Rcm

BONNEVILLE POWER NAVIGATION PROJECT
13-TH CONTRACT — CONCRETE
POWER HOUSE SUBSTRUCTURE & NAVIGATION LOCK
SHIP LOCK
TIMBER MITER GATES.
PINTLE CASTINGS & MISCEL. DETAILS.
SCALES AS SHOWN.
U.S. ENGINEER OFFICE, PORTLAND, OREGON DISTRICT
SUBMITTED R.A. Mackenzie ENGINEER
APPROVED H. C. Williams MAJOR, CORPS OF ENGINEERS
RECOMMENDED [illegible] HEAD ENGINEER
DESIGNED BY F.E.D. M.R.L. DATE 7/15/1935
DRAWN BY A.C.D. TRACED BY A.C.D. CHECKED [illegible]



ARRANGEMENT

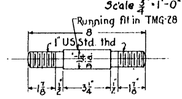
Scale ¾"=1'-0"

OPERATING ROD

MAKE 8 MARK TMG-21
STRUCT. STEEL WT.=48LB.

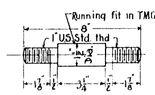
OPERATING ROD

MAKE 8 MARK TMG-22
STRUCT. STEEL WT.=19.5LB.



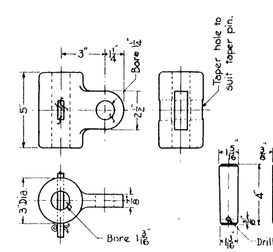
ROLLER PIN

MAKE 8 MARK TMG-23
COLD ROLLED STEEL WT.=2.5LB.



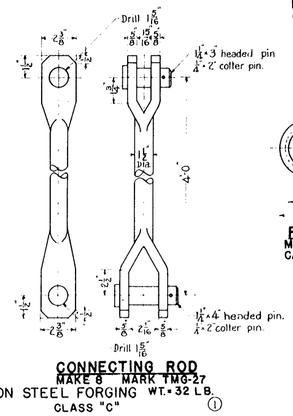
CENTER PIN

MAKE 8 MARK TMG-24
COLD ROLLED STEEL WT.=2.7 LB. ①



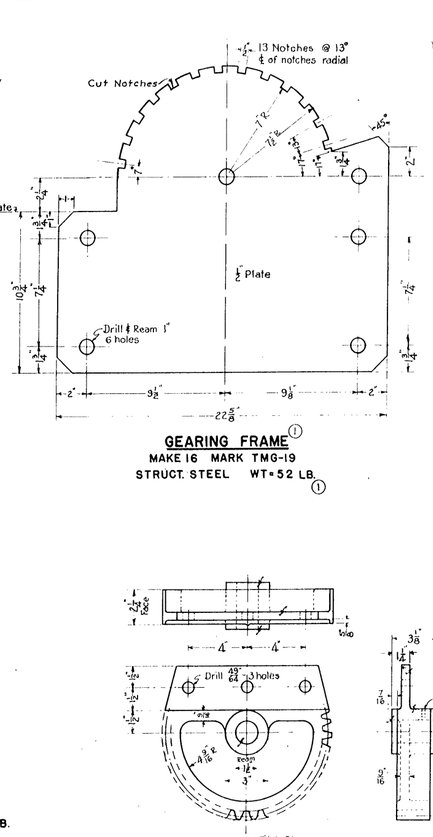
CONNECTOR

MAKE 8 MARK TMG-26
CAST STEEL WT.=10LB. ①



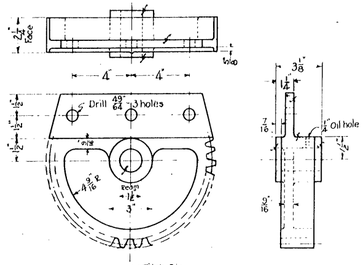
CONNECTING ROD

MAKE 8 MARK TMG-27
CARBON STEEL FORGING WT.=32 LB. ①
CLASS "C"



GEARING FRAME

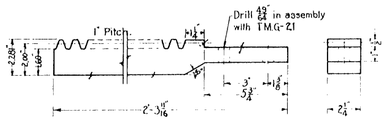
MAKE 16 MARK TMG-19
STRUCT. STEEL WT.=52 LB. ①



35 Teeth in full circle - Cut 21 teeth, to fit TMG-25
1" C. Pitch.

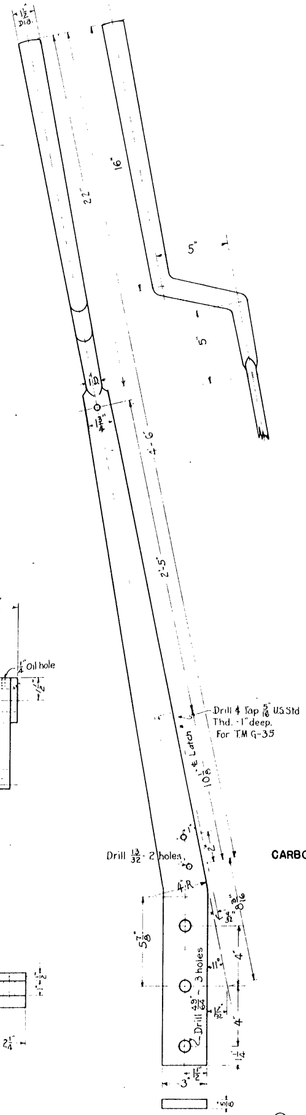
GEAR SEGMENT

MAKE 8 MARK TMG-20
CAST STEEL WT.=28LB. ①



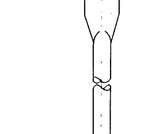
OPERATING RACK

MAKE 8 MARK TMG-25
CAST STEEL WT.=32LB. ①



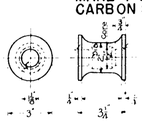
OPERATING HANDLE ①

MAKE 4 AS SHOWN MARK TMG-31R.
MAKE 4 OPPOSITE MARK TMG-31L.
CARBON STEEL FORGING WT.=30 LB.
CLASS "C"



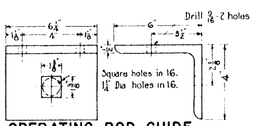
RACK ROLLER

MAKE 8 MARK TMG-28
CAST IRON WT.=6 LB.



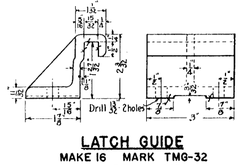
FRAME SEPARATOR

MAKE 32 MARK TMG-29
CAST IRON WT.=3.5 LB.



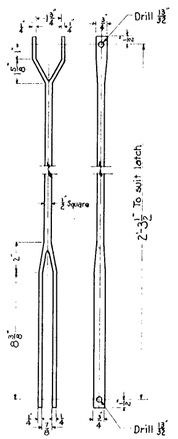
OPERATING ROD GUIDE

MAKE 32 MARK TMG-30 STRUCT. STEEL.
8.5LB. ①



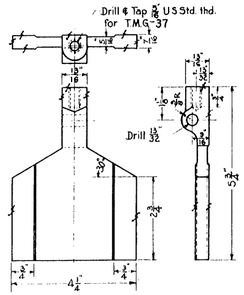
LATCH GUIDE

MAKE 16 MARK TMG-32
CAST STEEL WT.=3 LB.
Scale 6"=1'-0"



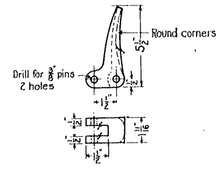
LATCH ROD

MAKE 8 MARK TMG-33
CARBON STEEL FORGING WT.=2.8 LB.
CLASS "C"



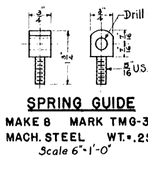
LATCH

MAKE 8 MARK TMG-36
CAST STEEL WT.=3 LB.
Scale 6"=1'-0"



LATCH HANDLE

MAKE 8 MARK TMG-34
CAST STEEL WT.=2.7 LB. ①

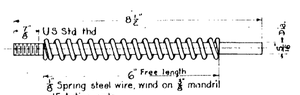


SPRING GUIDE

MAKE 8 MARK TMG-35
MACH. STEEL WT.=.25LB.
Scale 6"=1'-0"

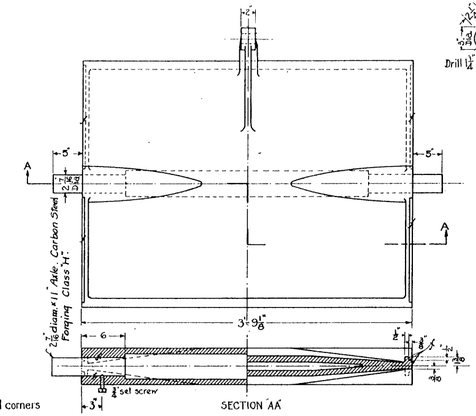
SPRING GUIDE

MAKE 8 MARK TMG-35
MACH. STEEL WT.=.25LB.
Scale 6"=1'-0"



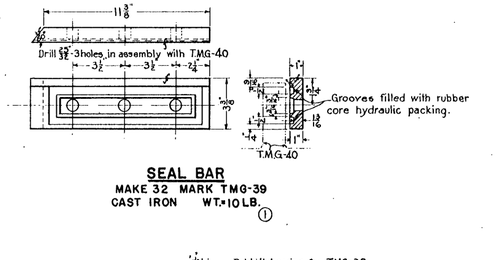
LATCH SPRING & GUIDE

MAKE 8 MARK TMG-37
COLD ROLLED STEEL WT.=0.5LB.
Scale 6"=1'-0" ①



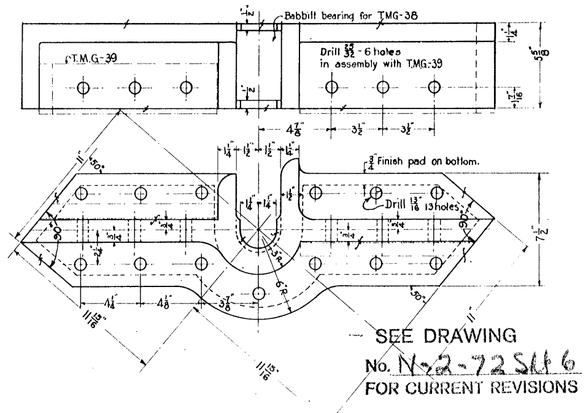
WICKET VALVE

MAKE 8 MARK TMG-38
CAST IRON WT.=700LB.
Scale 1½"=1'-0"



SEAL BAR

MAKE 32 MARK TMG-39
CAST IRON WT.=10LB. ①



SEE DRAWING
No. N-2-72 Sht 6
FOR CURRENT REVISIONS

WICKET VALVE BEARING

MAKE 8 AS SHOWN MARK TMG-40-R
MAKE 8 OPPOSITE MARK TMG-40-L
CAST. IRON WT.=130 LB.

GENERAL NOTES

Quantities are for complete installation on 2 Gate Leaves.
Weights are for single pieces.
Scale 3"=1'-0" unless otherwise indicated.

REFERENCES

For general arrangement of wicket valves see Sheet 2 N-263

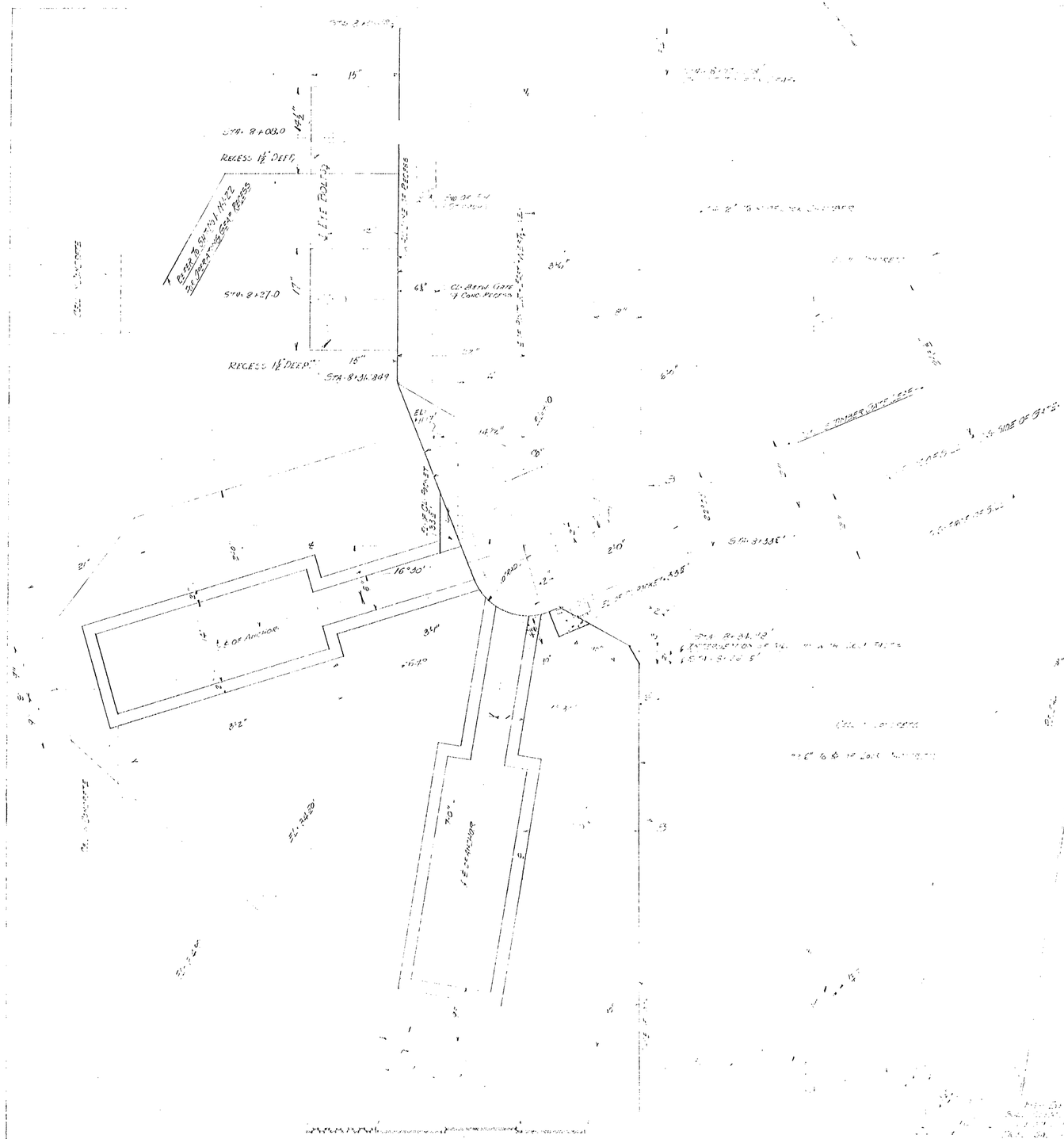
NO.	REVISION	DATE	BY	APV'D
1	Gearing frame revised	3-20-35	A.C.D.	Beam
1	Operating handle revised	- - - -	- - -	Beam
1	Weights revised	3-20-35	A.C.D.	Beam

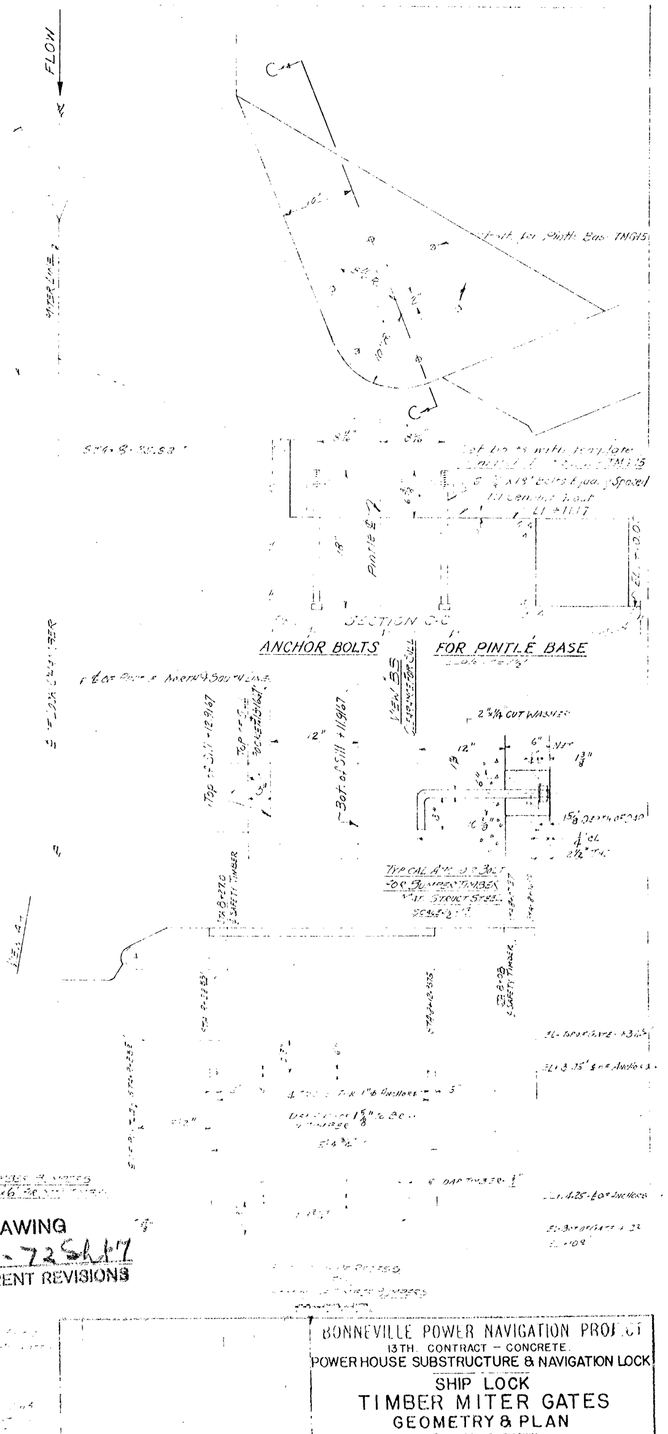
BONNEVILLE POWER NAVIGATION PROJECT
13TH CONTRACT— CONCRETE
POWER HOUSE SUBSTRUCTURE & NAVIGATION LOCK
SHIP LOCK

TIMBER MITER GATES

WICKET GATES-ASSEMBLY AND DETAILS
SCALES AS SHOWN
U.S. ENGINEER OFFICE, PORTLAND, OREGON DISTRICT
SUBMITTED R.P. Mackenzie ENGINEER
APPROVED H.C. Wiaus MAJOR CORPS OF ENGINEERS
RECOMMENDED CHIEF ENGINEER
DESIGNED BY F.T.O. ME'L DATE 3/15/1935
DR. BY A.E.B. TR. BY A.C.D. CHECKED BY

SHEET 6 OF N-2-63





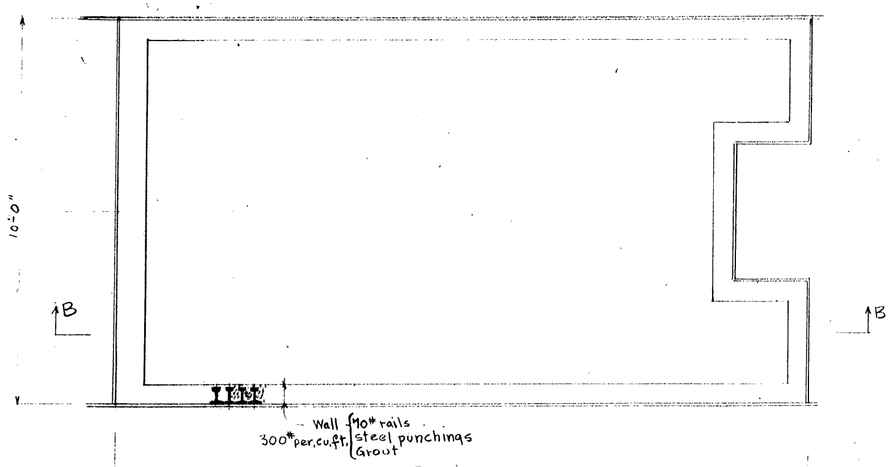
— SEE DRAWING
No. N-2-725 Sh 17
FOR CURRENT REVISIONS

GENERAL NOTES:

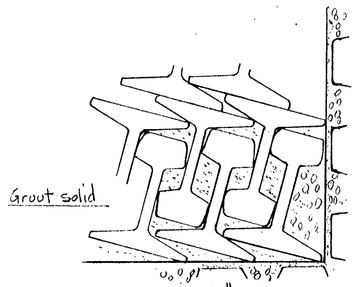
REFERENCES:

BONNEVILLE POWER NAVIGATION PROJECT
13TH CONTRACT – CONCRETE
POWER HOUSE SUBSTRUCTURE & NAVIGATION LOCK
SHIP LOCK
TIMBER MITER GATES
GEOMETRY & PLAN
SCALES AS SHOWN

SHEET 7 OF N-2-63

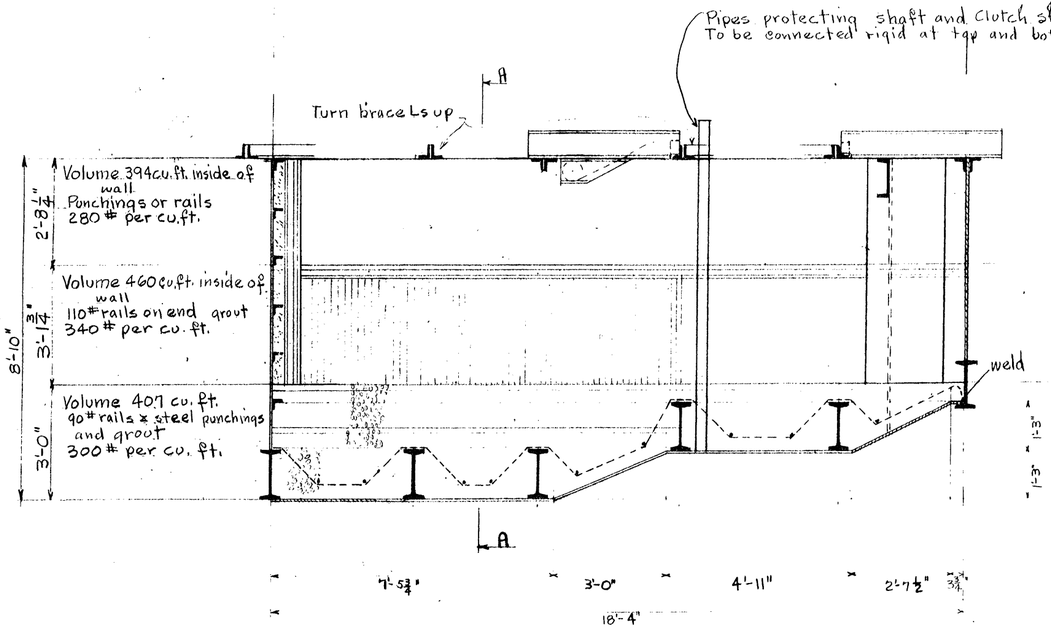


PLAN

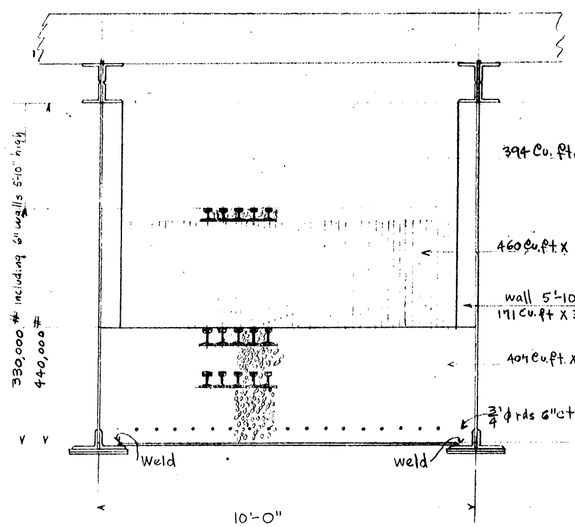


Arrangement of 110# rails to give abt 340# per cu.ft.
Scale 3" = 1'-0"

Note:-
This suggested arrangement to take place of that shown on Dwg. N-2-61 Sh.3 of 13 Sec.LL



SEC B-B
Scale 1/2" = 1'-0"



SEC A-A

394 Cu. ft. X 280# =	110,000 #	removable
460 Cu.ft X 340 =	156,600 #	grouted solid
wall 5'-10" high 171 Cu.ft X 300 =	51,300 #	grouted solid
407 Cu.ft. X 300# =	122,100 #	grouted solid
	330,000 #	Total grouted solid
	440,000 #	Total counterweight

BONNEVILLE POWER NAVIGATION PROJECT
20TH CONTRACT
BRIDGE ACROSS NAVIGATION CANAL
COUNTERWEIGHT
PROPOSED ARRANGEMENT

U. S. ENGINEER OFFICE, PORTLAND OREGON DISTRICT
R.A. Mackenzie
Major, C. of E.
G.S.D. 3-16-35

APPROVED FOR CONSTRUCTION
Major, C. of E. 7-18-35

N-2-69 SH1

EL. 55'-1½" TOP OF DECK PLANKS

SCREW & NUT

2-L.H. FOR END JACKS
1-L.H FOR TURN. GEAR
1-R.H. FOR WEDGES
2-R.H. FOR LATCHES
1-R.H. FOR EM. BRAKE

1½"
1½"
3½"
8⅝"
5/16
3"
1" 3/4
MAX TRAVEL
7½"
3" SHE CAP SCREWS AND LOCK WASHERS
2-RIBS
2-RIBS
2-RIBS
3"
3"
FINISH
6½"
4/16
18

SECTION No. 2
SUGGESTED CHANGES

ANGLE OF GUIDE TO SUIT-FOR TURNING GEAR

1"

5-4800
5-4789
5" MAX TRAV.

SECTION No. 1
AS DETAILED

3/32

HOLE TOO CLOSE TO EDGE OF SHIMS

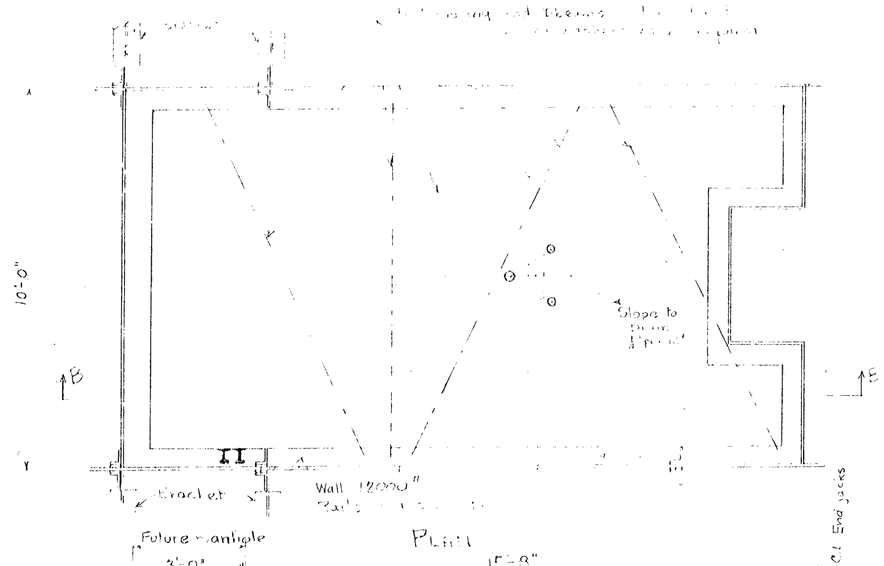
BONNEVILLE POWER NAVIGATION PROJECT
BRIDGE ACROSS NAVIGATION CANAL
SWING SPAN
HAND OPERATING MECHANISM
PROPOSED CHANGE IN BRACKET S-4789

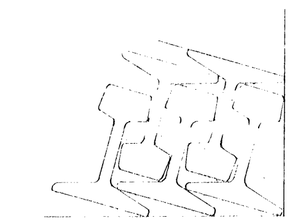
U S ENGINEER OFFICE, PORTLAND, OREGON DISTRICT

SUBMITTED: ENGINEER — APPROVED: MAJOR, CORPS OF ENGINEERS

RECOMMENDED: HEAD ENGINEER — DRAWN BY: G.W.I.S. DATE MAR. 28 35 — TRACED BY ..... CHECKED BY .....

N-2-70

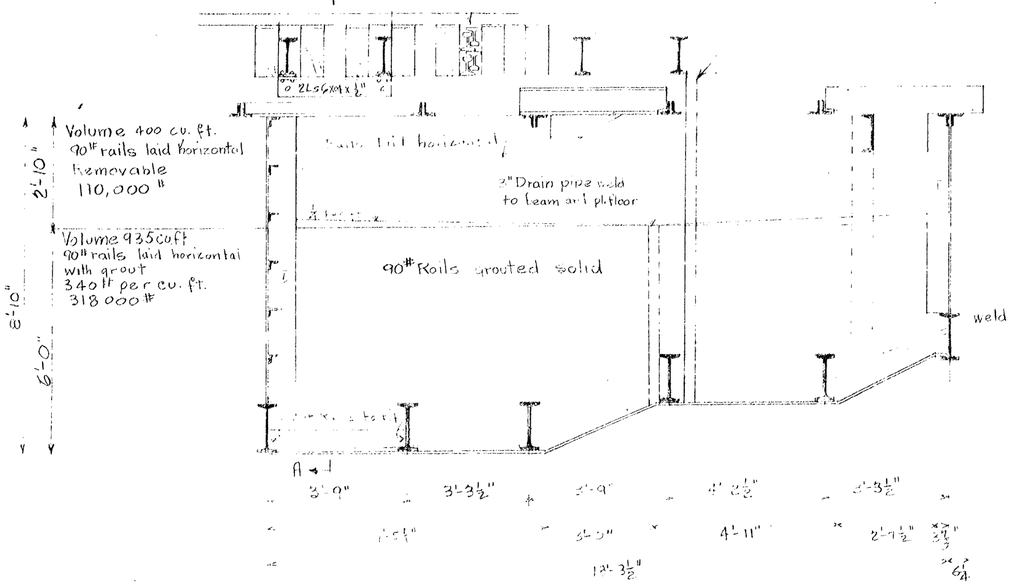




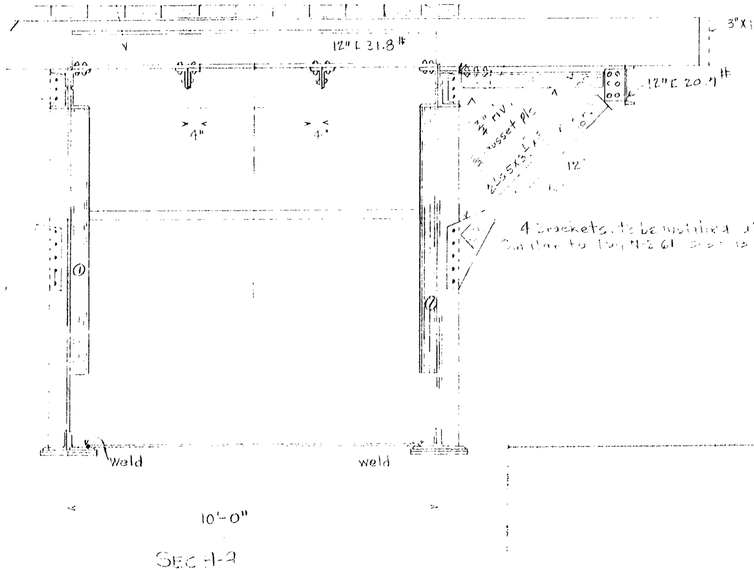
Bottom 6'-0" 90# rails grouted 340# cu. ft. 318,000#
Wall Top 2'-10" 12,000#
Removable 90# rails 110,000#
Total 440,000

About 20,000# of 90# rails 24'-0" long can be placed between ties in addition

Types pratt truss shaft and clutch shifting rod to be connected rigid at top and bottom



SECTION B-B
Scale 1/2" = 1'-0"



SEC A-A

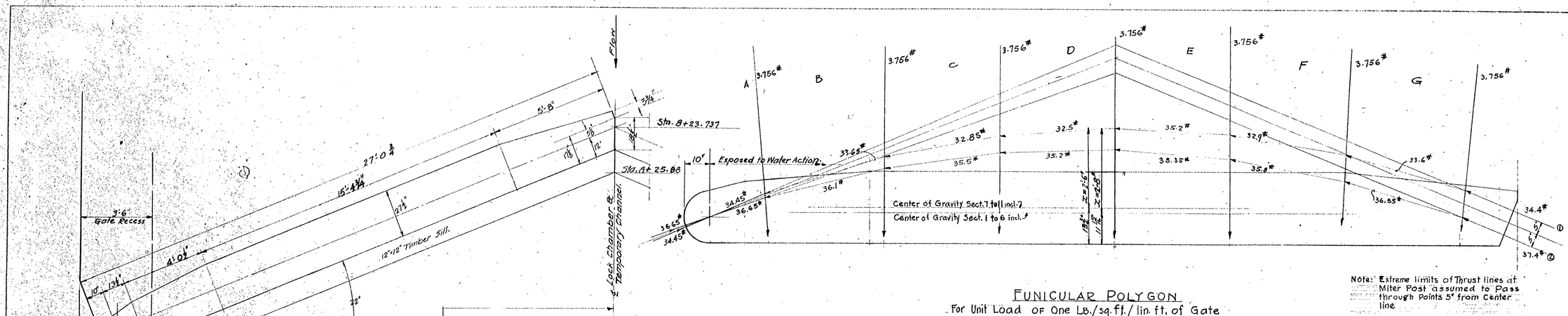
Note:-
This suggested arrangement to take place of that shown on Dwg. N-2-61 Sht 2 of 13 Sec. LL.
This Dwg. Supersedes Dwg N 2-69 Dated 3-11-35

BONNEVILLE POWER NAVIGATION PROJECT

U. S. ENGINEER OFFICE, PORTLAND OREGON DISTRICT

SUBMITTED ENGINEER
APPROVED Major Corps of Engrs.
RECOMMENDED Asst. Engineer
DRAWN BY
TRACED BY
CHECKED

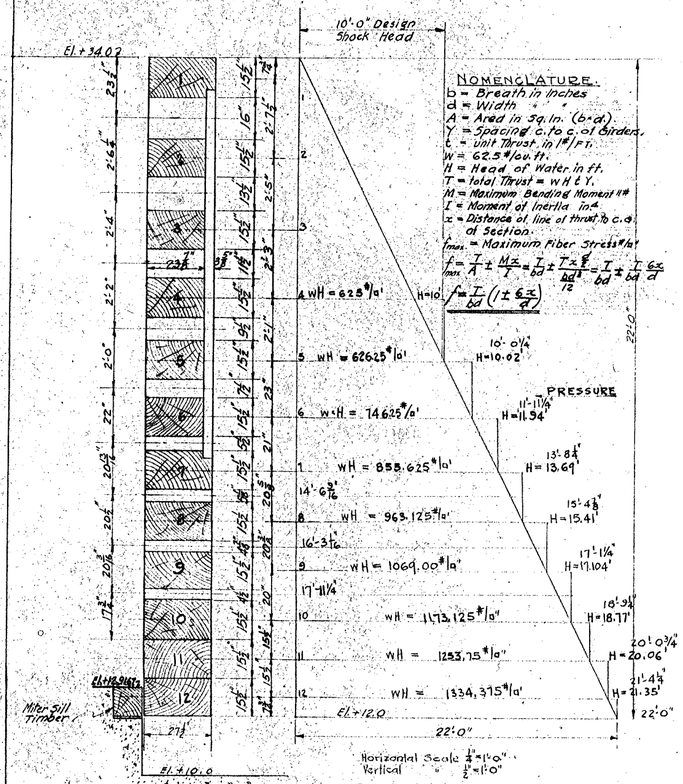
N-2-11



PLAN OF GATE
Scale 1/2" = 1'-0"

FUNICULAR POLYGON
For Unit Load of One Lb./sq.ft./lin.ft. of Gate
Scale 3/4" = 1'-0"

Note: Extreme limits of Thrust lines at Miter Post assumed to Pass through Points 5" from Center line



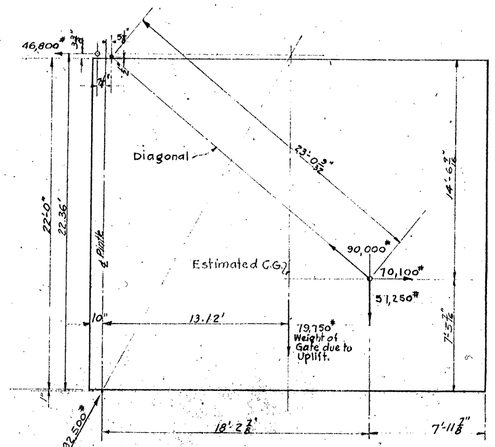
NOMENCLATURE.
b = Breath in Inches
d = Width " "
A = Area in Sq. In. (b x d)
Y = Spacing c. to c. of Girders.
t = Unit Thrust. in #/Ft.
W = 62.5 #/cu. ft.
H = Head of Water in ft.
T = Total Thrust = wHtY.
M = Maximum Bending Moment in #
I = Moment of Inertia in⁴
x = Distance of line of thrust to c.g. of Section.
f_{max} = Maximum Fiber Stress #/in²

$f_{max} = \frac{T}{A} \pm \frac{Mx}{I} = \frac{T}{bd} \pm \frac{T \times \frac{d}{2}}{\frac{bd^3}{12}} = \frac{T}{bd} \pm \frac{T\,6x}{bd}$

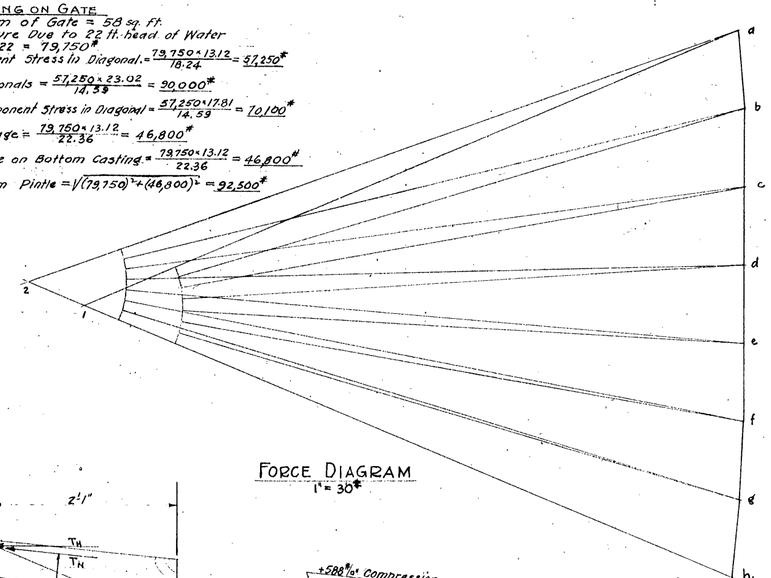
$f_{max} = \frac{T}{bd}\left(1 \pm \frac{6x}{d}\right)$

wH = 625 #/ft
wH = 626.25 #/ft
wH = 746.25 #/ft
wH = 858.625 #/ft
wH = 963.125 #/ft
wH = 1069.00 #/ft
wH = 1173.125 #/ft
wH = 1253.75 #/ft
wH = 1334.375 #/ft

LOADING DIAGRAM.
Scale 1/2" = 1'-0"

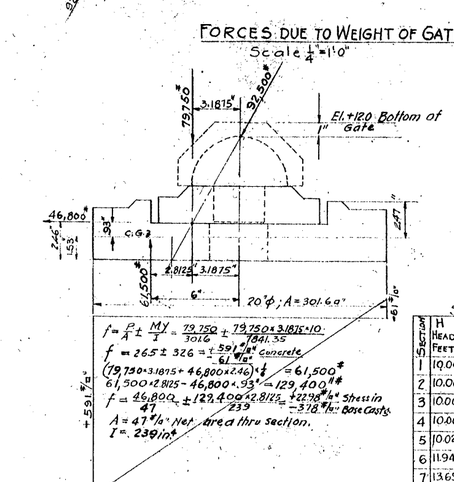


FORCES ACTING ON GATE
Area of Bottom of Gate = 58 sq. ft.
Uplifting Pressure Due to 22 ft. head of Water
58 × 62.5 × 22 = 79,750#
Vertical Component Stress in Diagonal = $\frac{79,750 \times 13.12}{18.24}$ = 57,250#
Stress in Diagonals = $\frac{57,250 \times 23.02}{14.59}$ = 90,000#
Horizontal Component Stress in Diagonal = $\frac{57,250 \times 17.81}{14.59}$ = 70,100#
Pull on Anchorage = $\frac{79,750 \times 13.12}{22.36}$ = 46,800#
Horizontal Force on Bottom Casting = $\frac{79,750 \times 13.12}{22.36}$ = 46,800#
Load on bottom Pintle = $\sqrt{(79,750)^2 + (46,800)^2}$ = 92,500#



FORCE DIAGRAM
1" = 30#

FORCES DUE TO WEIGHT OF GATE.
Scale 1/4" = 1'-0"



$f = \frac{P}{A} \pm \frac{MY}{I} = \frac{79,750}{3016} \pm \frac{79,750 \times 3.1875 \times 10.}{7041.55}$

$f = 26.5 \pm 32.6 = \begin{cases} +59.1\ \#/in^2\ \text{Concrete} \\ -6.1\ \#/in^2 \end{cases}$

$(79,750 \times 3.1875 + 46,800 \times 2.46) \times \frac{1}{4.47} = 61,500\#$

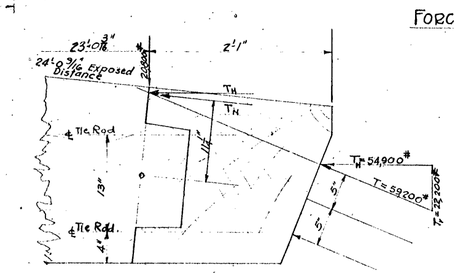
$61,500 \times 2.8125 - 46,800 \times .93^{+} = 129,400\#$

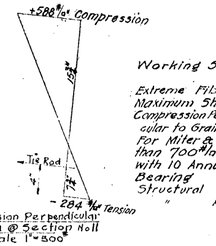
$f = \frac{46,800}{47} \pm \frac{129,400 \times 2.8125}{239} = +2.96\ \#/in^2$ Stress in Concrete $-3.18\ \#/in^2$ Base Casting.

A = 47 #/in² Net area thru section.
I = 239 in⁴

LOADS ON PINTLE BASE
Scale 3" = 1'-0"

MITER POST - STRESSES
Scale 1" = 10" ; T = 30,000#





Compression Perpendicular to Grain @ Section Nall
Scale 1" = 300

SUMMARY OF STRESSES

Section	H Head Feet	wH 62.5 H	T = wHLY Total Thrust Lbs.	f = T/A Fiber Stress	Normal Thrust T = wHt b	Horizon. T_H Vertic. T_V	T_H Miter Joint North T_H ± .9955	Compr. Perpen. to Grain
1	10.00	625.0	39,800	+875	27,700	25,750	25,820	+276
				-644		10,390		-133
2	10.00	625.0	51,250	+1250	27,700	25,750	25,820	+276
				-910		10,390		-133
3	10.00	625.0	47,400	+1155	27,700	25,750	25,820	+276
				-900		10,390		-135
4	10.00	625.0	44,000	+1010	27,700	25,750	25,820	+276
				-834		10,390		-133
5	10.02	626.2	40,750	+992	27,800	25,820	25,960	+278
				-883		10,430		-134
6	11.94	746.25	44,500	+1082	33,200	30,800	30,900	+329
				-962		12,425		-160
7	13.69	855.63	48,300	+1060	38,100	35,300	35,500	+378
				-780		14,280		-183
8	15.41	963.13	53,500	+947	42,750	39,600	39,780	+426
				-691		16,100		-265
9	17.104	1069.0	58,250	+1032	47,400	44,000	44,250	+410
				-760		17,750		-278
10	18.77	1173.13	56,300	+991	52,100	48,500	48,500	+516
				-734		19,510		-250
11	20.06	1253.75	52,600	+932	56,600	52,500	52,750	+560
				-686		21,200		-262
12	21.35	1334.4	57,100	+1012	59,200	54,900	55,100	+588
				-745		22,200		-284

DESIGN DATA.
Working Stresses for Dense Select-Structural Douglas Fir-Side Cut

	Wet	Dry
Extreme Fiber	1200 #/in²	1600 #/in²
Maximum Shear	125 #/in²	125 #/in² (10% higher than table Values).
Compression Perpendicular to Grain	400 #/in²	400 #/in²

For Miter & Quoin Posts Fiber Stress at Elastic limit Shall be not less than 700 #/in² for Compression Perpendicular to Grain. Side cut timbers with 10 Annual Rings per Inch as called in Specifications.
Bearing 250 #/in²
Structural Steel 16,000 #/in² Tension & Bending.
" Rivets 12,000 #/in² Shear - Power Driven

GENERAL NOTES.

SUPERSEDES N-2-63

For List of References Drawings See Sheet 2 - N-2-72
Unit Weights Used:
Douglas Fir 38 #/cu. ft. Green
Structural Steel } .283 #/in inch
Castings }
Cast Iron .260 #/in inch
See General Notes Sheet 2.

No.	REVISION	DATE	BY	APP'D

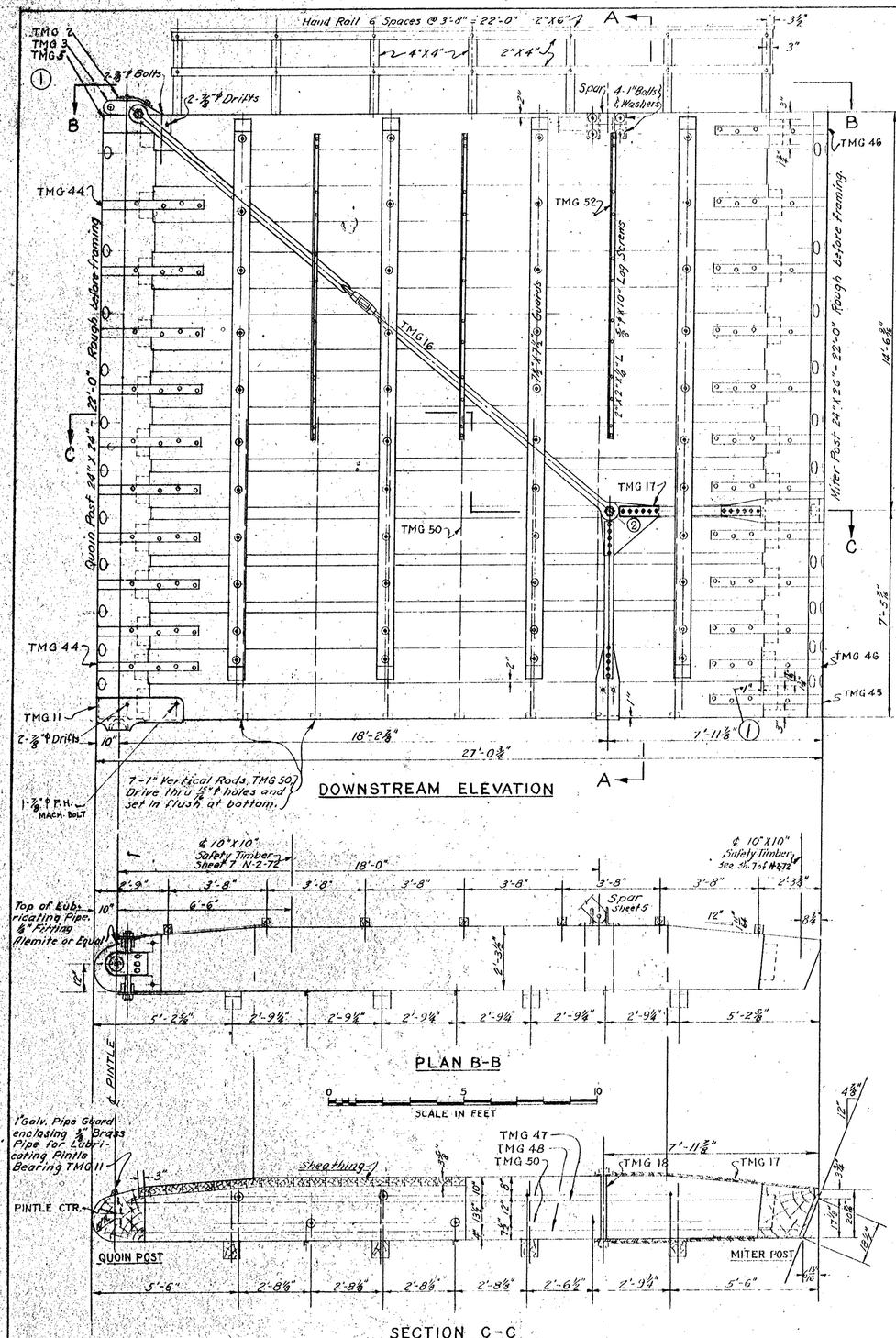
BONNEVILLE POWER-NAVIGATION PROJECT
15TH CONTRACT — CONCRETE
POWER HOUSE SUBSTRUCTURE & NAVIGATION LOCK
SHIP LOCK
TIMBER MITER GATES.
DESIGN DATA.
Scales as Noted
U S ENGINEER OFFICE PORTLAND, OREGON DISTRICT

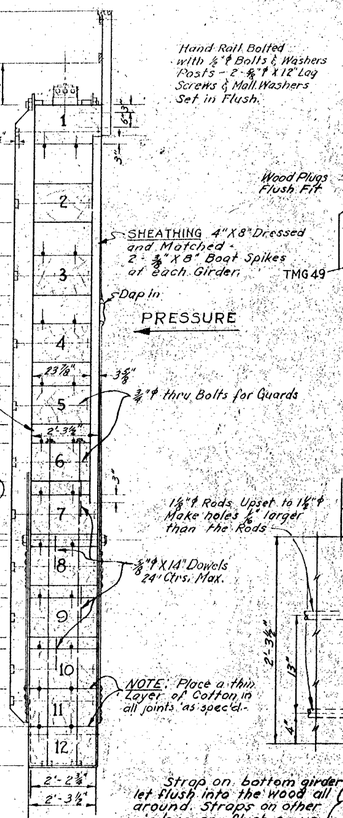
SUBMITTED: Neil Macleay (3) CHIEF, ENGINEERING DIVISION
APPROVED: for COLONEL, CORPS OF ENGINEERS, DISTRICT ENGINEER
4/3/1935

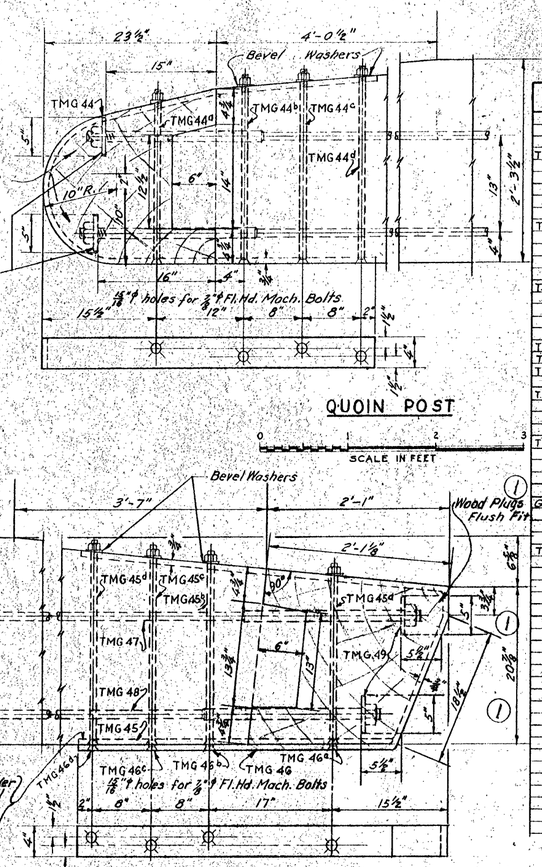
SHEET 1 OF 7 N-2-72

WAR DEPARTMENT

CORPS OF ENGINEERS U. S. ARMY

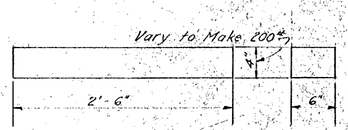






MATERIAL LIST

MARK	LOCATION	NO. REQ.	DESCRIPTION	LENGTH	LBS. W. EACH
	Quoin Post Cap	2	⅞"ϕ Bolts & Nuts	17"	3.43
	Quoin Post Cap	2	⅞"ϕ Mall. Washers		.50
	" " "	2	⅞"ϕ Drift Bolts	14"	2.39
TMG 44	Quoin Post	10	Straps, Struct. Steel	8'-6"	86.7
44a	" "	10	⅞"ϕ Flat Head Bolts	23"	4.45
44b	" "	10	" " " "	25"	4.79
44c	" "	10	" " " "	26"	4.96
44d	" "	10	" " " "	26½"	5.03
----	Quoin & Miter Post	88	Bevel Washers (⅞"ϕ Bolt)	2½"	.33
TMG 45	Miter Post	1	Strap, Struct. Steel	9'-7"	97.7
45a	" "	1	⅞"ϕ Flat Head Bolt	24"	4.62
45b	" "	1	" " " "	25½	4.87
45c	" "	1	" " " "	26"	4.96
45d	" "	1	" " " "	26½	5.03
TMG 46	Miter Post	11	Straps, Struct. Steel	9'-7"	97.7
46a	" "	11	⅞"ϕ Flat Head Bolts	25"	4.79
46b	" "	11	" " " "	26½	5.03
46c	" "	11	" " " "	27"	5.13
46d	" "	11	" " " "	27½	5.21
TMG 47	Horizontal Rods	11	1⅝"ϕ upset to 1½"ϕ (Fd-11)	24'-3"	99.3
TMG 48	" "	11	" " " "	23'-10"	97.8
TMG 49	Quoin & Miter Posts	44	¼" x 5"ϕ Plate Washers		2.5
	" " "	44	1½"ϕ Hex. Nuts		1.33
TMG 50	Vertical Rods	7	1"ϕ Rods (Thd. & Head)	10'-9"	29.0
	" "	7	1" Nuts		0.43
	" "	14	Mall. Washers		0.68
TMG 52	Counterwt. Retainer	3	2" x 2" x 7/16 L's	11'-2"	37
	" "	36	⅝"ϕ x 10" Lag Screws	10"	.79
	Quoin Post Shoe	1	⅞"ϕ Bolt & Nut (TMG 11)	26"	4.96
	" " "	2	⅞"ϕ Drift Bolts "	18"	3.06
	Sheathing Spikes	575	⅜" x 8" Boat Spikes	8"	.630
Guard	Fastenings	20	½"ϕ Bolts & Nuts	3.5"	4.46
	" "	24	" " "	2.7"	3.16
	" "	88	⅝"ϕ Malleable	—	0.33
	Stirrup Bolts	2	⅞"ϕ Fl. Hd. Bolts & Nuts	29½	5.5
TIMBER	Girders #'s 2,3,4,5,6	5	15¾" x 23⅜" Net	24'-2	
"	" #'s 1,7,8,9	4	15¾" x 27½" Net	24'-1"	
"	" #'s 10,11,12	3	15¾" x 27½" Net	24'-1"	
"	Filler bet. #'s 1&2	1	5¾" x 23⅜" Net	23'-1"	
"	Filler bet. #'s 7&8	1	5⅜" x 27½" Net	23'-1"	
"	Filler bet. #'s 8&9	1	4⅜" x 27½" Net	23'-1"	
"	Filler bet. #'s 9&10	1	4¾" x 27½" Net	23'-1"	
"	Quoin Post	1	23¾" x 23¾" Net	22'0"	
"	Miter Post	1	24" x 26" Net	22'0"	
"	Guards	4	7½" x 7½" Net	20'8"	
"	Railing (Posts)	7	3¾" x 3¾" Net	4'0"	
"	"	1	1⅝" x 5¼" Net	22'1"	
"	"	2	1⅝" x 3⅜" Net	11'6"	
"	Sheathing	41	4"x8" Dressed & Matched	14'-6"	
	Fillers bet. Girders	33	⅝"ϕ Drift Bolts	14"	1.21
	Hand Rail	14	⅝"ϕ Lag Screws	12"	.94
	" "	14	Mall. Washers (⅝"ϕ Lag)		.22
	" "	14	½"ϕ Bolts & Nuts	5"	.38
	" "	28	Mall. Washers (½"ϕ Bolt)		.12



COUNTERWEIGHT

Cast Iron Make 275
Wt. 200 lbs.

GENERAL NOTES

MATERIALS given for One Leaf Only; Two Leaves Required.
SCHEDULE OF MATERIALS GIVEN is for the convenience of the Contractor Only. All Lengths and Bending of Materials shall be checked by the Contractor.
DIMENSIONS: All dimensions are Net for Dressed Sizes. All timbers to be S4S unless otherwise shown.
PAINTING: All Timber shall be given One Coat of Rassmussen's "Checkseal" or Equal at the Mill. Painting shall be as called for in the Specifications. Paint all inaccessible Surfaces before assembling.
WEIGHT: Estimated Weight of One assembled Gate Leaf without Counterweights, 50,000 lbs.

SUPERSEDES Sheet 2 N-2-63

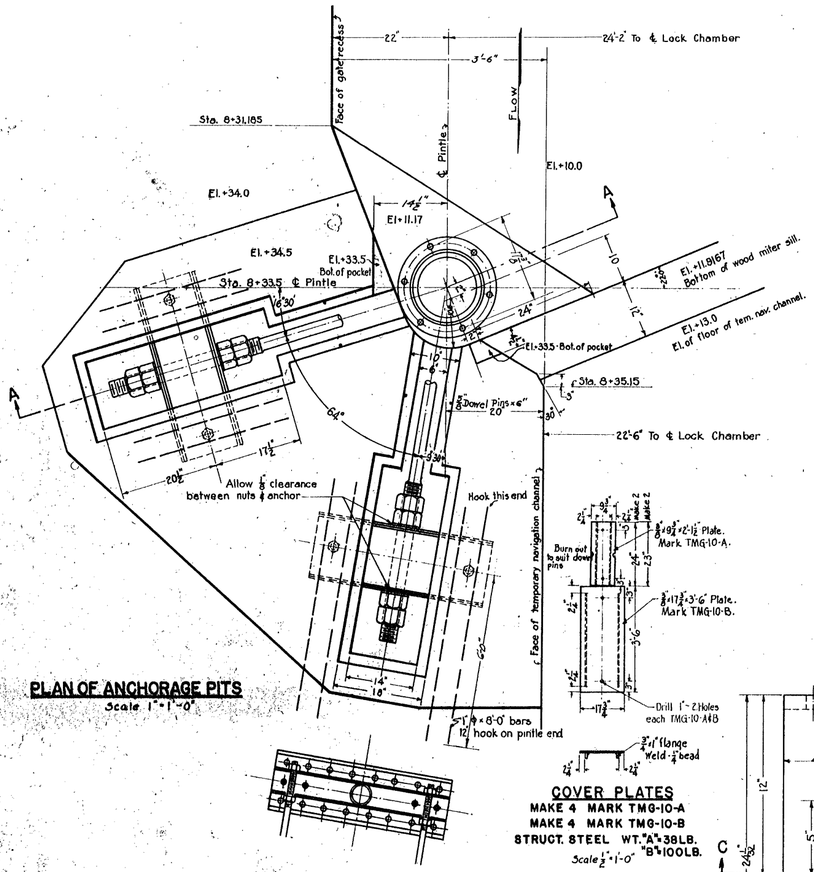
REFERENCES

Sheet No. 1 Design Data & Stresses.
2 General Assembly & Post Details.
3 Wall Anchorage & Quoin Post Castings.
4 Pintle Castings & Miscellaneous Details.
5 Spar & Connections.
6 Operating Mechanism.
7 Geometry & Plan.

NO.	REVISION	DATE	BY	APP'D
2	Weld Bar on TMG 1	9-4-35	T.M.O.	Rem
1	CORRECTION CHANGES	4-1-35	F.S.D.	Rem

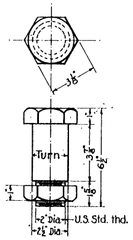
BONNEVILLE POWER NAVIGATION PROJECT
13TH CONTRACT - CONCRETE
POWER HOUSE SUBSTRUCTURE & NAVIGATION LOCK
SHIP LOCK
TIMBER MITER GATES
GENERAL ASSEMBLY & POST DETAILS
SCALES AS SHOWN
U. S. ENGINEER OFFICE, PORTLAND, OREGON DISTRICT

SUBMITTED: R. H. Mackenzie, ENGINEER
APPROVED: H. Williams, MAJOR, CORPS OF ENGINEERS
RECOMMENDED: [illegible], ASST. ENGINEER
A.C.O.
DRAWN BY M.R. Litt. DATE 4-3-35
TRACED BY J.A.S. CHECKED BY [illegible]

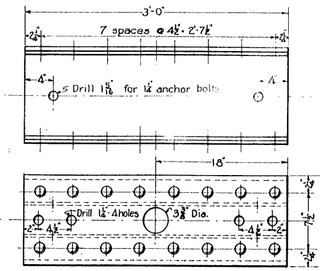


PLAN OF ANCHORAGE PITS
Scale 1"=1'-0"

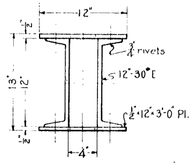
COVER PLATES
MAKE 4 MARK TMG-10-A
MAKE 4 MARK TMG-10-B
STRUCT. STEEL WT. "A"=38 LB. "B"=100 LB.
Scale ½"=1'-0"

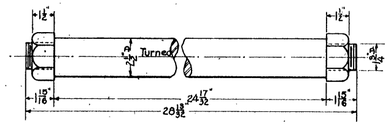


ANCHOR ROD PIN
MAKE 4 MARK TMG-8
MACHINE STEEL WT.=14.5 LB.
Scale 3"=1'-0" (Including nuts)

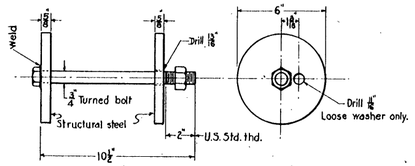


ANCHOR FRAME
MAKE 4 MARK TMG-9
STRUCTURAL STEEL WT.=300 LB.
Scale 1½"=1'-0"

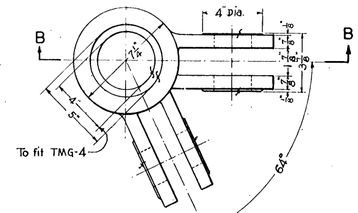




QUOIN POST CAP PIN
MAKE 2 MARK TMG-6
MACHINE STEEL WT.=44 LB.
Scale 3"=1'-0" (Including nuts)

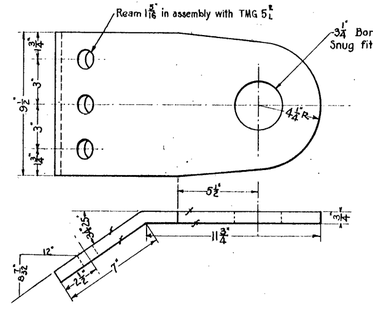


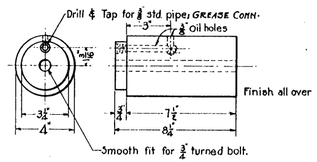
HINGE PIN BOLT
MAKE 2 MARK TMG-1
BOLT STEEL WT.=12 LB.
Structural Steel-10 lb.
Bolt Steel-2 lb.
Scale 3"=1'-0"



SECTION B-B

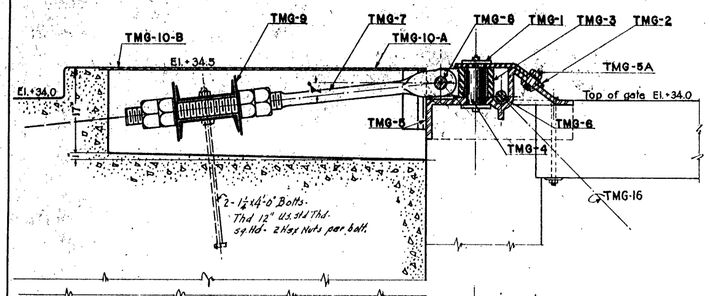
HINGE PIN COLLAR
MAKE 2 MARK TMG-3
CAST STEEL WT.=76.5 LB. Phos. bronze bushing - 12.5 lb. Cast Steel - 64.0 lb.
Scale 3"=1'-0"



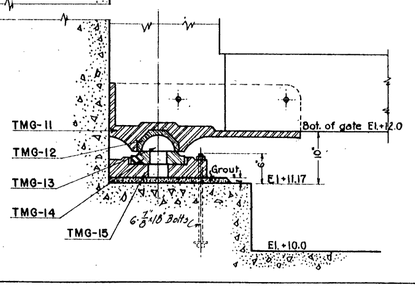


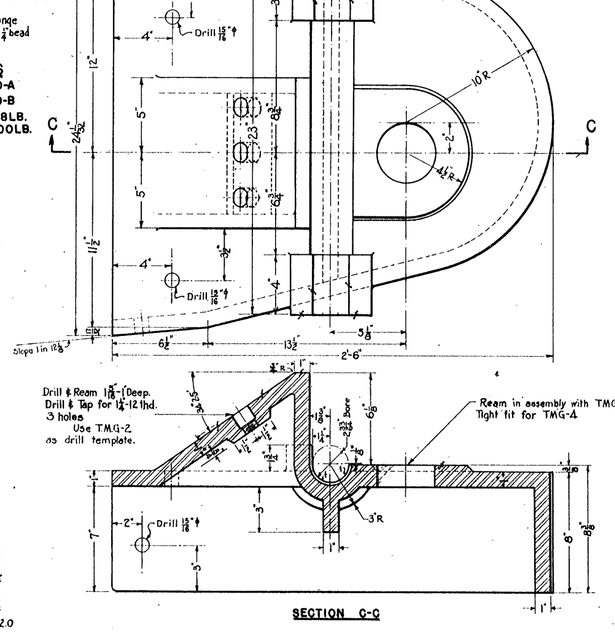
HINGE PIN
MAKE 2 MARK TMG-4
FORGED STEEL WT.=29 LB.
Class 'H'
Scale 3"=1'-0"

HINGE PIN CONNECTING PLATE
MAKE 2 MARK TMG-2
STRUCTURAL STEEL WT.=35 LB.
Scale 3"=1'-0"



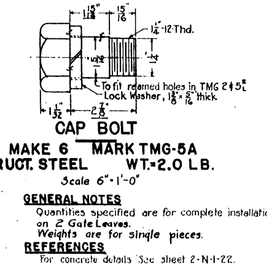
SECTION A-A



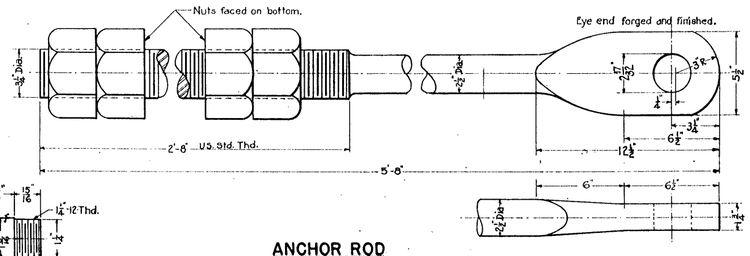


SECTION C-C

QUOIN POST CAP
MAKE 1 AS SHOWN MARK TMG-5-R
MAKE 1 OPPOSITE MARK TMG-5-L
CAST STEEL WT.=597 LB.
Scale 3"=1'-0"



CAP BOLT
MAKE 6 MARK TMG-5A
STRUCT. STEEL WT.=2.0 LB.
Scale 6"=1'-0"



ANCHOR ROD
MAKE 4 MARK TMG-7
FORGED STEEL WT.=192 LB.
Class 'C'
Scale 3"=1'-0" (Including nuts)

GENERAL NOTES
Quantities specified are for complete installation on 2 Gate Leaves.
Weights are for single pieces.

REFERENCES
For concrete details See sheet 2-N-1-72.
For parts TMG-11 to 15 See sheet 4-N-2-72

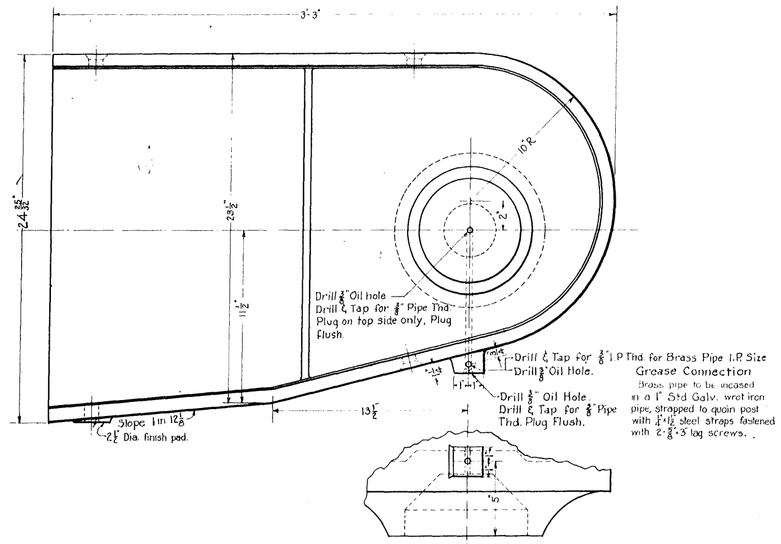
SUPERSEDES N-2-63

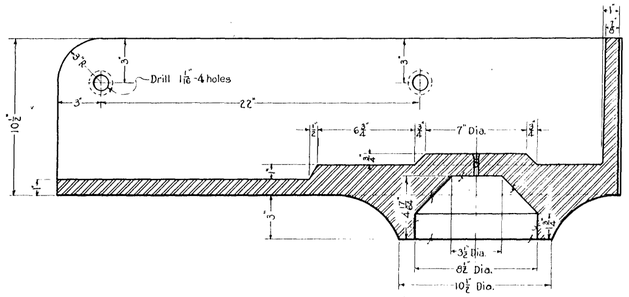
NO.	REVISION	DATE	BY	APV'D

BONNEVILLE POWER NAVIGATION PROJECT
13TH. CONTRACT -- CONCRETE
POWER HOUSE SUBSTRUCTURE & NAVIGATION LOCK
SHIP LOCK
TIMBER MITER GATES
WALL ANCHORAGE & QUOIN POST CASTINGS
SCALES AS SHOWN
U.S. ENGINEER OFFICE, PORTLAND, OREGON DISTRICT

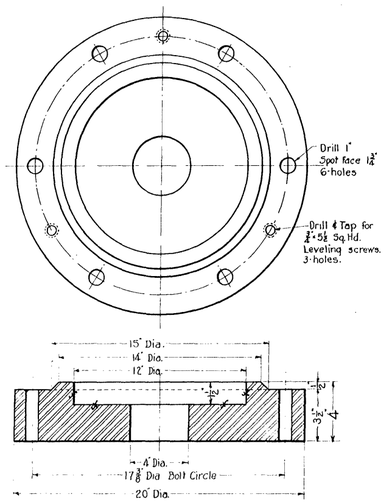
SUBMITTED R.R. Mackenzie ENGINEER — APPROVED H. C. Williams MAJOR, CORPS OF ENGINEERS

RECOMMENDED [illegible] HEAD ENGINEER — DESIGNED BY E.R.B. M.E.L. DATE 4-3-1935 CH. BY A.C.P. TR. BY A.C.P. CHECKED [illegible]

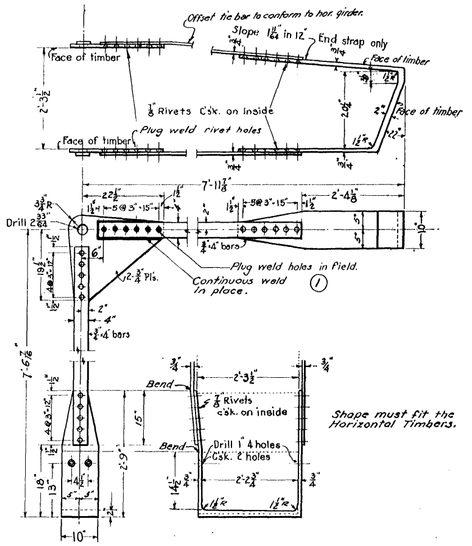




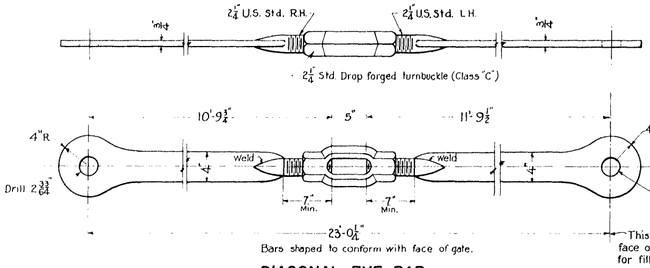
QUOIN POST SHOE
MAKE 1 AS SHOWN MARK TMG-11-R
MAKE 1 OPPOSITE MARK TMG-11-L
CAST STEEL WT=688 LB.
Scale 3"=1'-0"



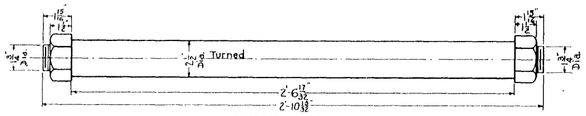
PINTLE BASE PLATE
MAKE 2 MARK TMG-15
CAST STEEL WT=295 LB.
Scale 3"=1'-0"



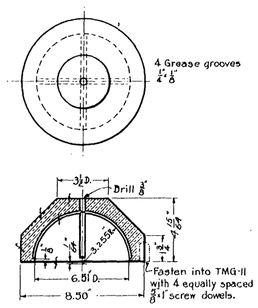
STIRRUP
MAKE 1 AS SHOWN MARK TMG-17-R
MAKE 1 OPPOSITE MARK TMG-17-L
STRUCT. STEEL WT.=880 LB.
Scale 3"=1'-0"



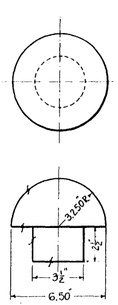
DIAGONAL EYE BAR
MAKE 4 MARK TMG-16
STRUCT. STEEL WT.=285 LB.
Scale 1 1/2"=1'-0"



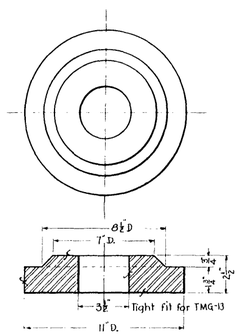
STIRRUP PIN
MAKE 2 MARK TMG-18
MACHINE STEEL WT.=52 LB.
Scale 3"=1'-0"



PINTLE BEARING
MAKE 2 MARK TMG-12
PHOS. BRONZE WT.= 32 LB.
Scale 3"=1'-0"



PINTLE
MAKE 2 MARK TMG-13
FORGED STEEL WT=29 LB.
Class "H" Scale 3"=1'-0"



PINTLE COLLAR
MAKE 2 MARK TMG-14
CAST STEEL WT=53 LB.
Scale 3"=1'-0"

GENERAL NOTES

Quantities specified are for complete installation on 2 Gate Leaves.
Weights are for single pieces.

REFERENCES

For general arrangement see Sheets 2 & 3 N-2-72

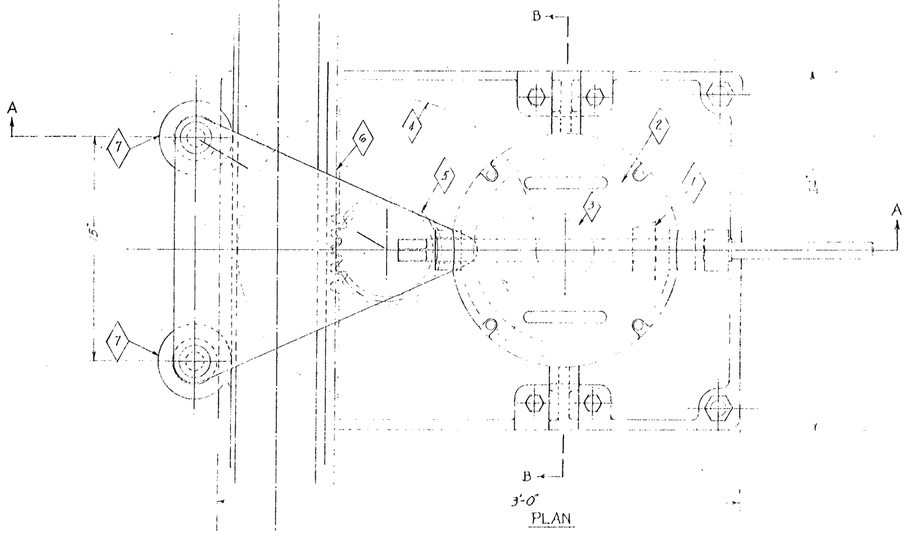
SUPERSEDES N-2-63

NO.	REVISION	DATE	BY	APV'D
1	Weld Bar on TMG-17	9-4-35	TMG	RLM

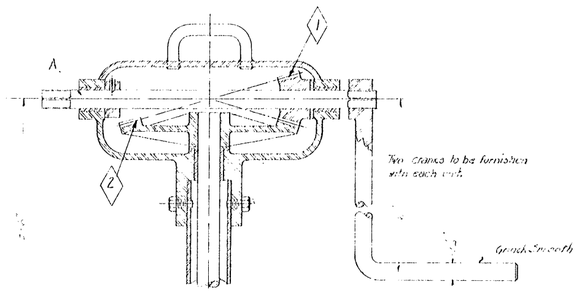
BONNEVILLE POWER NAVIGATION PROJECT
13-TH. CONTRACT — CONCRETE.
POWER HOUSE SUBSTRUCTURE & NAVIGATION LOCK
SHIP LOCK
TIMBER MITER GATES.
PINTLE CASTINGS & MISCEL. DETAILS.
SCALES AS SHOWN.
U. S. ENGINEER OFFICE, PORTLAND, OREGON DISTRICT

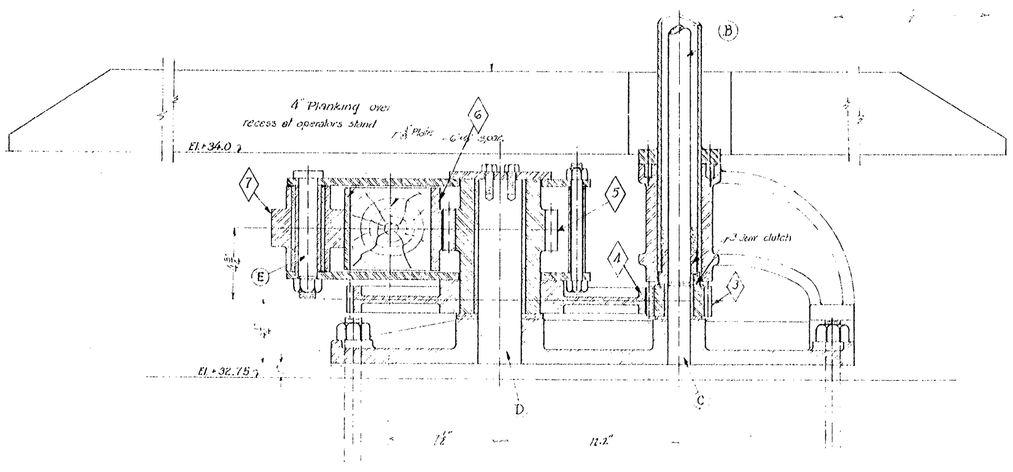
SUBMITTED R.M. Mackenzie ENGINEER
APPROVED H. J. Williams MAJOR, CORPS OF ENGINEERS
RECOMMENDED [illegible] HEAD ENGINEER
DESIGNED BY E.T.O. M.R.L. DATE A-3-1935
DR. BY A.C.O. TR. BY A.S.D. CHECKED [illegible]

WAR DEPARTMENT



PLAN





SECTION AA

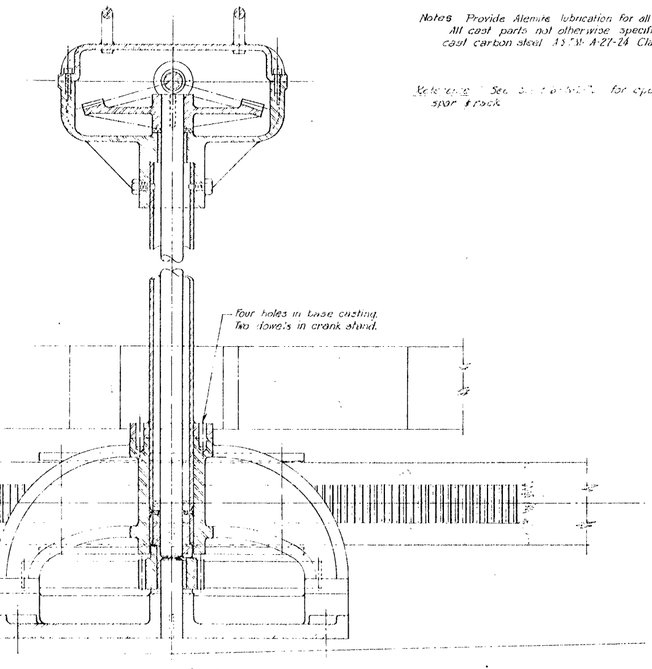
Scale inches

GEARS & ROLLERS COMPLETE INSTALLATION (2 UNITS)

Symbol	Make	Name	P. Dia.	Pitch	No. Teeth	Face	Hub Bore	Hub Length	Material	Remarks
1	2	Spur Pinion	3.500	6	21	1½	2"	4"	Mach. steel	Key to shaft A.
2	2	Spur Gear	12.33⅓	6	74	2	3½	6"	Cast Steel Grade No. C.S.	Key to shaft B.
3	2	Pinion	3.000	5	20	2	3"	4½	Mach. Steel	Includes 3 Jaw Clutch. Bush on Shaft C
4	2	Gear	20.400	5	102	2	4"	12"	Cast Steel Class B Std. C.S.	Key to shaft D
5	1	Pinion	3"	3	9	2½	3½	8½	Mach. Steel	Key to 4 Bush to suit D
6	2	Gear (Composite)		3	102					Made in sections - bolted to spoke rim. Bushed on assembly Shaft E
7	4	Roller	5"			2½	2½	5⅝		

SHAFTS COMPLETE INSTALLATION (2 UNITS)

Symbol	Make	Name	Dia.	Length	Material	Remarks
A	2	Crank shaft	1¼"	23"	Cold rolled steel	Squared each end - key to 1
B	2	Stub shaft	1½"	4 5/8"	" " "	Key to 2 & 3 Jaw clutch.
C	2	Stub	1½"	5¼"	" " "	Key to base casting. Bush to 3
D	2	Pinion shaft	2⅜"	12¼"	" " "	Key to base casting. Bush to 4
E	4	Roller shaft	1½"	8"	Machine steel	Key to base casting. Bush to 7



SECTION BB

Notes Provide Alemite lubrication for all moving parts. All cast parts not otherwise specified, to be cast carbon steel A.S.T.M. A-27-24 Class B-Soft.

Reference: See [illegible] for operation of spur track.

BONNEVILLE POWER NAVIGATION PROJECT

[illegible] CONTRACT [illegible]

[illegible]

U. S. ENGINEER OFFICE, SECOND PORTLAND DISTRICT, OREGON.

SUBMITTED: [illegible] APPROVED: [illegible]

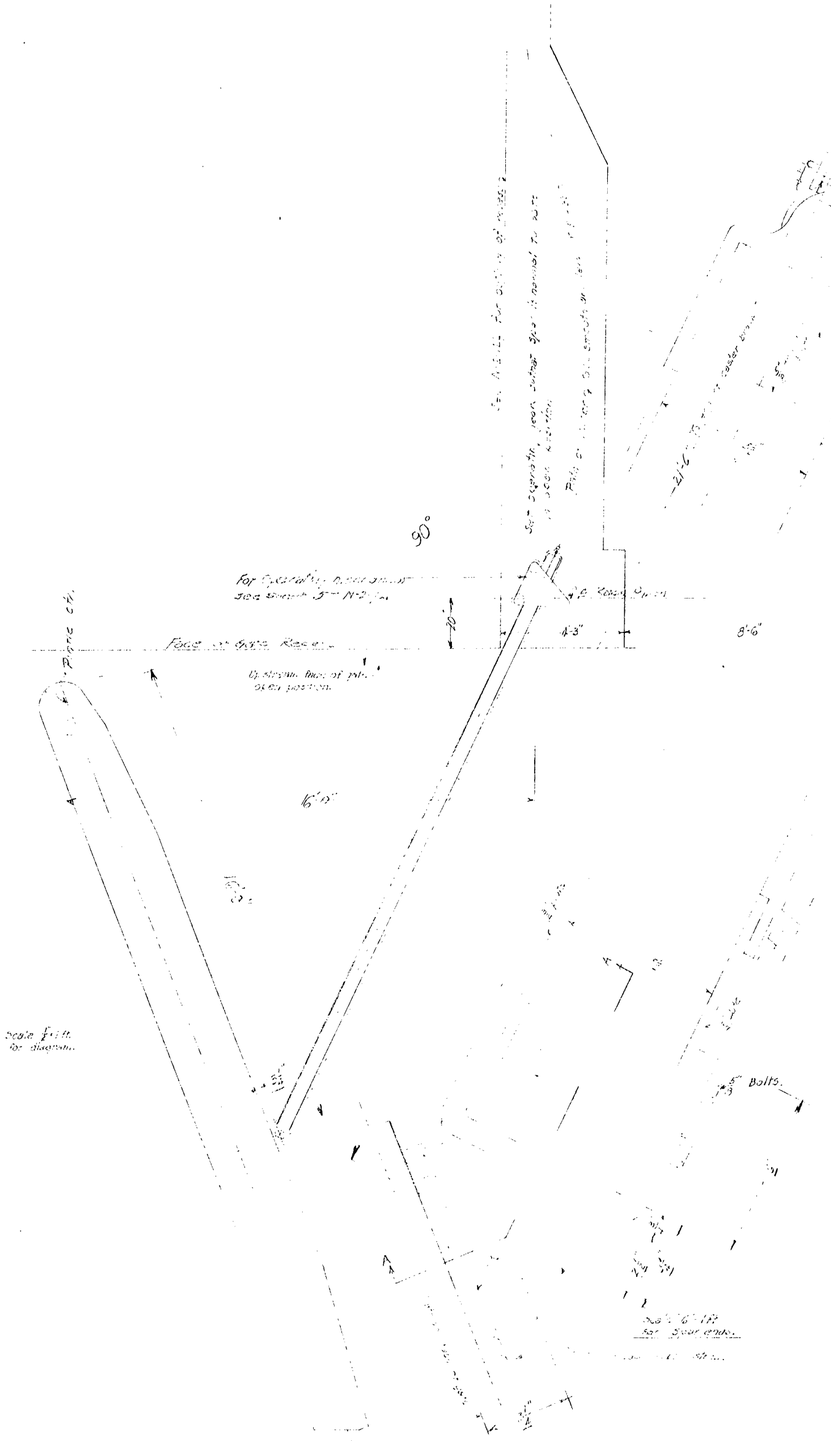
[illegible] DIVISION ENGINEERS

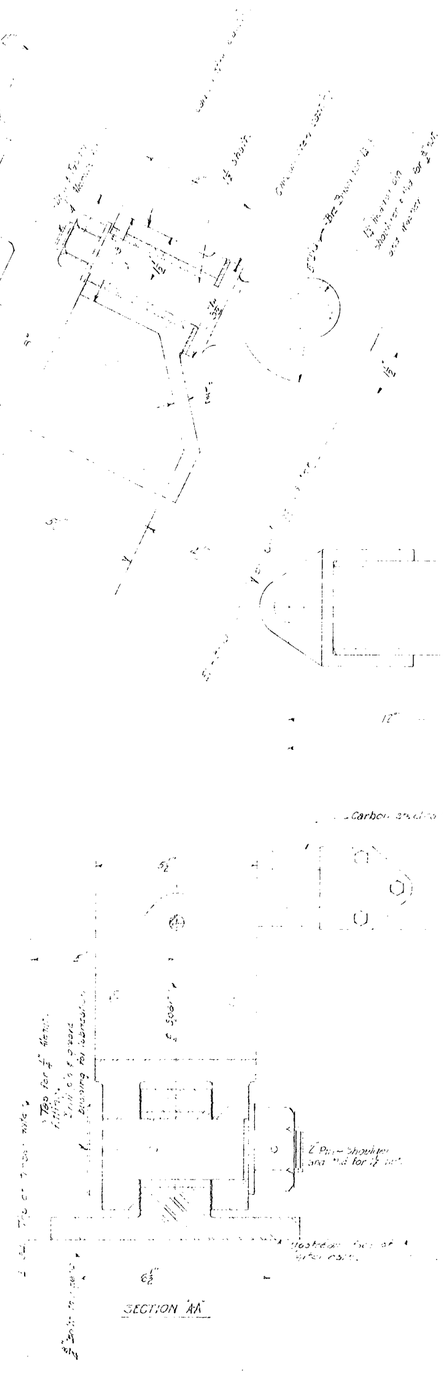
RECOMMENDED: [illegible] DATE [illegible]

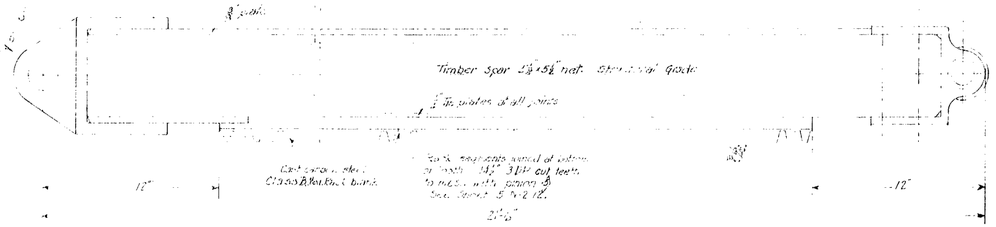
[illegible] DATE [illegible]

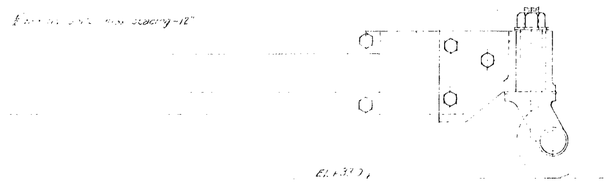
NO.	REVISION	DATE	BY	APV'D

T.S. N 2-









Note: All cast parts not otherwise specified to be A.S.T.M. A27-24: Class B Soft Carbon Steel Castings. Spring - Machine steel.

Tees as per A.S.T.M. Spec. No. A-7-24 Std. for operating mechanism. A.S.A. No. 1018 for spar ties as in lock structure.

NO.	REVISION	DATE	BY APVD

BONNEVILLE POWER NAVIGATION PROJECT

13TH CONTRACT W 608 ENG 607

POWER HOUSE SUBSTRUCTURE & NAVIGATION LOCK

TEMPORARY MITER GATES

OPERATING SPAR

SCALES AS SHOWN

U. S. ENGINEER OFFICE, SECOND PORTLAND DISTRICT, PORTLAND, OREGON

SUBMITTED: [illegible] Asst. U.S. Engr.

APPROVED: [illegible] Lt. Colonel, Corps of Engineers, U.S.A. Division Engineer

RECOMMENDED: [illegible] Major, Corps of Engineers, U.S.A. District Engineer

AS BUILT ACCEPTED BY [illegible] DATE JUNE 22, 1938

DRAWN BY [illegible] CHECKED BY [illegible]

SHEET 6, NP-607-E

STA. 8+06.92

STA. 8+08.0

RECESS 1½" DEEP

EYE BOLTS

REFER TO SECTION H-H-22 FOR OPERATING GEAR RECESS

END OF PAV. (SMOOTH)

CL WALL LINE OF RECESS

CELL IN CONCRETE

STA. 8+27.0

CL BETW. GATE & CONC. RECESS

RECESS 1½" DEEP

STA. 8+31.1849

"A"

EL. 1117

EL. 1110

CL OF CL POCKET EL. 335

CL OF PINTLE

CL OF ANCHOR

EL. 845.0

CELL IN CONCRETE

"H"

SCALE ½" 1 FOOT

STA. 8+107.2708
END OF TIMBER LEAF

EL. +113.0'

3" DIA

EL. +112.9167'

WASHER 2½" DIA × ½" PLT.

EL. +111.9167'

ANCHOR BOLTS 1"Ø × 4'-0"

SECTION "D-D"

624' 2" TO ℄ OF LOCK CHAMBER

EL. 1102'

TYPICAL ANCHOR BOLT FOR SILL TIMBERS

CELL IN CONCRETE

"E"

"D"

OUTSIDE TIMBER GATE LEAF

D.S. SIDE OF GATE

D.S. FACE OF SILL

12"×12" FIR TIMBER 545-HEM

D.S. FACE OF SILL

"D"

6 SPACES @ 2'0" = 24'0" FOR ANCHOR BOLTS

NOTE: CLEAN CL LEVEL CONCRETE SURFACES & SET SILL IN HOT ASPHALT.

MITER SILL

STA. 8+84.90'
℄ INTERSECTION OF SILL LINE WITH LOCK FACE =
℄ STA. 8+35.15'

CELL IN CONCRETE

22'6" TO ℄ OF LOCK CHAMBER

"B"

FACE OF TEMPORARY CONCRETE

EL. 382.4

KEEP EYE OF WELL CLEAR OF CONCRETE FOR FREE SWING OF BOOM

EL. 97.7 TO 98.38

FLOW

5'8"

MITER LINE

STA. 8+25.89'

"C"

10"

Bolts for Pintle Base TMG15

8⅛" R.

"C"

8⅛"

8⅛"

Set bolts with template to match Pintle Base TMG-15

6-⅞" X 18" Bolts Equally Spaced

1:1 Cement Grout

EL. +11.17'

6⅞"

18"

Pintle ℄

EL. +10.00

SECTION "C-C"

ANCHOR BOLTS FOR PINTLE BASE

Scale 1"=1'-0"

TOP OF SILL +12.9167

BOT. OF SILL +11.9167

12"

VIEW "B"

ALTERNATE FOR SILL

2¾" DIA. CUT WASHER

12"

6" NUT

1⅜"

15⅝" DEPTH OF DAP

1" ℄ 2¾" THD.

TYPICAL ANCHOR BOLT FOR BUMPER TIMBER

MAT. STRUCT. STEEL

SCALE 1½"=1'0"

STA. 8+27.88

STA. 8+10.88

STA. 8+08.0

SL. INVERT GATE +3.45'

SL. +3.15' ℄ of Anchors

4 SPACES @ 5" = 20" FOR 1"Ø ANCHORS

DAP ANCHOR 1⅝"Ø TO BOLT

15'4¾"

6" DAP TIMBER-1½"

SL. +1.425 - ℄ of ANCHORS

SL. BOT. OF GATE +1.20

SL. +10.9'

ELEVATION OF RECESS FOR LOCATION OF TIMBER BUMPERS

TIMBER BUMPERS 6×6" FIR (DET.) TIMBER

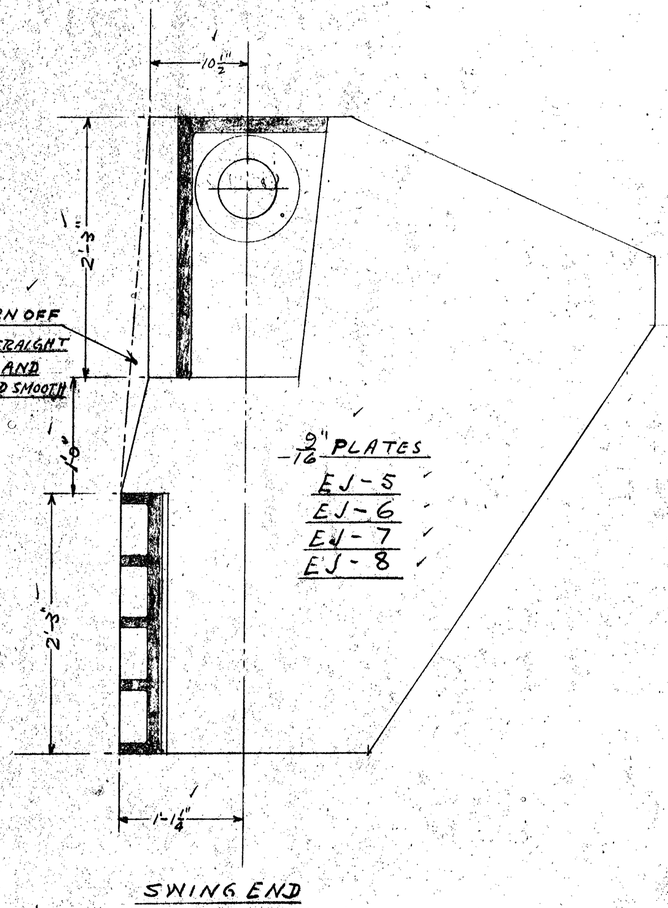
SUPERSEDES N-2-65

GENERAL NOTES:
MAINTAIN CONCRETE OUTLINE, ANGLE, LOCATION TO BE MAINTAINED AS CAST

REFERENCES:
REFER TO SHEET 5 & 9 OF N-2-72 FOR ANCHORAGE AND CAST IN PLACE DETAILS (SEE SCHEDULE)
FOR OPERATING GEAR RECESS REFER TO SHT. N-2-71
FOR TIMBER NOTES, SEE GENERAL SILL ON MASONRY, TIMBER AND MISC. SHT. N-2-67

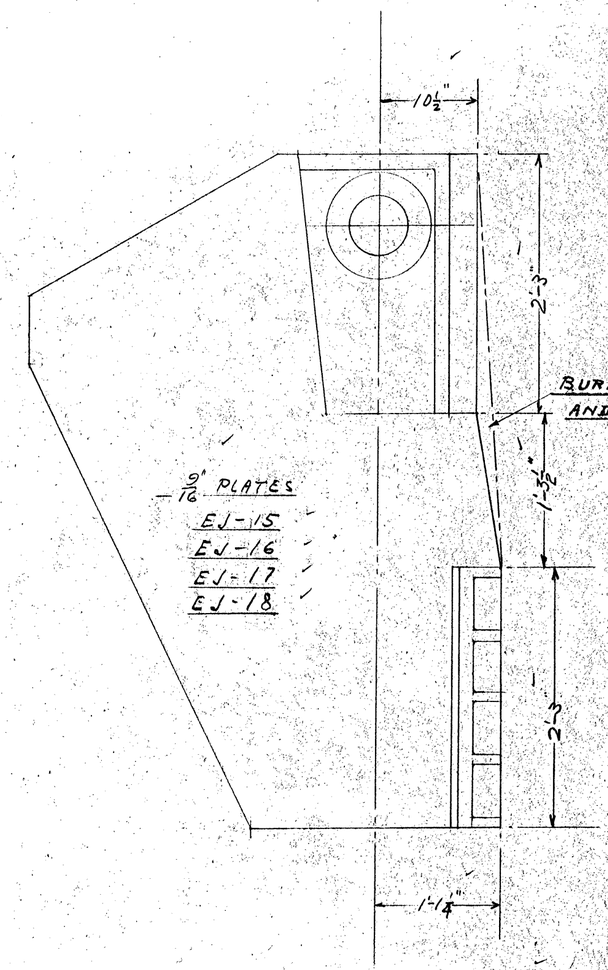
BONNEVILLE POWER NAVIGATION PROJECT
13TH. CONTRACT — CONCRETE.
POWER HOUSE SUBSTRUCTURE & NAVIGATION LOCK
SHIP LOCK
TIMBER MITER GATES
GEOMETRY & PLAN
SCALES AS SHOWN
U.S. ENGINEER OFFICE, PORTLAND, OREGON DISTRICT

DESIGNED: R.H. Mackenzie — APPROVED: MAJOR CORPS OF ENGINEERS
DRAWN BY: F.C.L. DATE: 4-3-35
TRACED BY: CHECKED BY: A.L.B.



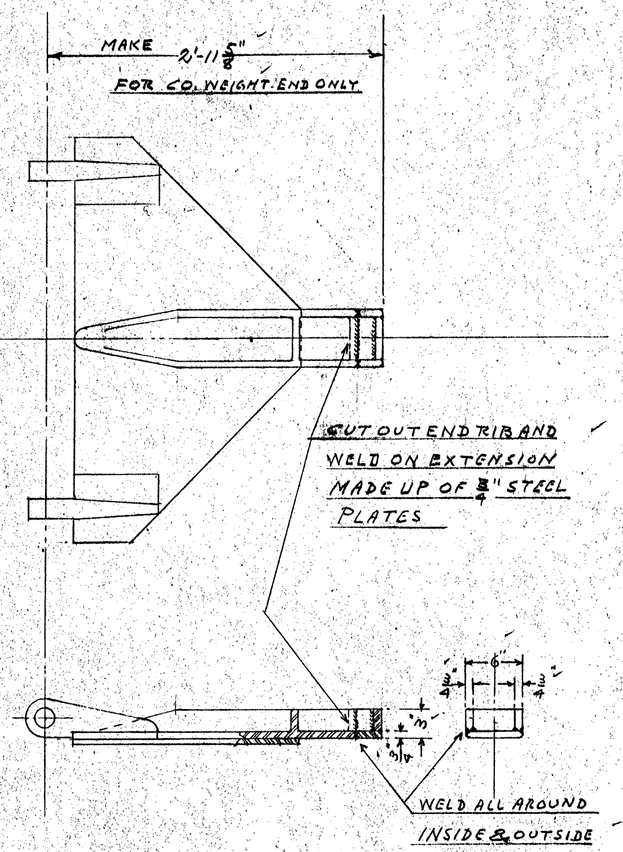
9/16" PLATES
EJ-5
EJ-6
EJ-7
EJ-8

SWING END



9/16" PLATES
EJ-15
EJ-16
EJ-17
EJ-18

CO. WEIGHT END



Note: This drawing No. changed from
N-2-72 to N-2-73

BONNEVILLE POWER NAVIGATION PROJECT
28TH CONTRACT
BRIDGE ACROSS NAVIGATION CANAL
SWING SPAN
ALTERATIONS
FOR CENTERING LATCH CLEARANCE
U. S. ENGINEER OFFICE, PORTLAND, OREGON, DISTRICT

SUBMITTED: R. H. Mackenzie, ENGINEER — APPROVED: E. H. Williams, MAJOR, CORPS OF ENGINEERS
RECOMMENDED: ..., HEAD ENGINEER
DRAWN BY: C.V.S. DATE 4-3-35
TRACED BY: ... CHECKED BY: ...

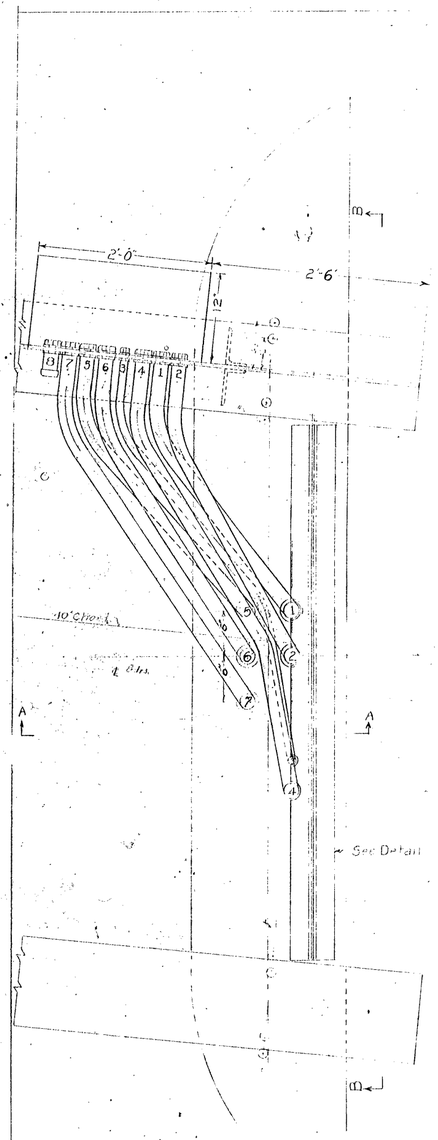
N-2-78

WAR DEPARTMENT

CORPS OF ENGINEERS U. S. ARMY

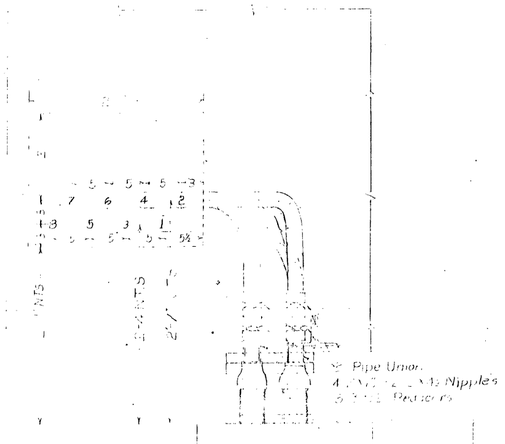
WAR DEPARTMENT

CORPS OF ENGINEERS U.S. ARMY



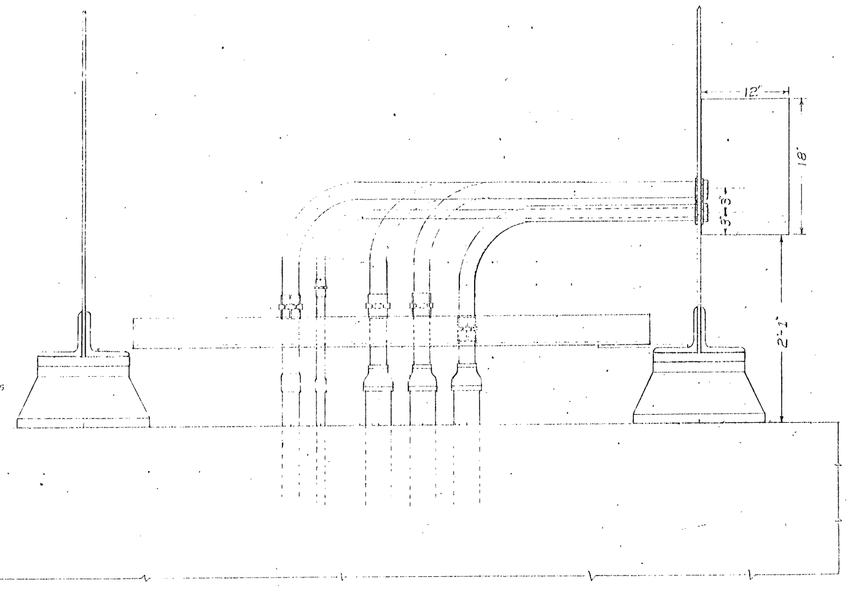
PLAN

Scale in inches
0 3 6 9 12



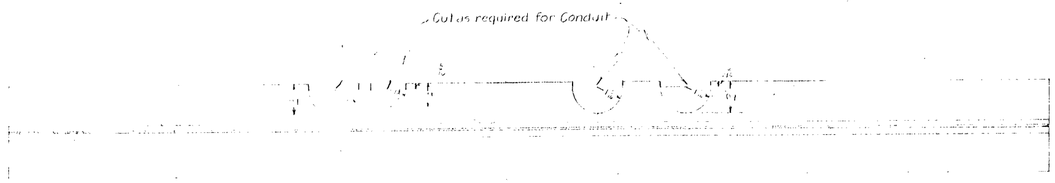
SECTION A-A

Scale in inches
0 3 6 9 12



SECTION B-B

Scale in inches
0 3 6 9 12

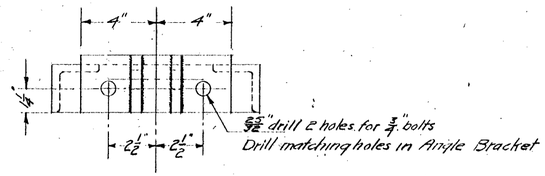


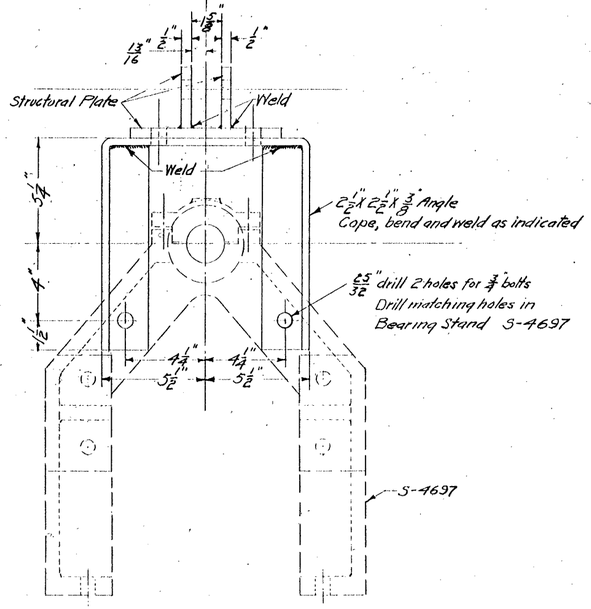
PLAN OF CONDUIT CF7

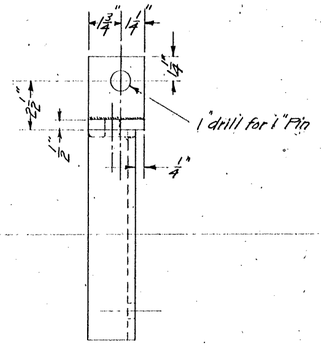
Scale in inches
0 6 12

BONNEVILLE POWER NAVIGATION PROJECT 28th CONTRACT	
BRIDGE ACROSS NAVIGATION CANAL CONDUIT DETAILS PIER No 3	
U.S. ENGINEER OFFICE PORTLAND OREGON DISTRICT	
SUBMITTED: ENGINEER	APPROVED: MAJOR, CORPS OF ENGINEERS
RECOMMENDED: ASSISTANT ENGINEER	DRAWN BY J.C.P DATE 3-22-35 TRACED BY CHECKED BY

N-2-75







General Notes:

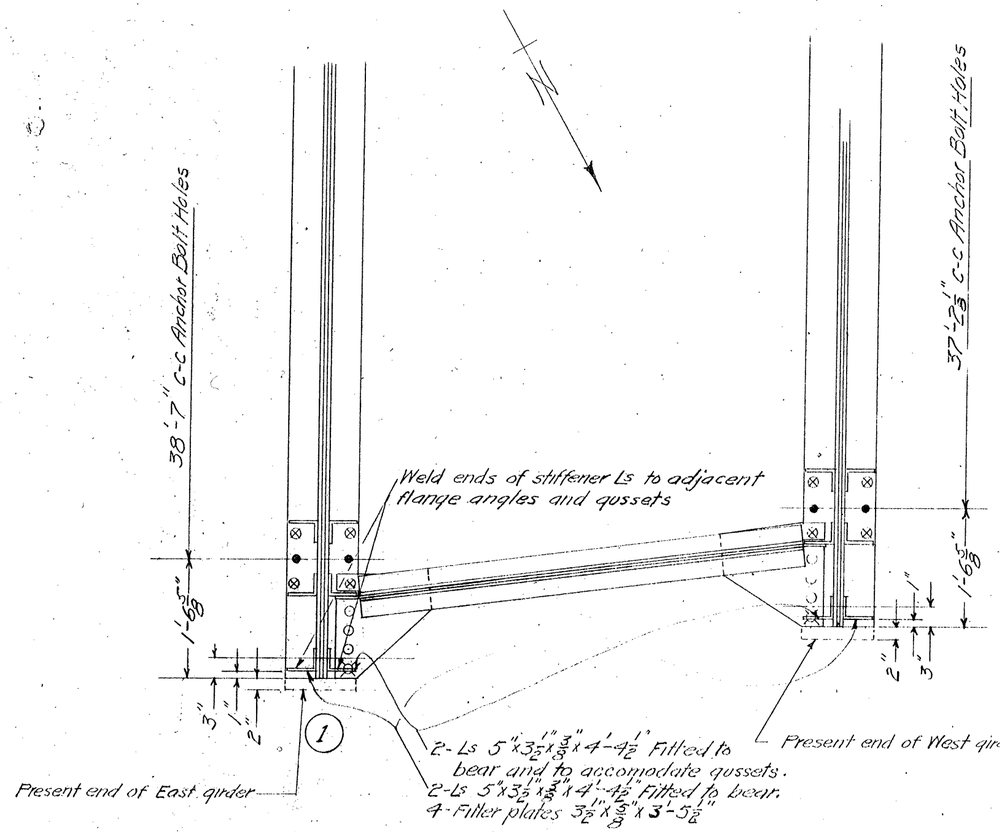
The clutch yoke mounting on the turning machinery for the Swing Span, as constructed encroaches upon the bridge track rail location and also entails an undesireably wide spacing of the contiguous ties.

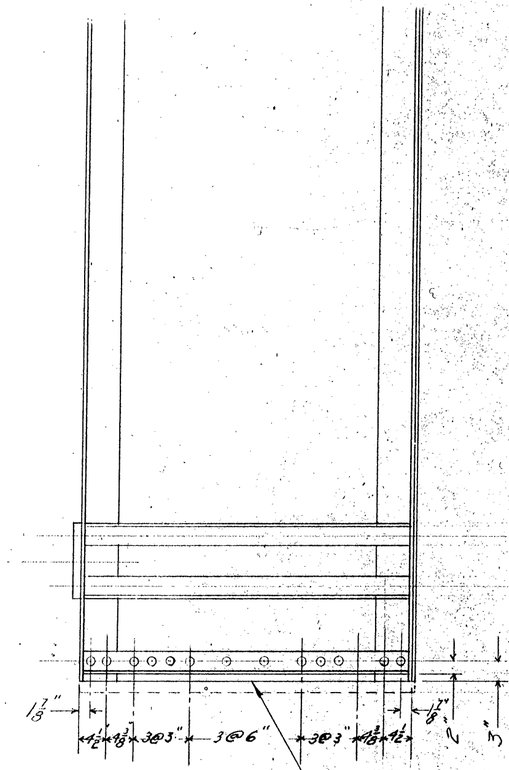
It is required that these conditions be corrected. The clutch yoke mounting submitted herewith is suggested as acceptable.

BONNEVILLE POWER NAVIGATION PROJECT
28TH CONTRACT
BRIDGE ACROSS NAVIGATION CANAL
SWING SPAN
CORRECTIONS TO TURNING MACHINERY
CLUTCH YOKE MOUNTING
U S ENGINEER OFFICE, PORTLAND, OREGON DISTRICT

SUBMITTED: ENGINEER	APPROVED: MAJOR, CORPS OF ENGINEERS
RECOMMENDED: HEAD ENGINEER	DRAWN BY: H.G.L. DATE 4-10-35 WN. TRACED BY ..... CHECKED BY .....

N-2-77





No.	Revision	Date	BY	Apv'd
1	Upon inspection, with the swing span in place, the clearance provided at the present end of the East girder is deemed adequate. The indicated correction is therefor required for the West girder only.	H.G.L. 5-3-35		

General Notes:

The positions, as installed, of fixed spans numbers 2 and 3 differ from the design positions sufficiently to encroach upon the clearance required to maneuver swing span number 1.

To correct this condition of impaired clearance, it is required that the northerly ends of the girders of fixed span number 2 be trimmed as indicated. The present end stiffener angles are to be removed and replaced by new fitted stiffener angles located along the next adjacent gage line. The outermost rivets in the end gusset plates are to be replaced by countersunk rivets. Those portions of the girder web and flange angles projecting beyond the newly located stiffener angles are to be burned off and ground smooth along line shown, leaving the gusset plates unimpaired.

BONNEVILLE POWER NAVIGATION PROJECT

28TH CONTRACT

BRIDGE ACROSS NAVIGATION CANAL

FIXED SPAN Nº2

CORRECTIONS TO NORTH ENDS OF GIRDERS

U. S. ENGINEER OFFICE, PORTLAND, OREGON DISTRICT

SUBMITTED: ..... ENGINEER

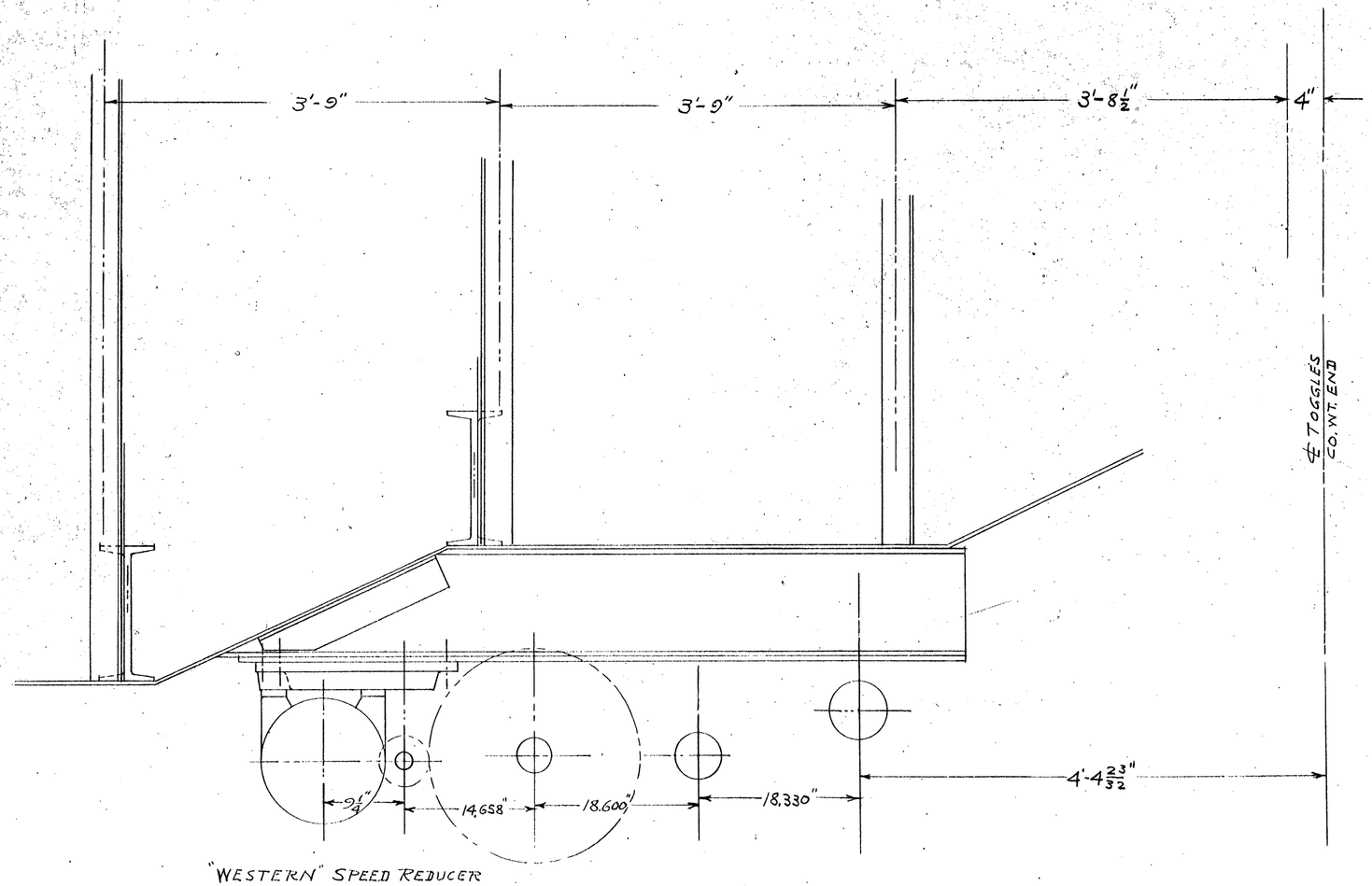
RECOMMENDED: ..... HEAD ENGINEER

APPROVED: ..... MAJOR, CORPS OF ENGINEERS

DRAWN BY: H.G.L. DATE 4-10-35

TRACED BY ..... CHECKED BY .....

N-2-78



"WESTERN" SPEED REDUCER

BONNEVILLE POWER NAVIGATION PROJECT

ARRANGEMENT SKETCH

TO SHOW LOCATION OF SPEED REDUCER

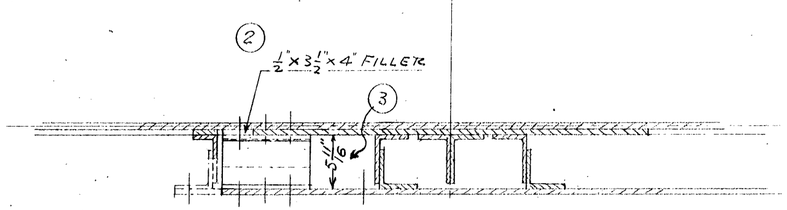
SWING SPAN

END JACKS MECHANISM.

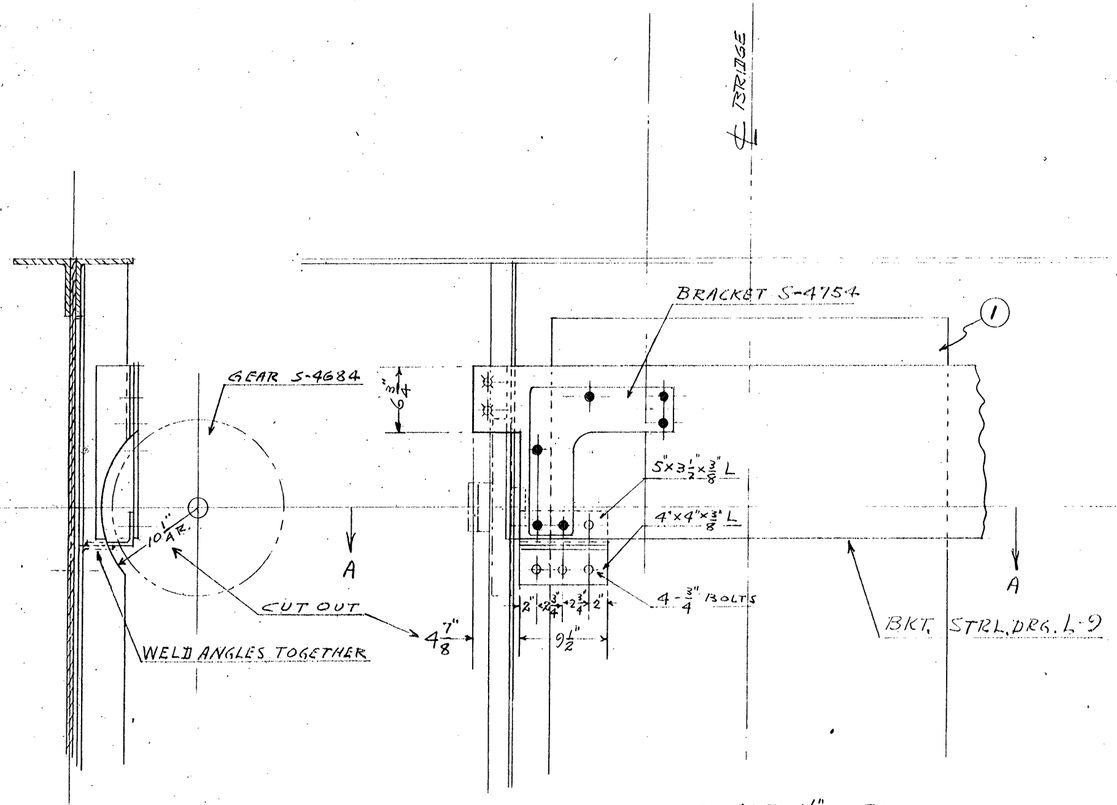
U. S. ENGINEER OFFICE, PORTLAND, OREGON DISTRICT

SUBMITTED: ..... ENGINEER	APPROVED: ..... MAJOR, CORPS OF ENGINEERS
RECOMMENDED: ..... HEAD ENGINEER	DRAWN BY: SWB DATE 2-28-35
	TRACED BY ..... CHECKED BY .....

N-2-79



SECTION A-A



SCALE 1 1/2" = 1 FT.

0 1 2 3 4

SCALE IN FEET

NO.	REVISION	DATE	BY	APP'D
3	DIM. G 1/2" CHANGED TO 5 1/2"	6-25-35	C.W.B.	[illegible]
2	1/2"x3 1/2"x4" FILL PL. ADDED	6-25-35	C.W.B.	[illegible]
1	FILL PL. ADDED TO SUIT N-2-89	6-25-35	C.W.B.	[illegible]

BONNEVILLE POWER NAVIGATION PROJECT

28TH CONTRACT

BRIDGE ACROSS NAVIGATION CANAL

SWING SPAN

ALTERATIONS

CHANGE IN BRACKET TO CLEAR GEAR S-4684

U. S. ENGINEER OFFICE, PORTLAND, OREGON DISTRICT

SUBMITTED: [signature] ENGINEER

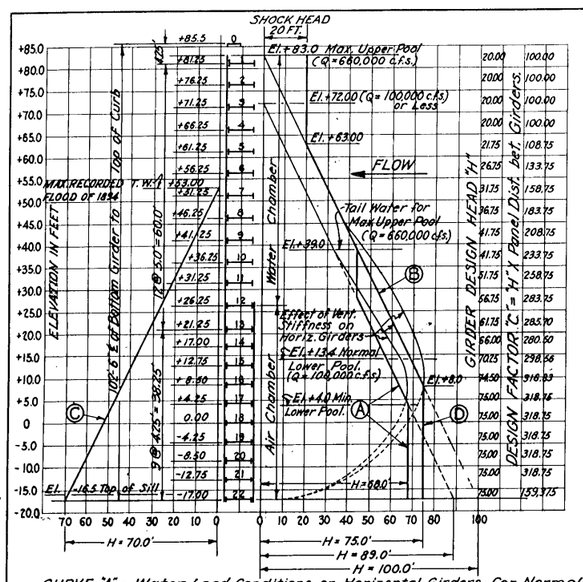
APPROVED: [signature] MAJOR, CORPS OF ENGINEERS

RECOMMENDED: [signature] HEAD ENGINEER

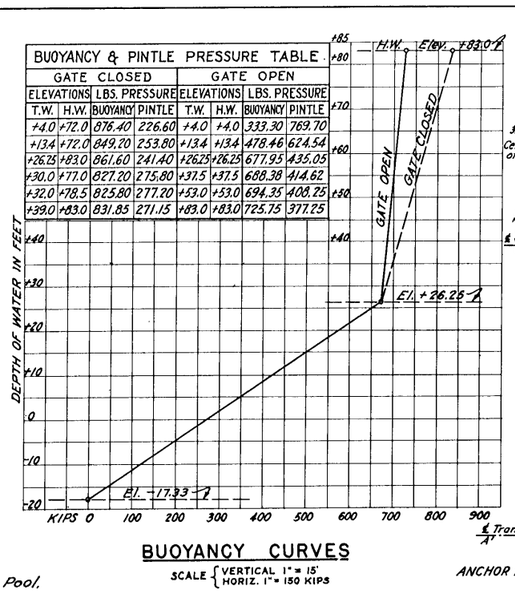
DRAWN BY: C.W.B. DATE 5-8-35

TRACED BY ..... CHECKED BY [illegible]

N-2-80

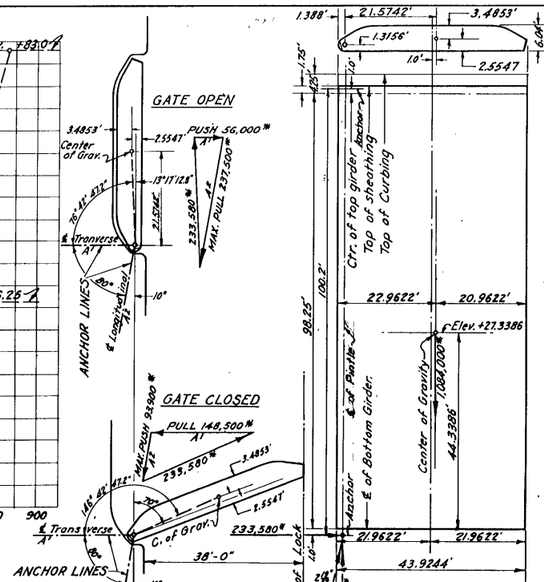


BUOYANCY & PINTLE PRESSURE TABLE.							
GATE CLOSED				GATE OPEN			
ELEVATIONS	LBS. PRESSURE			ELEVATIONS	LBS. PRESSURE		
T.W.	H.W.	BUOYANCY	PINTLE	T.W.	H.W.	BUOYANCY	PINTLE
+4.0	+72.0	876.40	226.60	+4.0	+4.0	333.30	769.70
+13.4	+72.0	849.20	253.80	+13.4	+13.4	478.46	624.54
+26.25	+83.0	861.60	241.40	+26.25	+26.25	677.95	435.05
+30.0	+77.0	827.20	275.80	+31.5	+31.5	688.38	414.62
+32.0	+78.5	825.80	277.20	+53.0	+53.0	694.35	408.25
+39.0	+83.0	831.85	271.15	+83.0	+83.0	725.75	377.25



BUOYANCY CURVES

SCALE { VERTICAL 1" = 15' HORIZ. 1" = 150 KIPS



REACTIONS

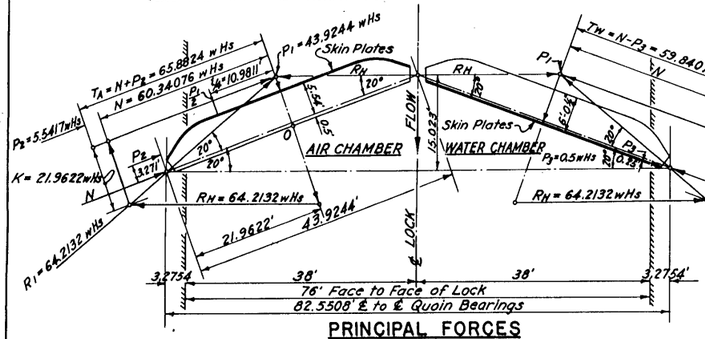
DUE TO WEIGHT OF GATE

SCALE 1" = 15'

CURVE "A" - Water Load Conditions on Horizontal Girders. for Normal Pool.
CURVE "B" - For Design of U.S. Skin Plate in Air Chamber, also
CURVE "B'" - For Design of D.S. Skin Plate above Air Chamber.
CURVE "C" - For Design of D.S. Skin Plate in Air Chamber.
CURVE "D" - Maximum Load Conditions for design of Horizontal Girders with Upper Pool raised by accident or design to Elev. + 83.0 when Lower Pool is at Elev. +8.0. This curve also used for the design of Embedded Quoins.

LOAD DIAGRAM — HORIZONTAL GIRDERS

SCALE: VERTICAL 1" = 15' HORIZONTAL 1" = 30'



PRINCIPAL FORCES

DUE TO WATER PRESSURE

SCALE 3/32" = 1'-0"

EQUATIONS

1. FOR AIR CHAMBER

$JA = \left[(21.9622 \times K) + (0.5 \times N) + (3.271 \times P_2) - (10.9811 \times \frac{P_1}{2})\right] \times \frac{1}{T_A}$

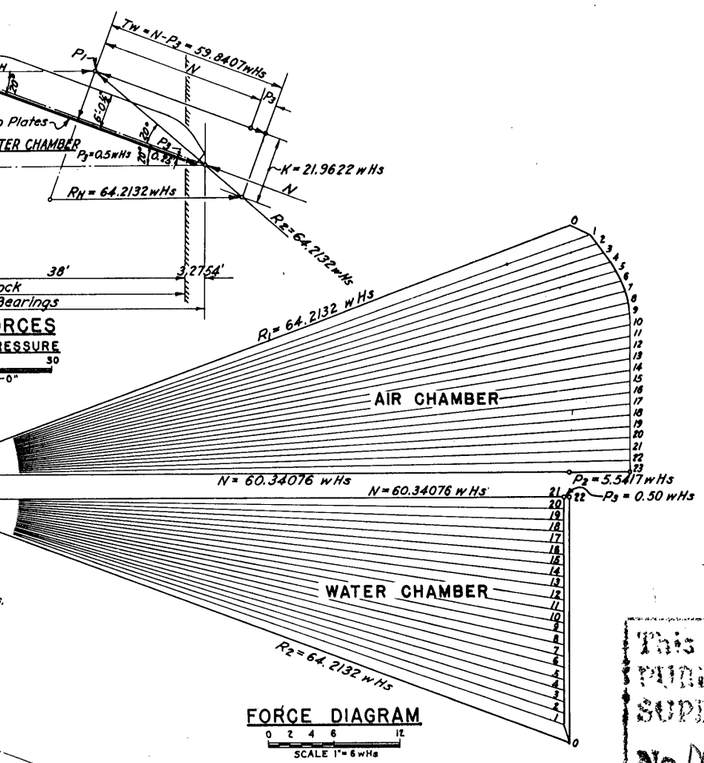
$Fu = (T_A \times JA) \frac{1}{d \times F}$; $Fd = [T_A \times (d - JA)] \frac{1}{d \times F}$

2. FOR WATER CHAMBER

$Jw = \left[(21.9622 \times K) + (0.5 \times N) - (0.25 \times P_3) - (10.9811 \times \frac{P_2}{2})\right] \times \frac{1}{T_W}$

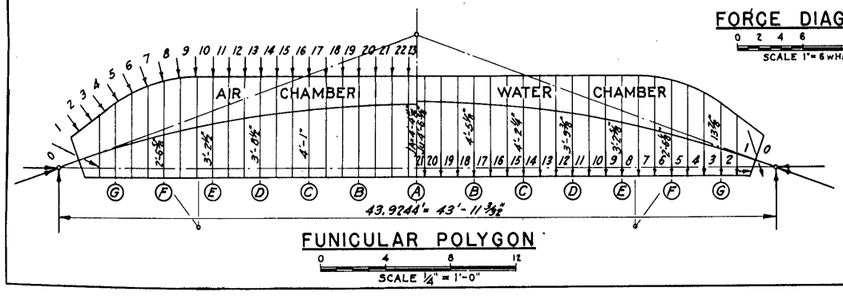
$Fu = (T_W \times Jw) \times \frac{1}{d \times F}$; $Fd = [T_W \times (d - Jw)] \frac{1}{d \times F}$

JA = Dist. from line of pressure to back of downstream flange angle at center of leaf in air chamber.
Jw = Dist. from line of pressure to back of downstream flange angle at center of leaf in water chamber.
T_A = Total force in girder at center of leaf in air chamber, lbs.
T_W = Total force in girder at center of leaf in water chamber, lbs.
Fu = Area required, upstream flange at center of leaf, □"
Fd = Area required, downstream flange at center of leaf, □"
F = Permissible unit stress in flange, lbs. per square inch.
d = Back to back of flange angles = 6'-0½" (6.04')



FORCE DIAGRAM

SCALE 1" = 6 wHs



FUNICULAR POLYGON

SCALE 1/4" = 1'-0"

This Drawing is FOR RECORD PURPOSES ONLY & has been SUPERSEDED BY DRAWING No. N-2-114 Series

MATERIALS

GIRDER NUMBERS			0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1		H_f = Head @ ℄ Girder in Ft.		1.75	6.75	11.75	16.75	21.75	26.75	31.75	36.75	41.75	46.75	51.75	56.75	61.75	66.00	70.25	74.50	78.75	83.00	87.25	91.50	95.75	100.0
2		H = Design Head on ℄ in Ft.		20.00	20.00	20.00	20.00	21.75	26.75	31.75	36.75	41.75	46.75	51.75	56.75	61.75	66.00	70.25	74.50	75.00	75.00	75.00	75.00	75.00	75.00
3		s = Panel Distance bet. Girders		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	4.625	4.25	4.25	4.25	4.25	4.25	4.25	4.25	4.25	2.75
4		C = Design Factor = Hs		100.0	100.0	100.0	100.0	108.75	133.75	158.75	183.75	208.75	233.75	258.75	283.75	285.70	280.50	298.56	316.63	318.75	318.75	318.75	318.75	318.75	206.12
5		P = Load/Lin. Ft. Girds. Kips		6.25	6.25	6.25	6.25	6.797	8.554	10.153	11.752	13.351	14.950	16.549	18.148	18.212	17.940	19.095	20.250	20.386	20.386	20.386	20.386	20.386	20.386
6		P_t = Tot. Load on Girds. Kips		274.5	274.5	274.5	274.5	298.5	367.2	435.8	504.4	573.1	641.7	710.3	779.0	784.3	770.1	819.6	869.2	875.1	875.1	875.1	875.1	875.1	875.1
7		R = 64.2132 X P in Kips		401.3	401.3	401.3	401.3	436.4	536.8	637.1	737.4	837.8	938.1	1038.4	1138.8	1146.6	1125.1	1198.2	1270.7	1279.2	1279.2	1279.2	1279.2	1279.2	1279.2
8		N = 60.3407 X P in Kips		377.1	377.1	377.1	377.1	410.1	504.4	598.7	693.0	787.2	881.5	975.8	1070.1	1077.1	1057.8	1125.9	1194.1	1202.1	1202.1	1202.1	1202.1	1202.1	1202.1
9		K = 21.9622 X P in Kips		137.3	137.3	137.3	137.3	149.3	183.6	217.9	252.2	286.5	320.9	355.2	389.5	392.2	385.0	409.8	434.6	437.5	437.5	437.5	437.5	437.5	437.5
10	DESIGN	F_u = Req'd. U.S. Grass Flge. 11"		14.87	14.87	14.87	14.87	16.17	19.89	23.60	27.32	31.04	34.75	38.46	45.03	45.34	44.52	47.38	50.24	50.59	50.59	50.59	50.59	50.59	50.59
11	D.S. FLANGE	P_d = Req'd. D.S. Gross Flge. 11"		4.95	4.95	4.95	4.95	5.38	6.62	7.89	9.10	10.33	11.57	12.81	16.88	17.00	16.70	17.76	18.84	18.97	18.97	18.97	18.97	18.97	18.97
12		t_f = Req'd. Thick. Web ℔ Shear		.159"	.159"	.159"	.159"	.172"	.212"	.250"	.278"	.332"	.370"	.412"	.450	.454"	.445"	.475"	.502"	.505"	.505"	.505"	.505"	.505"	.505"
13		F_u = Req'd. U.S. Gross Flge. 11"		6.90	6.90	6.90	6.90	7.50	9.23	10.95	12.68	14.40	16.13	17.85	17.25	17.37	17.06	18.15	19.25	19.38	19.38	19.38	19.38	19.38	19.38
14		F_d = Req'd. D.S. Gross Flge. 11"		15.27	15.27	15.27	15.27	16.60	20.42	24.24	28.06	31.88	35.70	39.51	39.33	39.60	38.88	41.38	43.88	44.18	44.18	44.18	44.18	44.18	44.18
15		t_z = Adopted Thick. Web ℔.		5/8"	5/8"	5/8"	5/8"	5/8"	5/8"	5/8"	5/8"	5/8"	5/8"	5/8"	1 1/16"	5/8"	5/8"	5/8"	5/8"	5/8"	5/8"	5/8"	5/8"	5/8"	1"
16		Dbl'g. ℝs @ Quoin & Miter Ends.		1 - 3/8" Plate																2 - 3/8" Plates				2 - 1/2" Plates	
17		Stiffeners		2 L 3 X 3 1/2" X 7/16"																					
18		Girder, Top of Air Chamber		1/8"																					
19		Girder, Bot. of Air Chamber		1"																					
20		Flange Angles		2 L 5 6" X 6" X 1 1/16"								2 L 5 6" X 6" X 3/4"			2 L 5 6" X 6" X 7/8"			2 L 5 6" X 6" X 15/16"							4 L 6 X 6 X 7/16" & 2 L 6 X 6 X 3/4"
21		Effective Size of Sheath. ℔		11 1/4" X 5/8"																					
22		Size of Inside Cover Plates										14" X 1/2"		14" X 5/8"		14" X 3/4"			14" X 7/8"					
23		Size of Outside Cover Plates		14" X 1/2"								13" X 7/8"		13" X 1 1/8"		13" X 1 3/8"			13" X 1 3/4"						14" X 1/2"
24		Area without O.S. Cover ℔s		26.50	15.56	15.56	15.56	15.56	15.56	15.56	15.56	23.88	25.63	25.63	29.96	29.96	29.96	32.99	32.99	32.99	32.99	32.99	32.99	32.99	33.24
25		Area with Outside Cover ℔		33.50	22.56	22.56	22.56	22.56	22.56	22.56	22.56	29.79	32.13	32.13	36.08	36.08	36.08	42.74	42.74	42.74	42.74	42.74	42.74	42.74	43.74
26		Flange Angle		2 L 5 6" X 6" X 7/16"								2 L 5 6" X 6" X 9/16"			2 L 5 6" X 6" X 5/8"			2 L 5 6" X 6" X 3/4"							4 L 6 X 6 X 7/16" & 2 L 6 X 6 X 3/4"
27		Effective Size of Sheath. ℔		11 1/4" X 5/8"																					
28		Size of Cover Plates		13 1/2" X 1/2"								13" X 1/2"			14" X 1/2"					14" X 5/8"					
29		Gross Area with Cover ℔		28.94	19.36	19.36	19.36	19.36	19.36	19.36	19.36	19.86	19.86	21.22	21.22	21.22	21.22	21.22	25.63	25.63	25.63	25.63	25.63	25.63	39.13
30		Net Area with Cover Plate		27.26	17.24	17.24	17.24	17.24	17.24	17.24	17.24	17.24	17.74	18.42	18.42	18.42	18.42	18.42	22.27	22.27	22.27	22.27	22.27	22.27	35.77
31																									
32																									

PANEL NUMBERS			0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20	20-21	21-22
33		Hz in Ft. @ ℄ Between Girders	20.00	20.00	20.00	20.00	20.88	24.25	29.25	34.25	39.25	44.25	49.25	54.25	59.25	63.88	68.13	72.38	76.63	80.88	85.13	89.38	93.63	97.88
34		VHz	4.47	4.47	4.47	4.47	4.57	4.93	5.41	5.85	6.27	6.65	7.02	7.36	7.70	7.99	8.25	8.51	8.75	8.99	9.23	9.45	9.68	9.89
35		Panel Height in Inches	51	60	60	60	60	60	60	60	60	60	60	60	60	51	51	51	51	51	51	51	51	51
36		b - in Inches		45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	22.5
37		S - Required	10.99	10.99	10.99	11.47	13.33	16.07	18.82	21.57	24.31	27.06	29.81	32.55	25.36	27.04	28.72	30.41	32.10	33.78	35.47	37.16	38.84	
38		Intercostal Selected.		2 L 5 3 1/2 X 3 1/2 X 7/16" - 1/2 Plate Diaphragm																				
39		S - Furnished		13.6	13.6	13.6	16.85	16.85	16.85	26.3	26.3	26.3	26.3	26.3	38.0	38.0	38.0	38.0	38.0	38.0	38.0	38.0	38.0	38.0	38.0
40		b - Inches		49	49	49	49	49	49	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5	24.5
41		S - Required													35.45	27.61	29.44	31.27	33.12	34.95	36.78	38.62	40.47	42.30
42		Intercostal Selected													2-8" X 3" Ship L 25.5 #					2 - 9" X 3 1/2" Ship L 3 @ 28.5 #				
43		S - Furnished													35.8	35.8	35.8	35.8	35.8	41.4	41.4	41.4	41.4	41.4
44		b - Inches													32	32	32	32	32	32	32	32	32	32
45		S - Required													11.45	9.56	10.76	11.96	13.16	14.36	15.56	16.76	17.96	19.16
46		Intercostal Selected													1-8" X 3 1/2" Ship L @ 21.4 #							9 X 3 1/2" Sh. L @ 23.9 #		
47		S - Furnished													15.3	15.3	15.3	15.3	15.3	15.3	15.3	18.7	18.7	18.7
48		a - in Inches													41	41	41	41	41	41	41	41	41	17
49		b - in Inches													40.5	40.5	40.5	40.5	40.5	40.5	40.5	40.5	40.5	40.5
50		t - Required in Inches																						
51		t - Furnished													1/16 Of P.L. Will Suf. & 7/16 Buckle Plate - Die No. 29, a = 36", b = 37 1/2"									Skin
52		b - Inches												42	42	42	42	42	42	42	42	42	42	42
53		t - Required																						
54		t - Furnished		3/4" Skin Plate											1/2" X 3/4" Plates (1 1/4" Skin Plate)									
55		a - in Inches		50	50	50	50	50	50	50	50	50	50	41	41	41	41	41	41	41	41	41	41	17
56		b - in Inches		40.5	40.5	40.5	40.5	40.5	40.5	40.5	40.5	40.5	40.5	40.5	40.5	40.5	40.5	40.5	40.5	40.5	40.5	40.5	40.5	40.5
57		t - Required																						
58		t - Furnished		7/8" Skin	7/8" Buckle Plate - Die No. 6; a = 45", b = 37"										7/8" Buckle Plate - Die No. 29, a = 36", b = 37 1/2"									7/8" Skin
59		b - Inches		48"	48"	48"	48"	48"	48"	48"	48"	48"	48"	48"	48"	48"	48"	48"	48"	48"	48"	48"	48"	48"
60		t - Required																						
61		t - Furnished		3/4" Skin											1/2" & 3/4" Plates (1 1/16" Skin Plate)									
62		End Vertical Frames		Spec'l				Web 1/2" Plate							4 L 3 3 1/2" X 3 1/2" X 1/2"									Spec'l
63		Vertical Frames		Spec'l				Web 7/16" Plate							4 L 3 3 1/2" X 3 1/2" X 7/16"									Spec'l
64																								
65		H in Feet	20.0	20.0	20.0	20.0	21.75	26.75	31.75	36.75	41.75	46.75	51.75	56.75	61.75	66.00	70.25	74.50	75.0	75.0	75.0	75.0	75.0	75.0
66		R = Reaction in Kips	401.3	401.3	401.3	401.3	436.4	536.8	637.1	737.4	837.8	938.1	1038.4	1138.8	1146.6	1125.1	1198.2	1270.7	1279.2	1279.2	1279.2	1279.2	1279.2	1279.2
67		V_R = Avge. Bearing Per Vert. Foot	94.3	80.3	80.3	80.3	87.3	107.4	127.4	147.5	167.6	187.6	207.7	246.2	263.8	264.9	281.9	299.0	301.0	301.0	301.0	301.0	301.0	301.0
68		$t_f^3 = \frac{R}{d \times F \times 2}$ d = 72" d = Depth of Diaphragm = 72" F = 13750 #/□" t_f^3 =		243	243	243	264	325	386	447	508	569	629	690	694	682	726	770	775	775	775	775	775	502
69		t_f^3 - Furnished		1/2"	1/2"	1/2"	9/16"	3/8"	3/8"	3/4"	7/8"	7/8"	7/8"	1"	1"	1"	1"	1"	1"	1"	1"	1"	1"	1"
70		Rivet Diameter		7/8"	7/8"	7/8"	7/8"	7/8"	7/8"	7/8"	7/8"	7/8"	1"	1"	1"	1"	1"	1"	1"	1"	1"	1"	1"	1"	1"
71		No. of Rivets Reqd. in Web		19	19	19	17	21	25	24	23	26	24	24	24	24	25	27	27	27	27	27	27	27
72		Field Rivets Reqd. Single Shear One End		34	34	34	37	45	53	62	70	78	67	73	74	72	77	81	81	81	81	81	81	81
73		Top & Bottom Connection L8		2 L 5 6" X 6" X 1/2"				2 L 5 6" X 6" X 3/4"						2 L 5 8" X 8" X 7/8"					2 L 5 8" X 8" X 1"					
74		Vertical Bearing L8		2 L 5 8" X 6" X 7/8"				2 L 5 8" X 6" X 1"						2 L 3 8" X 8" X 7/8"										
75		Fills		2 - 12" X 1/2" Plates										2 - 12" X 5/8" Plates					2 - 14" X 3/4" Plates					
76		Rear Vertical L8												2 L 3 5" X 5" X 3/8"										
77		Web Stiffeners L8 U.S. & D.S.												2 L 3 4" X 4" X 1/2"					2 L 5 5" X 5" X 1/2"					
78		S - Required	151	151	151	164	201	239	277	314	351.8	389	427	365.5	359	382	405	407	408	408	408	408	408	408
79		C_1 = Dist. from N.A. to Outside-Inch	20	20	20	20.7	20.7	20.7	21.2	21.2	21.2	21.2	21.2	20.3	20.3	20.3	20.3	21	21	21	21	21	21	21
80		I - Furnished. Inch⁴		10226.0			13222.0			15201.8			16763.6				17902.0							
81		S - Furnished. Inch³ Compres'n.		510.0			645.0			720.0			825.0				849.2							
82		End Plates, Bent.		2 - 1/4" Plates, Bent.																				
83		End Doubling Plates, Bent		1 - 7/8" Plate, Flanged.																				
84		U.S. Doubling Plates, Bent		7/8" Doub. Pl. & 3/4" I.S. Pl.										3/4" Plate (Outside) & 7/8" Plate (Inside)										
85		D.S. Doubling Plates, Bent		7/8" Doub. Pl. & 7/8" I.S. Pl.										3/4" Plate (Outside) & 7/16" Plate (Inside)										
86																								

GENERAL NOTES

For General Notes - See Sheet No. 2, N-2-81

REFERENCES

For Design Specifications - Sh. No. 1, N-2-81

SEE DRAWING No. N-2-114 Series FOR CURRENT REVISIONS

NO.	REVISION	DATE	BY	APV'D

BONNEVILLE POWER NAVIGATION PROJECT

36TH CONTRACT — LOCK OPERATING EQUIPMENT

LOWER MITER GATE

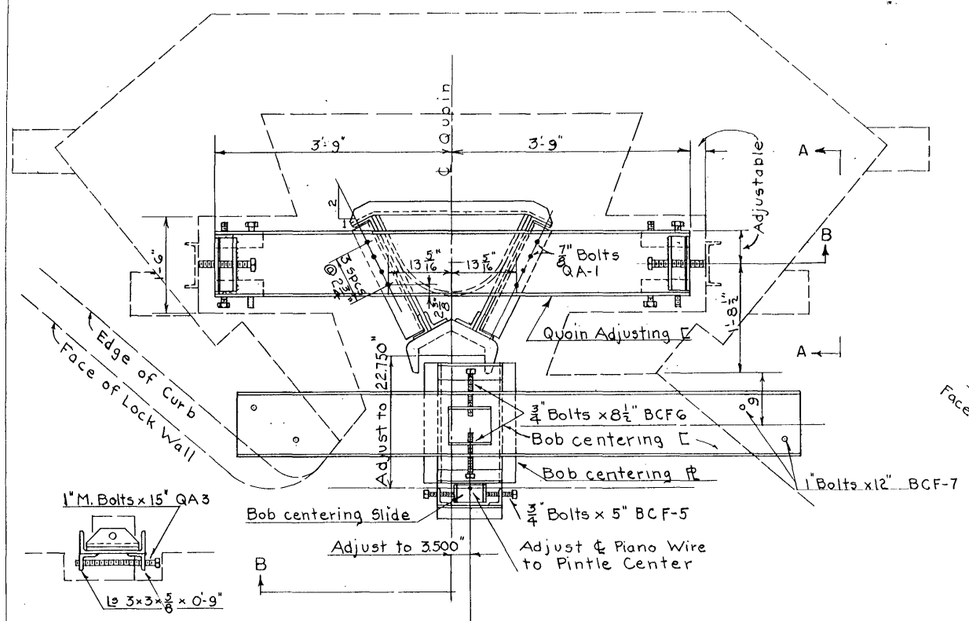
DESIGN DATA

SCALES AS SHOWN

U. S. ENGINEER OFFICE, PORTLAND, OREGON DISTRICT

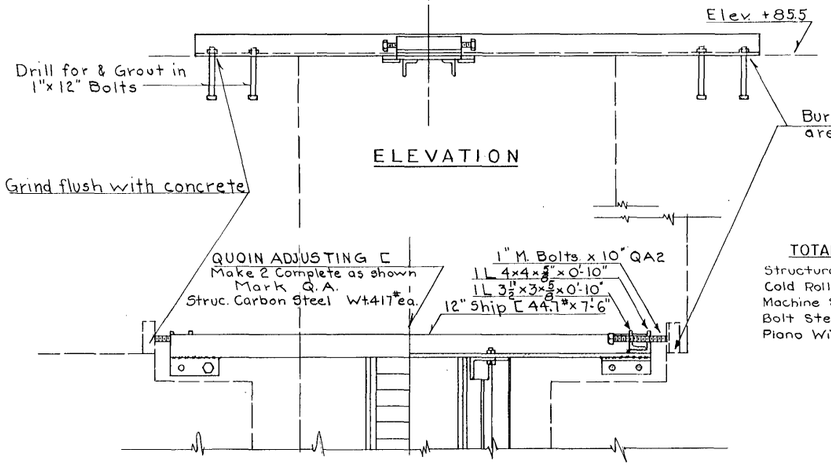
SUBMITTED R. MacKenzie, ENGINEER — APPROVED D. Williams, MAJOR, CORPS OF ENGINEERS

RECOMMENDED Ed Greimann, HEAD ENGINEER — DESIGNED BY A.A.Q. & F.T.O. DATE 6-17-35 — DR. BY M.R.L. TR. BY J.A.S. CHECKED BY



ELEVATION "A-A"

PLAN

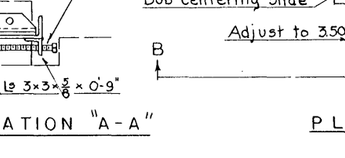


ELEVATION

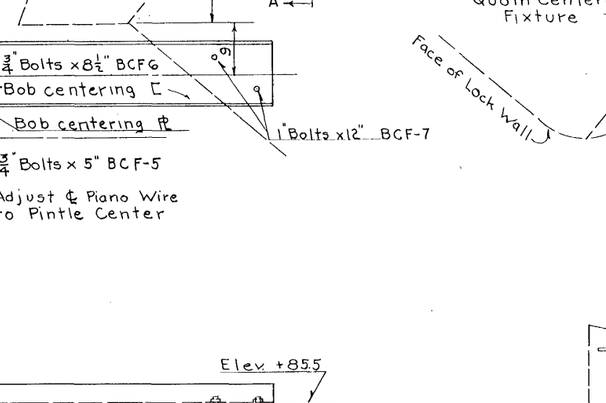
SECTION "B-B"

ARRANGEMENT AT TOP OF QUOIN

SCALE IN FEET



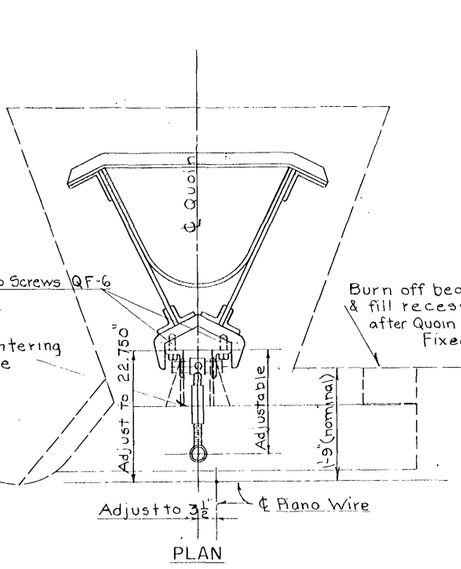
BOB CENTERING SLIDE
One Req'd per fixture Mark BCF-1
Struct. Carbon Steel Wt. 8.3# each



BOB CENTERING PLATE
One Req'd per fixture Mark BCF-2
Struct. Carbon Steel Wt. 125# each

BOB CENTERING FIXTURE
Make 2 Thus Complete Mark BCF

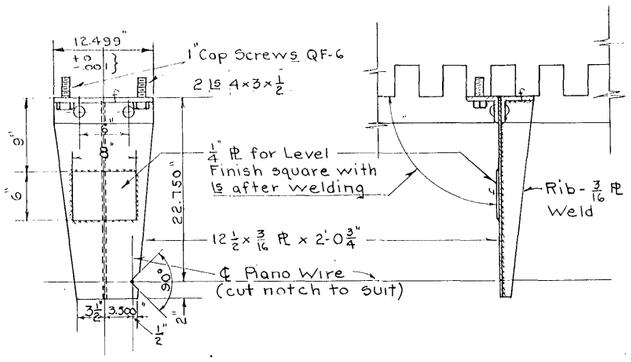
SCALE IN FEET

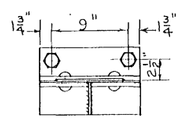


PLAN

BOLT SCHEDULE

BOLTS		
Size	No.	Mark
7/8 x 2 1/4	16	QA-1
3/4 x 5	4	BCF-5
3/4 x 8 1/2	4	BCF-6
1 x 10	4	QA-2
1 x 10 1/2	16	QF-5
1 x 12	16	BCF-7
1 x 15	8	QA-3
1/2 x 2 1/2	6	BCF-4
Nuts for QA1 & BCF4 only		
CAP SCREWS		
1 x 1 3/4	24	QF-6
SET SCREWS		
1/4 x 1 1/2	8	QF-7



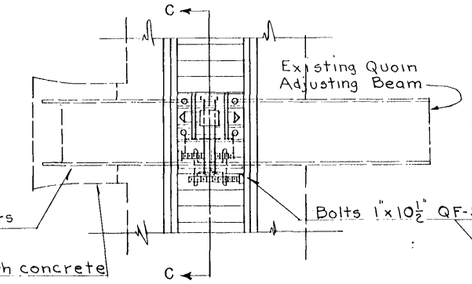


QUOIN ADJUSTING GAUGE

Make 2 Thus Mark Q.G-R.
Make 2 Opp. Hand Mark Q.G.-L.

SCALE IN FEET

Str. Carbon Steel - Finish as shown Wt 47# ea.



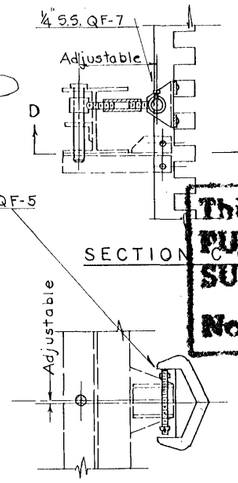
ELEVATION

ARRANGEMENT AT INTERMEDIATE POINTS

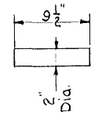
SCALE IN FEET

TOTAL ESTIMATED WEIGHTS

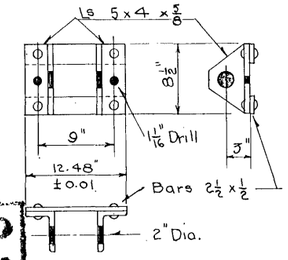
Structural Carbon Steel	2382 #
Cold Rolled Steel	230 #
Machine Steel	184 #
Bolt Steel	230 #
Piano Wire (#30) - 250'	5 #



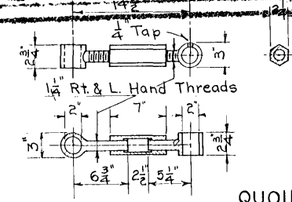
SECTION "D-D"



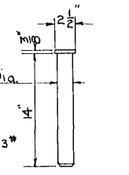
PIN
One Req'd per fixture
Mark Q.F.-1
Struct Carbon Steel Wt. 8.5#



BRACKET
One Req'd per fixture
Mark Q.F.-2
Struct Carbon Steel
Wt. 30# each



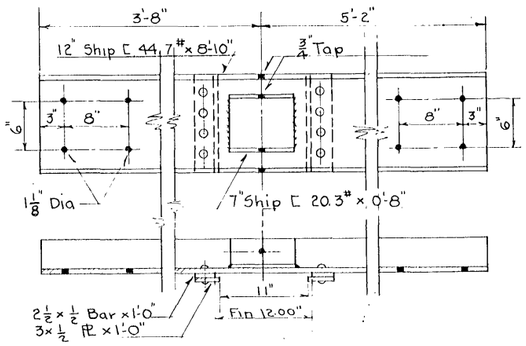
TURNBUCKLE
One Req'd per fixture
Mark Q.F-3
Machine Steel Wt. 23#



PIN
One Req'd per fix.
Mark QF-4
C.R. Steel Wt. 20.3#

QUOIN CENTERING FIXTURE
Make 8 Complete Thus Mark QF

SCALE IN FEET



BOB CENTERING CHANNEL
One Req'd per fixture Mark BCF-3
Struct Carbon Steel Wt 427# each

GENERAL NOTES

Contractor shall Furnish Piano Wire And Suitable Plumb Bobs Or Other means of Hanging And Locate As Directed.

REFERENCES

For Embedded Quoin Posts See N-2-81 Sheets 4 & 5; N-2-82 Sheet 3 Location, Etc. See N-1-52 Sheet 2

This Drawing is FOR RECORD PURPOSES ONLY & has been SUPERSEDED BY DRAWING No. N-2-114 Series

NO.	REVISION	DATE	BY	APV'D

BONNEVILLE POWER NAVIGATION PROJECT
36TH CONTRACT - LOCK OPERATING EQUIPMENT
LOWER MITER GATE
ADJUSTMENT FACILITIES
FOR EMBEDDED QUOIN POSTS
SCALES AS SHOWN
U S ENGINEER OFFICE, PORTLAND, OREGON DISTRICT

SUBMITTED: R.O. Mackenzie, ENGINEER
APPROVED: Thos. M. Williams, MAJOR, CORPS OF ENGINEERS
RECOMMENDED: HEAD ENGINEER
DRAWN BY: F.A.H. DATE 6-17-35
DESIGNED BY: A.A.O. & F.F.O.
TRACED BY: F.A.H. CHECKED BY

NO	REVISION	DATE	BY	APV'D

SECTION A-A

DOWNSTREAM ELEVATION

SCALE IN FEET 0 5 10 15 20

SECTION B-B

TYPICAL VERTICAL FRAME

PLAN

UPSTREAM ELEVATION

SECTION J-J

SECTION H-H

SECTION G-G

SECTION F-F

SECTION C-C

END VERT. FRAME

SECTION D-D

END REACT. DIAPH.

SECTION E-SEE DRAWING No. N-2-114 Sheet 1

FOR CURRENT REVISIONS

MATERIALS

Buckle Plates	Struct. Carbon Steel	A.S.T.M. A-7-34
Flat Plts. & Doubling Plts.	Struct. Silicon Steel	" " " A-94-33
Quoin & Miter Posts	Struct. Silicon Steel	" " " A-94-33
Horizontal Girders	Struct. Silicon Steel	" " " A-94-33
End Vertical Frames	Struct. Carbon Steel	" " " A-7-34
Vertical Frames	Struct. Carbon Steel	" " " A-7-34
Intercostals, Main & Intermediate	Struct. Carbon Steel	" " " A-7-34
Miscellaneous Plates, Ls & Clips	Struct. Carbon Steel	" " " A-7-34
End Reaction Diaphragms	Struct. Silicon Steel	" " " A-94-33
Rivets	Carbon Steel	" " " A-141-33
Rivets	Nickel Steel	" " " A-8-29

GENERAL NOTES

Gate Leaves shall be watertight in Air Chamber and downstream side of Water Chamber.

Caulking Edges shall be planed to 60° bevel; Maintain edge distance for Caulking. Rolled edge caulking will not be permitted.

Welding will not be permitted for water tightness except parts that are inaccessible after erection.

Rivet Holes: For ⅞" Rivets, subpunch to 13/16" and ream to 15/16". For 1" Rivets, subpunch to 1⅛" and ream to 1 1/16".

Unwatering Pump Well, Sounding Pipes and Drainage Holes shall be provided

Timber Fenders shall be Provided on the Downstream of Gate Leaf also in Miter Gate Recess

REFERENCES

Sheet 1. Design Data
" 2. General Assembly
" 3. Quoin & Miter Castings
" 4. Embedded Quoin Post, Elev.
" 5. Embedded Quoin Post, Sections and Details.
" 6. Pintle Castings, Assembly and Details.
" 7. Lower Seals, Arrangement and Details.
" 8. Air Chamber Girders, 15-20, & Connections.
" 9. Top Girder Anchorage & Strut Connections.
Sheet 10. Embedded Quoin Post Adjustment.

This Drawing is FOR RECORD PURPOSES ONLY & has been SUPERSEDED BY DRAWING No. N-2-114 Sheet 1

BONNEVILLE POWER NAVIGATION PROJECT

36TH. CONTRACT—LOCK OPERATING EQUIPMENT

LOWER MITER GATE.

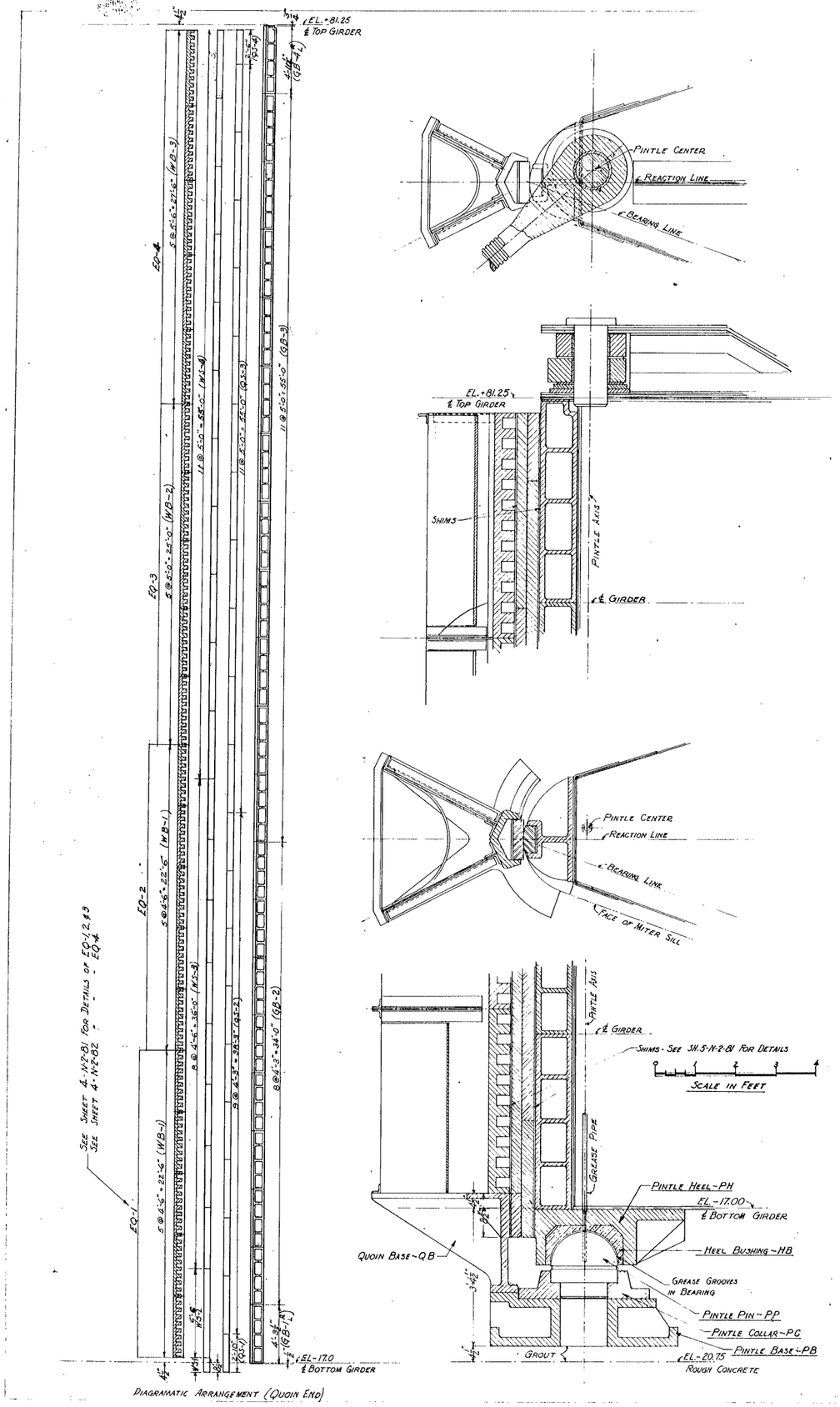
GENERAL ASSEMBLY.

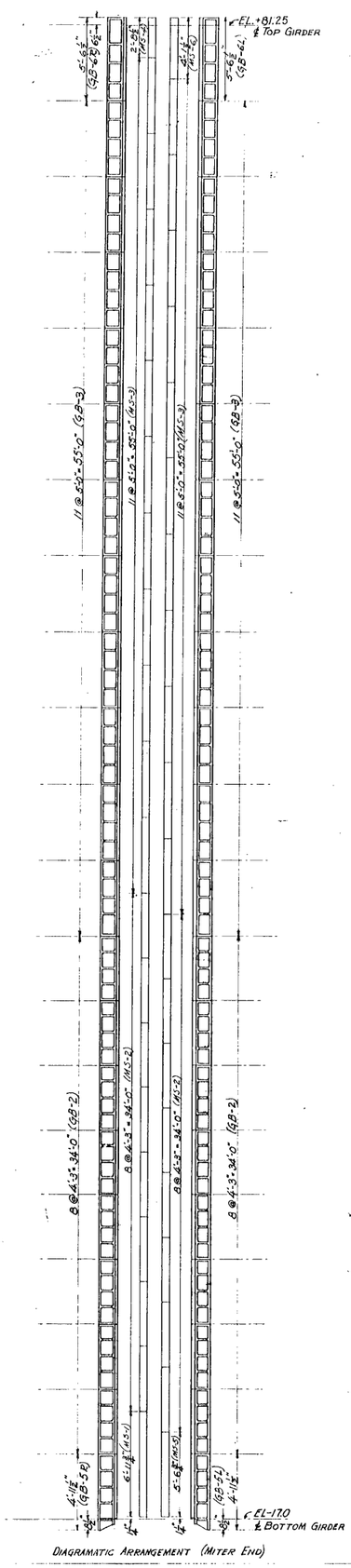
SCALES AS SHOWN

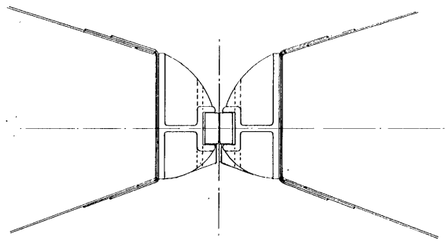
U.S. ENGINEER OFFICE, PORTLAND, OREGON DISTRICT

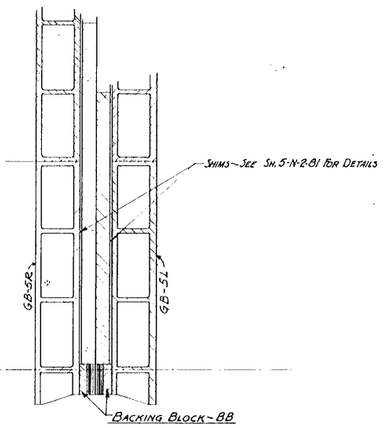
SUBMITTED R. D. Mackenzie, ENGINEER — APPROVED H. Williams, MAJOR, CORPS OF ENGINEERS

RECOMMENDED [illegible], HEAD ENGINEER — DESIGNED BY A.A.G & E.C.O DATE 6-17-35 — DR. BY G.S.D. TR. BY J.A.S. CHECKED BY

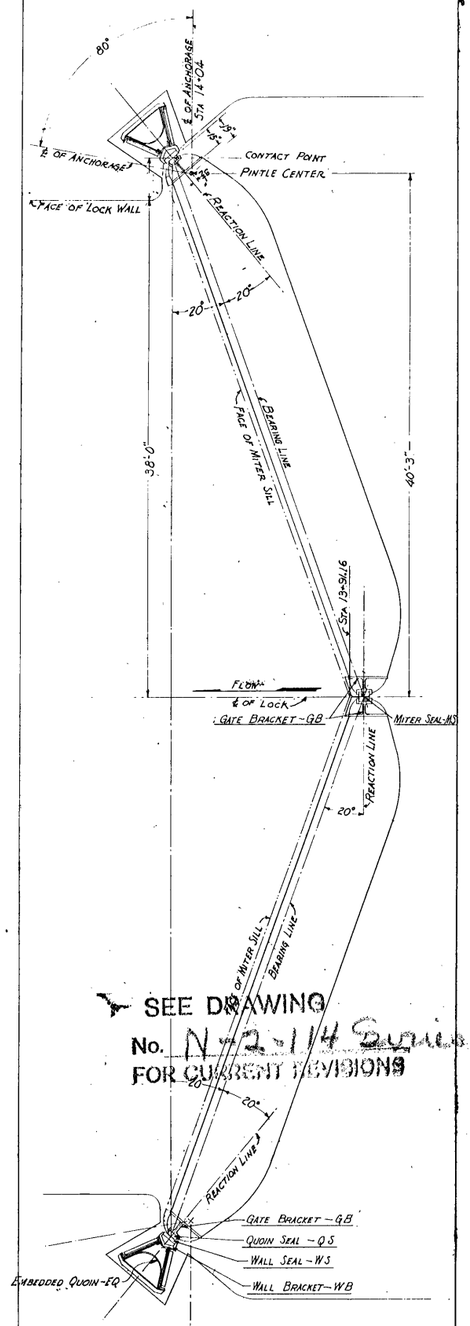








GATE BRACKET (MITER END) GB



MARKING DIAGRAM

0 2 4 6 8 10

SCALE IN FEET

QUOIN AND MITER CASTINGS
LOWER MITER GATE

NAME	SYMBOL	No. REQ'D.	MATERIAL	WEIGHT EACH	WEIGHT TOTAL	DETAILED ON DWG. NO.
PINTLE BASE	PB	2	CARBON STEEL CASTING	4675	9350	SH. 6-N-2-81
PINTLE COLLAR	PC	2	" " "	1425	2850	" " " "
PINTLE PIN	PP	2	FORGED NICKEL STEEL	1235	2470	" " " "
HEEL BUSHING	HB	2	BRONZE CAST, GRADE 4	790	1580	" " " "
PINTLE HEEL	PH-R	1 Rt.	CARBON STEEL CASTING	3420	3420	" " " "
PINTLE HEEL	PH-L	1 Lt.	" " "	3420	3420	" " " "
QUOIN BASE	QB-R	1 Rt.	" " "	1940	1940	" " " "
QUOIN BASE	QB-L	1 Lt.	" " "	1940	1940	" " " "
WALL BRACKET	WB-1	20	" " "	1051	21020	SH 3-N-2-82
WALL BRACKET	WB-2	10	" " "	1170	11700	" " " "
WALL BRACKET	WB-3	10	" " "	1290	12900	" " " "
WALL SEAL	WS-1	2	FORGED STEEL	84	168	SH 6-N-2-81
WALL SEAL	WS-2	2	" "	910	1820	SH-3-N-2-82
WALL SEAL	WS-3	16	" "	624	9984	" " " "
WALL SEAL	WS-4	22	" "	695	15290	" " " "
QUOIN SEAL	QS-1	2	" "	265	530	" " " "
QUOIN SEAL	QS-2	18	" "	397	7146	" " " "
QUOIN SEAL	QS-3	22	" "	467	10274	" " " "
QUOIN SEAL	QS-4	2	" "	233	466	" " " "
GATE BRACKET	GB-1R	1 Rt.	CARBON STEEL CASTING	1519	1519	
GATE BRACKET	GB-1L	1 Lt.	" " "	1519	1519	
GATE BRACKET	GB-2	32	" " "	1789	57248	SH. 3-N-2-82
GATE BRACKET	GB-3	44	" " "	2018	88792	" " " "
GATE BRACKET	GB-4R	1 Rt.	" " "	2000	2000	
GATE BRACKET	GB-4L	1 Lt.	" " "	2000	2000	
GATE BRACKET	GB-5R	1 Rt.	" " "	1948	1948	
GATE BRACKET	GB-5L	1 Lt.	" " "	1948	1948	
GATE BRACKET	GB-6	1 Rt. - 1 Lt.	" " "	2184	4368	
MITER SEAL	MS-1	1	FORGED STEEL	652	652	SH-3-N-2-82
MITER SEAL	MS-2	16	" "	397	6352	" " " "
MITER SEAL	MS-3	22	" "	467	10274	" " " "
MITER SEAL	MS-4	1	" "	253	253	" " " "
MITER SEAL	MS-5	1	" "	519	519	" " " "
MITER SEAL	MS-6	1	" "	385	385	" " " "
BACKING BLOCK	BB	2	CARBON STEEL CASTING	10	20	

NOTES

REFERENCES

Weights Of Seal Shims Are Listed On Dwg. Sheet 3 N-2-82

See Sheet 4 N-2-81 For Details Of EQ1, 2 & 3.

See Sheet 4 N-2-82 " " " EQ4

This Drawing is FOR RECORD PURPOSES ONLY & has been SUPERSEDED BY DRAWING No. N-2-114 Series

NO.	REVISION	DATE	BY	APP'D

BONNEVILLE POWER NAVIGATION PROJECT

36 TH CONTRACT — LOCK OPERATING EQUIPMENT

LOWER MITER GATE

QUOIN AND MITER CASTINGS

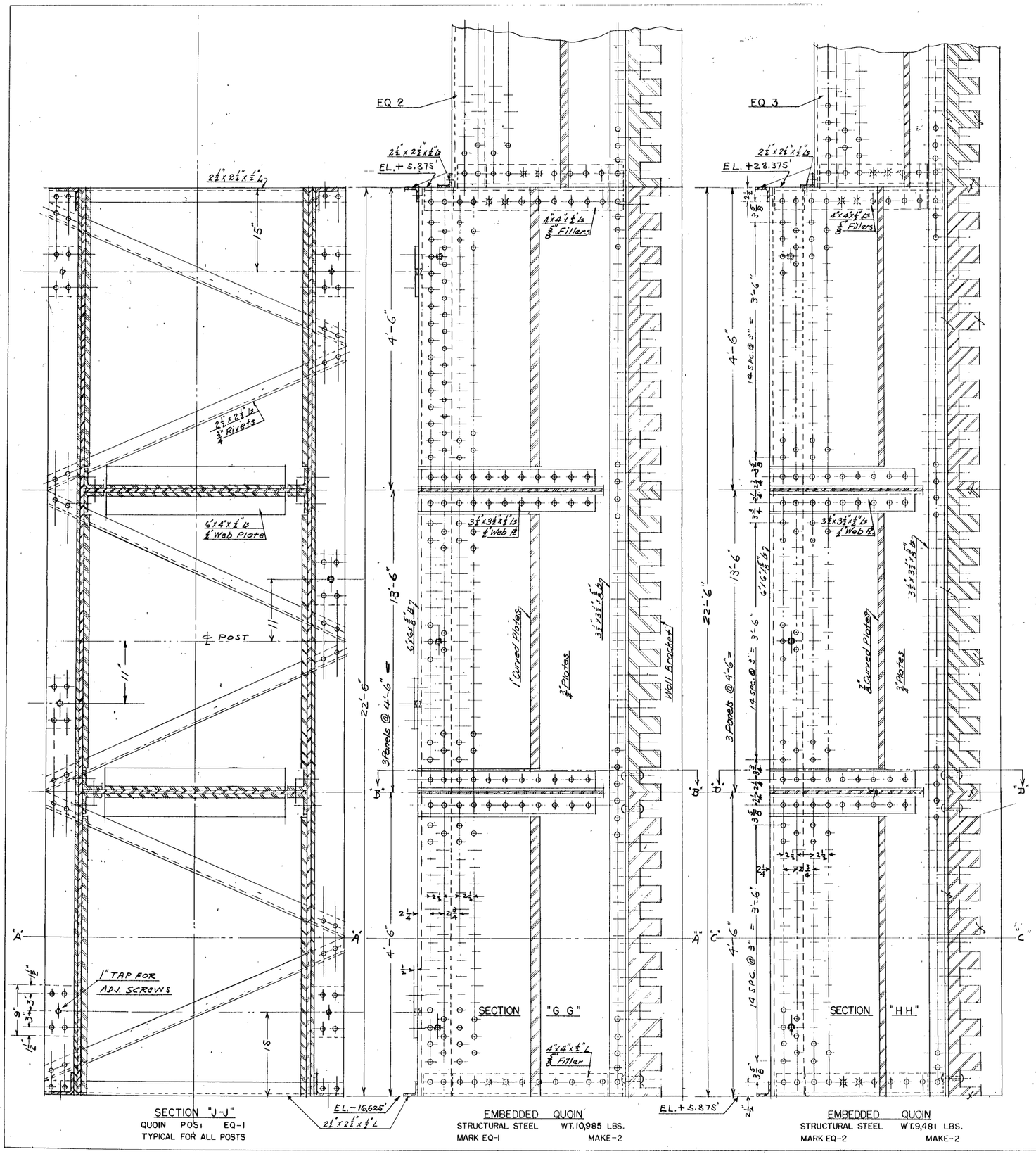
SCALES AS SHOWN

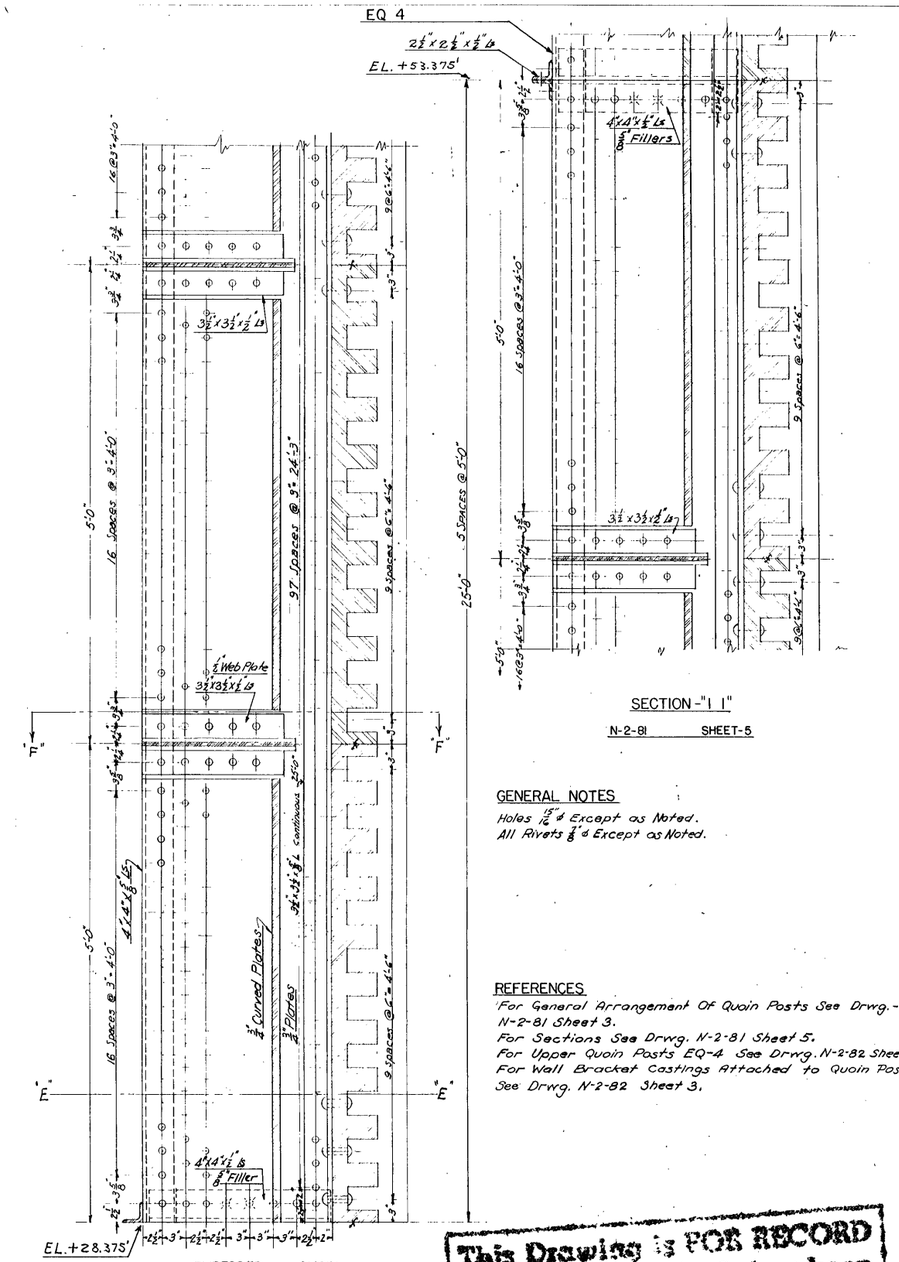
U. S. ENGINEER OFFICE, PORTLAND, OREGON DISTRICT

SUBMITTED: K. Mackenzie, ENGINEER — APPROVED: Williams, MAJOR, CORPS OF ENGINEERS

RECOMMENDED: [illegible], HEAD ENGINEER

DRAWN BY: A.C.D. DATE 6-17-35
DESIGNED BY: F.A.R. & F.T.D.
TRACED BY A.C.D. CHECKED BY





SECTION - "I I"

N-2-81 SHEET-5

GENERAL NOTES

Holes 15/16" ϕ Except as Noted.
All Rivets ⅞" ϕ Except as Noted.

REFERENCES

For General Arrangement Of Quoin Posts See Drwg.- N-2-81 Sheet 3.
For Sections See Drwg. N-2-81 Sheet 5.
For Upper Quoin Posts EQ-4 See Drwg. N-2-82 Sheet 4.
For Wall Bracket Castings Attached to Quoin Posts See Drwg. N-2-82 Sheet 3.

SCALE - 1½" = 1'-0"

0 1 2 3

SCALE IN FEET

This Drawing is FOR RECORD PURPOSES ONLY & has been SUPERSEDED BY DRAWING No. N-2-114 Series

NO.	REVISION	DATE	BY	APV'D

BONNEVILLE POWER NAVIGATION PROJECT
36 TH CONTRACT- LOCK OPERATING EQUIPMENT

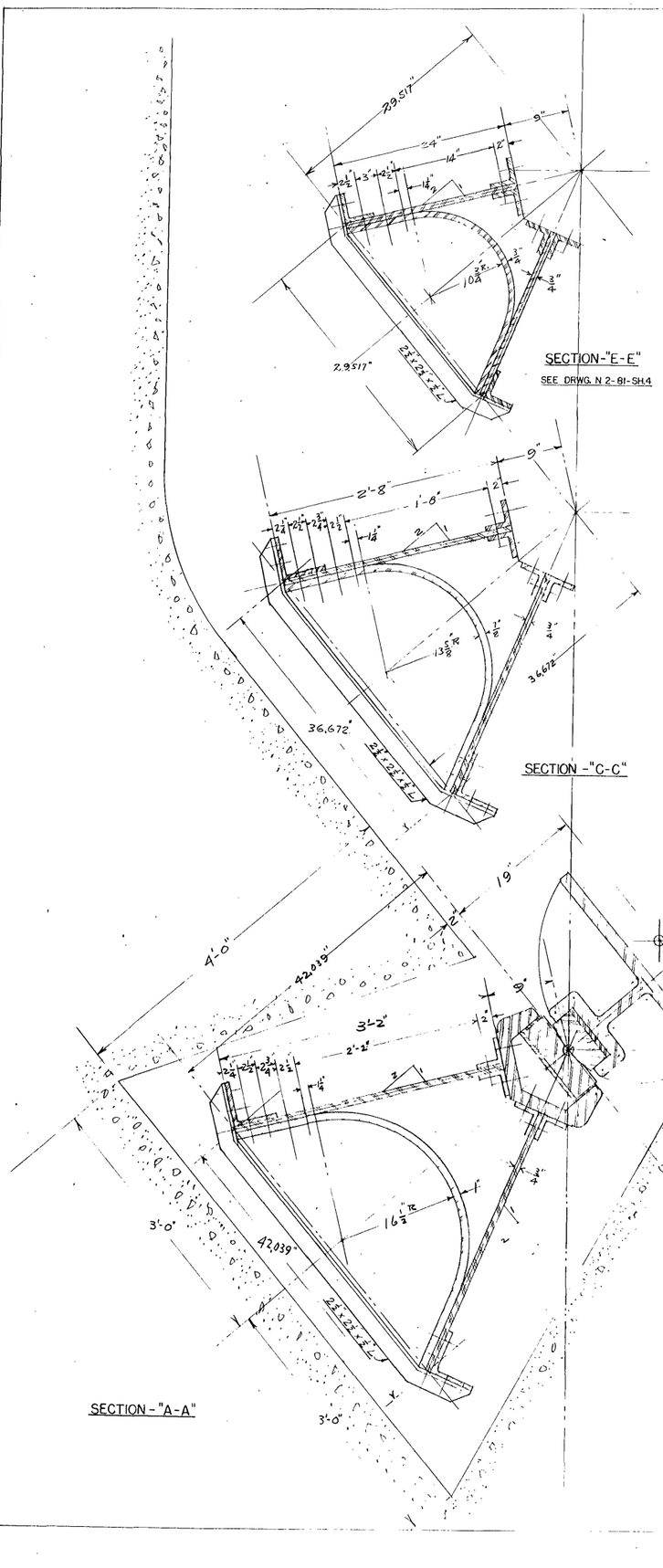
LOWER MITER GATE
EMBEDDED QUOIN POST, ELEVATIONS
SCALES AS SHOWN

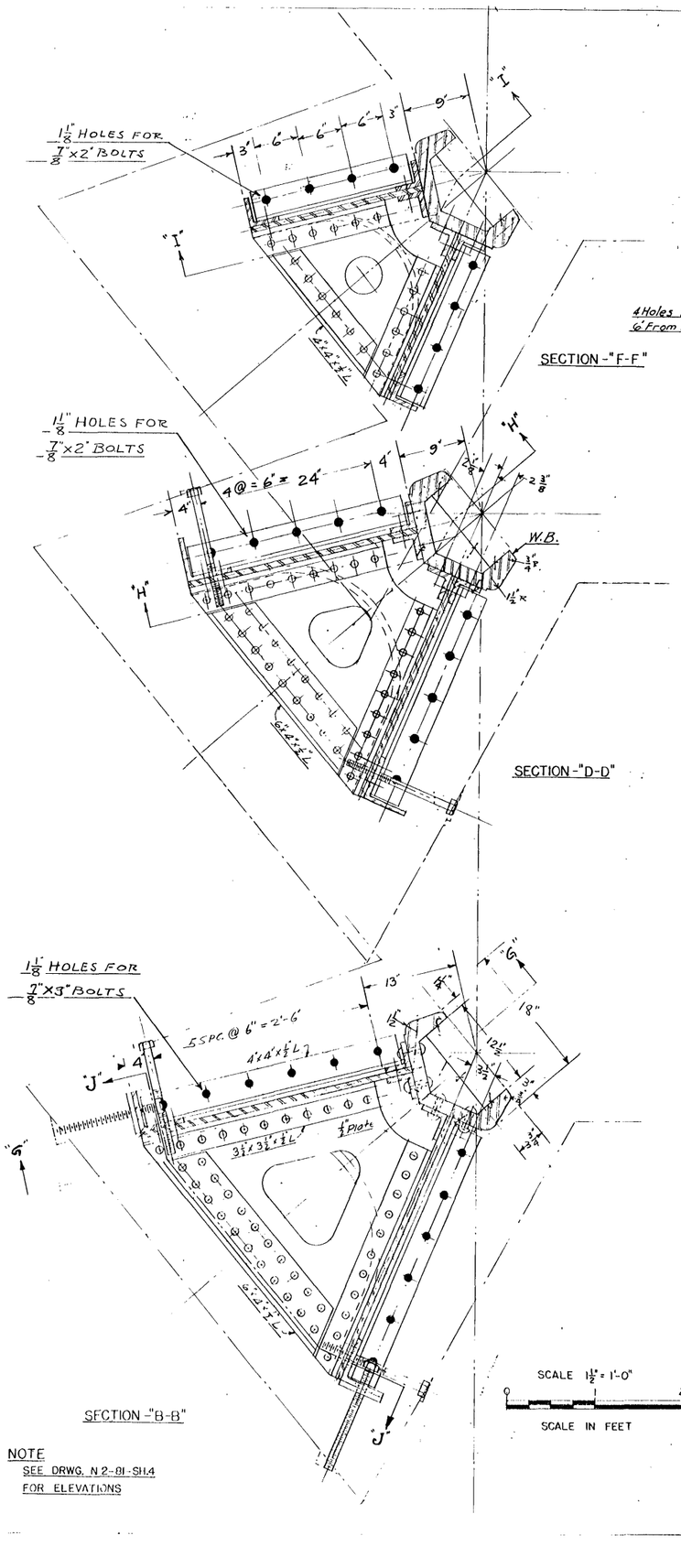
U S ENGINEER OFFICE, PORTLAND, OREGON DISTRICT

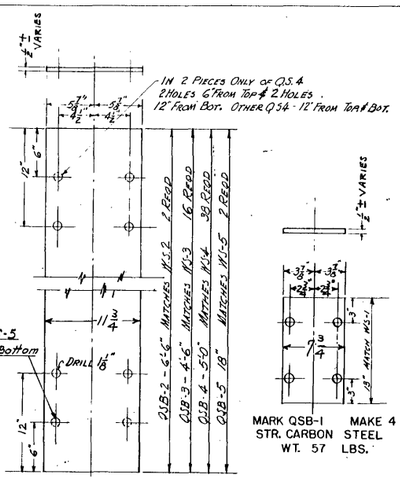
SUBMITTED R.E. Mackenzie ENGINEER
APPROVED O.H. Williams MAJOR, CORPS OF ENGINEERS
RECOMMENDED [illegible] HEAD ENGINEER
DRAWN BY C.W.B. DATE 6-17-55
DESIGNED BY C.A.S. & F.T.B.
TRACED BY C.W.B. CHECKED BY

WAR DEPARTMENT

CORPS OF ENGINEERS U.S. ARMY

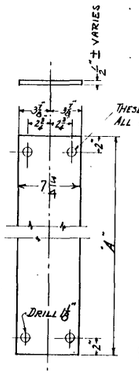






EMBEDDED QUOIN SHIMS-BACK
STR. CARBON STEEL WT. 5,554 LBS.
MARK-QSB-2T05

EMBEDDED QUOIN SHIMS-SIDE
STR. CARBON STEEL WT. 1774 LBS.
MARK-QSS-2T05



MARK	"A"	MATCHES	REQ'D.
GS-1	1'5"	QS-5	4
GS-2	2'-6"	QS-4	2
GS-3	2'-8½"	MS-7	1
GS-4	2'-8½"	MS-4	1
GS-5	2'-9½"	MS-9	1
GS-6	2'-10"	QS-1	2
GS-7	4'-1½"	MS-6	1
GS-8	4'-3"	MS-2 & QS-2	34
GS-9	4'-10¾"	MS-8	1
GS-10	5'-0"	MS-3 & QS-3	75
GS-11	5'-6¾"	MS-5	1
GS-12	6'-11½"	MS-1	1

QUOIN & MITER POST SHIMS
STR. CARBON STEEL WT. 7,580 LBS.
MARK-GS-1 TO 12

GENERAL NOTES
Shims To Be Planed In The Field To Insure Perfect Fit Of All Seals As Specified. The Thickness Given For These Shims Is Nominal.
Holes 1⅛" Except As Noted.
All Rivets ⅞" Except As Noted.
Weights Of Shims Are Total Amounts.
Vertical Web Plates Finished To Bear On Wall Brackets W.B.

REFERENCES
For Elevations Of Quoin Posts See Drwgs. N-2-81 & N-2-82 Sheet 4.

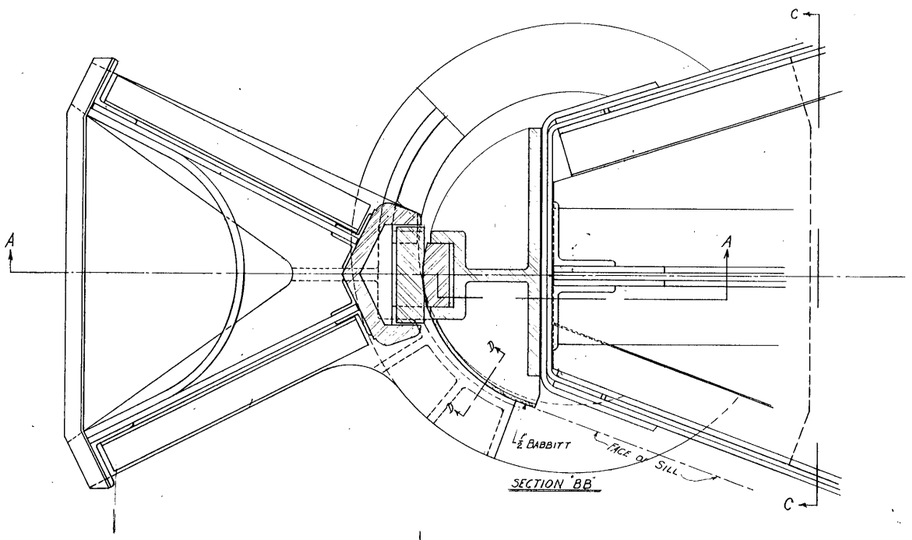
SCALE 1½" = 1'-0"
0 2
SCALE IN FEET

This Drawing is FOR RECORD PURPOSES ONLY & has been SUPERSEDED BY DRAWING No. N-2-114 Series

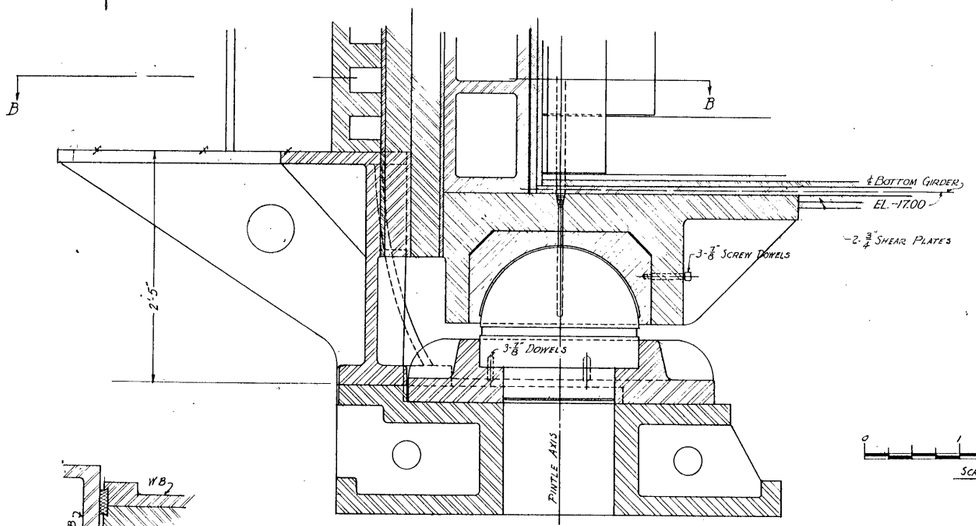
NO.	REVISION	DATE	BY	APV'D

BONNEVILLE POWER NAVIGATION PROJECT
36 TH CONTRACT-LOCK OPERATING EQUIPMENT
LOWER MITER GATE
EMBEDDED QUOIN POST, SECTIONS & DETAILS
SCALES AS SHOWN
U S ENGINEER OFFICE, PORTLAND, OREGON DISTRICT
SUBMITTED: R. Mackenzie ENGINEER
APPROVED: H. Williams MAJOR, CORPS OF ENGINEERS
RECOMMENDED: HEAD ENGINEER
DRAWN BY: C.W.B. DATE 6-17-35
DESIGNED BY: L.G.C. & C.C.D.
TRACED BY: A.C.M. CHECKED BY:

SHEET 5 N-2-81



SECTION "BB"



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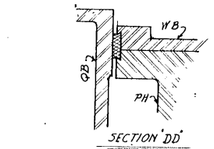

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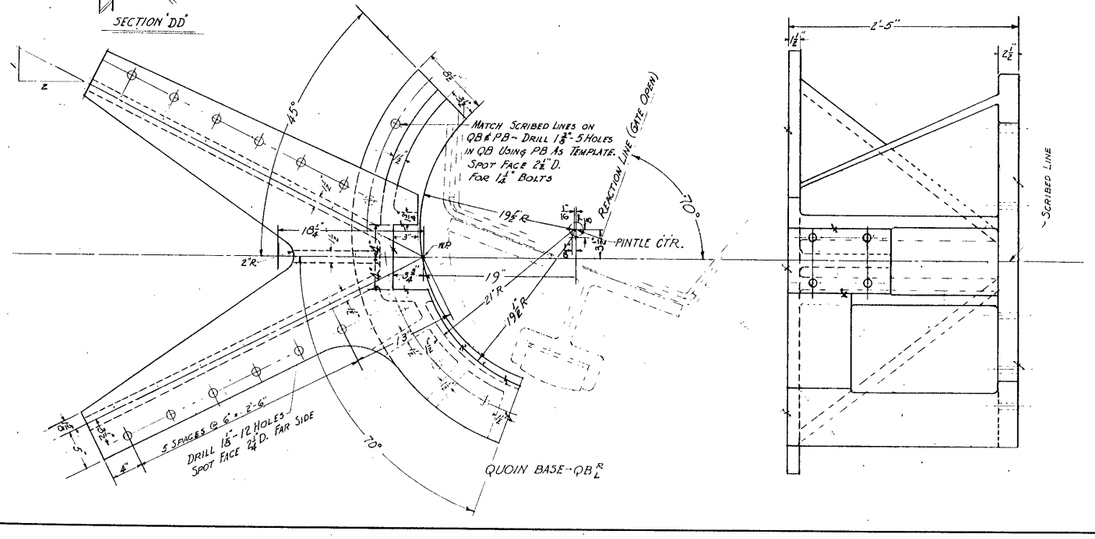
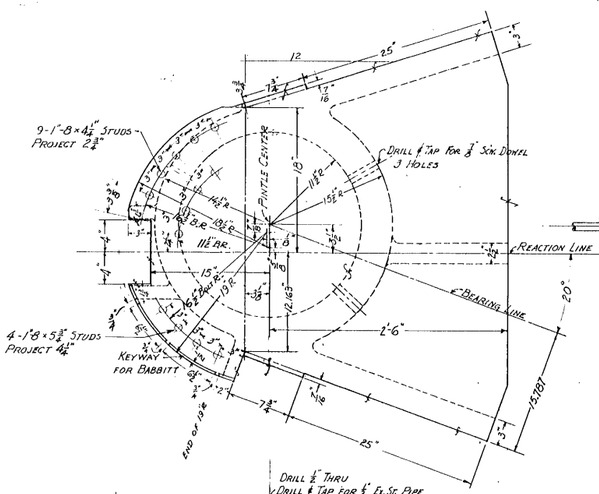
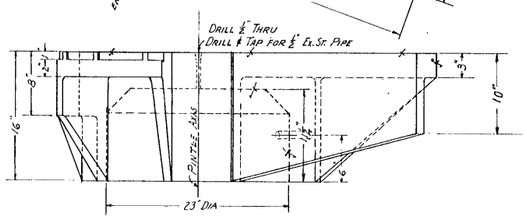


0 1 2 3

SCALE IN FEET

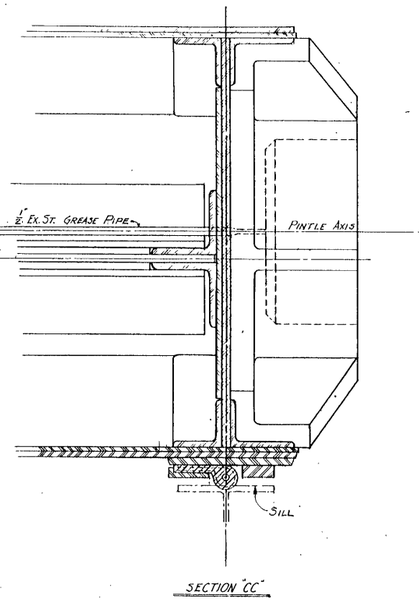




PINTLE HEEL PH R

CARBON STEEL CASTING

Two As Shown PH-R
Two Opposite PH-L



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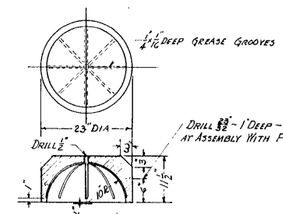
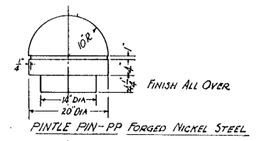
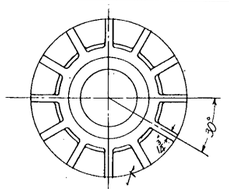


HEEL BUSHING-HB

PHOS BRONZE

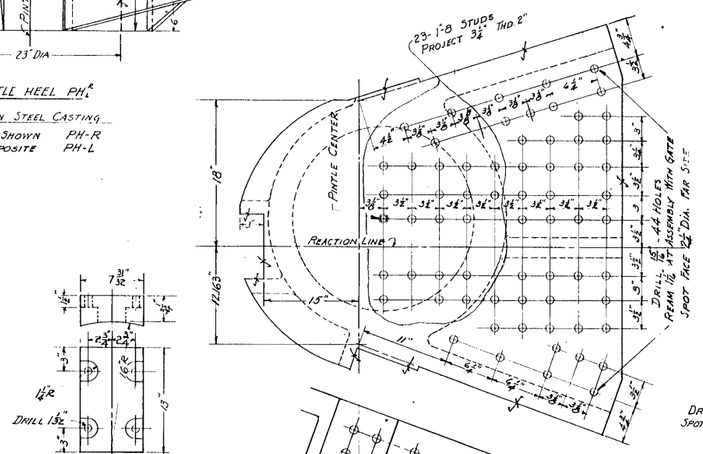


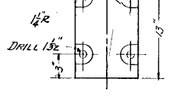
PINTLE PIN-PP FORGED NICKEL STEEL



PINTLE COLLAR-PC

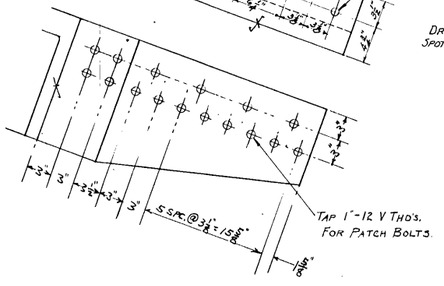
CARBON STEEL CASTING





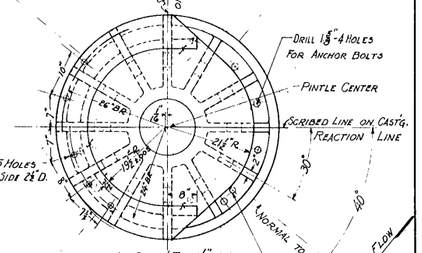
WALL SEAL WS-1

FORGED STEEL



DRILLING DIAGRAM

For PH L



PINTLE BASE-PB

CARBON STEEL CASTING

0 1 2 3 4 5

SCALE IN FEET

REFERENCES

For Weights see Drwg. Sheet 3, N-2-81 & N-2-82.

This Drawing is FOR RECORD PURPOSES ONLY & has been SUPERSEDED BY DRAWING No. N-2-114 Series

NO.	REVISION	DATE	BY	APVD

BONNEVILLE POWER NAVIGATION PROJECT

36-TH CONTRACT- LOCK OPERATING EQUIPMENT

LOWER MITER GATE PINTLE CASTINGS, ASSEMBLY & DETAILS

SCALES AS SHOWN

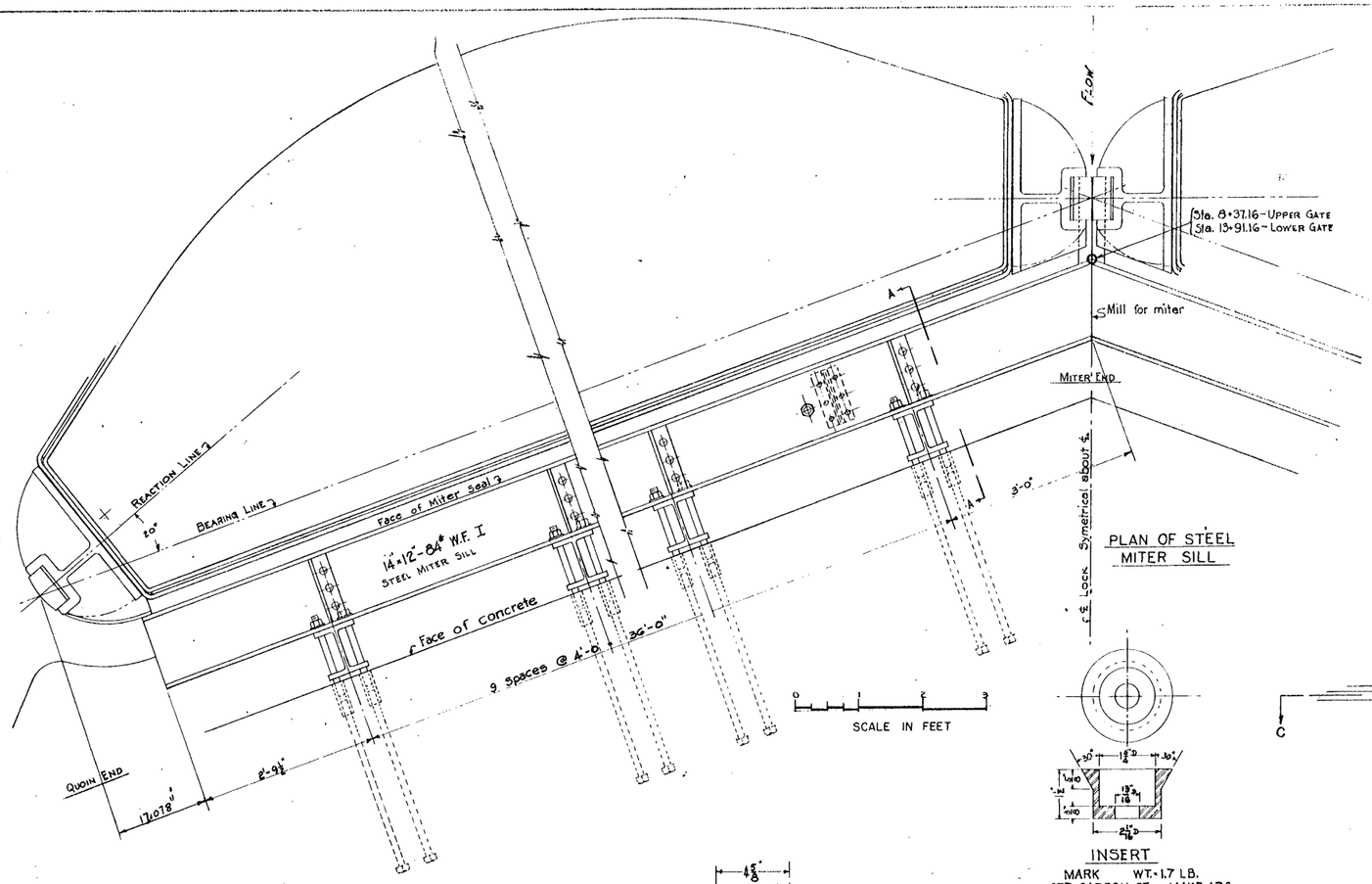
U S ENGINEER OFFICE, PORTLAND, OREGON DISTRICT

SUBMITTED R.D. Mackenzie ENGINEER

APPROVED C.H. Williams MAJOR, CORPS OF ENGINEERS

RECOMMENDED ... CHIEF ENGINEER

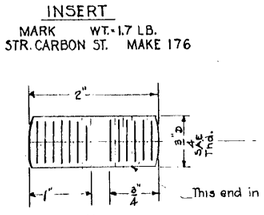
DRAWN BY: A.C.D. DATE 6-17-35
DESIGNED BY: A.A.A. & E.E.A.
TRACED BY: A.C.D. CHECKED BY: ...



PLAN OF STEEL MITER SILL

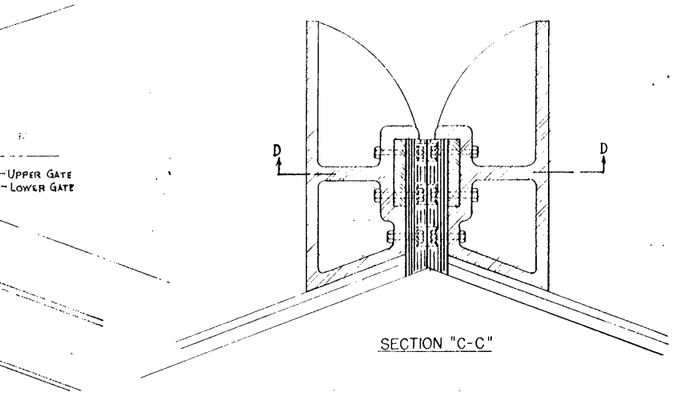
INSERT

MARK WT.-1.7 LB.
STR. CARBON ST. MAKE 176

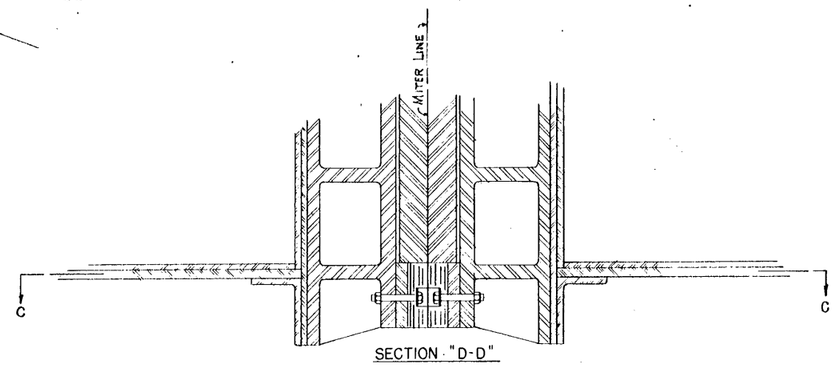


STUD

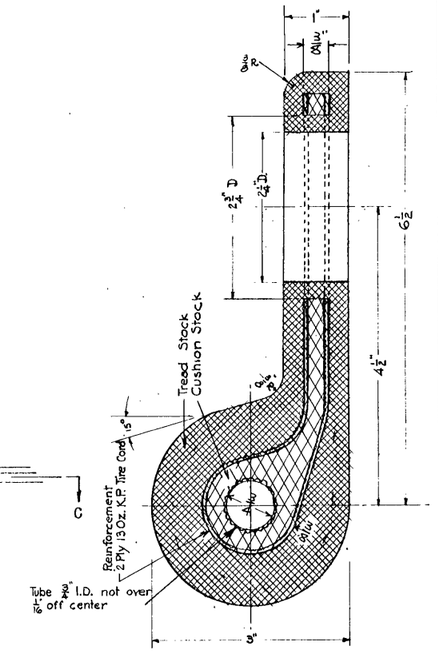
MARK WT.-.31 - LBS.
CORROSION RESISTING STEEL MAKE-328



SECTION "C-C"

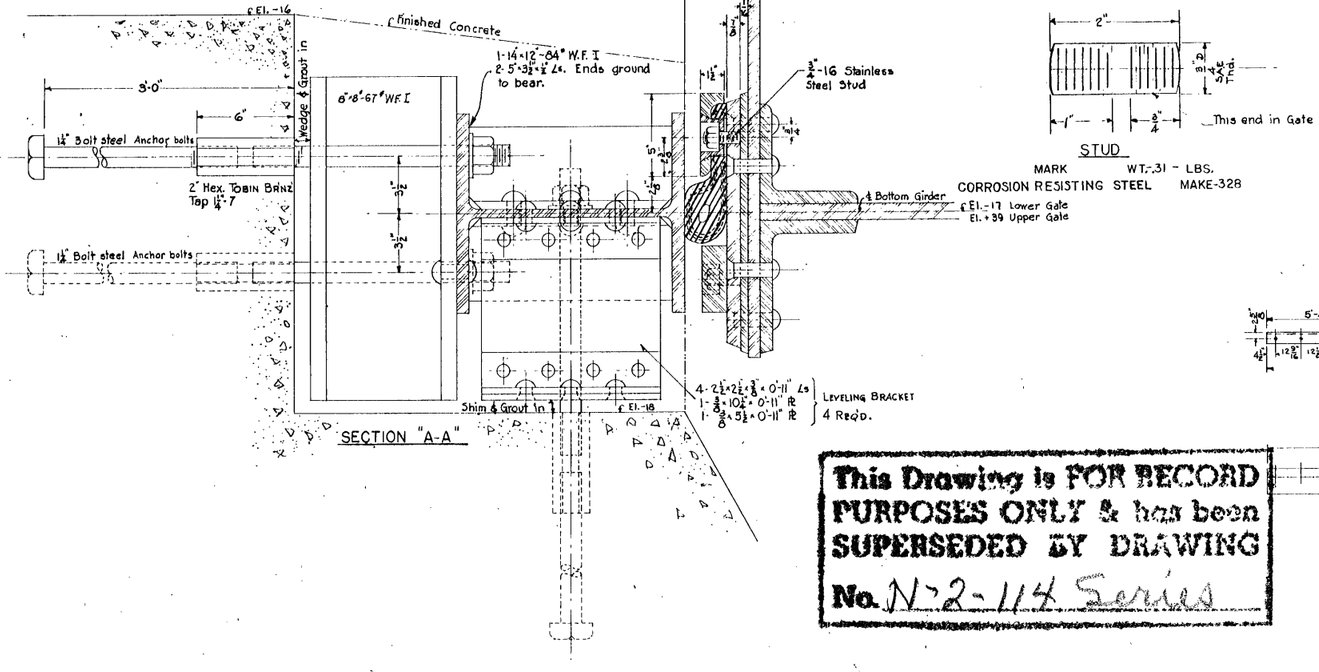


SECTION "D-D"



"J" RUBBER

MARK WT.-6.75 LBS./FT.
MAKE 4



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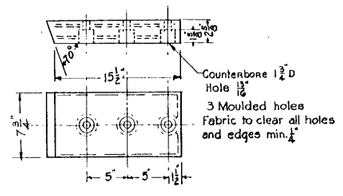
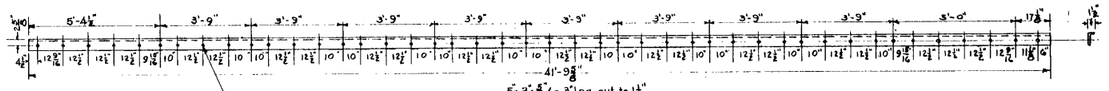
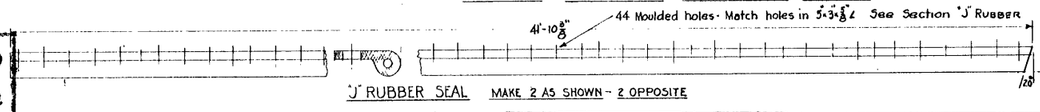


RUBBER SEAL MITER END

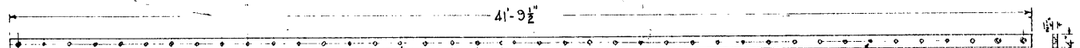
MARK WT.-18 - LBS.
MAKE-4



SEAL STRIP STR. CARBON ST. MAKE 2 AS SHOWN - 2 OPPOSITE



"J" RUBBER SEAL MAKE 2 AS SHOWN - 2 OPPOSITE



SEAL STOP STR. CARBON ST. MAKE 4

This Drawing is FOR RECORD PURPOSES ONLY & has been SUPERSEDED BY DRAWING No. N-2-114 Series

WEIGHTS

STRUCTURAL CARBON STEEL	26,250 LBS.
BOLT STEEL	1,772 LBS.
TOBIN BRONZE	400 LBS.
RUBBER SEALS	1,164 LBS.

GENERAL NOTES

Steel Miter Sills as shown required for both Upper & Lower Miter Gates. Bolts & Studs for fastening seals to gate leaf shall be Corrosion Resisting Steel 18-8

REFERENCES

For Framing Plan of Upper & Lower Miter Gates see Shee 2-N-2-82 & Sheet 2-N-2-81 respectively.
for Quoin & Miter End Castings see Sheet 3-N-2-81 & N-2-82

NO.	REVISION	DATE	BY	APV'D

BONNEVILLE POWER NAVIGATION PROJECT

36 TH CONTRACT - LOCK OPERATING EQUIPMENT

LOWER MITER GATE
LOWER SEALS
ARRANGEMENT AND DETAILS
SCALES AS SHOWN

U. S. ENGINEER OFFICE, SECOND PORTLAND DISTRICT (OREGON)

SUBMITTED: R.D. Mackenzie, ENGINEER
APPROVED: H. Williams, MAJOR, CORPS OF ENGINEERS
RECOMMENDED: [illegible], HEAD ENGINEER
DRAWN BY C.W.B. DATE 6-17-35
DESIGNED BY A.A.S. & C.C.
TRACED BY A.G.D. CHECKED BY

FLOW

END REACTION GIRDER
2 L 8"x8"x7/16" - 4 CLIP L 3½"x3½"x7/16"
WEB PLT. 1" - FILL PLTS. ¾"x14"

END VERTICAL FRAME
4 L 3½"x3½"x7/16" - 4 CLIP L 3½"x3½"x7/16"
WEB PLT. 5/8" - 1 REINF PLT 12"x 5/8"

7/16" BUCKLE PLATE - DIE № 29

MANHOLE 18"x 24"
2 - REINF. PLTS. 60"x ⅜"x 33"
LADDER STANCHIONS 2½"x ½"
STEPS ⅝" ϕ 12" O.C.

3" SHIP. C. 28.6#
2 PLT 6½"x 7/16" x 17⅛" FILL PLT 4"x 3½" x 15⅛"
2 CLIP L 3"x 4"x ½"

7/16" BENT PLTS.

3" SHIP. C. 28.6#
2 PLT 12"x ⅞"x 14½" - FILL PLT 4"x 3½"x 8"
2 CLIP L 3"x 4"x ½"

2 L 6"x 6"x 15/16"
WEB PLT. 1" - FILL PLTS. ¾"x14"

3½"x 3½"x 7/16" L

5/8" WEB PLT.

3½"x 3½"x 7/16" L
7/16" WEB PLT

2 L 6"x 6"x ¾"

FILL PL 7½"x ⅜"

FILL PL 7½"x ⅜"

LADDER

2 - ⅝" DBL. PLTS.

1" RIVETS

QUOIN END

MITER END

B.to B. of L

C.to C. of L

END REACTION GIRDER

PLAN - AA -

SCALE 3/4" = 1 FT.

DRILL & REAM FOR 1" TURNED BOLTS

ELEVATION OF QUOIN END

DOWNSTREAM ELEVATION

UPSTREAM ELEVATION

SECTION "X-X"

SCALE 1½" = 1 FT.

TYPICAL VERTICAL FRAME
SECTION "B-B"

END VERTICAL FRAME
SECTION "C-C"

END REACTION GIRDER
SECTION "D-D"

REFERENCES

GENERAL NOTES

This Drawing is FOR RECORD PURPOSES ONLY & has been SUPERSEDED BY DRAWING No. N-2-114 Series

BONNEVILLE POWER NAVIGATION PROJECT
36TH CONTRACT - LOCK OPERATING EQUIPMENT

LOWER MITER GATE
AIR CHAMBER GIRDERS,
15 TO 20, AND CONNECTIONS
SCALES AS SHOWN

U.S. ENGINEER OFFICE, SECOND PORTLAND DISTRICT, OREGON

NO.	REVISION	DATE	BY	APV'D

SUBMITTED: R.M. Mackenzie, ENGINEER
APPROVED: MAJOR, CORPS OF ENGINEERS
RECOMMENDED: HEAD ENGINEER
DRAWN BY: R.M.H. DATE 4-11-35
DESIGNED BY: A.A.C. & F.T.D.
TRACED BY: C.A.D. CHECKED BY

Eye-bar Assembly Make 2
Carbon Steel Forging Weight complete 2295#
Eye-bar Pin Make 2
Carbon Steel Forging Weight 155#
6" Bridge Nut for Eye-bar Pin Make 2
Carbon Steel Casting Weight 19#

Flow

El +85.50

El +85.00

Rubber Gasket

SECTION "E-E"

Gate Recess Wall

El. Recess +80.875

Hexagon Sleeve Nut - 12" across Flats

Provide fitting for pressure lubrication

Carbon Steel Forging Make 1 Weight 631#
Bronze Casting Grade Make 2 Weight 62#

El +82.5625
El +81.9375
Elev. 81.25

SECTION "A-A"

Pressure

Provide fitting for pressure lubrication

℄ Operating Strut

El +82.625

SECTION "B-B"

"D"

Tapped Hole for Eye Bolt.

Slip collar welded to stanchion

Bronze Casting Grade Make 2 Weight 41#
Carbon Steel Forging Make 1 Weight 89#
Carbon Steel Forging Make 1 Weight 265#

2 Pl. x 10½" diam. Make 2

SECTION "D-D"

DETAIL OF STRUT CONNECTION

Scale 1½" = 1'-0"

Scale in feet

Walkway handrail to be built up of 1½" Std pipe rails and stanchions, with handrail fittings. Handrail to be in independent, removable, symmetrical sections approximately 11'-2" long, each section to be supported by two stanchions spaced [illegible] apart. Approximate weight per section 85#

5/16" Checkered Plate

3½ x 3½ x ½ L

⅜" Plate

4 x 3½ x ½ L Clips

2½ x 2½ x ½ L

6 x 4 x ⅜ L

6 - 4 x ⅜ L Clip

Pressure

℄ Lock

TYPICAL SECTION THROUGH WALKWAY

Outline of walkway checkered plate

Outline of checkered plate over eye bolt recess

Min 3'-0" R 12" Rad

℄ Strut when gate is recessed

UPSTREAM SIDE

"B"

℄ Strut at limit of angular displacement

℄ Strut when gate is mitered

Flow

3" Sounding pipe extending to bottom of air chamber and equipped with handled pipe cap.

1 Lock Wall

6'-0½" 8-8 L's

5'-6½"

¾" Fl x 24" diam.

1'-7"

1'-3"

8½"

2-6 x 6 x ¾ L's

Weld ⅜" SYY Bare wire

1'-9"

6"

30°

1'-7 1/16"

1'-9 15/16"

8'-7⅛"

R 4'-0" To Back of ⅜

⅛" Fl.

¾" Fl.

¾" Bent Pl.

⅜" Fill Pl.

33 x ⅜ Reinf. Pl.

⅜ Reinf. Pl.

⅜" Fl.

3½ x 3½ x ½ L's

60" x 1" Reinf. Plate

2 33 x ⅜ Reinf. Pl.

"E"

3" Drain Pipe

Miter Guard

Clearance for adjustment

Harden Bearing faces

18" x 24" vertically slipped manholes through water chamber, provided with a ladder to bottom of water chamber. The manhole through top girder is equipped with a bipped and latched hatch.

18" x 24" manhole to air chamber, provided with a ladder extending to bottom of air chamber and equipped with a watertight hatch secured with quick acting [illegible]

"B"

PLAN "C-C"

43.9244 Ft.

TOP GIRDER

℄ Operating Strut Connection

QUOIN END

MITER END

This Drawing is FOR RECORD PURPOSES ONLY & has been SUPERSEDED BY DRAWING No. N-2-114 Series

Elev. 85.50 Top of Curb

4'-3"

2'-6"

Elev. 81.25 C.L. Girder G1

℄ C.L. Between Girders G1 & G2

"C"

16'-10⅜"

2 - 6 x 6 x ¾ L's

1" Plate

⅜" Fl.

3½ x 3½ x ½ L's

12" Fl.

⅜ Reinf. Pl.

5 x 3½ x ½ L's

Hole .625

6 x 4 x ½ L

DOWNSTREAM ELEVATION

Scale in Feet

GENERAL NOTES:

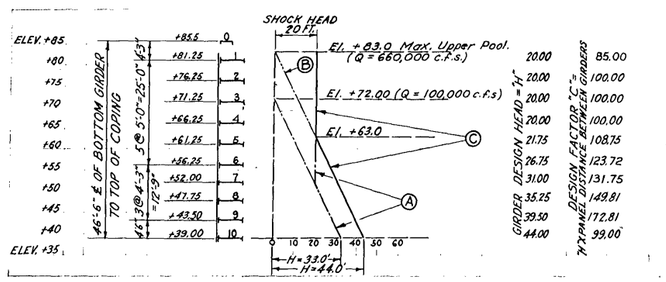
Quantities noted are for one gate leaf.
Welds, as noted are for strut pieces, unless otherwise noted.

REFERENCES:

For general assembly of miter gate see Sheet 2 Dwg. N-2-81
For operating strut details, see Sheet 3 Dwg. N-2-83

BONNEVILLE POWER NAVIGATION PROJECT
36 TH CONTRACT-LOCK OPERATING EQUIPMENT
LOWER MITER GATE
TOP GIRDER, ANCHORAGE AND STRUT CONNECTIONS
SCALES AS SHOWN
U S ENGINEER OFFICE, PORTLAND, OREGON DISTRICT

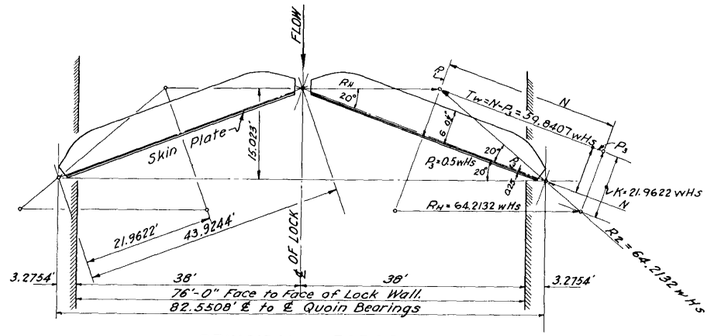
SUBMITTED: R.R. Mackenzie, ENGINEER
APPROVED: [illegible], MAJOR, CORPS OF ENGINEERS
RECOMMENDED: [illegible], HEAD ENGINEER
DRAWN BY: G.S.D. DATE 6-17-35
DESIGNED BY: A.A.P. & T.H.
TRACED BY: H.G.L. CHECKED BY



CURVE "A" — Water Load on Horizontal Girders for Normal Pool.
CURVE "B" — Maximum Water Load for Down Stream Skin Plates.
CURVE "C" — Maximum Load Conditions for Design of Horizontal Girders; Shock Head assumed 20 feet.

LOAD DIAGRAM —— HORIZONTAL GIRDERS

SCALE: VERTICAL 1" = 15' HORIZONTAL 1" = 30'



PRINCIPAL FORCES

DUE TO WATER PRESSURE

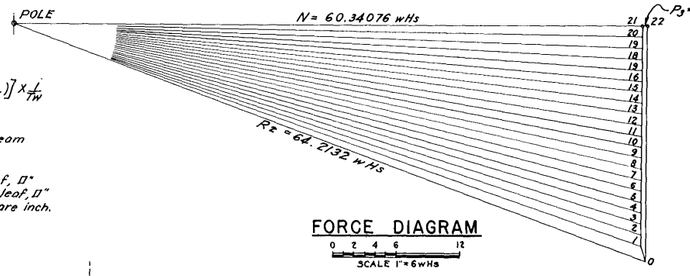
SCALE: 3/32 = 1'-0"

EQUATIONS

$Jw = \left[(21.9622 \times K) + (0.5 \times N) - (0.25 \times P_3) - (10.9811 \times \frac{P_1}{P_2})\right] \times \frac{1}{Tw}$

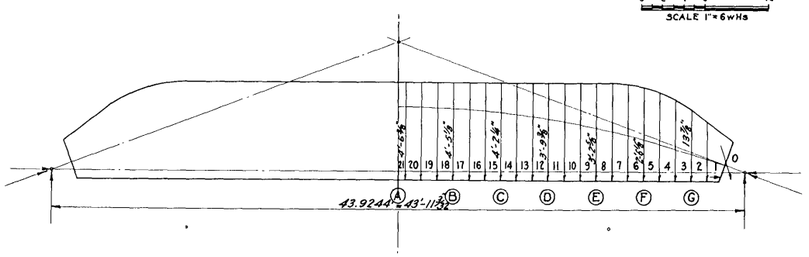
$Fu = (Tw \times Jw) \times \frac{1}{d \times f}$; $Fd = [Tw \times (d - Jw)] \frac{1}{d \times f}$

Jw = Distance from line of pressure to back of downstream flange angle at center of leaf, Ibs.
Tw = Total force in girder at center of leaf, lbs.
Fu = Area required, upstream flange at center of leaf, □"
Fd = Area required, downstream flange at center of leaf, □"
f = Permissible unit stress in flange, lbs. per square inch.
d = Back to back of flange angles = 6'-0¾" (6.04')



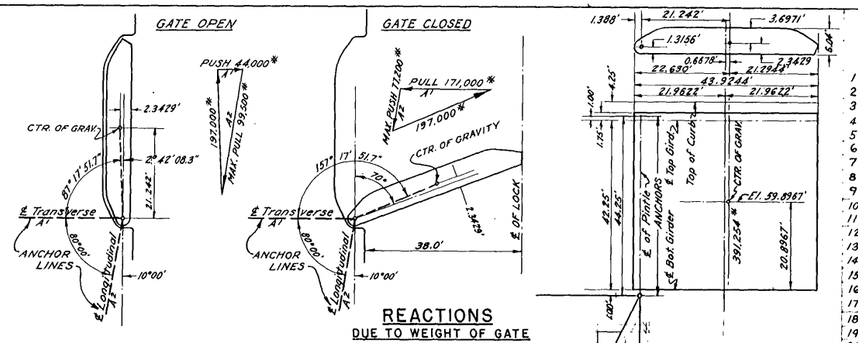
FORCE DIAGRAM

SCALE 1" = 6 wH²



FUNICULAR POLYGON

SCALE ¼" = 1'-0"



REACTIONS

DUE TO WEIGHT OF GATE

DESIGN SPECIFICATIONS

1 - HORIZONTAL GIRDERS:

Flange Areas are assumed to be concentrated at backs of flange angles and to be composed of ⅛ of the web plate, the flange angles and the cover plates; no portion of sheathing plates is included into the flange areas.

Pressure Curves and Force Polygons show the effect on the horizontal girders of a water load of 6 w H³ (where Hs = 100) per lineal foot, and the requirements resulting therefrom are plotted as shown. The critical section for web plates and downstream flanges has been taken at 3.4622' from the miter and quoin bearing faces.

For purpose of design a Minimum Water Load of 20 feet has been used as a shock head and for certain girders the water head has been increased to provide for the probable transfer of load due to stiffness of the vertical framing system.

2 - END BEARING DIAPHRAGM:

The End Bearing Diaphragms of both quoin and miter ends are assumed to carry the full panel end reactions; maximum lower reaction per panel in each case.

3 - MATERIALS:

Intercostals are designed as simple beams, uniformly loaded to carry their full panel load without considering the effect of sheathing plates. The end connections, however, are to be made adequate for probable moments.

4 - SHEATHING PLATES:

The Flat Sheathing Plates are designed according to the following formula:

$t = 0.4\, b \sqrt{a^2 H - (a^2 + b^2)\, fa}$

Where: t = thickness of plate required in inches.
a = effective height of panel in inches.
b = effective width of panel in inches.
H = head in feet at center of panel.
fa = allowable working unit stress.

5 - BUCKLE PLATES:

Buckle Plates used for sheathing, all placed in tension; total allowable uniformly distributed load is computed by the following formula:

$W = 12 \times f \times d \times t$ $\qquad W = \frac{625 \times H \times \text{area supported by Buckle}}{144}$

Where: f = allowable fiber stress, lbs. per sq.in.
d = rise of buckle, inches
t = thickness of plate.
H = head in feet at center of panel.

6 - STIFFENER SPACING:

Stiffener Spacing is based on the following formula:

$d = 71\, t \sqrt{\frac{19250}{V} - 1}$ Where: t = thickness of plate
d = clear distance between stiffeners
V = lbs. per sq.in. on web due to shear load;

gross section where and if the web between flanges or side plates of girder exceeds 55 times the thickness of plate, web shall be stiffened by LS, not exceeding 66 in.

7 - MINIMUM THICKNESS OF MATERIAL:

The Minimum Thickness of Material is to be inch; except for fillers and such others as indicated on drawings.

8 - BUCKLING:

Safe Web Thickness against buckling is based on the following formula:

$V = \frac{19250}{1 + \frac{1}{5040} \frac{d}{t}}$ NOTE: Values and Designations V, d & t are the same as for Stiffener Spacing.

9 - ALLOWABLE UNIT STRESSES:

BENDING

Horiz. Girders & End React. Diaphragms	20,000 #/□" Sil. St.	Gross Section for Flange
Girders No. 12 & 22 Webs as Sheathing	8,000 #/□"	Gross
Stiffeners as Intercostals	16,000 #/□"	Gross
Intercostals; Water & Air Chambers	16,000 #/□"	
Sheathing, Flat Pls., Water Chamber, D.S.	8,000 #/□"	
Sheathing, Flat Pls., Air Chamber, U.S.	3,000 #/□"	
Sheathing, Flat Pls., Air Chamber, D.S.	8,000 #/□"	

SHEAR

Web of Girders and Diaphragms 13,500 #/□" Silicon Steel
Web of Intercostals, Main, Intermediate & End. 13,000 #/□" Carbon Steel

RIVETS	Shear	Bearing	Enclosed
Shop	13,500 #/□"	24,000 #/□"	24,000 #/□"
Field	11,250 #/□"	22,500 #/□"	20,000 #/□"
In Tension	10,000 #/□"		

MATERIALS

GIRDER NUMBERS	0	1	2	3	4	5	6	7	8	9	10
1 H_1 = Head @ ℄ Girder in Ft.		1.75	6.75	11.75	16.75	21.75	26.75	31.00	35.25	39.50	44.00
2 H = Design Head on ℄ in Ft.		20.0	20.0	20.0	20.0	21.75	26.75	31.00	35.25	39.50	44.00
3 a = Panel Distance B'twn Girders		4.25	5.0	5.0	5.0	5.0	4.625	4.25	4.25	4.375	2.25
4 C = Design Factor = He		85.0	100.0	100.0	100.0	108.75	123.75	131.75	149.8	172.81	99.00
5 P = Load/Lin. Ft. Grds. kips		5.31	6.25	6.25	6.25	6.79	7.73	8.23	9.36	10.80	6.18
6 P_1 = Total Load on Grd's Kips		233.3	274.5	274.5	274.5	298.5	339.6	361.6	411.3	474.4	271.8
7 R = 64.2132 × P in Kips		341.1	401.3	401.3	401.3	436.5	496.5	528.8	601.2	693.5	397.3
8 N = 60.3401 × P in Kips		320.6	377.1	377.1	377.1	410.1	466.6	496.9	565.0	651.7	373.4
9 K = 21.9622 × P in Kips		116.7	137.2	137.2	137.2	149.3	169.8	180.8	205.6	237.2	135.9
10 Web Plate U.S. Flange @ Each End of Girder — F_u = Reqd. U.S. Gross Flng.□"		14.87	14.87	14.87	14.87	16.17	18.40	19.59	22.28	25.70	14.12
11 F_d = Reqd. D.S. Gross Flng.□"		4.95	4.95	4.95	4.95	5.38	6.13	6.52	7.42	8.55	4.90
12 t_1 = Reqd. thick Web Pl. -Shear		0.159	0.159	0.159	0.159	0.1732	0.214	0.209	0.239	0.277	0.158
13 f_b = Req'd. U.S. Gross Flange#		6.04	6.04	6.04	6.04	6.57	7.47	17.05	9.05	10.44	5.98
14 f_d = Req'd. D.S. Gross Flng.#		13.78	13.78	13.78	13.78	14.99	7.96	18.16	20.65	23.81	13.64
15 t_2 Adopted thick. Web Plate		5/8"	5/8"	5/8"	5/8"	5/8"	5/8"	5/8"	5/8"	5/8"	5/8"
16 Doubling Pls @ Quoin & Miter End		2 - ⅞" Pl's.							1-⅞" Pl. & 1-¾" Pl.		
17 Stiffeners		5" × 3½" × 7/16"									
18											
19											
20 U.S. Flange Flange Angles		2 L's 6" × 6" × 1⅛"									6"×6"×⅞" & 6"×6"×¾"
21 Effective Size of Sheath. ℄		17½" × ⅝"	NEGLECTED - (Buckle Pl's.)								17½" × ⅝"
22 Size of Inside Cover Plates		NONE									
23 Size of Outside Cover Plates		13" × ½"									15" × ½"
24 Area without Outside Cover ℄		15.56									15.47
25 Area with Outside Cover ℄		22.06									22.97
26 D.S. Flange Flange Angle		2 L's 6" × 6" × ½"									2 L's 6"×6"×⅞" & 6"×6"×¾"
27 Effective Size of Sheathing ℄	17½" × ⅝"										17½" × ⅝"
28 Size of Cover Plates		13" × ½"									15" × ½"
29 Gross Area with Cover Plate		18.00									20.72 28.59
30 Net Area with Cover Plate		14.74									17.20 24.31

PANEL NUMBERS	0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10
33 H_2 in Ft @ ℄ Between Girders	20.0	20.0	20.0	20.0	20.88	24.25	28.88	33.12	37.38	41.75
34 $\sqrt{FH_2}$	4.47	4.47	4.47	4.47	4.57	4.93	5.38	5.76	6.12	6.47
35 Panel Height in Inches		60	60	60	60	60	51	51	51	54
36 Upstream Intercostals @ Quoin & Miter Ends — b-in inches										
37 S-Required										
38 Intercostal Selected										
39 S-Furnished										
40 Intercostals Intermediate — b-in inches										
41 S-Required										
42 Intercostal Selected										
43 S-Furnished										
44										
45										
46										
47										
48 U.S. Sheathing @ Quoin Intercostals & Miter Ends — a - in inches										
49 b - in inches										
50 t - Required										
51 t - Furnished										
52 U.S. Sheathing @ Quoin Intercostals & Miter Ends — b - in inches										
53 t - Required										
54 t - Furnished										
55 D.S. Sheathing @ Quoin Intercostals & Miter Ends — a - in inches										
56 b - in inches										
57 t - Required										
58 t - Furnished										
59 D.S. Sheathing @ Quoin Intercostals & Miter Ends — b - in inches										
60 t - Required										
61 t - Furnished										
62 End Vertical Frames										
63 Intermediate Vertical Frames										
64										
65 H in Ft.										
66 R = Reaction in kips										
67 Va = Average Brng. per Vertical Foot										
68 End Framing Miter & Quoin Ends Brng. Diaphr. — $t^3 = \frac{R}{d \times F \times 2}$ d = 72" f = 13,750 #/□"										t^3 =
69 t^3 - Furnished										
70 Rivet Diameter										
71 No. of Rivets Req'd. in Web.										
72 Field Rivets Req'd. - Single Shear One End										
73 Top & Bottom Connection ∠s										
74 Vertical Bearing ∠s										
75 Fills										
76 Rear Vertical & Crimped										
77 Web Stiffeners U.S. & D.S.										
78 S - Req'd.										
79 C. = Dist from N.A. to Outside Inch										
80 I - Furnished Inch⁴										
81 S - Furnished Inch³ Compression										
82 End Plates - Bent										
83 End Doubling Plates										
84 U.S. Doubling Plates										
85 D.S. Doubling Plates.										
86										

This Drawing is FOR RECORD PURPOSES ONLY & has been SUPERSEDED BY DRAWING No. N-2-115 Series

NO.	REVISION	DATE	BY	AP'V'D

BONNEVILLE POWER NAVIGATION PROJECT

36TH CONTRACT - LOCK OPERATING EQUIPMENT

UPPER MITER GATE

DESIGN DATA

SCALES AS SHOWN

U S ENGINEER OFFICE, SECOND PORTLAND DISTRICT, ORE

SUBMITTED R. L. Mackenzie ENGINEER — APPROVED H. C. Williams MAJOR, CORPS OF ENGINEERS

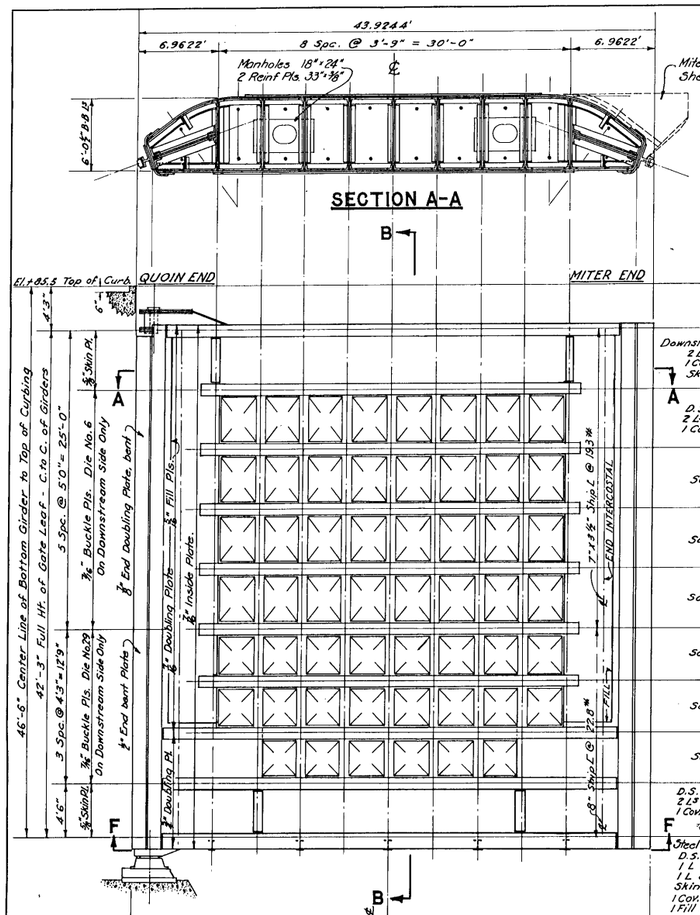
RECOMMENDED E. A. Evans HEAD ENGINEER

DESIGNED BY A.A.Q. & F.T.O. DATE 6-17-35

DR. BY M.R.L. TR. BY J.A.S. CHECKED BY

WAR DEPARTMENT

CORPS OF ENGINEERS U. S. ARMY



This Drawing is FOR RECORD PURPOSES ONLY & has been SUPERSEDED BY DRAWING No. N-2-115 Series

DOWNSTREAM ELEVATION

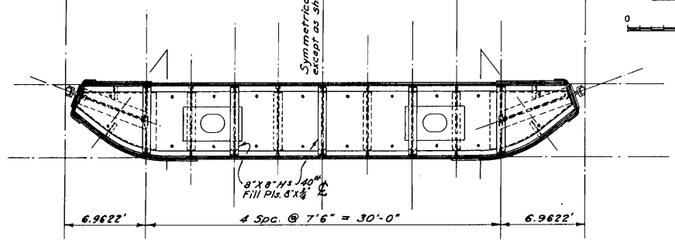
UPSTREAM ELEVATION

SECTION A-A

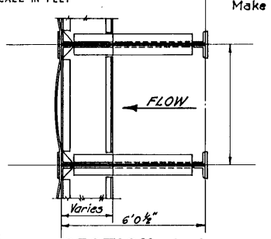
SECTION B-B
TYPICAL VERTICAL FRAME

SECTION L-L

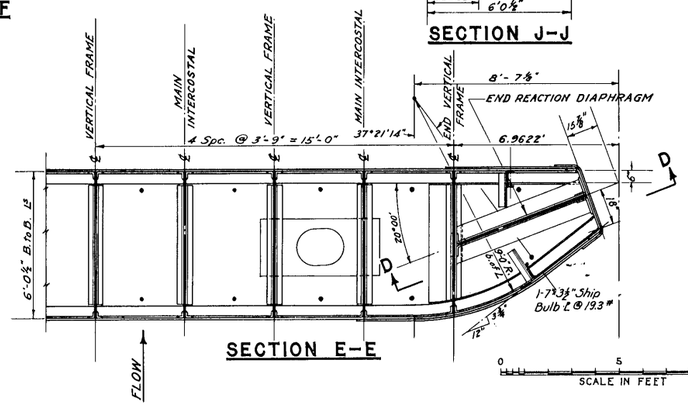
VIEW K-K



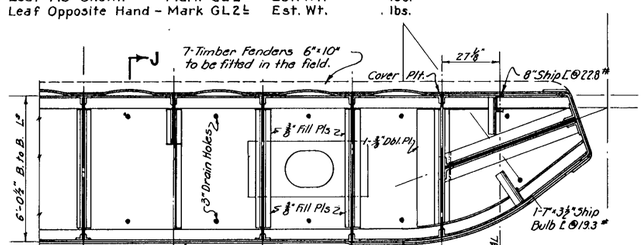
VIEW F-F



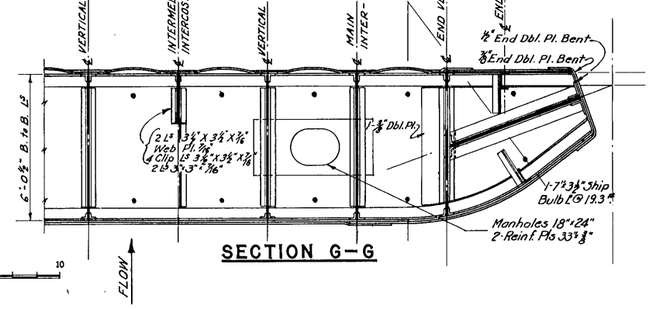
SECTION J-J



SECTION E-E



SECTION J-J



SECTION H-H

SECTION G-G

NOTE: Mill all girder webs, doubling pls, & flange L's to bear on Quoin & Miter end bent plates.

UPPER MITER GATE

Make 1 Gate Leaf As Shown Mark GL2R Est. Wt. lbs.
Make 1 Gate Leaf Opposite Hand - Mark GL2L Est. Wt. lbs.

SECTION C-C
END VERTICAL FRAME

SECTION D-D
END REACTION DIAPHRAGM

MATERIALS

Buckle Plates:	Struct. Carbon Steel	A.S.T.M.	A-7-34
Flat Plts. & Doubling Plates:	Struct. Silicon Steel	" " "	A-94-33
Quoin and Miter End Framing:	Struct. Silicon Steel	" " "	A-94-33
Horizontal Girders:	Struct. Silicon Steel	" " "	A-94-33
End Vertical Frames:	Struct. Carbon Steel	" " "	A-7-34
Vertical Frames:	Str. Carbon Steel	" " "	A-7-34
Intercostals, Main & Intermediate:	Str. Carbon Steel	" " "	A-7-34
Miscellaneous Plates, L's & Clips:	Str. Carbon Steel	" " "	A-7-34
End Reaction Diaphragms:	Struct. Silicon Steel	" " "	A-94-33
Rivets:	Carbon Steel	" " "	A-141-33
Rivets:	Nickel Steel	" " "	A-8-29

GENERAL NOTES

Gate Leaves shall be watertight in downstream side of water chamber.

Caulking Edges shall be planed to 60° bevel; Maintain edge distance for caulking. Rolled edge caulking will not be permitted.

Welding will not be permitted for watertightness except parts that are inaccessible after erection.

Drainage holes shall be provided

Timber Fenders shall be provided on the upstream side of Gate Leaf, also in Miter Gate Recesses.

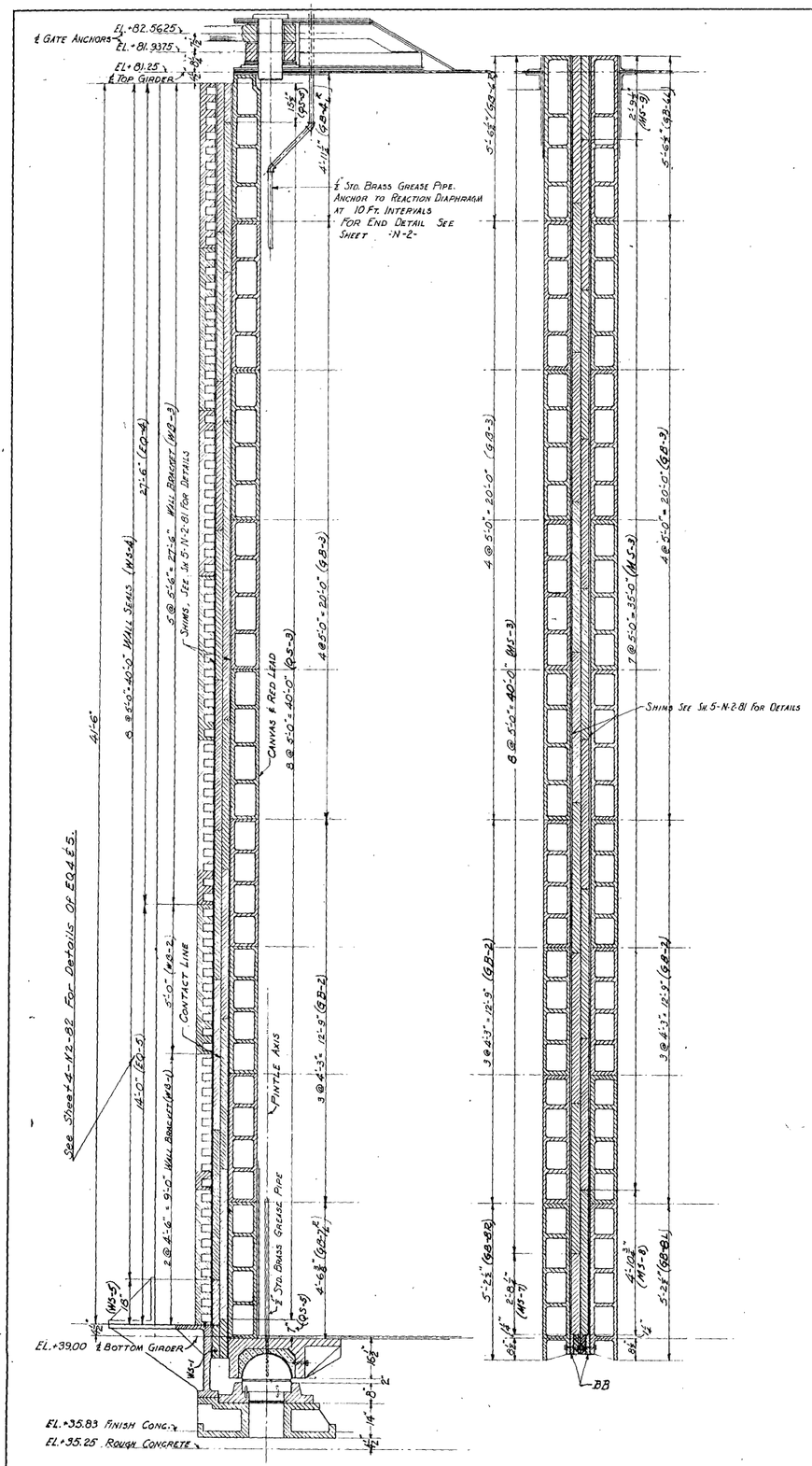
NO.	REVISION	DATE	BY	APV'D

BONNEVILLE POWER NAVIGATION PROJECT
36TH CONTRACT — LOCK OPERATING EQUIPMENT

UPPER MITER GATE
GENERAL ASSEMBLY
SCALES AS SHOWN
U. S. ENGINEER OFFICE, PORTLAND, OREGON DISTRICT

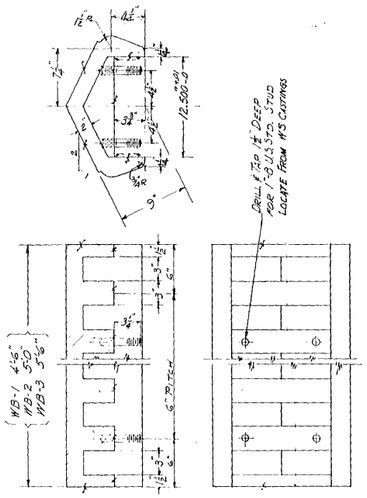
SUBMITTED R. R. Mackenzie ENGINEER
APPROVED H. Williams MAJOR, CORPS OF ENGINEERS
RECOMMENDED H. Skinner HEAD ENGINEER
DESIGNED BY A.A.G. & E.F.P. DATE 6-11-35
DR. BY G.S.D. TR. BY J.A.S. CHECKED BY

SHEET 2 N-2-82

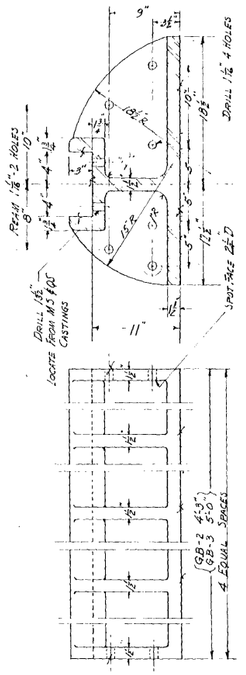


QUOIN END
CASTING ARRANGEMENT

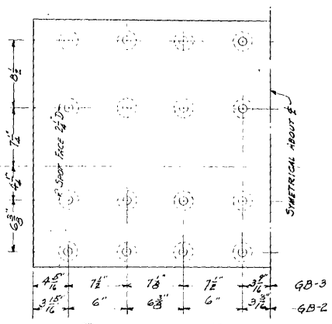
MITER END
CASTING ARRANGEMENT



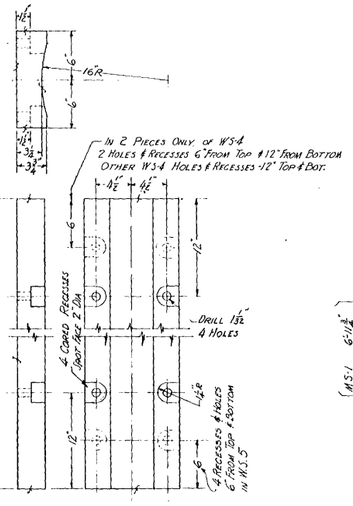
WALL BRACKET-WB
CARBON STEEL CASTING



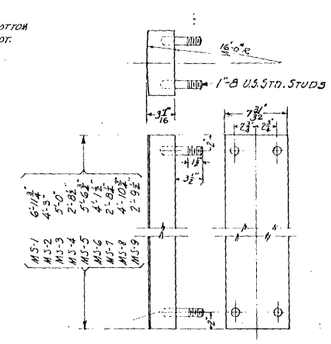
GATE BRACKET-GB
CARBON STEEL CASTING



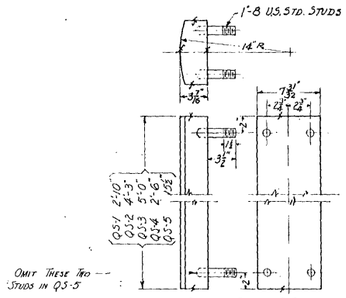
Drill 15/16" - 32 Holes Ream 1 1/16" at Assembly



WALL SEAL-WS
FORGED STEEL
FINISH ALL OVER



MITER SEAL-MS
FORGED STEEL
FINISH ALL OVER



QUOIN SEAL-QS
FORGED STEEL
FINISH ALL OVER

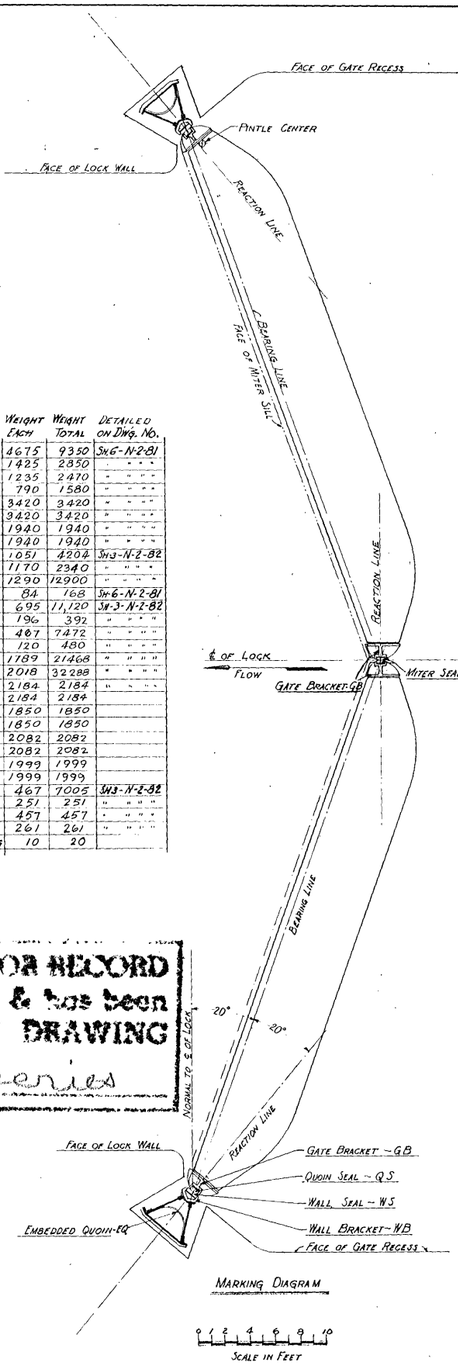
0 1 2
SCALE IN FEET

NAME	SYMBOL	NO. REQ'D.	MATERIAL	WEIGHT EACH	WEIGHT TOTAL	DETAILED ON DWG. NO.
PINTLE BASE	PB	2	CARBON STEEL CASTING	4675	9350	Sk 6-N-2-81
PINTLE COLLAR	PC	2	" " "	1425	2850	" " "
PINTLE PIN	PP	2	FORGED NICKEL STEEL	1235	2470	" " "
HEEL BUSHING	HB	2	BRONZE CASTING Gendce	790	1580	" " "
PINTLE HEEL	PH-R	1 Rt.	CARBON STEEL CASTING	3420	3420	" " "
PINTLE HEEL	PH-L	1 Lt.	" " "	3420	3420	" " "
QUOIN BASE	QB-R	1 Rt.	" " "	1940	1940	" " "
QUOIN BASE	QB-L	1 Lt.	" " "	1940	1940	" " "
WALL BRACKET	WB-1	4	" " "	1051	4204	Sh 3-N-2-82
WALL BRACKET	WB-2	2	" " "	1170	2340	" " "
WALL BRACKET	WB-3	10	" " "	1290	12900	" " "
WALL SEAL	WS-1	2	FORGED STEEL	84	168	Sh 6-N-2-81
WALL SEAL	WS-4	16	" "	695	11,120	Sh 3-N-2-82
WALL SEAL	WS-5	2	" "	196	392	" " "
QUOIN SEAL	QS-3	16	" "	467	7472	" " "
QUOIN SEAL	QS-5	4	" "	120	480	" " "
GATE BRACKET	GB-2	12	CARBON STEEL CASTING	1789	21468	" " "
GATE BRACKET	GB-3	16	" " "	2018	32288	" " "
GATE BRACKET	GB-6R	1 Rt.	" " "	2184	2184	" " "
GATE BRACKET	GB-6L	1 Lt.	" " "	2184	2184	" " "
GATE BRACKET	GB-7R	1 Rt.	" " "	1850	1850	
GATE BRACKET	GB-7L	1 Lt.	" " "	1850	1850	
GATE BRACKET	GB-8R	1 Rt.	" " "	2082	2082	
GATE BRACKET	GB-8L	1 Lt.	" " "	2082	2082	
GATE BRACKET	GB-4R	1 Rt.	" " "	1999	1999	
GATE BRACKET	GB-4L	1 Lt.	" " "	1999	1999	
MITER SEAL	MS-3	15	FORGED STEEL	467	7005	Sh 3-N-2-82
MITER SEAL	MS-7	1	" "	251	251	" " "
MITER SEAL	MS-8	1	" "	457	457	" " "
MITER SEAL	MS-9	1	" "	261	261	" " "
BACKING BLOCK	BB	2	CARBON STEEL CASTING	10	20	

NOTES

This Drawing is FOR RECORD PURPOSES ONLY & has been SUPERSEDED BY DRAWING No. N-2-115 Series

REFERENCES



MARKING DIAGRAM

0 2 4 6 8 10
SCALE IN FEET

NO.	REVISION	DATE	BY	APP'D

BONNEVILLE POWER NAVIGATION PROJECT
36TH CONTRACT — LOCK OPERATING EQUIPMENT

UPPER MITER GATE
QUOIN & MITER CASTINGS

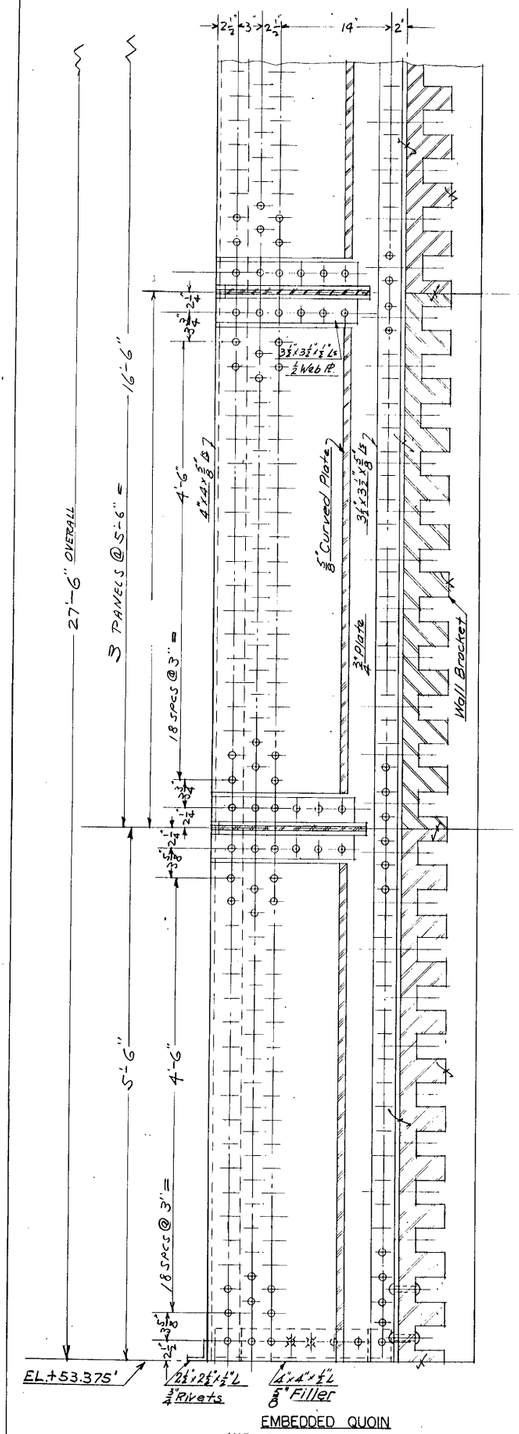
SCALES AS SHOWN

U.S. ENGINEER OFFICE, PORTLAND, OREGON DISTRICT

SUBMITTED: R.P. Mackenzie, ENGINEER — APPROVED: H. Williams, MAJOR, CORPS OF ENGINEERS

RECOMMENDED: [signature], HEAD ENGINEER

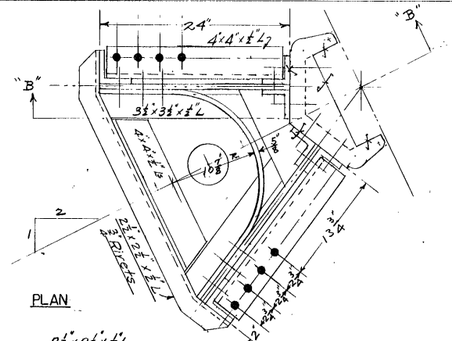
DRAWN BY A.C.P. DATE 6-11-35
DESIGNED BY A.C.P. & F.S.K.
TRACED BY A.C.P. CHECKED BY

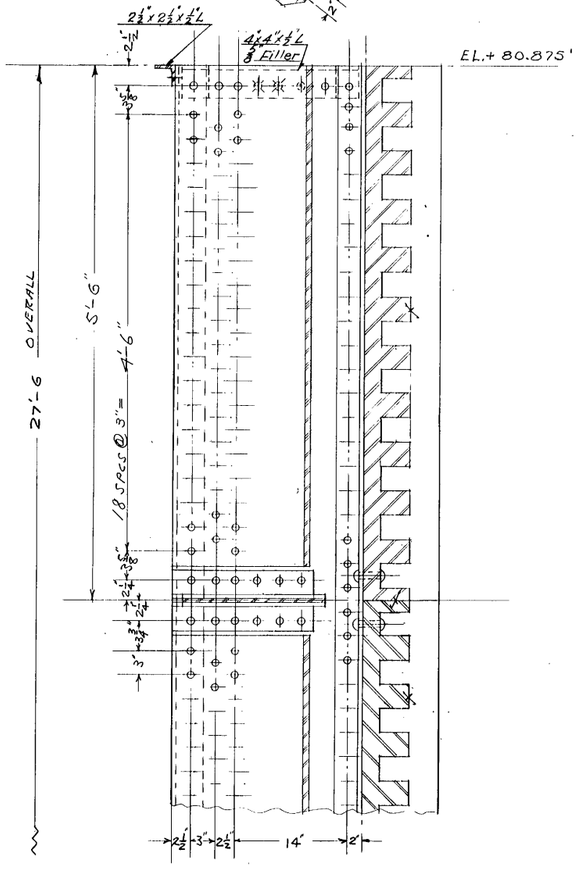


EMBEDDED QUOIN

MARK EQ-4 MAKE-4

STRUCTURAL STEEL WT. 8,065 LBS.



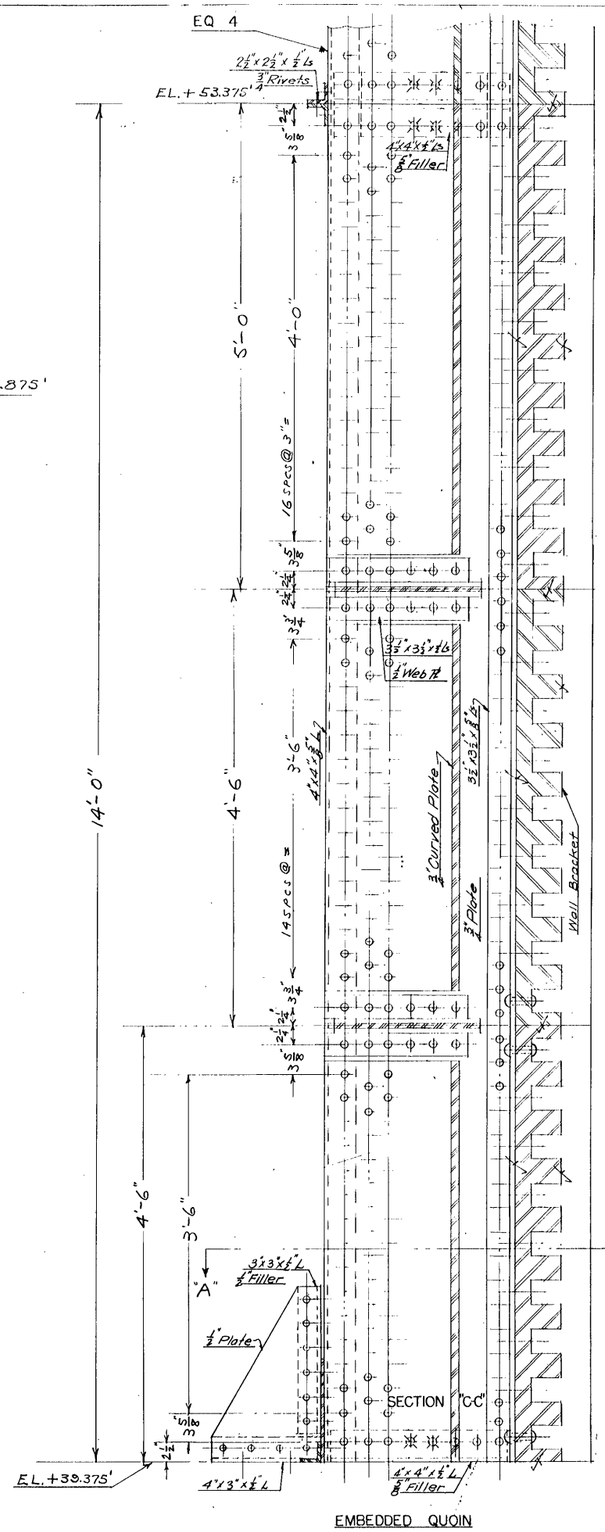


SECTION "B-B"

SCALE - 1½" = 1'-0"

0 1 2 3 4

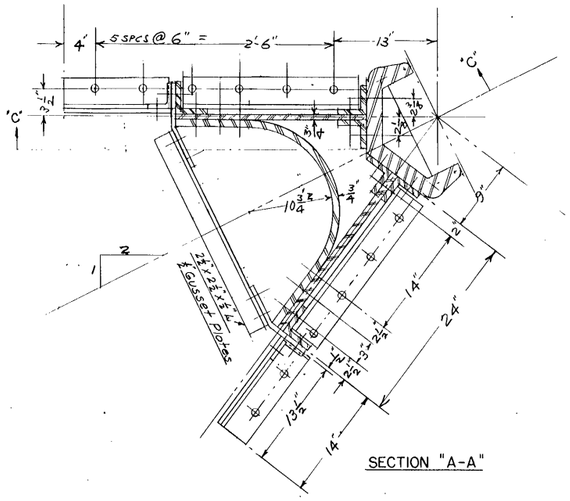
SCALE IN FEET



EMBEDDED QUOIN

MARK EQ-5 MAKE-2

STRUCTURAL STEEL WT. 5,966 LBS.



SECTION "A-A"

GENERAL NOTES

Holes 13/16" Except As Noted.
All Rivets ¾ ϕ Except As Noted.
Quoin Post EQ-4 Used On Both Lower And Upper Gates.

REFERENCES

For Quoin Bracket Castings Attached to Quoin Posts See Drwg. N-2-82-Sheet 3. (General Arrangement Of Quoin Posts)
For Typical Section See N-2-81 Sheet 4.

This Drawing is FOR RECORD PURPOSES ONLY & has been SUPERSEDED BY DRAWING No. N-2-115 Series

NO.	REVISION	DATE	BY	APV'D

BONNEVILLE POWER NAVIGATION PROJECT

36 TH CONTRACT – LOCK OPERATING EQUIPMENT

UPPER MITER GATE EMBEDDED QUOIN POST, ELEVATIONS

SCALES AS SHOWN

U. S. ENGINEER OFFICE, SECOND PORTLAND DISTRICT (OREGON)

SUBMITTED R.L. Mackenzie ENGINEER

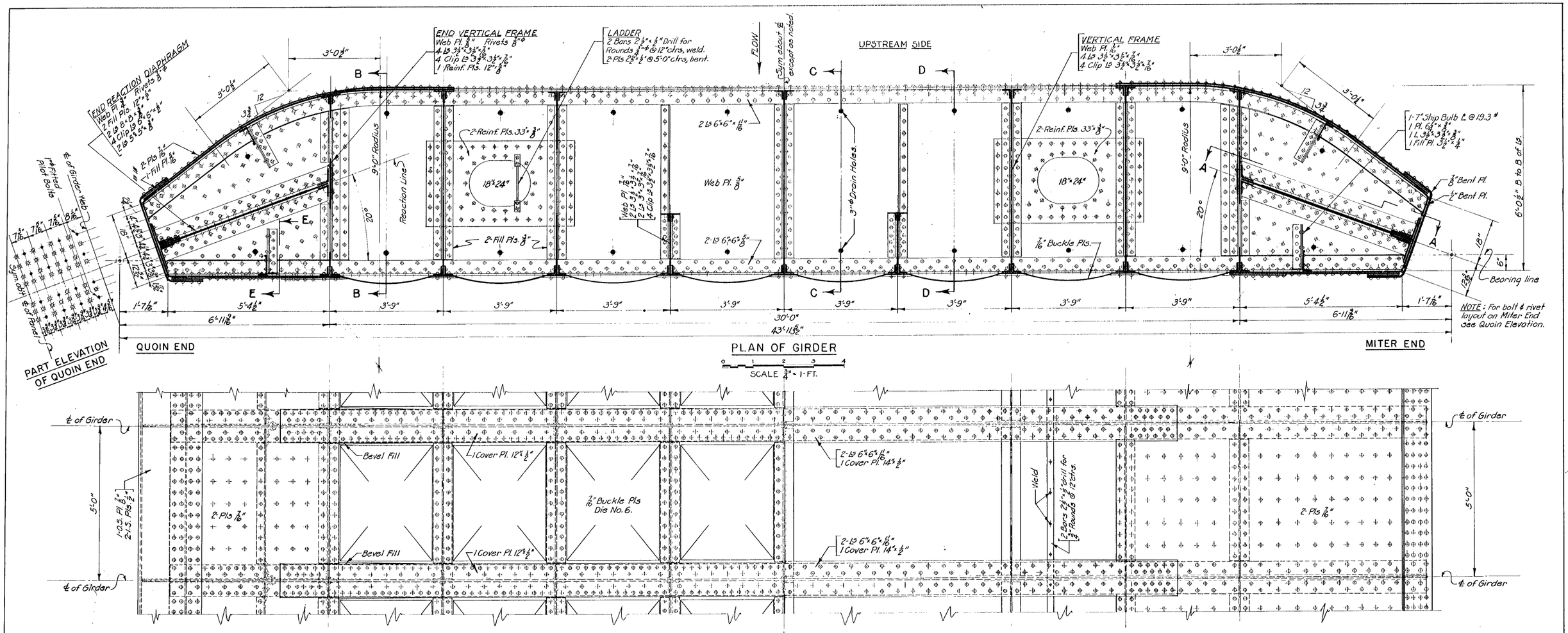
APPROVED [illegible] MAJOR, CORPS OF ENGINEERS

RECOMMENDED [illegible] HEAD ENGINEER

DRAWN BY C.W.B. DATE 6-11-35

DESIGNED BY A.A.B. & T.T.C.

TRACED BY C.W.B. CHECKED BY



REFERENCES:-

Refer to Drawing N-2-82 Sheet No. 2 for location of Girders as designated. Refer to Drawing N-2-82 Sheet No. 3 for details of Quoin and Miter Castings.

GENERAL NOTES:-

For General Notes See Drawing N-2-82 Sheet No. 2

Rivets 7/8" ϕ

Holes [illegible] except ladder connections - 13/16" ϕ

Holes for [illegible] to 1 5/16" ϕ

This Drawing is FOR RECORD PURPOSES ONLY & has been SUPERSEDED BY DRAWING No. N-2-115 Series

BONNEVILLE POWER-NAVIGATION PROJECT
36TH CONTRACT— LOCK OPERATING EQUIPMENT

UPPER MITER GATE
WATER CHAMBER GIRDERS 2 TO 6, AND CONNECTIONS

SCALES AS SHOWN

U.S. ENGINEER OFFICE, SECOND PORTLAND DISTRICT, ORE.

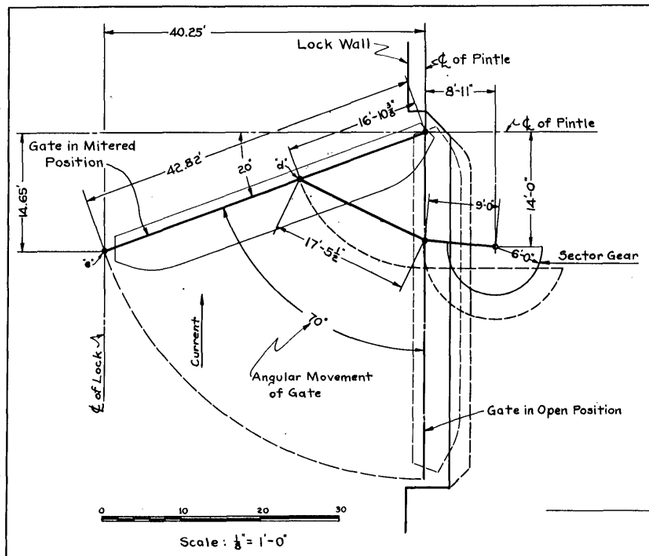
SUBMITTED: R. L. Drake ENGINEER

APPROVED: [illegible] Williams MAJOR, CORPS OF ENGINEERS

RECOMMENDED: [illegible] HEAD ENGINEER

DRAWN BY: V.G.H. DATE: 6-17-35
DESIGNED BY: A.D.A. & F.P.O.
TRACED BY: V.G.H. CHECKED BY:

NO.	REVISION	DATE	BY	APV'D



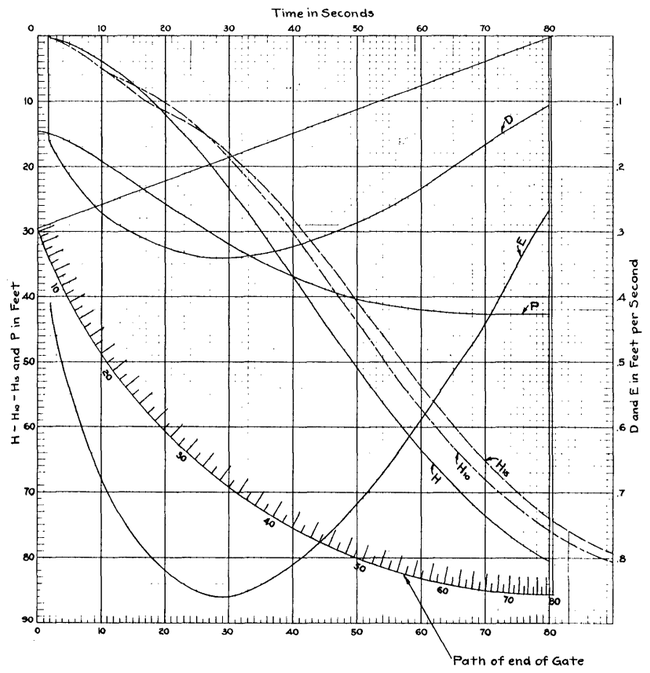
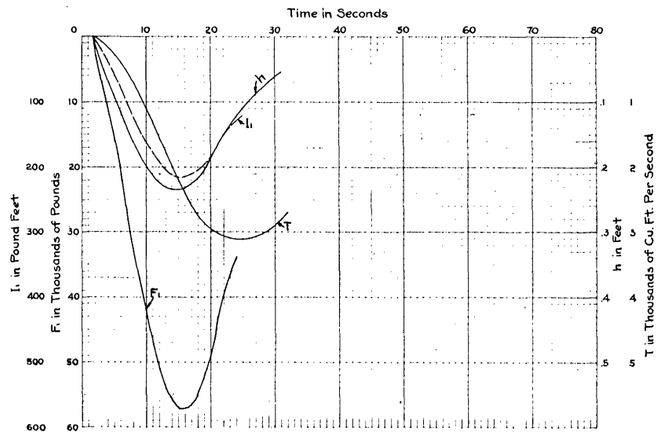


CHART SHOWING MOVEMENT OF END OF GATES



130,000 Tooth Load at 150% Overload on Motor
497.2 Pound Feet Motor Torque at 150% Overload on Motor

POWER CHART

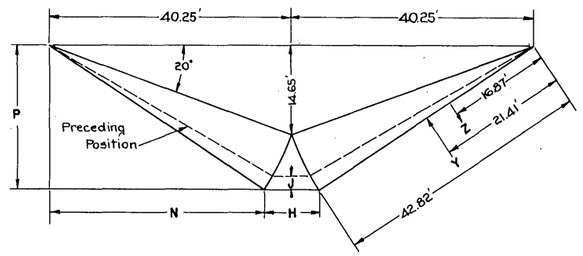


DIAGRAM OF GATE DISPLACEMENT AND EFFLUX AREAS

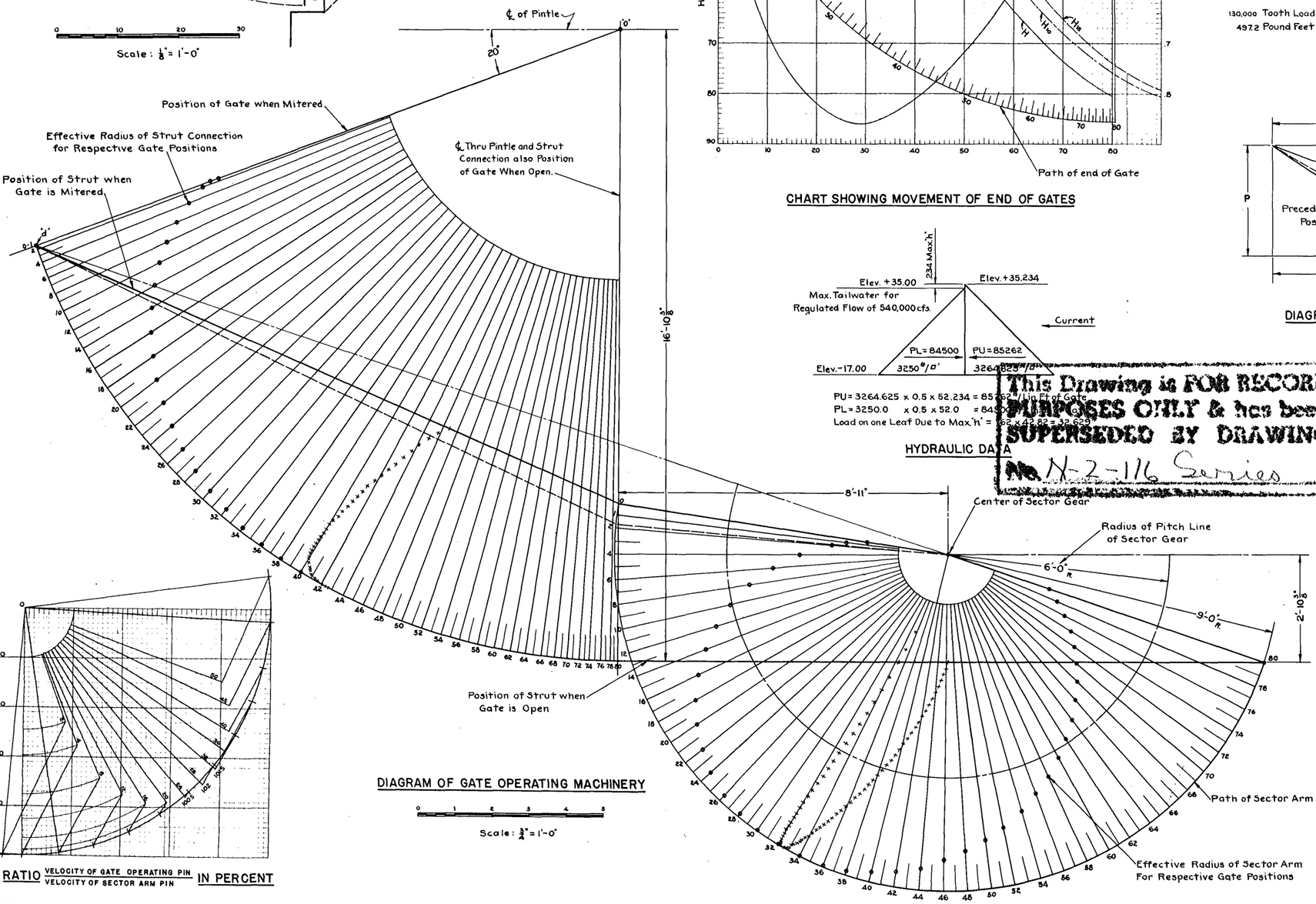


DIAGRAM OF GATE OPERATING MACHINERY

0 1 2 3 4 5
Scale: ¾" = 1'-0"

RATIO $\frac{\text{VELOCITY OF GATE OPERATING PIN}}{\text{VELOCITY OF SECTOR ARM PIN}}$ IN PERCENT

PU = 3264.625 x 0.5 x 52.234 = 85262 Lbs. per Ft. of Gate
PL = 3250.0 x 0.5 x 52.0 = 84500
Load on one Leaf Due to Max. 'h' = 762 x 42.82 = 32629

HYDRAULIC DATA

This Drawing is FOR RECORD PURPOSES ONLY & has been SUPERSEDED BY DRAWING No. N-2-116 Series

GENERAL NOTES

Motor:-
Rating - 30/10 HP. - 900/300 R.P.M.
Full Load Slip = 12% Minimum.
Full Load Speed = 792 R.P.M.
Full Load Torque = 30 x 5250 ÷ 792 = 198.8#'.

Time Assumed to Open or Close Gate, 80 Seconds at Uniform Full Load Speed of Motor.
Arc of Travel of Sector Gear and Arm 169°.
Speed of Sector Gear and Arm = (169÷360) x (60÷80) = .352 R.P.M.
Max. Thrust in Gate Strut (Gates Mitered) Due to 150% Overload on Motor = 354,000#.

A = Travel of Sector Arm Pin = 18 x π x 169 ÷ (360 x 80) = .332'/Sec.
B = Travel of Gate Operating Pin 'd' in % of A. (From Chart).
C = Ratio of Travel of End of Gate 'e' to Gate Operating Pin 'd' = 42.82 ÷ 16.87 = 2.53.
D = Speed of Gate Operating Pin d in Feet Per Sec. = A x B.
E = Speed of End of Gate 'e' in Feet Per Sec. = D x C = 2.53 D.
F = Reduction in Area of Pool = (80.5 - N)P - 40.25 x 14.65 = (80.5 - N)P - 589.7.
G = (H for Preceding Position + H) ÷ 2
H = Distance Between Gate Ends, Opening Simultaneously (From Chart).
H_{10} = Distance Between Gate Ends with 10 Second Lag. (From Chart).
H_{15} = Distance Between Gate Ends with 15 Second Lag. (From Chart).
J = P for Preceding Position - P.
K = G.J (52+h).
L = Area of Efflux Between Gates = H x (52+h).
M = Area of Efflux Under Gates = N(P - N Tan 20°) = N(P - .364N). Max. = 10 x 42.82 = 428.2
N = Horizontal Distance from Pintle 'o' to End of Gate = 40.25 - .5H.
P = Longitudinal Distance from Pintle 'o' to End of Gate (See Chart).
Q = Total Efflux Area = L + M.
R = Area of Pool = 5.54 x 76 - F = 42100 - F.
S = Volume of Pool = S for Preceding Position - T.
T = Total Reduction in Volume = U + V.
U = Efflux = $Q\sqrt{2gh}$ x .7 (Assuming 70% Efficiency) = $Q\sqrt{h}$ x 5.6.
V = Reduction of Volume Due to Movement of Gates = K(52 + h).
X = PU - PL. Pressure Per Lin. Ft. of Gate Due to Difference in Head 'h'.
Y = Load on one Leaf Due to Head 'h' = 42.82 x.
Z = Normal Force on Gate Operating Pin Due to Load 'Y' = 21.41 ÷ 16.87 = 1.27 Y.
g = 32.16
h = Difference in Head = (S for Preceding Position ÷ R) - 52.

SAMPLE CALCULATIONS

Position -15 :-
F = (80.5 - 36.6) x 22.4 - 589.7 = 393.7.
R = 42100 - 393.7 = 41706.3
h = 2178534 ÷ 41706.3 - 52 = .235
L = 7.3 x 52.235 = 381.3
M = 36.6 x (22.4 - 364 x 36.6) = 333.1
Q = 381.3 + 333.1 = 714.4
U = 714.4 $\sqrt{.235}$ x 5.6 = 1936
V = 4.8 x 52.235 = 251
T = 1936 + 251 = 2187
S = 2178534 - 2187 = 2176347
PU = 62.5 x .5 x 52.235 = 85262
X = 85262 - 84500 = 762
Y = 42.82 x 762 = 32629
Z = 1.27 x 32629 = 41439
F_1 = 2.81 x 41439 x 7.27 ÷ 14.88 = 56891
I_1 = .00381 x 56891 = 216.8
J_1 = 56891 x 6 + 7.27 = 46953 Tension.

Position Zero :-
F_1 Max. = 497.2 x 2250 ÷ 6 x .7 = 130000
J_1 Max. = 130,000 x 6 ÷ 2.21 = 354000 Compression

A_1 = Effective Gate Arm (Scale Diagram).
B_1 = Normal Gate Arm = 16.87'
C_1 = Normal Sector Arm = 9.0'
D_1 = Effective Sector Arm (Scale Diagram).
E_1 = Pitch Radius of Sector Gear = 6.0".
F_1 = Tooth Load on Sector Gear = $(Z\ B_1D_1) \div (A_1E_1)$ = $(2.81\ Z\ D_1) \div A_1 = I_1G_1 \div E_1H_1$.
G_1 = Reduction from Sector to Motor = 792 ÷ 352 = 2250.
H_1 = Overall Efficiency = 90% (Sector Gears) x 85% (Bevel Gears) x 92% (Reducer) = 70%.
I_1 = Motor Torque = $(F_1E_1) \div (G_1H_1)$ = .00381 F_1.
J_1 = Load on Strut = $F_1 \times E_1 + D_1$ (Tension or Comp.).

DESIGN NOTES:-

For an Assumed Wind Load of 5#/a' an Additional 1.7 HP Required at Position 15
Machinery to be Designed for 250% of Full Load Motor Torque with Design Stresses Increased 50%.

NO.	REVISION	DATE	BY	AP'V'D

BONNEVILLE POWER NAVIGATION PROJECT
36-TH. CONTRACT - LOCK OPERATING EQUIPMENT

MITER GATE MACHINERY
DESIGN DATA

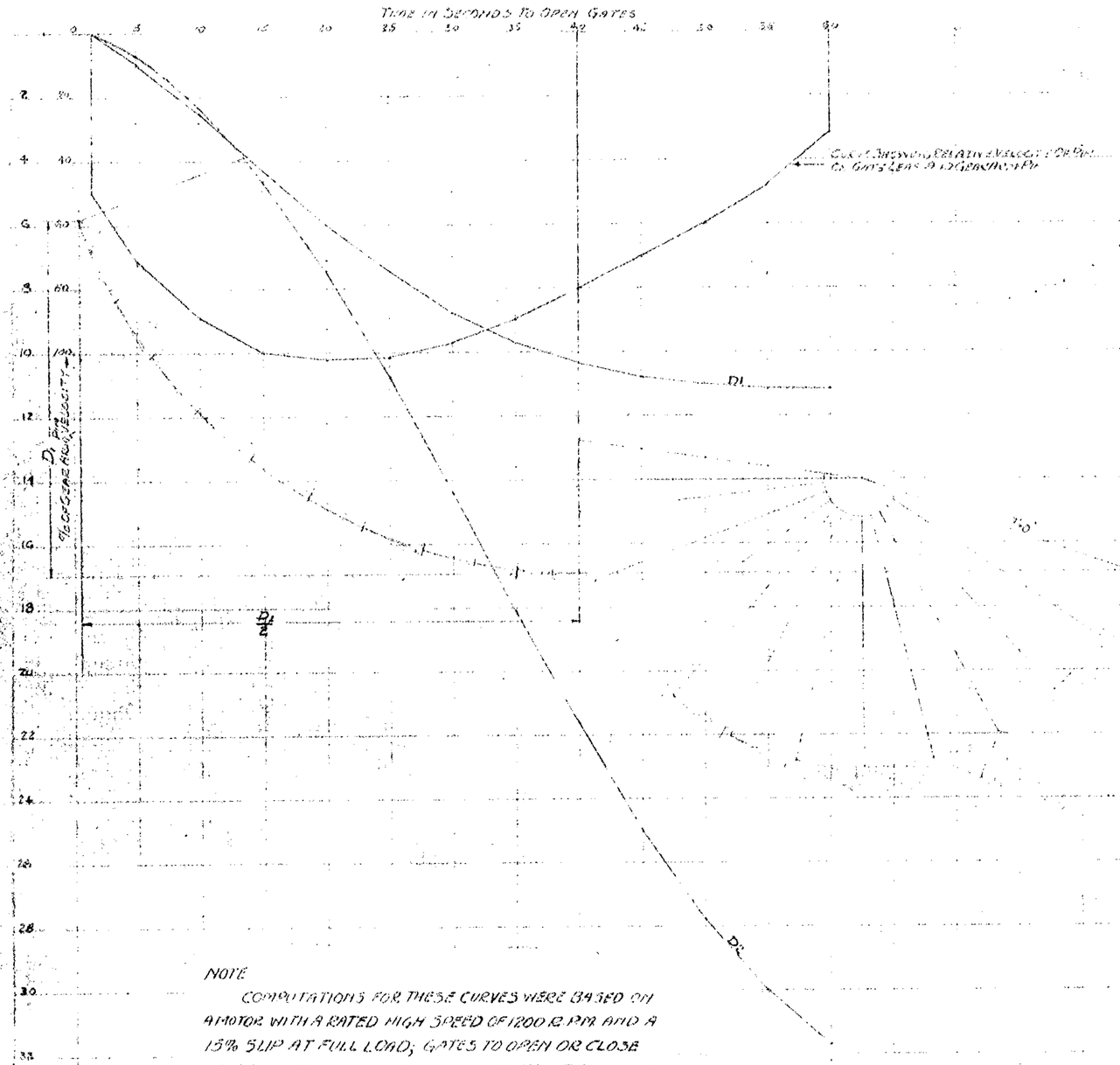
SCALES AS SHOWN

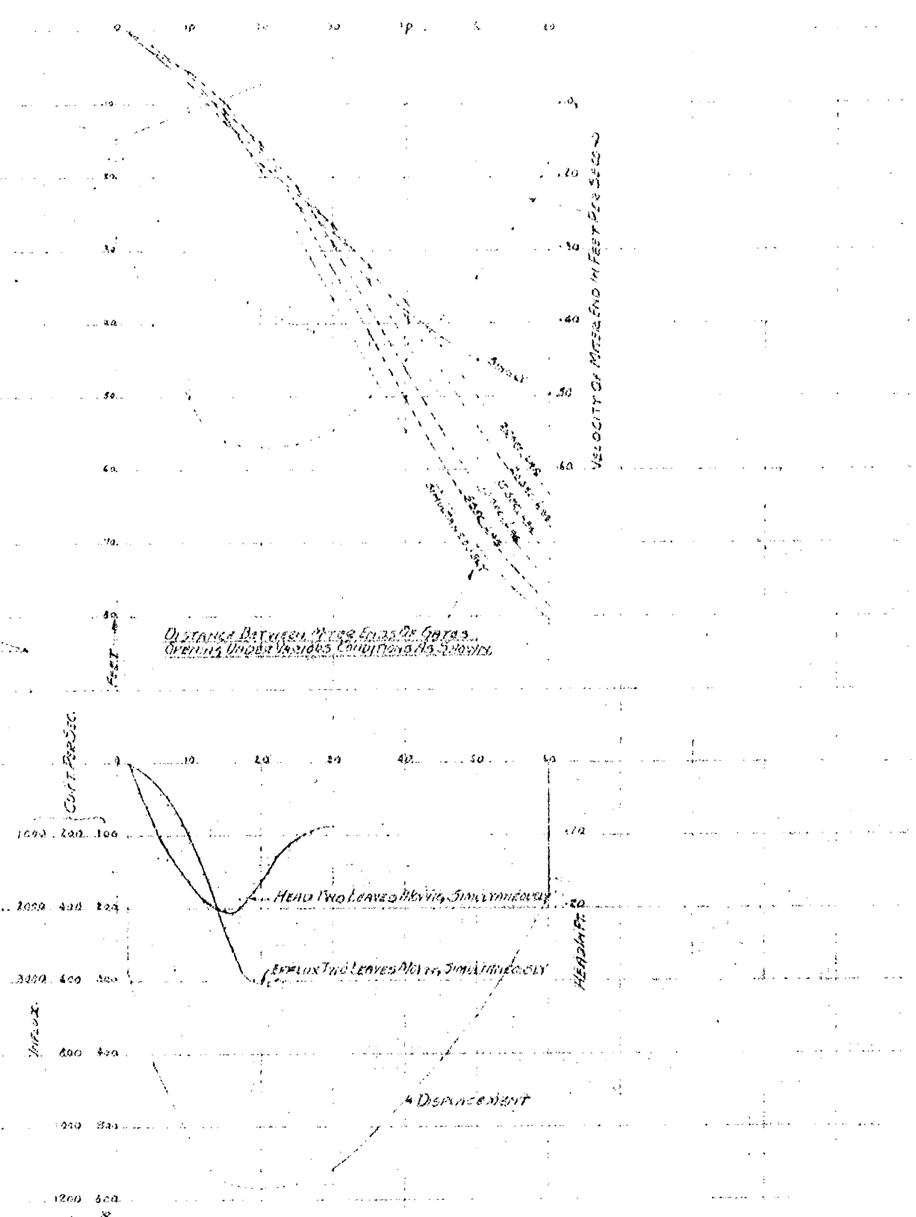
U.S. ENGINEER OFFICE, SECOND PORTLAND DISTRICT, OREGON

SUBMITTED R.L. Mackenzie, ENGINEER — APPROVED H. Williams, MAJOR, CORPS OF ENGINEERS

RECOMMENDED Geo. Flaherty, HEAD ENGINEER

DESIGNED BY A.A.O. & R.L.D. DATE 6-17-38
DR. BY R.J.F. TR. BY R.K.W. CHECKED BY





NOTE

COMPUTATIONS FOR THESE CURVES WERE BASED ON A MOTOR WITH A RATED HIGH SPEED OF 1200 R.P.M. AND A 15% SLIP AT FULL LOAD; GATES TO OPEN OR CLOSE IN 60 SECONDS, ASSUMING A CONSTANT FULL LOAD SPEED THROUOT THE SWING AND AN OVERALL EFFI-CIENCY OF 60%.

CONTRACT DRAWINGS ARE BEING REVISED TO AL-LOW A LONGER PERIOD OF TIME FOR OPERATING THE GATES. A MOTOR WITH A RATED HIGH SPEED OF 900 R.P.M. AND A MINIMUM SLIP OF 12% WILL BE USED.

DATA FROM SHEET 'IA' WILL BE INCORPORATED INTO SHEET 1.

BONNEVILLE POWER NAVIGATION PROJECT

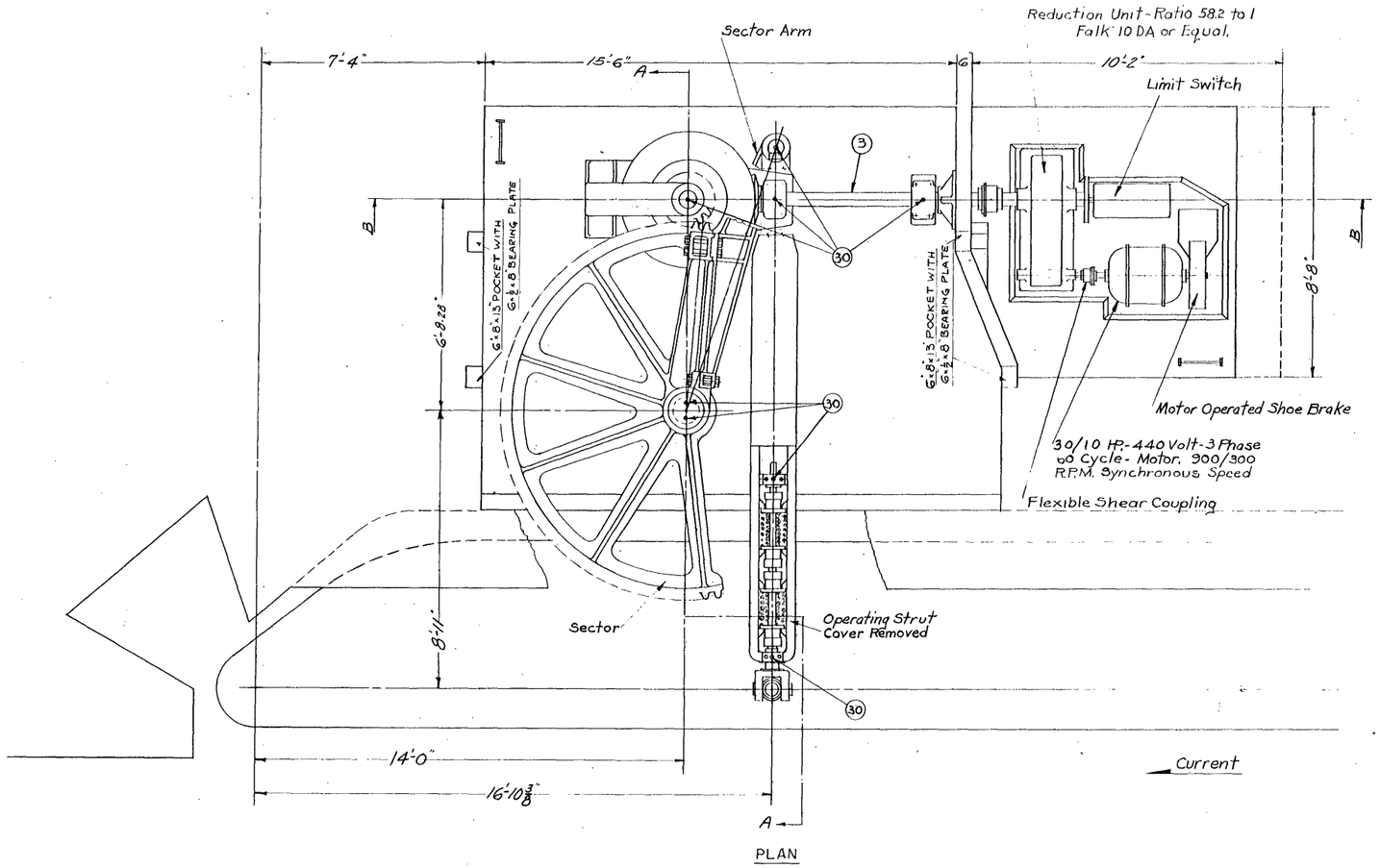
Computations Covering Fish Water Gates Operating Mechanism

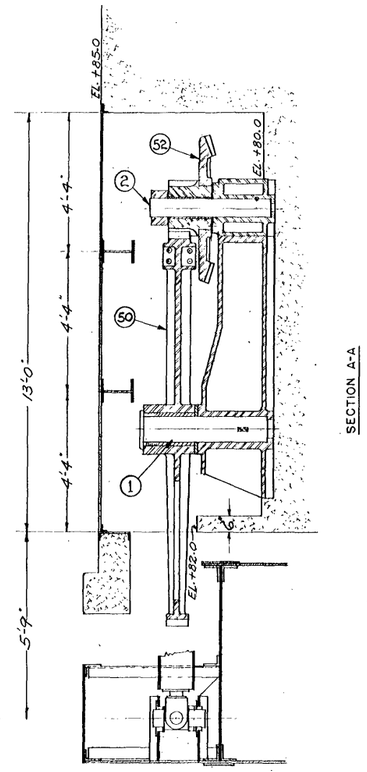
U.S. ENGINEER'S OFFICE, PORTLAND, OREGON, DIS...

SUBMITTED ... APPROVED ...

RECOMMENDED ... DRAWN ... TRACED ... CHECKED ...

SHEET IA N-2-83



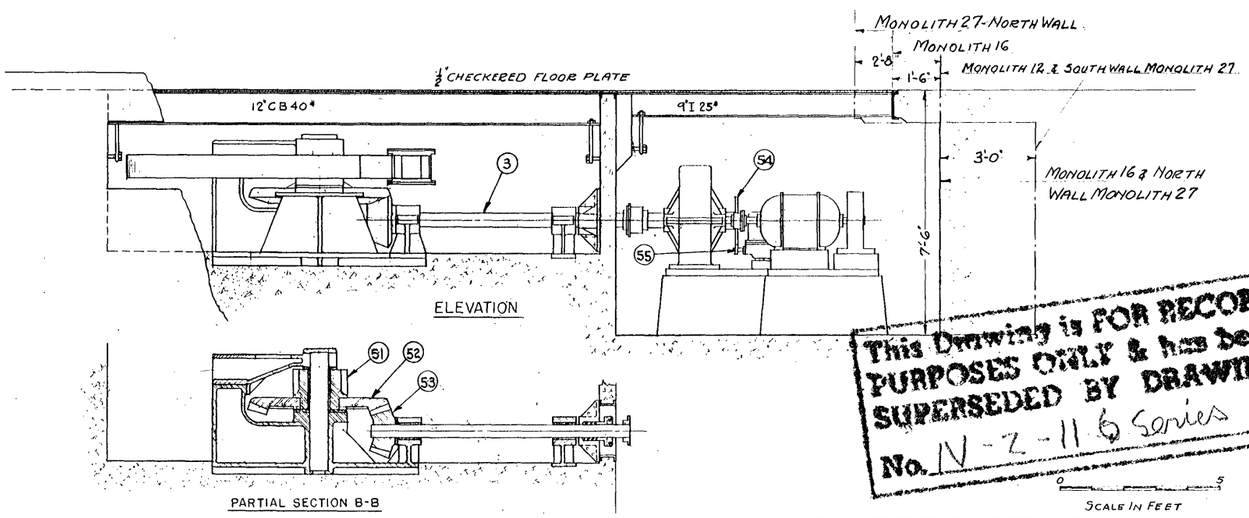


SECTION A-A

GEAR TABLE								
ALL GEARS TO HAVE 20° INVOLUTE STUB CUT TEETH								
MARK	AMOUNT	PART	No. TEETH	PITCH	FACE	BORE	HUB	MATERIAL
50	1	SECT. GEAR		4"	8"	10"	20"	MED. S.C.
51	1	SECT. PIN.	13	4"	8"	8"	15½"	CH.NI.ST.
52	1	BEVEL GEAR	56	1	7½"	15"	4½"	MED. S.C.
53	1	BEV. PINION	13	1	7½"	5¼"	9"	CH.NI. ST.
54	1	L.SW. GEAR	174	10	1½"	6"	3"	C.S.C.
55	1	L. SW. PIN.	36	10	1½"	1¼"	2½"	MACH. ST

SHAFTING							
MARK	AMOUNT	PART	MATERIAL	DIAM.	LENGTH	KEYWAYS	REMARKS
1	1	SECT. GEAR PIN	CH.NI. ST.	10"	47"		
2	1	SECT. PINION PIN	CH.NI. ST.	8"	46"		
3	1	BEV. PINION SH.	CH.NI. ST.	5¼"	100"	2	

MARK	AMOUNT	SIZE	MATERIAL	REMARKS
30	8	¼"	ZERK # 137	OR EQUAL



GENERAL NOTES:—

Two Right Hand Assemblies as shown in North Wall, One in Monolith 16, and One in North Wall of Monolith 27. Two Left Hand Assemblies Opposite as shown in South Wall, One in Monolith 12 and One in South Wall of Monolith 27.
Total Reduction about 2250 to 1
Checkered Plate Fastened down with ½" Flat Head Machine Screws Spaced About 24" Centers.

REFERENCES:—

For Design Data See N-2-83 Sheet 1.
For Operating Strut Arrangement Details of Sector and Arm See N-2-83 Sheet 3.

This Drawing is FOR RECORD PURPOSES ONLY & has been SUPERSEDED BY DRAWING No. N-Z-11 6 Series

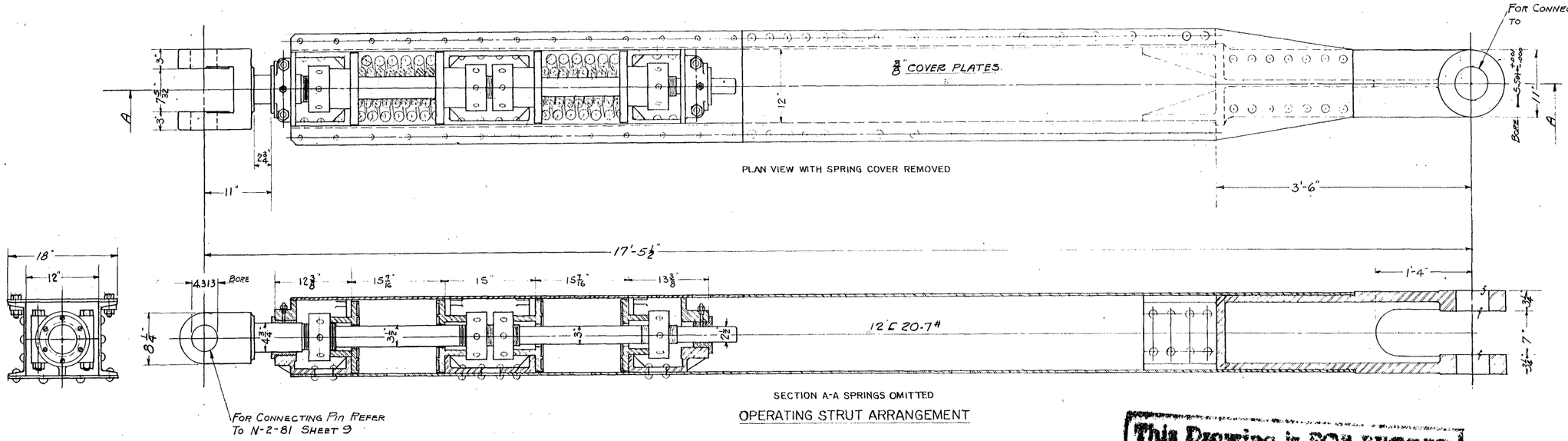
0 5
SCALE IN FEET

NO.	REVISION	DATE	BY	APP'D

BONNEVILLE POWER NAVIGATION PROJECT
36-TH. CONTRACT — LOCK OPERATING EQUIPMENT
MITER GATE MACHINERY
GENERAL ASSEMBLY
SCALE AS SHOWN
U. S. ENGINEER OFFICE, PORTLAND, OREGON DISTRICT
SUBMITTED: R. Mackenzie, ENGINEER
APPROVED: [illegible], MAJOR, CORPS OF ENGINEERS
RECOMMENDED: [illegible], ROAD ENGINEER
DRAWN BY: R.L.F. DATE: 6-17-35
DESIGNED BY: A.A.A. & R.L.F.
TRACED BY: R.L.F.
CHECKED BY:

WAR DEPARTMENT

CORPS OF ENGINEERS U.S. ARMY



OPERATING STRUT ARRANGEMENT

GENERAL NOTES:—

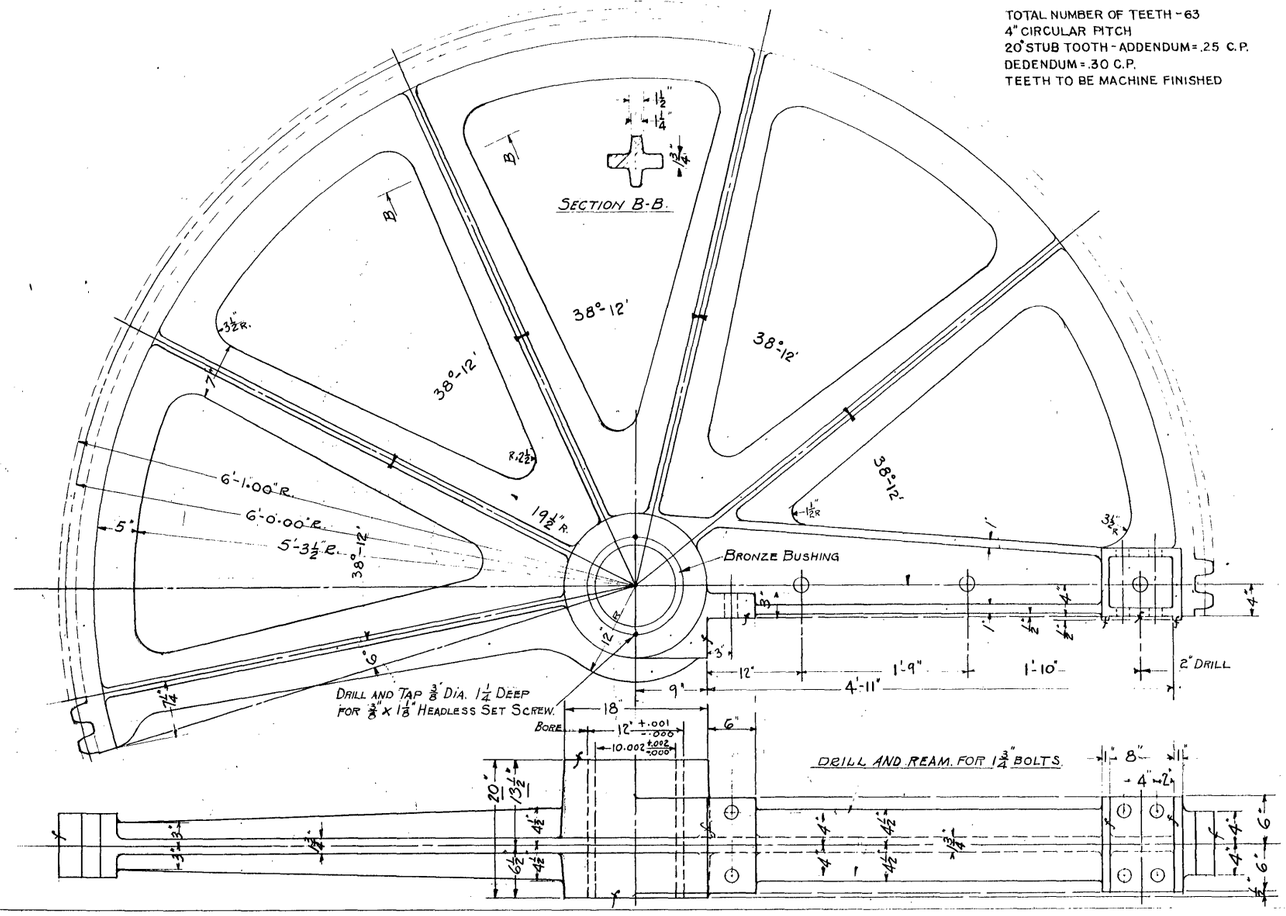
FOR STRUT FABRICATION 15/16" REAMED HOLES FOR ⅞" RIVETS AND BOLTS.
FOR BOLTING MACHINERY PARTS DRILL AND REAM FOR TURNED BOLTS AS SHOWN.

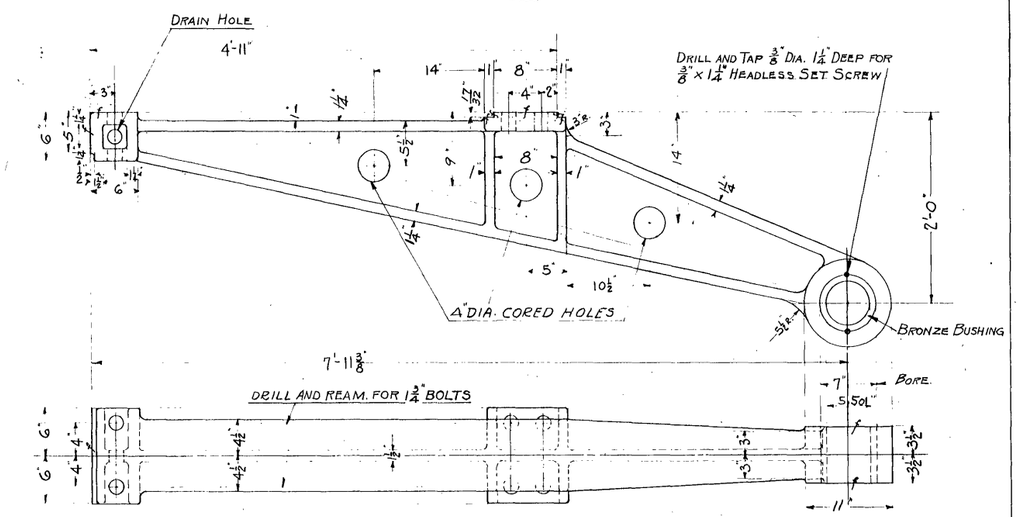
REFERENCES:—

FOR GENERAL ASSEMBLY OF MITER GATE MACHINERY SEE N-2-83 SHEET 2.

This Drawing is FOR RECORD PURPOSES ONLY & has been SUPERSEDED BY DRAWING No. N-2-116 Series

TOTAL NUMBER OF TEETH - 63
4" CIRCULAR PITCH
20° STUB TOOTH - ADDENDUM = .25 C.P.
DEDENDUM = .30 C.P.
TEETH TO BE MACHINE FINISHED





SECTOR ARM

CARBON STEEL CASTING WT- 1085 LBS
MARK - MGM- MAKE - 4
SCALE - 1½" = 1'-0"

SECTOR GEAR

CARBON STEEL CASTING WT.-
MARK MGM- -R MAKE - 2 R.H.
MARK MGM- -L MAKE - 2 L.H.
SCALE - 1½" = 1'-0"

SCALE IN FEET

NO.	REVISION	DATE	BY	APV'D

BONNEVILLE POWER NAVIGATION PROJECT
36TH CONTRACT — LOCK OPERATING EQUIPMENT

MITER GATE MACHINERY
OPERATING STRUT ARRANGEMENT
DETAILS OF SECTOR AND ARM

SCALES AS SHOWN

U S ENGINEER OFFICE, PORTLAND, OREGON DISTRICT

SUBMITTED: R.L. Mackenzie, ENGINEER — APPROVED: [illegible], MAJOR, CORPS OF ENGINEERS

RECOMMENDED: [illegible], HEAD ENGINEER

DRAWN BY: R.S.C. DATE 6-17-35
DESIGNED BY: R.A.M. & C.E.O.
TRACED BY: R.A.E. CHECKED BY

WAR DEPARTMENT

CORPS OF ENGINEERS U.S. ARMY

VALVE CLOSED
Water in Lock at El. +4.00

LOAD IN LBS.	
W =	+18,908
F =	+3,360
S =	+14,700
R =	+7,900
U =	-10,500
Total Vertical on Chain =	34,368
Total along Chain =	36,150
Less Counterweight =	11,400
Net Pull on Chain =	24,750

VALVE ½ OPEN IN 45 SECONDS
Water in Lock at El. +5.08

LOAD IN LBS.	
W =	21,013
F =	2,680
S =	12,010
R =	75
U =	0
Total Vertical on Chain =	35,718
Total along Chain =	40,100
Less Counterweight =	11,400
Net Pull on Chain =	28,700

VALVE ½ OPEN IN 90 SECONDS
Water in Lock at El. +8.08

LOAD IN LBS.	
W =	22,948
F =	1,880
S =	8,430
R =	300
U =	0
Total Vertical on Chain =	33,558
Total along Chain =	38,500
Less Counterweight =	11,400
Net Pull on Chain =	27,100

VALVE ⅞ OPEN IN 135 SECONDS
Water in Lock at El. +12.73

LOAD IN LBS.	
W =	25,338
F =	836
S =	3,750
R =	730
U =	0
Total Vertical on Chain =	30,654
Total along Chain =	34,900
Less Counterweight =	11,400
Net Pull on Chain =	23,300

VALVE OPEN IN 180 SECONDS
Water in Lock at El. +18.80

LOAD IN LBS.	
W =	28,888
F =	0
S =	0
R =	0
U =	0
Total Vertical on Chain =	28,888
Total along Chain =	29,100
Less Counterweight =	11,400
Net Pull on Chain =	17,700

SYMBOLS
W = Total Weight on Chain
F = Friction of Trunnion Bearing
S = Friction of Side Seals
R = Reaction at Bottom Seal
U = Uplift at Top Seal

ASSUMPTIONS
Upper Pool Elev. = +72.00
Tail Water Elev. = +4.00
Coefficient of Discharge = 0.70
Coefficient of Friction on Trunnion = 0.20
Coefficient of Frict. on Rubber Seals = 0.75
Working Hd. on Valve = Static Head - Velocity Hd.
Velocity Head = $\frac{V^2}{2g}$, Velocity in Main Conduit used.
Weight of Gate in Air = 18,356 lbs.

POSITION "1"

POSITION "2"

POSITION "3"

POSITION "4"

POSITION "5"

SCALE ¼" = 1'-0"

SPACE DIAGRAM
SCALE ¼" = 1'-0"

MAX. DESIGN CONDITIONS
Upper Pool Elev. = 78.50
Lock Dry Elev. = 30.50
107 Ft.
10% for Impact 11 Ft.
Max. Design Head 120 Ft.

FORCE DIAGRAM
DESIGN DATA FOR REACTION ON STRUTS
SCALE 1IN = 100,000 LB.

LOAD DIAGRAM
DESIGN DATA FOR LIFTING MACHINERY
SCALE 1IN = 30FT.

TYPICAL EXAMPLE (POSITION "3")

Area Valve Opening = 7'X 5.75' = 40.20 in²
Area at Top Seal = 7'X 0.292 = 1.82 in²
Area Total Opening = 42.02 in²
Average Area = 20.91 in²
Assumed Static Head = 64.0'
$Q = 0.7 \times 20.91 \times \sqrt{64 \times 64.4} = 936$ c.f.s.
Rise in Lock $\frac{936 \times 90 \times 12}{41232} = 4.08'$
Water in Lock at 90 Sec. = 4.08 + 4.00 = El. +8.08
Average Velocity in Conduit = $\frac{936}{90.5}$ = 11.62 ft/sec.
Velocity Head = $\frac{V^2}{2g} = \frac{11.62^2}{64.4} = 2.12'$
Velocity Head Pressure = 2.12' X 0.433 lb = 0.92 lb/in²
Pressure on Valve = wh = 62.4 x 61.8 = 3860 lb/ft² = 26.8 lb/in²

Head Water =	+72.00
Starting Tail Water =	+4.00
Starting Head =	68.00'
Rise in Lock =	4.08'
Static Head at 90 Sec. =	63.92'
Velocity Head =	2.12'
Working Head =	61.80'

Weight of Tainter Valve (submerged)
= 16014 x 126.9 / 135.8 = 14,950 lb

Weight of Lower Strut (21' Submerged) =	2,965
Radial Frames 2 x 1765 x 14.17 / 156 =	1,680
Upper Strut, Castings, Pins & Chain	3,353
W = Total Weight on Chain. =	22,948 lb
F = 0.28 X 7 X 6.75 X 3060 X 5 / 135.8 =	1,880
S = 0.75 X 2 X 2 X 81 X 26.8 X 176 / 135.8 =	8,430
R = 3 X 84 X 0.92 X 176 / 135.8 =	300
U =	0
Total Load Vertical on Chain =	33,558 lb
Total Load along Chain =	38,500
Less Counterweight =	11,400
Net Pull on Chain =	27,100 lb

DESIGN NOTES

FOR CLOSING VALVE: All Valve Operating Machinery, Struts, Radius Frames and Pin Connections are designed to withstand 250 % Torque on Motor (approx. 130,000 lbs. Pull on Chain), using 150 % of Normal Design Stresses.

Diagonal and Web Framing of Valve is designed to withstand shock of Valve dropping freely, in case of breakdown, using 150 % of Normal Design Stresses.

Skin Plate of Valve and Supporting Beams are designed for Static Head of 68 ft. + 10% for Impact = 75 ft. Head, using Normal Design Stresses.

Time required to Fill Lock, from Elev. +4.00 to Elev. +72.00, including 3 Minutes for Opening Valves. = Approx. 13 Minutes.

BONNEVILLE POWER NAVIGATION PROJECT
(36-TH) CONTRACT W 694 ENG-47.
LOCK OPERATING EQUIPMENT

TAINTER VALVES
DESIGN DATA

SCALES AS SHOWN

U.S. ENGINEER OFFICE, SECOND PORTLAND DISTRICT, OREGON

SUBMITTED: R.M. Mackenzie, ENGINEER
APPROVED: C. Williams, LT. COL., CORPS OF ENGINEERS
RECOMMENDED: H.F. Kenneth, SENIOR ENGINEER
DESIGNED BY J.A.G. 4/10, 1935
DRAWN BY J.F.H.
TRACED BY J.A.G.
CHECKED BY F.T.D.

NO.	REVISION	DATE	BY	APP'D
	ISSUED FOR CONSTRUCTION	9/30/35	JAG	RM

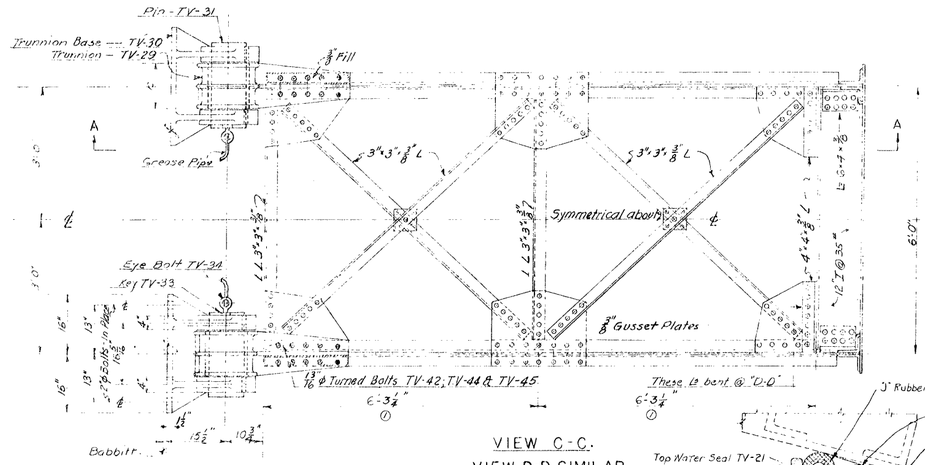
THIS DRAWING SUPERSEDES DRAWING OF SAME NUMBER NOT BEARING THIS CAPTION

SHEET 1

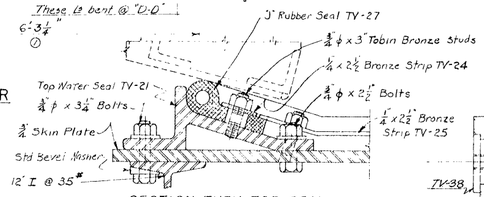
N-2-84

WAR DEPARTMENT

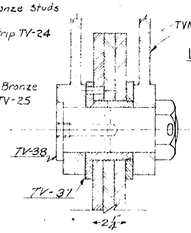
CORPS OF ENGINEERS U.S. ARMY.



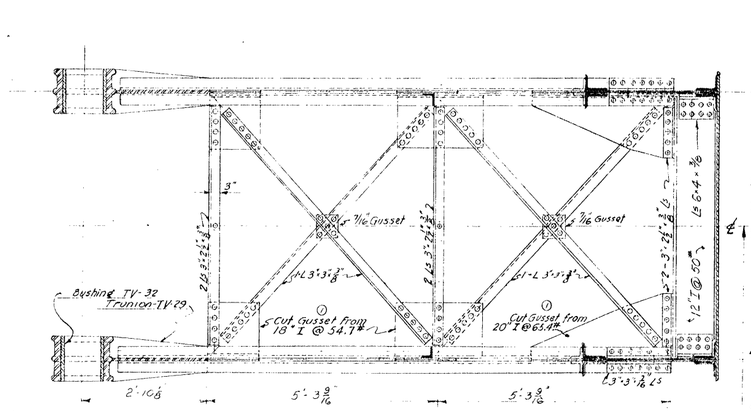
VIEW C-C.
VIEW D-D SIMILAR



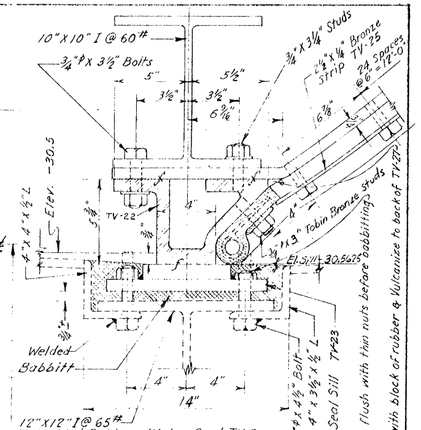
SECTION THRU TOP SEAL



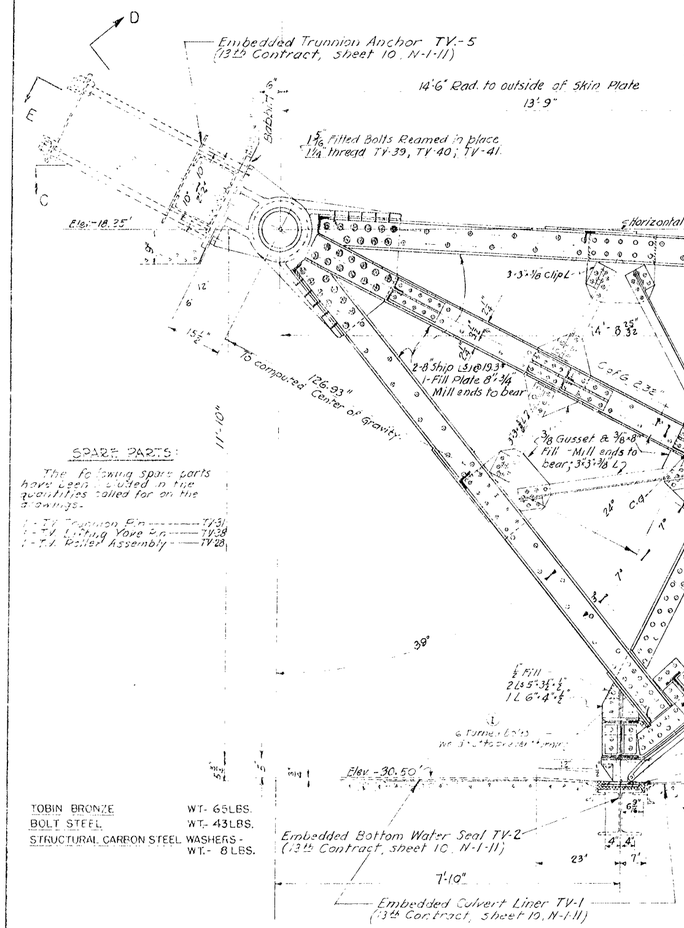
LIFTING YOKE ASSEMBLY
SECTION-XX
SCALE 3" = 1'-0"
Scale in inches



SECTION E-E.



SECTION THRU BOTTOM SEAL
SCALE 3" = 1'-0"



SPARE PARTS:

The following spare parts have been included in the quantities called for on the drawings.

1 - TV Trunnion Pin ——— TV-31
1 - TV Lifting Yoke Pin ——— TV-38
1 - T.V. Roller Assembly ——— TV-28

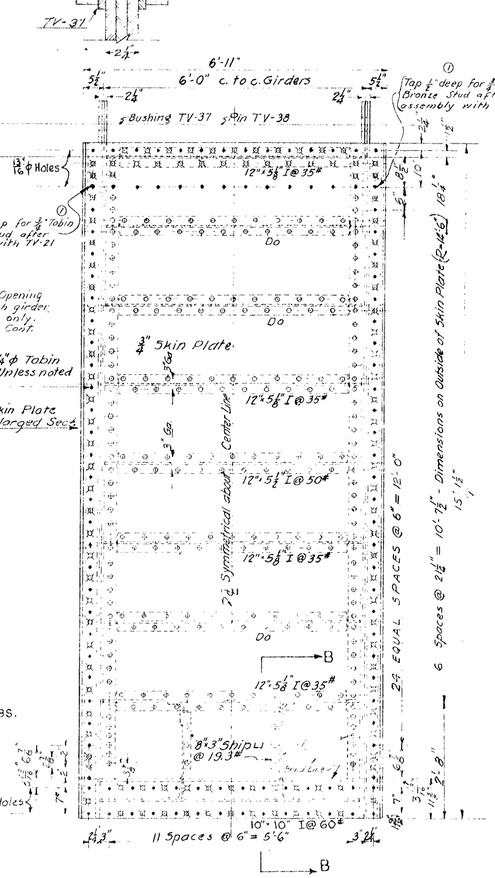
TOBIN BRONZE	WT- 65LBS.
BOLT STEEL	WT- 43LBS.
STRUCTURAL CARBON STEEL WASHERS -	WT.- 8 LBS.

SECTION A-A

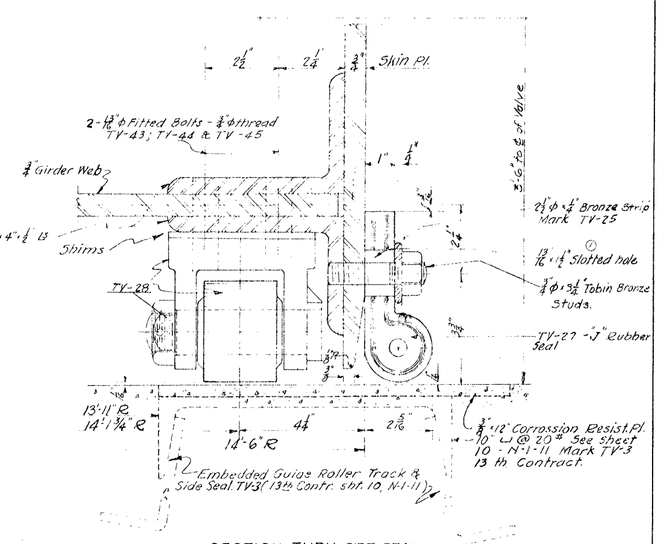
TAINTER VALVE

STRUCTURAL CARBON STEEL; WEIGHT 15,969 LBS.
MAKE - 4

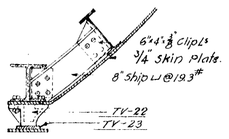
SCALE ¾" = 1'-0"
Scale in Feet.



SKIN PLATE DEVELOPED



SECTION THRU SIDE SEAL
Scale 6" = 1'-0"



SECTION B-B

REFERENCES:

Design Data	Sheet	1 of N-2-84
Seats - Details	"	3 " " "
Details - Trunnions	"	4 " " "
Tainter Valve - Machinery	"	1 - N - 2 - 85

(1) McClintic-Marshall Co. Cat. sheet 425 - Part 2 - 1940

NOTES:

Steel Embedded in Concrete not included in 36th Contr.
All open holes 13/16 ϕ unless otherwise noted.
All Elevs 3/4 ϕ " " "
Weights given are for one item.
Numbers required are for entire installation.
Estimated Total Assembled Weight of one Tainter Valve incl. TV-29 and TV-38 - 18,719 #

NO.	REVISION	DATE	BY	APV'D
1	REVISED TO AGREE WITH SHOP DRAWINGS	4/23/56	RMA	
	ISSUED FOR CONSTRUCTION	9-10-55		

BONNEVILLE POWER NAVIGATION PROJECT
(36-TH) CONTRACT - LOCK OPERATING EQUIPMENT
CONTRACT W 694 ENG.- 47

TAINTER VALVES
GENERAL ASSEMBLY.

SCALES AS SHOWN

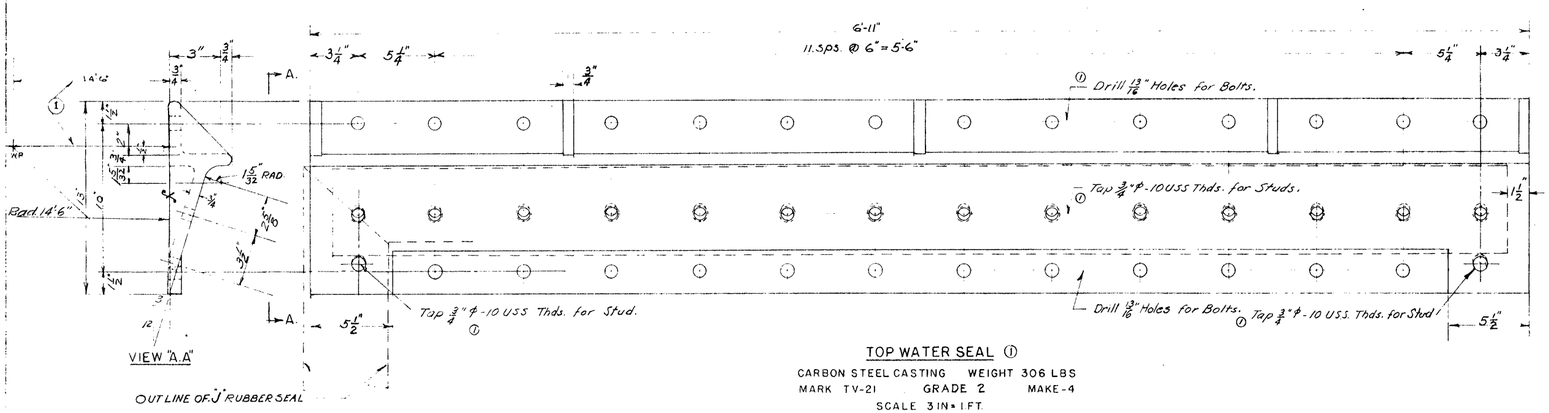
U.S. ENGINEER OFFICE, SECOND PORTLAND DISTRICT, OREGON

SUBMITTED	APPROVED
RECOMMENDED	LT. COL. CORPS OF ENGINEERS
SENIOR ENGINEER	DESIGNED BY A.A.O. & F.T.O. DATE 8-9-55
	DRAWN BY G.S.D.
	TRACED BY M.K.L. CHECKED BY F.T.O.

SHEET 2

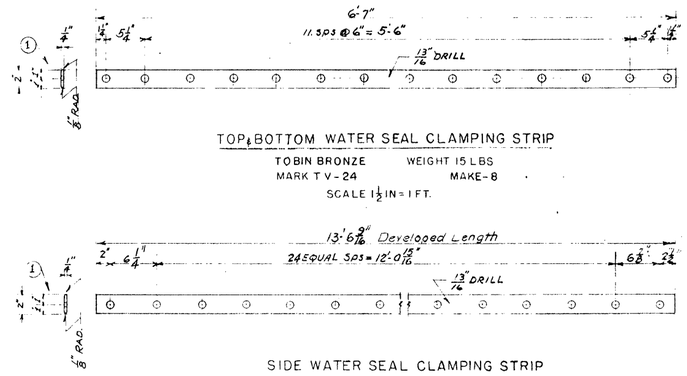
N-2-84

THIS DRAWING SUPERSEDES DRAWING OF SAME NUMBER NOT BEARING THIS CAPTION



TOP WATER SEAL ①

CARBON STEEL CASTING WEIGHT 306 LBS
MARK TV-21 GRADE 2 MAKE-4
SCALE 3 IN = 1 FT.

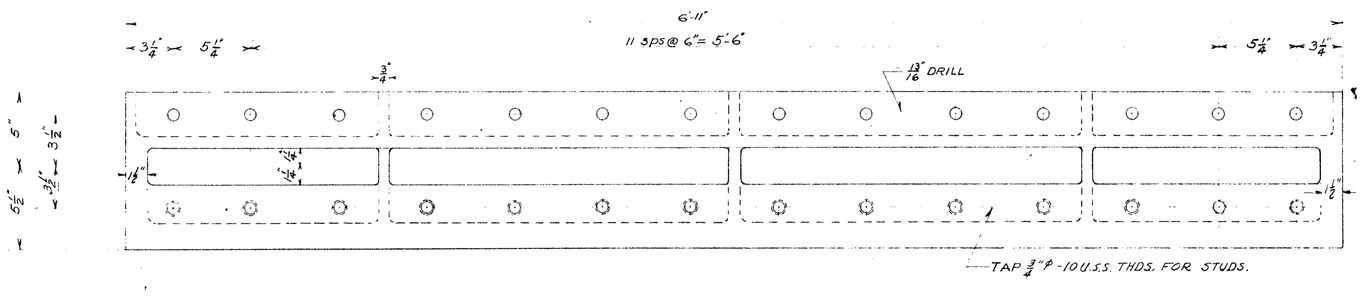


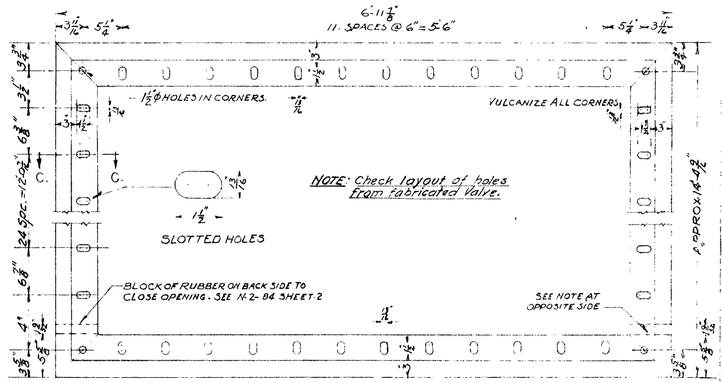
TOP & BOTTOM WATER SEAL CLAMPING STRIP

TOBIN BRONZE WEIGHT 15 LBS
MARK TV-24 MAKE-8
SCALE 1½ IN = 1 FT.

SIDE WATER SEAL CLAMPING STRIP

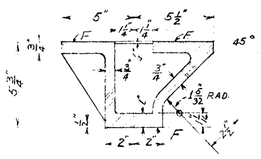
TOBIN BRONZE WEIGHT 31 LBS.
MARK TV-25 MAKE-8
SCALE 1½ IN = 1 FT.

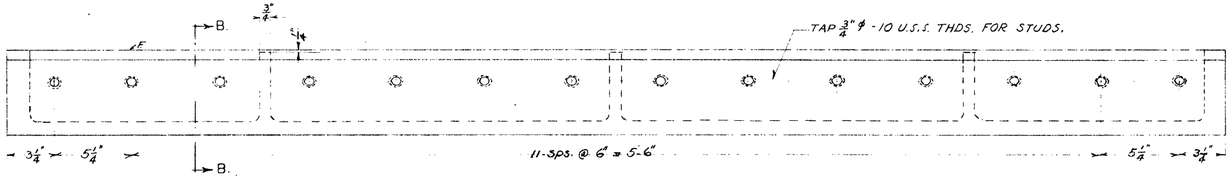




① ——— "J" RUBBER SEAL

2 PLY REINFORCED RUBBER WEIGHT 220 LBS.
MARK TV-27 MAKE-4
SCALE 1½ IN = 1 FT.

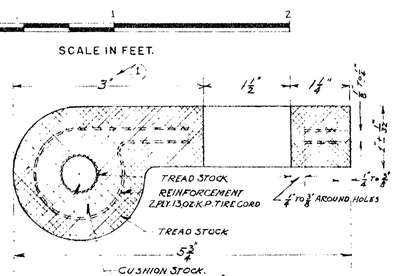




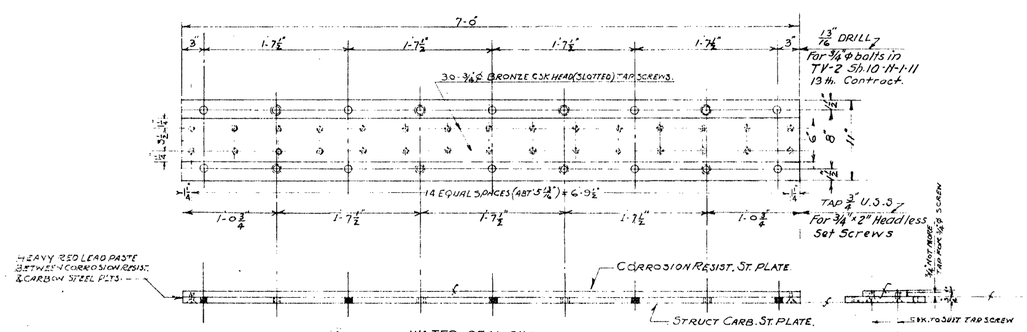
BOTTOM WATER SEAL ①

CARBON STEEL CASTING WEIGHT 431 LBS.
MARK TV-22 GRADE 2 MAKE-4
SCALE 3 IN = 1 FT.

SCALE IN FEET.



SECTION "C-C"
SCALE FULL SIZE



① ——— WATER SEAL SILL

CORROSION RES. STEEL WEIGHT 140 LBS.
STRUCT. CARB. STEEL WEIGHT 195 LBS.
MARK TV-23 MAKE-4.
SCALE 1½ IN = 1 FT.

SCALE IN FEET

NOTES

INDICATED WEIGHTS ARE FOR SINGLE PIECES.
QUANTITIES GIVEN ARE FOR 4 VALVES.
FOR TOLERANCES, ALLOWANCES & GAUGES SEE PARAGRAPH 711-4 SPECIFICATIONS.
DETAILS SHOWN ON THIS SHEET ARE :- TV-21 TO 25 INCLUSIVE & TV-27. (TV-26 OMITTED).

REFERENCES

TAINTER VALVE DESIGN DATA SHOWN ON	SHEET 1 N-2-84
TAINTER VALVE SHOWN ON	SHEET 2 "
VALVE DETAILS SHOWN ON	SHEET 4 "
GENERAL ASSEMBLY OF VALVE OPERATING MACHINERY SHOWN ON	SHEET 1 N-2-85
GENERAL ARRANGEMENT OF OPERATING MACHINERY SHOWN ON	SHEET 2 "

① McCLINTIC-MARSHALL'S DRWG. - SHEET 3 - CONTRACT NO. CJ 2070-2

NO.	REVISION	DATE	BY	APV'D
1	REVISED TO AGREE WITH SHOP DRAWINGS.	4/14/36	CMH	
	ISSUED FOR CONSTRUCTION	9-10-35		

BONNEVILLE POWER NAVIGATION PROJECT
(36 TH) CONTRACT W 694 ENG-47
LOCK OPERATING EQUIPMENT

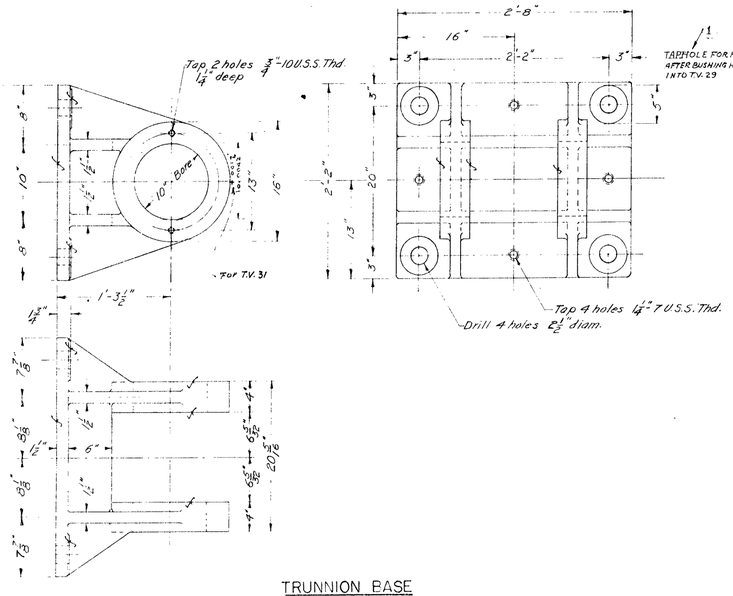
TAINTER VALVES
SEALS & SEAL CASTINGS.
SCALES AS SHOWN

U.S. ENGINEER OFFICE, SECOND PORTLAND DISTRICT (OREGON)

SUBMITTED: R.M. Mackenzie, ENGINEER
APPROVED: Lt. Col. Corps of Engineers
RECOMMENDED: SENIOR ENGINEER
DESIGNED BY A.A.D. & F.E.D. DATE 9-9-35
DRAWN BY F.S.D.
TRACED BY R.M.N. CHECKED BY

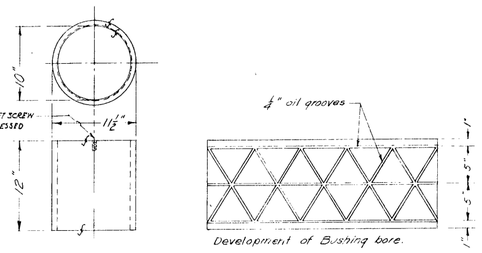
SHEET 3 N-2-84

THIS DRAWING SUPERSEDES DRAWING OF SAME NUMBER NOT BEARING THIS REVISION



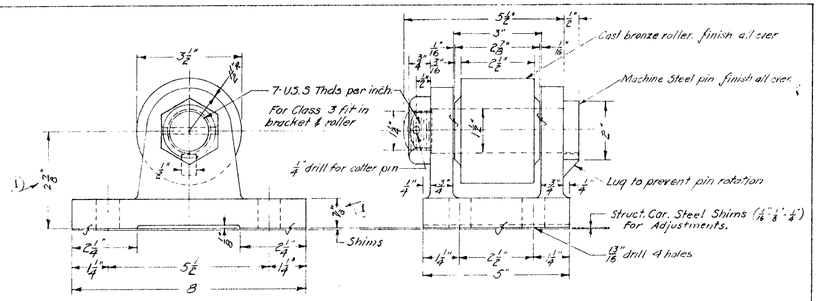
TRUNNION BASE

CARBON STEEL CASTING WEIGHT 787 LBS.
MARK TV-30 GRADE 2 MAKE 8
SCALE - 1 1/2" = 1'-0"



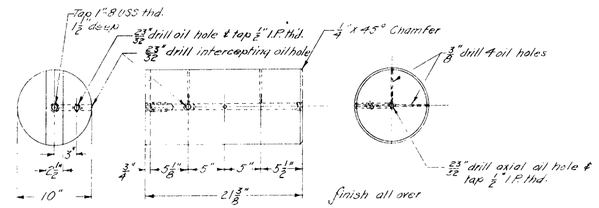
TRUNNION BUSHING ①

BRONZE CASTING CL. "C" WEIGHT 95 LBS.
MARK TV-32 MAKE 8
SCALE - 1 1/2" = 1'-0"



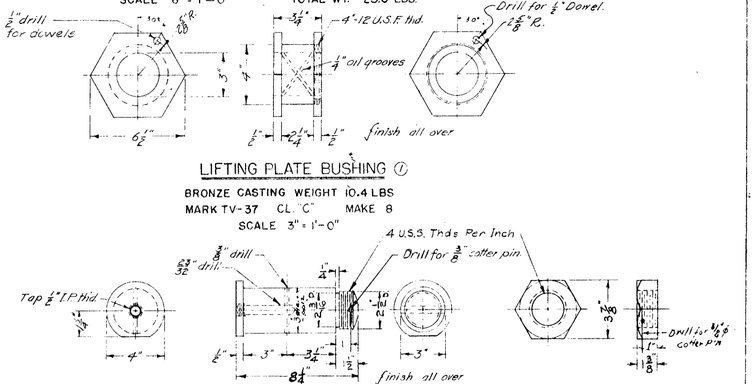
GUIDE ROLLER-ASSEMBLED ①

MARK TV-28 MAKE 17 (Incl. 1 Spare)
BRACKET - CARBON STEEL CAST'G. GR. 2 - WT. 15 LBS.
ROLLER - BRONZE CASTING - CL. "C" WT. 6.5 LBS.
PIN - MACHINE STEEL WT. 3.5 LBS
SCALE 6" = 1'-0" TOTAL WT. 25.0 LBS.



TRUNNION PIN

CARBON STEEL FORGING WEIGHT 470 LBS.
MARK TV-31 CLASS "E" MAKE 9 (Incl. 1 Spare)
SCALE - 1 1/2" = 1'-0"

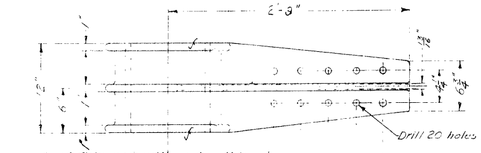


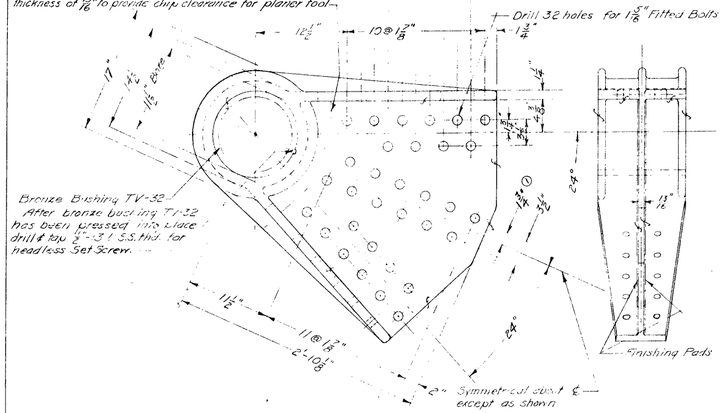
LIFTING PLATE BUSHING ①

BRONZE CASTING WEIGHT 10.4 LBS
MARK TV-37 CL. "C" MAKE 8
SCALE 3" = 1'-0"

LIFTING YOKE PIN & NUT ①

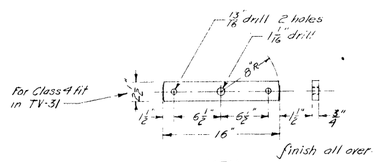
CARBON STEEL FORGING WEIGHT 18 LBS.
MARK TV-38 CLASS "E" MAKE 9 (Incl. 1 Spare)
SCALE 3" = 1'-0"





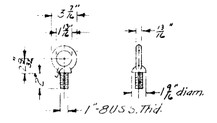
TRUNNION

CARBON STEEL CASTING WEIGHT 625 LBS.
MARK TV-29 GRADE 2 MAKE 8
SCALE - 1 1/2" = 1'-0"



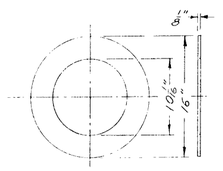
KEY

KEY STEEL WEIGHT 8 LBS.
MARK TV-33 MAKE 8
SCALE 1 1/2" = 1'-0"



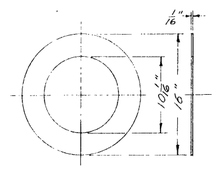
EYE BOLT

CARBON STEEL FORGING WT. 2 LBS.
MARK TV-34 CL. "C" MAKE 8
SCALE 1 1/2" = 1'-0"



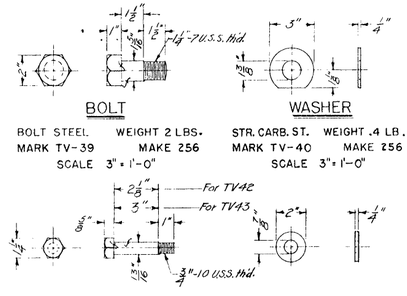
PIN WASHER

TOBIN BRONZE WEIGHT 4.8 LBS.
MARK TV-35 MAKE 8
SCALE 1 1/2" = 1'-0"



PIN WASHER

TOBIN BRONZE WEIGHT 2.4 LBS
MARK TV-36 MAKE 16
SCALE 1 1/2" = 1'-0"



BOLT

BOLT STEEL WEIGHT 2 LBS.
MARK TV-39 MAKE 256
SCALE 3" = 1'-0"

WASHER

STR. CARB. ST. WEIGHT .4 LB.
MARK TV-40 MAKE 256
SCALE 3" = 1'-0"

NUT

BOLT STEEL WEIGHT .8 LB.
MARK TV-41 MAKE 256
SCALE 3" = 1'-0"

BOLT

BOLT STEEL WEIGHT .8 LB.
SHORT, MARK TV-42 MAKE 160
LONG, MARK TV-43 MAKE 68
SCALE 3" = 1'-0"

WASHER

STR. CARB. STEEL WT. .2 LB.
MARK TV-44 MAKE 228
SCALE 3" = 1'-0"

NUT

BOLT. STEEL WEIGHT .2 LB.
MARK TV-45 MAKE 228
SCALE 3" = 1'-0"

NOTES:
For tolerances, allowances & gages see paragraph 711 Specifications.
Indicated weights are for single pieces.
Quantities indicated are for 4 valves.
Details shown on this sheet are:- TV-28 to 45 Inclusive.

REFERENCES:
For assembly and related details see sheets 2&3.
① McClintic-Marshall's Drwg. Sheets 1 & 2, CJ. 2010-2

NO.	REVISION	DATE	BY	APV'D
1	REVISED TO AG REV WITH SHOP DRAWINGS	4/22/36	RMM.	
	ISSUED FOR CONSTRUCTION	9.10.34	Accd. RMM.	

THIS DRAWING SUPERSEDES DRAWING OF SAME NUMBER NOT BEARING THIS CAPTION

BONNEVILLE POWER NAVIGATION PROJECT
(36-TH) CONTRACT W 694 ENG.-47.
LOCK OPERATING EQUIPMENT.

TAINTER VALVES
TRUNNION & GUIDE ROLLER DETAILS

SCALES AS SHOWN

U. S. ENGINEER OFFICE, SECOND PORTLAND DISTRICT (OREGON)

SUBMITTED R.M. Mackenzie ENGINEER
APPROVED Fred Wilms COLONEL, CORPS OF ENGINEERS
RECOMMENDED Thos. Hammond SENIOR ENGINEER
DESIGNED BY A.A.D. & T.E.D. DATE 9-9-35.
DRAWN BY G.S.D.
TRACED BY H.G.L. CHECKED BY C.H.K.

SHEET 4

N-2-84

HIGH PRESSURE GREASE SYSTEM.

Swivel joints on grease pipes on Radius Frame Anchor TV-7 and Trunnion Bearing Anchor TV-5 shall be Brass fittings to be used where absolutely necessary. To eliminate fittings, curved pipes with a convenient radius shall be substituted. Drawings shall be submitted for approval to the Contracting Officer.

High Press. Grease Fitgs. As Per Specifactions

To Upper Radius Frame Bearings

To Chain Sheave Bearings

To Chain Sheave Bearing

To Upper End Lat. Pin.

To Lower End Lat. Pin.

Grease Pipe to Chain Sheave Bearing

1/8" I.P.S. Brass Grease Pipes.

Pipe Supports @ 5'-0" Ctrs. Max. Fasten to wall with 4 - 3/8" Expans Bolts.

Embedded: Trench Edging for Floor Plates (13th Contract Sheet 11, N-1-11)

ELEVATION B-B

Embedded: Machinery Support Beam No.1, TV-9 (13th Contract Sheet 11, N-1-11)

Elev. +630

CTRWT SHEAVE TVM 11

GUARD

COUNTERWEIGHT TVM 63

GUIDE RAILS TVM 61

Embed: C'trwt Guide Anch. Bolts & Plates TV-8 (13th Contract Sheets 10 & 11, N-1-11)

Embed: Mach. Support Beam No. 2, TV-10 (13th Contract Sheet 11, N-1-11)

1 1/2" I.P.S. Brass Grease Pipe

Ladder (13th Cont. Sh. 11, N-1-11)

CHAIN TVM 67

TVM-73

TVM-72

TVM-66

CABLE

HOIST CABIN TVM 64

FRAMES TVM 53

Elev. +850

Embed: Mach. Support Beam No. 3, TV-11 (13th Cont. Sh. 11, N-1-11)

Embedded: Plates (13th Cont. Sh. 11, N-1-11)

RADIUS FRAME TVM 49

PLATFORM GRATING TVM 44

1/2" I.P.S. Brass Grease pipe

TVM-55

TVM-54

TVM-52

1/2" I.P.S. Brass Grease Pipes

Embedded: Radius Frame Anchor TV-7 (13th Contract Sheets 10 & 11, N-1-11)

Elev. +640

Elev. +510

PLAN A-A

CHAIN SHEAVE MOUNTING Sheet 7 N-2-85

Elev. +570

Embedded: Lower Sprocket Anchor TV-6 (13th Contract Sheet 11 N-1-11)

EXTENSION LADDER

TVM-56 UPPER STRUT TVM 50

41'-1 1/4"

TVM-57

PIPE RAILING

LOWER PLATFORM Grating

Embed: Platform Support (13th Cont. Sh. 10 & 11, N-1-11)

17'-0"

Elev. +228.875

Elev. 0.0

Embedded: Ladder (13th Cont. Sh. 11 N-1-11)

33'-11 3/8"

LOWER STRUT TVM 51

Embed: Guide Roller Track & Side Seal TV-3. (13th Cont. Sh. 10 N-1-11)

Elev. 110

Elev. 190

Embedded: Top Water Seal TV-4 (13th Contract Sheet 10 N-1-11)

FLOW

GUIDE ROLLERS TV-28

SEALS TV-27

Hand Holes burned out (36th Contract)

TAINTER VALVE

WATER SEAL SILL

TRUNNION TV 29

TV 31

TV 30

TV-7

Embedded: Trunnion Bearing Anchor TV-5 (13th Contract Sheet 10 N-1-11)

Elev. -18.25

Elev. -190

Embedded: Top Water Seal, TV-4 (13th Contract Sheet 10 N-1-11)

Embedded: Water Seal, TV-4 (13th Contract Sheet 10 N-1-11)

Embedded: Culvert Liner, TV-1 (13th Contract Sheet 10 N-1-11)

Elev. -195 Top of Lower Hinge

YOKE

GUIDE ROLLERS TV-28

Embedded Support (13th Contract Sheet 11 N-1-11)

ELEVATION C-C

DRAWING INDEX		
N-2-85	TAINTER VALVE MACHINERY	
SHEET NUMBERS	1	General Assembly
	2	Hoist Assembly
	3	Gears, Pinions and Sheaves
	4	Bearing Details
	5	Shafts, Bushings, Sprockets & Ect.
	6	Hoist & Counterweight Sheave Frames
	7	Chain Sheave Details
	8	Radius Frame, Struts and Yokes.
	9	Counterweight and Details
	10	Hoist Frame Gratings & Lower Platform
	11	Det. of Chain, Upper Strut & Cable Connection
	12	Gear Guards.
	13	Overload Clutch Details.
	14	Covers for Pits and Bearing Bitt Recesses
	15	Greasing Layout & Commercial Parts.
	16	Electrical Details ①
N-2-84	TAINTER VALVES	
SHEET NUMBERS	1	Design Data
	2	General Assembly
	3	Seals and Seal Castings
	4	Trunnion & Guide Roller Details

ELEVATION

SCALE 1/2" = 1'-0"

0 1 2 3 4

NOTES

The contractor shall furnish spare parts and tools, as specified in par. 628 of the specifications; also the following:

1 - Radius frame bearing pin	TV-53
6 - Chain links	TVM-67
2 - Overload Clutch, Wedge	TVM-87
2 - Overload Clutch, Spring	TVM-88

The above spare parts are included in the quantities called for on the drawings.

Arrange lubrication Piping for Hoist as called for in Paragraph 402G of Specifications.

REFERENCES

For location of Tainter Valves. See Sheet 2, N-1-52

① For Counter weight Cable Data. See sheet N-3-628

NO.	REVISION	DATE	BY	APV'D
2	Numbers Nos. 1, 2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16 & 17 were changed to Nos. 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16 & 17 respectively - See N-2-85	9/24/52	RMH	
1	Corrected location of Hand Rail - Rollers, Hand holes 3/8 & C. WT. Travel Shown.	8/18/52	RMH	
0	ISSUED FOR CONSTRUCTION	6/20/52	RMH	

THIS DRAWING SUPERSEDES DRAWING OF SAME NUMBER NOT BEARING THIS CAPTION

BONNEVILLE POWER NAVIGATION PROJECT

(36-TH) CONTRACT W 694 ENG-47.

LOCK OPERATING EQUIPMENT

TAINTER VALVE MACHINERY

GENERAL ASSEMBLY

SCALES AS SHOWN

U.S. ENGINEER OFFICE, SECOND PORTLAND DISTRICT, OREGON

SUBMITTED: R.L. Mackenzie, DISTRICT ENGINEER

APPROVED: C.H.D. Clarus, LT. COL., CORPS OF ENGINEERS

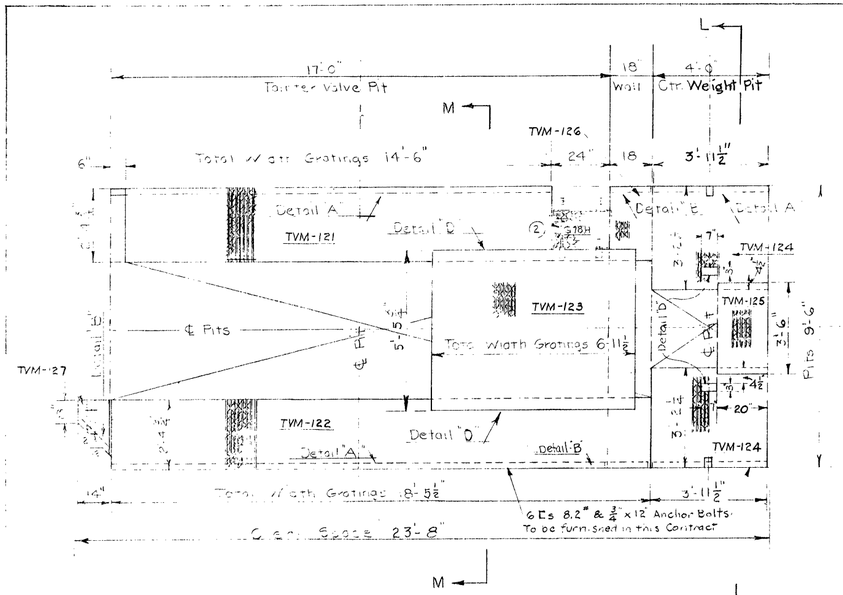
RECOMMENDED: [illegible], SENIOR ENGINEER

DESIGNED BY A.A.G. & F.T.O. DATE 5-5-52

DRAWN BY M.K.L. & A.F. CHECKED BY [illegible]

SHEET 1

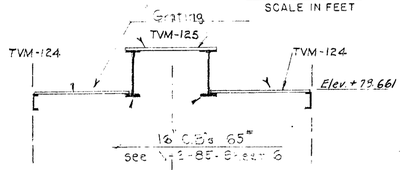
N-2-85



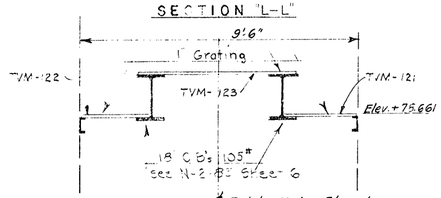
PLAN

HOIST FRAME GRATINGS

SCALE IN FEET

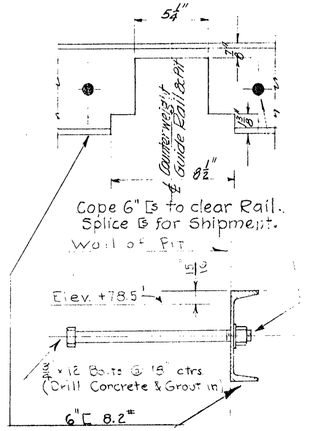


SECTION "L-L"

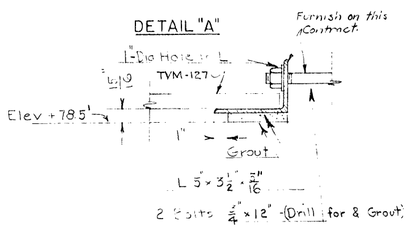


℄ Tainter Valve Chamber Symmetrical about ℄

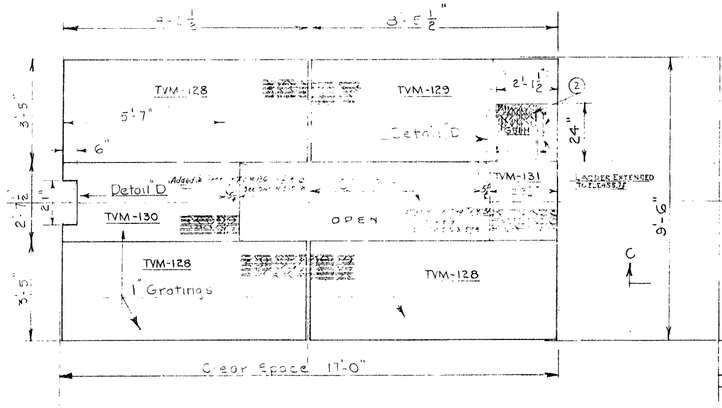
SECTION "M-M"



DETAIL "A"

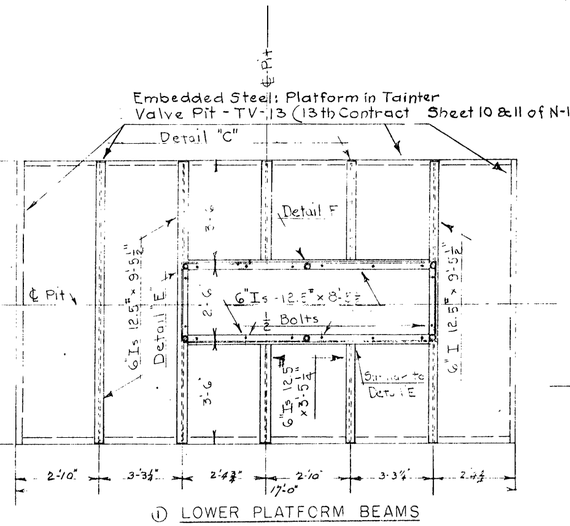


DETAIL "B"



D LOWER PLATFORM GRATINGS

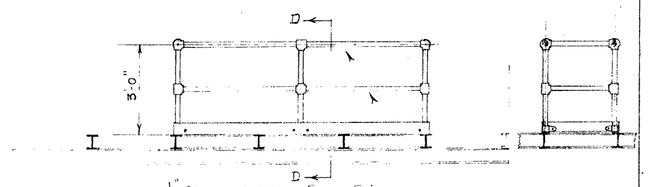
SCALE ½ FEET



① LOWER PLATFORM BEAMS

STRUCTURAL CARBON STEEL WT. 931 LBS.
STEEL PIPE & FITTINGS WT. 194 LBS.
MARK TVM-98 MAKE 4

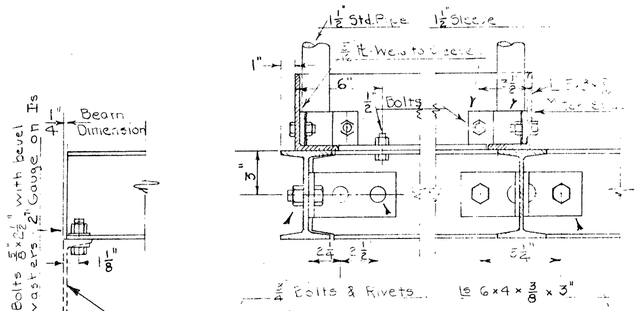
SCALE 1" = 1'-0"



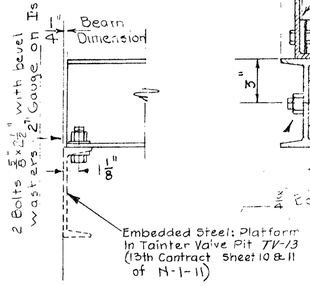
SEC. "D-D"

SECTION "C-C"

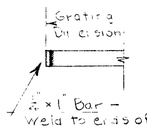
SCALE ½ FEET

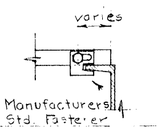


DETAIL "E"



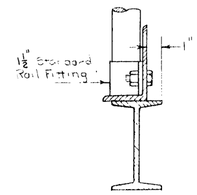
DETAIL "C"





GRATING CONNECTION

DETAIL "D"



DETAIL "F"

NOTES

All bolts to be equipped with lock washers.
All Deck Gratings & Platforms required as shown For Welding See Specifications Paragraph 713
Manufacturers Standard Fasteners to be spaced @ 12" c to c Maximum at each supporting beam. This spacing applies only to Lower Platform Grating.
Parts shown on this sheet are TVM-98 and 121 to 131 inc.

ESTIMATED TOTAL WEIGHTS

Structural Carbon Steel	5222.00 lbs
Floor Gratings	1151.44 "
Steel Pipe & Fittings	778.00 "
Bolt Steel (Bolts & Washers)	323.00 "

REFERENCES

For location see ... Sheet 2 - N-1-5?
For Tainter Frame see ... Sheet 6 - N-2-85
For Embedded Steel see ... Sheet 11 - N-1-11
For Welding Symbols conform to A.W.S. Code Sheet 8.

PARTS NOT DETAILED

QUANTITIES ARE FOR FOUR TAINTER VALVE PITS

MARK	MATERIAL	SIZE	WT. EACH	MAKE	TOTAL WT.
TVM-121	1 GRATING	2'-4¾" x 14'-6"	341.40	4	1365.60
TVM-122	1 "	2'-4¾" x 18'-5½"	433.10	4	1732.40
TVM-123	1 "	5'-2¾" x 6'-11½"	248.50	4	994.00
TVM-124	1 "	2'-3¾" x 3'-11½"	138.60	8	1108.80
TVM-125	1 "	20" x 3'-6"	58.30	4	233.20
TVM-126	1 "	18" x 2'-4¾"	51.20	4	204.80
TVM-127	1 "	8" x 14" x 22"	44.70	4	178.80
TVM-128	1 "	3'-5" x 8'-5½"	201.50	12	2418.00
TVM-129	1 "	3'-5" x 5'-7½"	131.50	4	526.00
TVM-130	1 "	2'-7½" x 2'-1"	42.00	4	168.00
TVM-131	1 "	2'-7½" x 2'-9"	70.20	4	280.80

Total Estimated Total Weight 11,211.60

DETAILS

SCALE IN INCHES

BONNEVILLE POWER NAVIGATION PROJECT
(SECTION CONTROL W 694 FINAL 67)
LOCK OPERATING EQUIPMENT
TAINTER VALVE MACHINERY
MONT FRAME GRATINGS
& LOWER PLATFORM
SCALES AS SHOWN

U. S. ENGINEER OFFICE, SECOND PORTLAND DISTRICT, OREGON

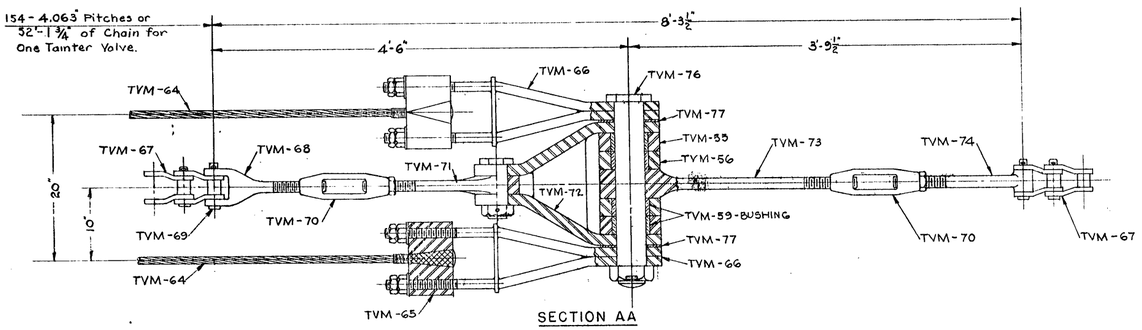
SUBMITTED K.B. Mackenzie, ENGINEER — APPROVED [illegible], LT. COL. CORPS OF ENG.

RECOMMENDED [illegible], SENIOR ENGINEER — DESIGNED BY A.A.Q. & F.I.C. DATE [illegible]
DRAWN BY [illegible]
TRACED BY [illegible]

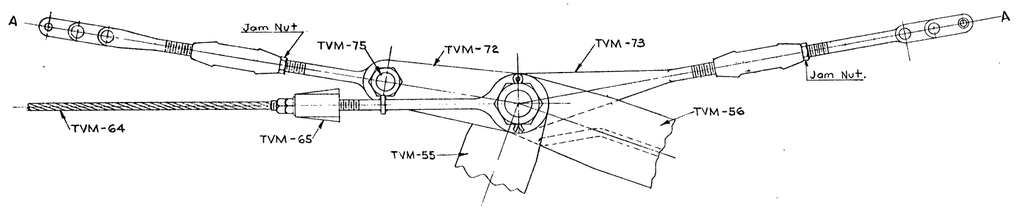
NO. REVISION DATE BY APP'D

ISSUED FOR CONSTRUCTION 3-10-43 [illegible]

SHEET 10 N-2-85



SECTION AA

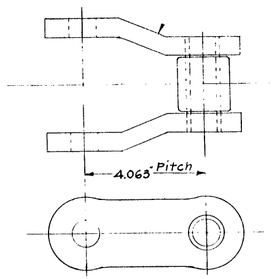


UPPER STRUT CONNECTIONS

SCALE 1½" = 1'-0"

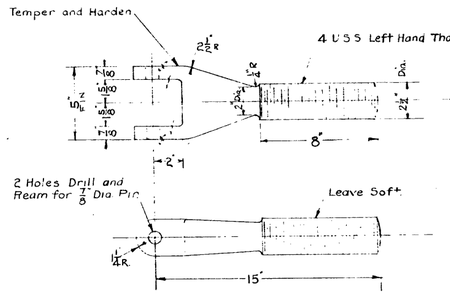
Scale in Feet

Link Belt Co's. "SS-124 3 Bar Hyper" Steel Roller Chain, or Equal. Ult Strength - 180,000." Yeild Point - 160,000" Load



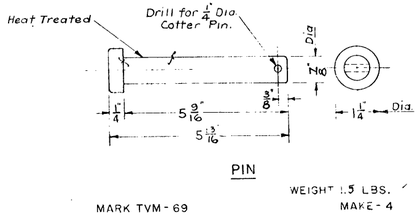
CHAIN

LENGTH 208'-6 13/16" WT. 16.3 LBS. PER FT.
MARK TVM-67 622 PITCHES REQ'D (Incl-6 Spares)
SCALE - HALF SIZE



① CHAIN CLEVIS

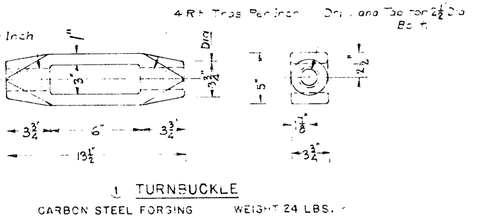
CHROME NICKEL STEEL FORGING WEIGHT 15 LBS.
MARK TVM-68 MAKE-4
SCALE - 3" = 1'-0"



PIN

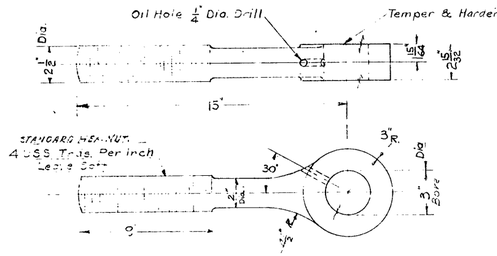
WEIGHT 11.5 LBS.
MARK TVM-69 MAKE-4
FINISH ALL OVER SCALE - HALF SIZE

NOTE PIN FURNISHED WAS LINK BELT CO. "9355 STEEL" SPEC. 1,650,000 lbs PER SQ. IN SHEARING STRENGTH. SEE LETTER JAN-18-1936. FILE B5212.8/9-94/1



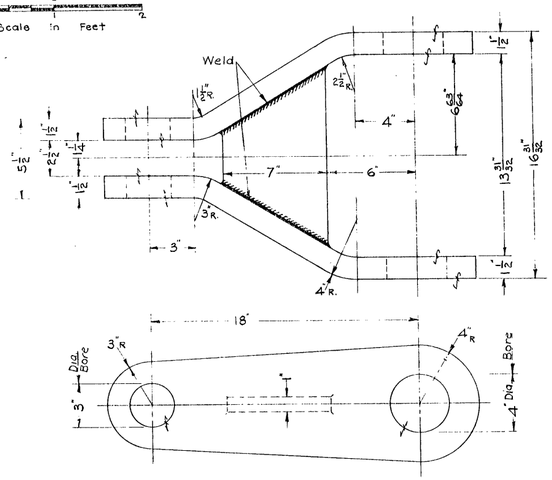
① TURNBUCKLE

CARBON STEEL FORGING WEIGHT 24 LBS.
MARK TVM-70 MAKE-8
SCALE - 3" = 1'-0"



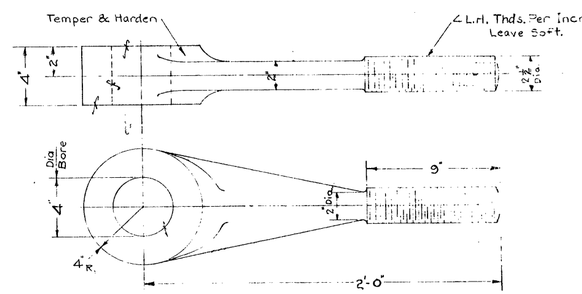
① EYE BOLT

CHROME NICKEL STEEL FORGING WEIGHT 20 LBS.
MARK TVM-71 MAKE-4
SCALE - 3" = 1'-0"



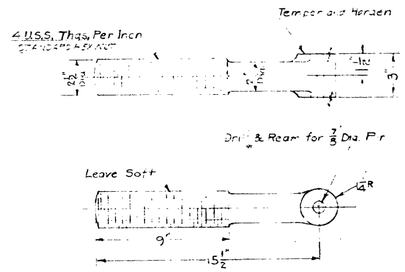
LINK

STR. CARBON STEEL WEIGHT 136 LBS.
MARK TVM-72 MAKE-4
SCALE - 3" = 1'-0"



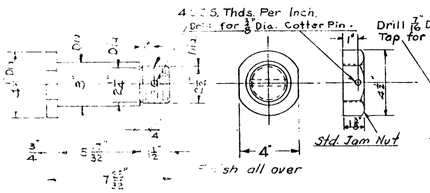
① EE BOLT

CHROME NICKEL STEEL FORGING WEIGHT 88 LBS.
MARK TVM-73 MAKE-4
SCALE - 3" = 1'-0"



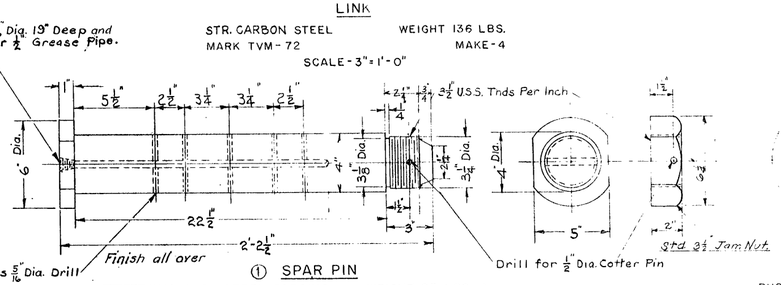
① EYE BOLT

CHROME NICKEL STEEL FORGING WEIGHT 14 LBS.
MARK TVM-74 MAKE-4
SCALE - 3" = 1'-0"



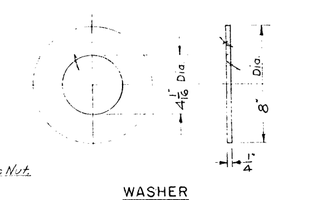
① EYE BOLT PIN

CHROME NICKEL STEEL FORGING WEIGHT 17. LBS.
MARK TVM-75 MAKE-4
FINISH ALL OVER SCALE - 3" = 1'-0"



① SPAR PIN

CHROME NICKEL STEEL FORGING WEIGHT 93 LBS.
MARK TVM-76 MAKE-4
FINISH ALL OVER SCALE - 3" = 1'-0"



WASHER

PHOSPHOR BRONZE WEIGHT 3 LBS.
MARK TVM-77 MAKE-8
SCALE - 3" = 1'-0"

Scale in feet

NOTES:-

Physical Properties of Pin TVM-69 Equal to that of Chain TVM-67.
Quantities Shown are for Four Tainter Valve Machines.
Weights Given are for Each Piece.
For Tolerances, allowances & Gauges see Paragraph 711-1 Specifications
Details shown on this sheet are TVM-67 to 77 incl.

REFERENCES ① COMMERCIAL IRON WORKS DWG. P 5C-30-1464L
For General Assembly see Sheet 1 N-2-85
For Counterweight & other parts see Sheet 9 N-2-85

NO.	REVISION	DATE	BY	APP'D
1	REVISED TO AGREE WITH SHOP DRAWINGS	4/21/36	RMH	
	ISSUED FOR CONSTRUCTION	9/10/36		

BONNEVILLE POWER NAVIGATION PROJECT
(36-TH) CONTRACT W 694 ENG.-47
LOCK OPERATING EQUIPMENT

TAINTER VALVE MACHINERY
DETAILS OF CHAIN, UPPER STRUT, AND CABLE CONNECTIONS

SCALES AS SHOWN

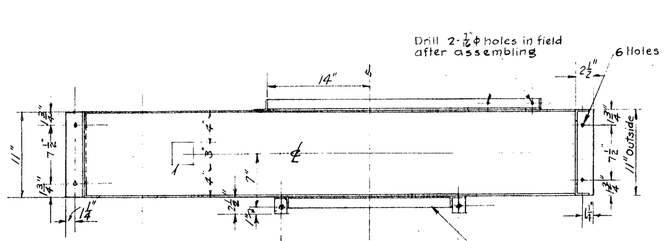
U. S. ENGINEER OFFICE, SECOND PORTLAND DISTRICT (OREGON)

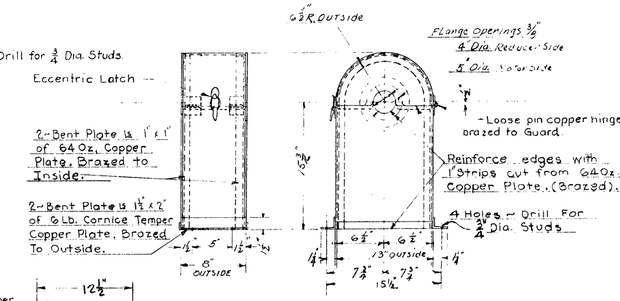
SUBMITTED: K. MacKenzie, MANAGER
RECOMMENDED: [illegible], SENIOR ENGINEER
APPROVED: [illegible], DIVISION ENGINEER, U.S. CORPS OF ENGINEERS

DESIGNED BY A.A.B. & F.T.R. DRAWN BY R.K.W. DATE 9-9-36
TRACED BY R.K.W. CHECKED BY F.T.C.

SHEET 11

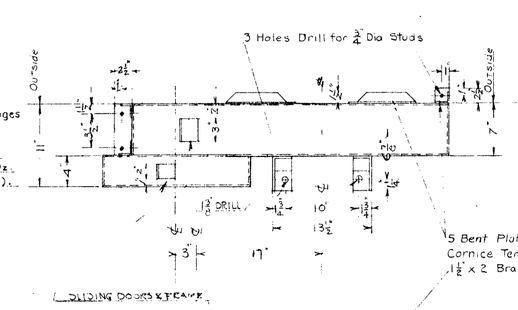
N-2-85

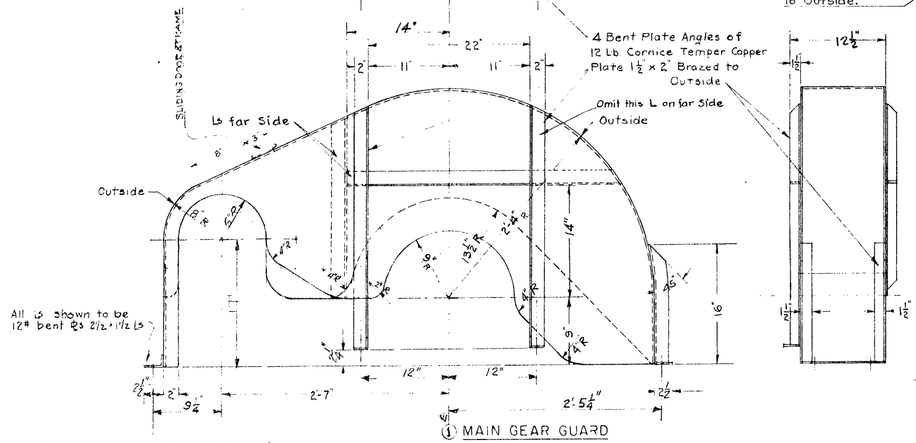




① CLUTCH GUARD

64 OZ. COPPER PLATE — WEIGHT 30.4 LBS.
6 LB. COPPER PLATE — WEIGHT 2.6 LBS.
MARK TVM- 94 — TOTAL WEIGHT 33.0 LBS
MAKE-4

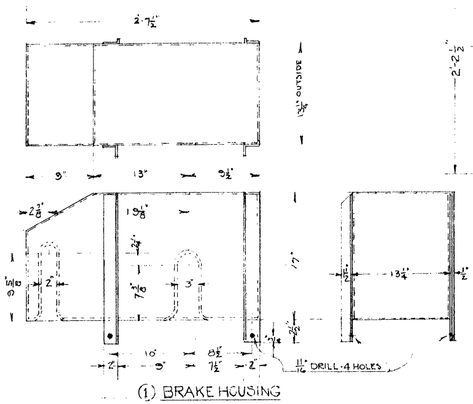




Reinforce edges with 1" Strips cut from 64 oz. Copper Plate and brazed on outside.

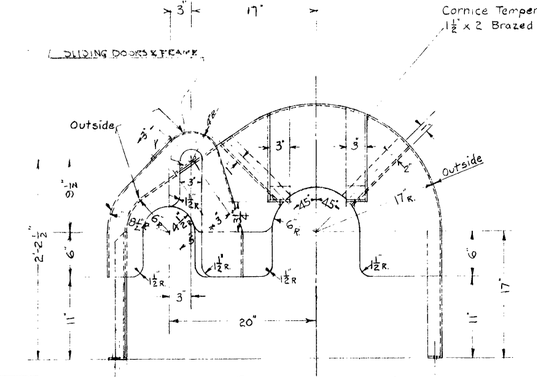
① MAIN GEAR GUARD

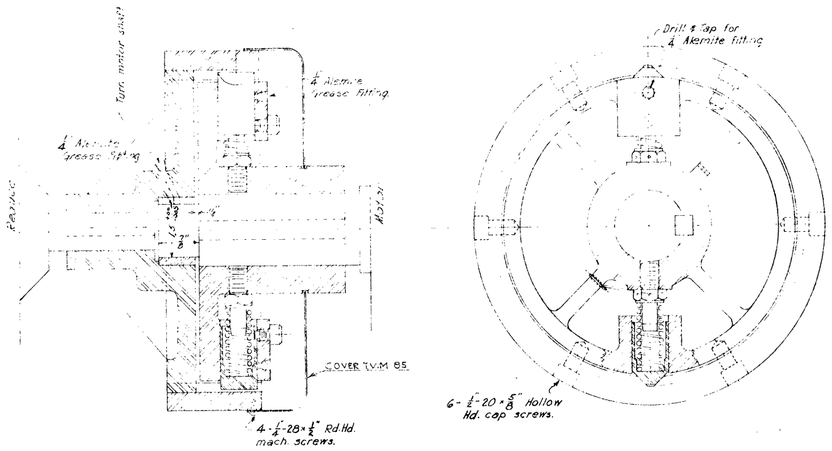
64 OZ. COPPER PLATE — WEIGHT 100 LBS.
12 LB. COPPER PLATE — WEIGHT 66 LBS.
MARK TVM- 78 — TOTAL WEIGHT 166 LBS.
MAKE-4



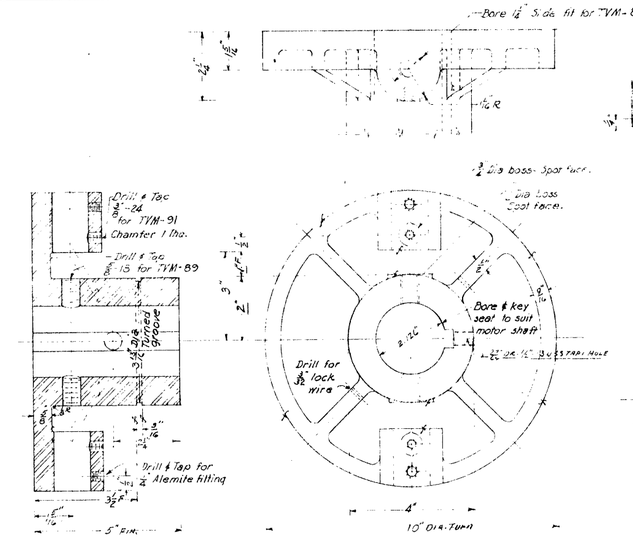
① BRAKE HOUSING

16 GA. GALV. IRON - WITH ¼" GALV. BENT PLT. LG — WEIGHT 46 LBS.
MARK - TVM 35 A — MAKE 4


SLIDING DOORS & FRAME
Outside
3"
3"
3"

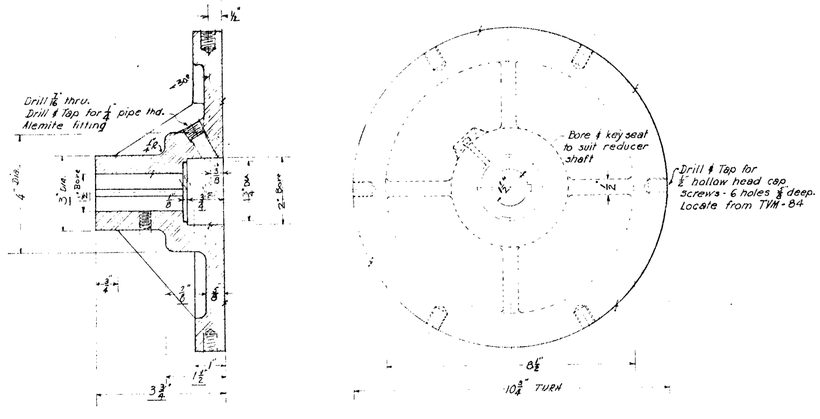


① ASSEMBLY

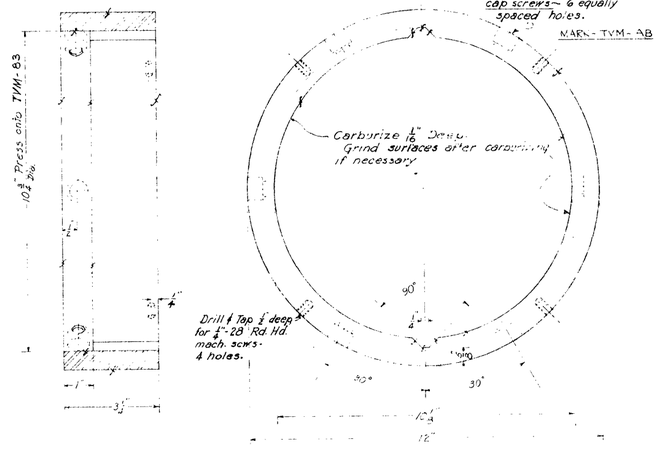


① FLANGE
CARBON STEEL CASTING WT= 30 LB.
GRADE "2" MAKE 4
MARK TVM-82

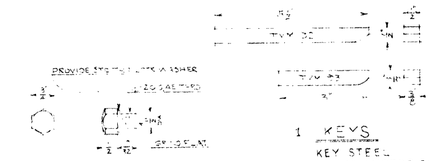
1 COVER
64 OZ COPPER PLATE WT= 2 LB.
MARK TVM-85 MAKE 4



① FLANGE
CARBON STEEL CASTING WT= 30 LB.
GRADE "2" MAKE 4
MARK TVM-83



FLANGE RING
CARBON STEEL FORGING WT= 27 LB.
MARK TVM-84 MAKE 4



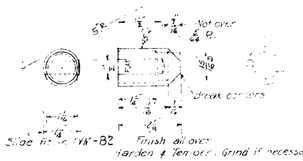
① GUIDE SCREW
HARDENED TOOL STEEL WT= 0.05 LB
MARK TVM-91 MAKE 8

1 KEYS
KEY STEEL
MARK TVM-92 (MOTOR SHAFT) WT= 3 LB
MARK TVM-93 (REDUCER SHAFT) WT. 1 LB
MAKE 4 EACH

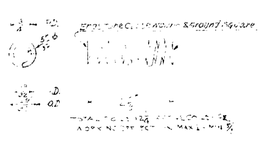
NOTES:
Quantities specified are for complete installation of four Tainter Valves.
Weights are for individual pieces.
For tolerances, allowances & gages see paragraph 711 of specifications.
Bores for shafts to suit equipment.
Shop test to be made for the adjustment of springs to the required torque. (1150 ft-lbs) Motor for ... Details shown on this sheet are TVM-82 to 93 inclusive.
Alternate Designs may be presented for the approval of the Contracting Officer

REFERENCE:
For General Assembly see sheet ... of ...
For Summary of Weights ... see sheet ...

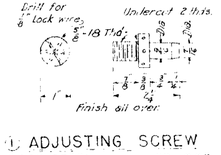
1 BUSHING
PHOS. BRONZE CLASS "C" WT=0.6 LB.
MAKE 4
MARK TVM-86



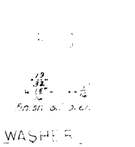
① WEDGE
TOOL STEEL WT=0.2 LB
MARK TVM-87 MAKE 10 (INCL. 2 SPARES)



① WEDGE SPRING
MARK TVM-88 MAKE 10 (INCL. 2 SPARES)



① ADJUSTING SCREW
MACH. STEEL WT. = 0.25 LB.
MARK TVM-89 MAKE 8



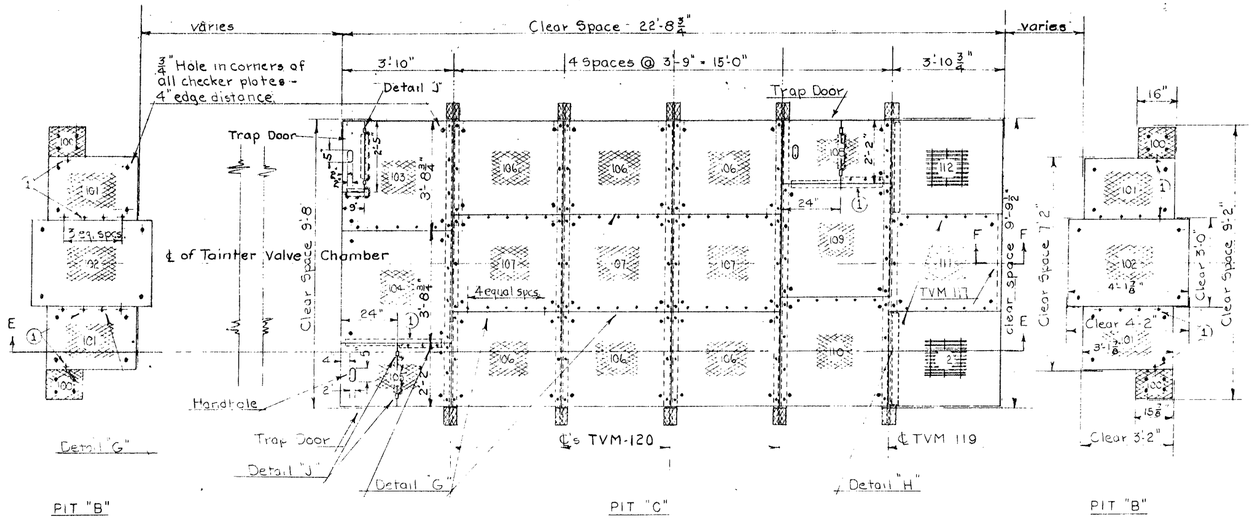
① WASHER
STRUCTURAL CARBON STEEL WT. = .01 LB.
MARK TVM-90 MAKE 8

0 1 2 3 4 5 6

BONNEVILLE POWER NAVIGATION PROJECT
(36 TH) CONTRACT W 654 ENG-47
LOCK OPERATING EQUIPMENT
TAINTER VALVE MACHINERY
OVER-LOAD CLUTCH
DETAILS

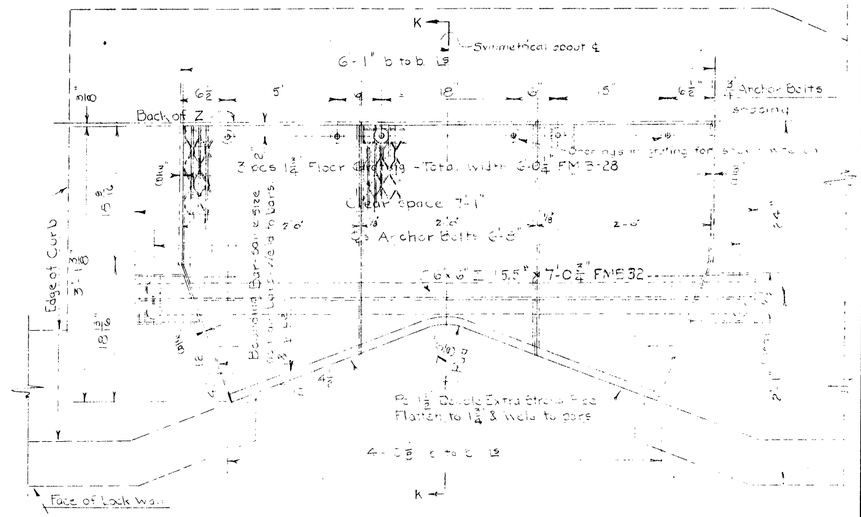
NO. REVISION APPVD
ISSUED FOR CONSTRUCTION 1910.15

SHEET 13 N-2-85



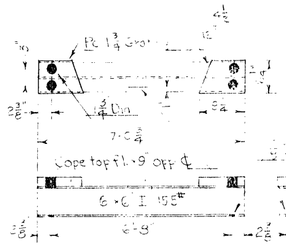
PLAN OF TAINTER VALVE & STOP LOG PIT COVERS

SCALE IN FEET



2 PLAN OF FLOATING MOORING BIT HATCH COVER - RECESS D"

SCALE IN FEET

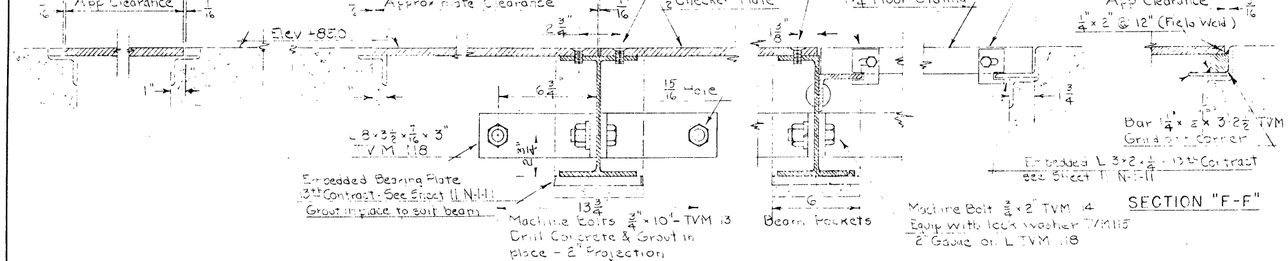


BEAM DETAILS

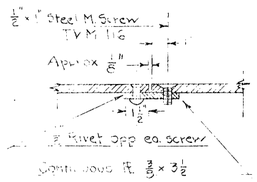
CARBON STRUCTURAL STEEL — WEIGHT 120 LBS.
MARK FMB 32 — MAKE 6 THUS

NO SCALE

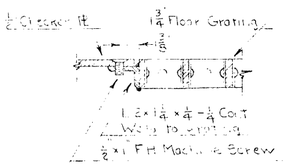
SECTION "F-F"



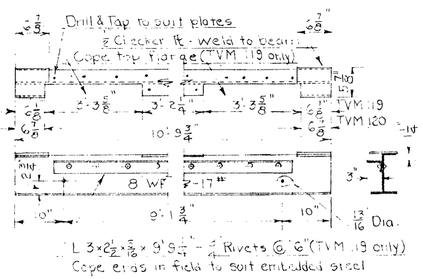
SECTION "E-E"



DETAIL "G"



DETAIL "H"

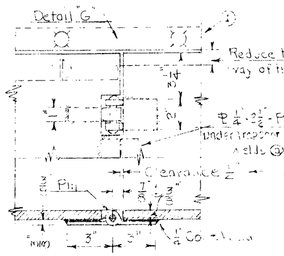


BEAM DETAILS

STRUCTURAL CARBON STEEL — WEIGHT 250 LBS
MARK TVM-119 — MAKE 4 THUS

STRUCTURAL CARBON STEEL — WEIGHT 195 LBS
MARK TVM-120 — MAKE 16 AS NOTED
(OMIT ANGLE & COPING FOR TVM-120)

NO SCALE



DETAIL "J"

SCALE IN INCHES

EXCEPT AS NOTED

MATERIAL NOT DETAILED

TAINTER VALVE & STOP LOG PITS

	MARK	MATERIAL	SIZE	WT. EACH	MAKE	TOTAL
1	TVM 100	½ Checker ℄	1'-8" × 11'-8"	72	6	480
	101	〃	5 - ⅝ × 2'-5⅞	14⅝	16	2336
	102	〃	2 - ⅝ × 1'-8	23⅝	8	2392
	104	〃	4 - ⅝ × 3'-8¼	360	4	1440
	105	〃	3 - ⅝ × 3'-8¼	270	4	1396
	106	〃	3 - ⅝ × 2'-3	211	4	844
	107	〃	3 - ⅝ × 3'-8¼	270	12	3192
	103	〃	3 - ⅝ × 3'-8¼	270	4	1148
	99	〃	3 - ⅝ × 3'-8¼	270	4	360
	110	〃	2 - ⅝ × 2'-3	211	4	1200
(2)	111	〃	2 - ⅝ × 3'-8¼	270	4	1112
	112	¾ Grating	3'-0" × 3'-3⅛	216	3	585
	113	〃	3'-0" × 3'-3⅛	195	4	1249
	114	〃	1'-0" × 3'-3⅛	65	40	2608
	115	〃	1'-0" × 1'-0"	6.04	40	1616
	116	F. H. Machine Screw	½ × 1"	0.01	552	4554
	117	〃 〃	½ × 1¼"	0.01	4	24
	118	〃 〃	⅝ × 3"	0.04	80	320
	FM 32			356	6	2136
	29			53	3	159
	30			53	60	3180
	31			53	60	3180

REFERENCES

For location of Sheet Piling see
For details of Steel Sheet Piling see
For details of Steel for Floating Mooring Bitt Recess see
Drawing Appendix etc see

2 Machine Marks shall conform to

BONNEVILLE POWER NAVIGATION PROJECT

(Fifth Contract W 57-4 ENG-47)

OREGON

TAINTER VALVE & STOP LOG PIT COVERS & FLOATING MOORING BITT RECESS COVER

U.S. ENGINEER OFFICE, SECOND PORTLAND DISTRICT, OREGON

SUBMITTED: R. W. Carlson, Engr. Asst.

RECOMMENDED: [illegible], Senior Engineer

APPROVED: [illegible], Lt. Col. Corps of Engrs.

DESIGNED BY A.A.B. & E.D.

DRAWN BY [illegible]

TRACED BY [illegible]

CHECKED BY [illegible]

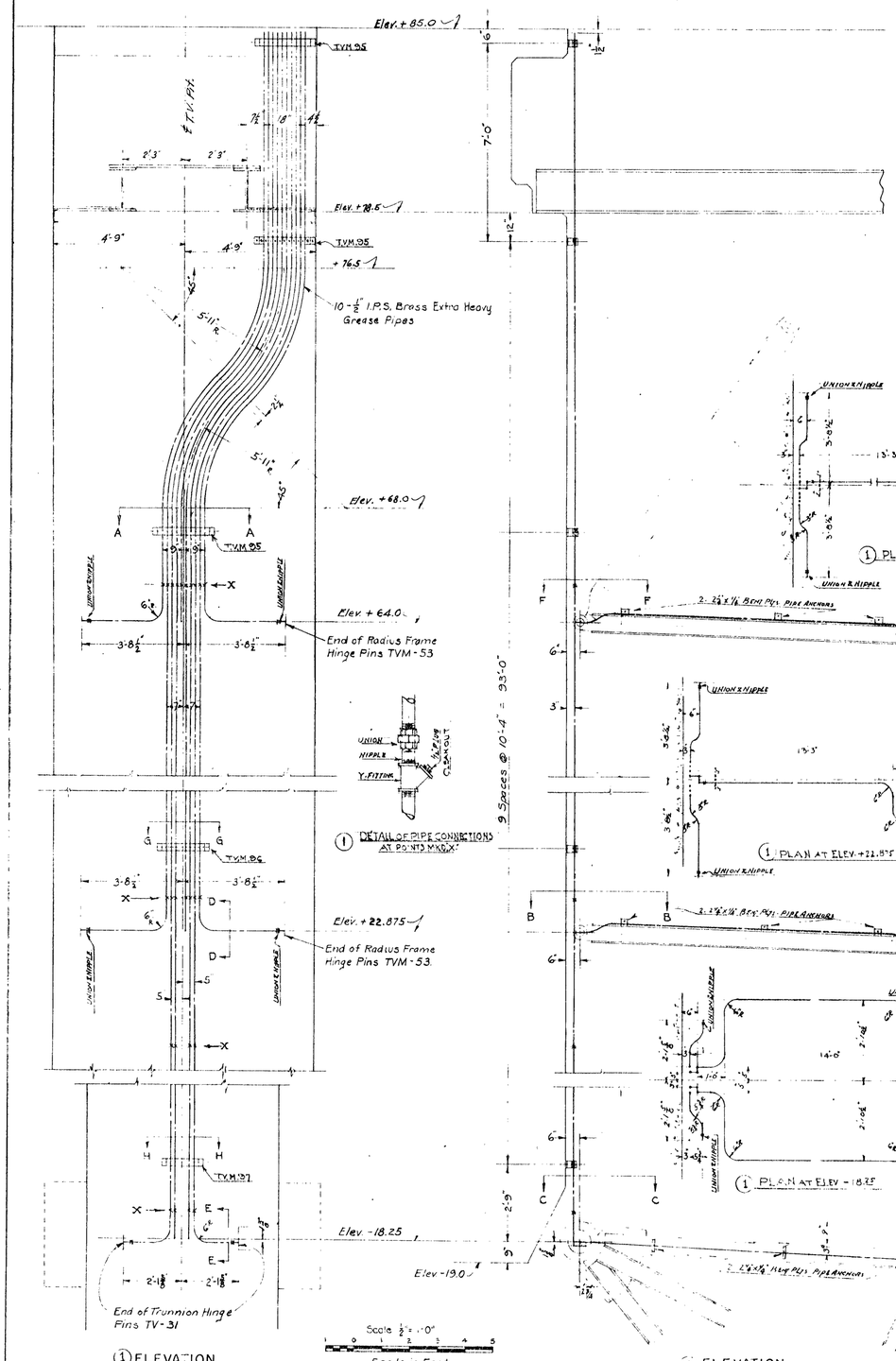
ISSUED FOR CONSTRUCTION

SHEET 14 OF

N-2-65

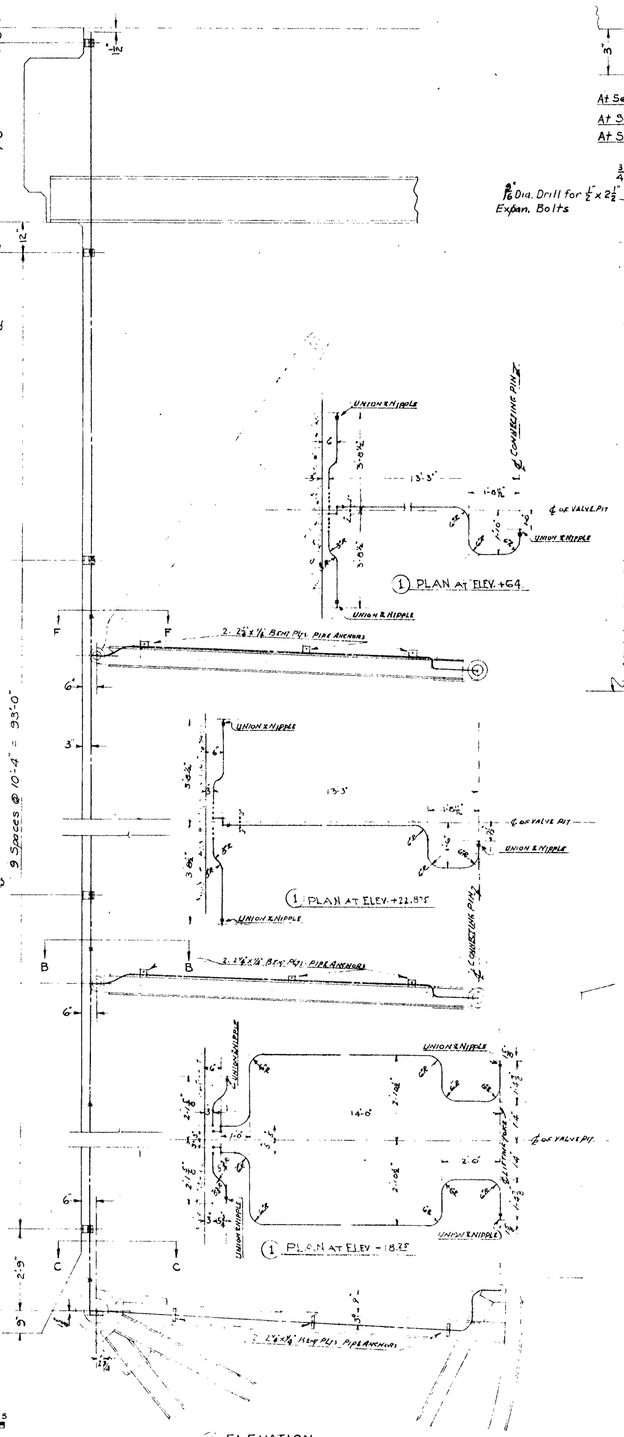
WAR DEPARTMENT

CORPS OF ENGINEERS U. S. ARMY

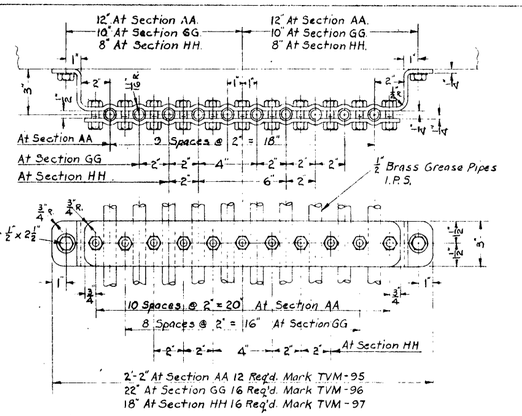


① ELEVATION

① DETAIL OF PIPE CONNECTIONS AT POINTS MARKED X



① ELEVATION



GREASE PIPE SUPPORT

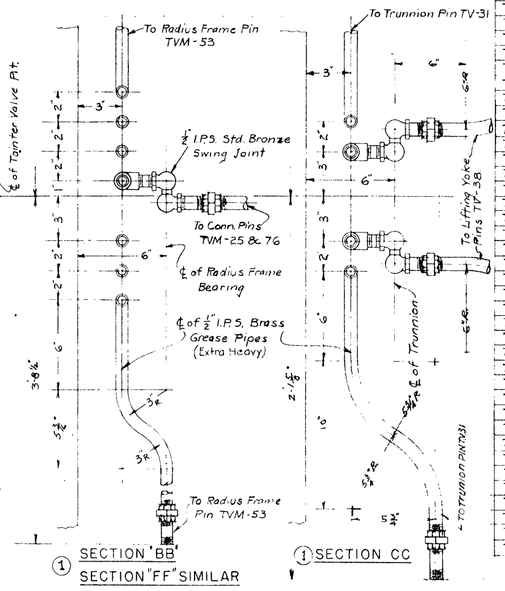
STRUCTURAL CARBON STEEL MAKE 44

MARK TVM-95 MAKE 12 WEIGHT 11.2 LBS.

MARK TVM-96 MAKE 16 WEIGHT 9.5 LBS.

MARK TVM-97 MAKE 16 WEIGHT 7.8 LBS.

SCALE 3" = 1'-0"



① SECTION "BB"
SECTION "FF" SIMILAR

① SECTION CC

① SECTION "DD"
SECTION "EE" SIMILAR

Scale in Feet.

COMMERCIAL PARTS NOT DETAILED

U.S. STANDARD BOLTS & NUTS, SCREWS & ETC.
QUANTITIES ARE FOR FOUR TAINTER VALVE MACHINES

MARK	NOMENCLATURE	MATERIAL	SIZE	THREADS	USED WITH	SHEET	QUAN.	UN. WT.	TOT. WT.
TVM-A	5/8" Hex. Hd. Fitted Bolts	Bolt Steel	5/8" - 9 x 3 3/4"	1 1/4" Long	TVM-26	6 N-2-85	32	1.37	43.8
TVM-B	" with 5/8" Hex. Nuts	"	5/8" - 9 x 2 3/4"	1" Long	TVM-50-51	8 N-2-85	288	1.2	346.
TVM-C	1 1/8" Hex. Hd. Fitt. Bolts & 1" Hex. Nut	"	1 1/8" - 8 x 3"	1 1/4" Long	TVM-49-55	8 N-2-85	112	1.8	201.6
TVM-D	1 1/8" Hex. Hd. Fitt. Bolts & 1 1/4" "	"	1 1/8" - 7 x 5 1/2"	1 1/2" Long	TVM-21-33	6 N-2-85	16	3.9	62.4
TVM-E	1 1/8" " " & 1 1/4" "	"	1 1/8" - 7 x 5 3/4"	1 1/2" Long	TVM-18-20	6 N-2-85	40	4.1	164.0
TVM-F	Hex. Hd. Bolts & Hex. Nuts	"	1/2" - 13 x 1 1/2"	Std. Length	TVM-95-97	15 N-2-85	372	.23	85.5
TVM-G	Hex. Hd. Bolts & Hex. Nuts	"	1/2" - 13 x 1 3/4"	" "	TVM-35	6 N-2-85	16	.25	4.0
TVM-H	Hex. Hd. Bolts & Hex. Nuts	"	3/4" - 10 x 2 1/4"	" "	TVM-33-35	6 N-2-85	20	.75	15.0
TVM-I	Hex. Hd. Bolts & Hex. Nuts	"	3/4" - 10 x 2 1/4"	" "	TVM-33-36	6 N-2-85	8	.75	6.0
TVM-J	Hex. Hd. Bolts & Hex. Nuts	"	3/4" - 10 x 2 3/4"	" "	TVM-35	6 N-2-85	16	.81	12.9
TVM-K	Hex. Hd. Bolts & Hex. Nuts	"	3/4" - 10 x 3"	" "	TVM-33-35	6 N-2-85	12	.84	10.1
TVM-L	Hex. Hd. Bolts & Hex. Nuts	"	3/4" - 10 x 3"	" "	TVM-33-36	6 N-2-85	16	.84	13.4
TVM-M	Hex. Hd. Bolts & Hex. Nuts	"	1" - 8 x 4"	" "	Speed Rdr.	6 N-2-85	8	1.9	15.2
TVM-N	Hex. Hd. Bolts & Hex. Nuts	"	1" - 8 x 4 1/2"	" "		6 N-2-85	4	2.0	8.0
TVM-O	Hex. Hd. Bolts & Hex. Nuts	"	1" - 8 x 5"	" "		6 N-2-85	12	2.13	25.6
TVM-P	Square Hd. Bolts & Hex. Nuts	"	1 1/4" - 7 x 2'-6"	6" Long	TVM-23-65	9 N-2-85	16	11.5	184.0
TVM-Q	Stud Bolts & Hex. Nuts	"	3/4" - 10 x 1 3/4"	1/2" & 1" Long	TVM-34-81	6 N-2-85	32	.45	14.4
TVM-R	Stud Bolts & Hex. Nuts	"	3/4" - 10 x 2 1/4"	Lg. Both Ends	Guards	6 N-2-85	60	.51	30.6
TVM-S	Stud Bolts & Hex. Nuts	"	3/4" - 10 x 2 1/2"	3/4" & 1 1/2" Lg.	TVM-18-78	4 N-2-85	8	.54	4.3
TVM-T	Stud Bolts & Hex. Nuts	"	1" - 8 x 4 1/2"	1 1/2" Lg. Both Ends	TVM-26-27	4 N-2-85	32	1.49	47.7
TVM-U	Stud Bolts & Hex. Nuts	"	1" - 8 x 5"	1 1/2" Lg. " "	TVM-21-22	4 N-2-85	16	1.6	25.6
TVM-V	Stud Bolts & Hex. Nuts	"	1" - 8" x 5"	1 1/2" Lg. " "	TVM-18-22	4 N-2-85	16	1.6	25.6
TVM-W	Stud Bolts & Hex. Nuts	"	1 3/8" - 6 x 6"	1/2" & 2" Long	TVM-19-20	4 N-2-85	16	3.83	61.3
TVM-X	Stud Bolts & Hex. Nuts	"	1 3/8" - 6 x 6"	1/2" & 2" Lg.	TVM-18-19	4 N-2-85	16	3.83	61.3
TVM-Y	Expansion Bolts	"	1/2" x 2 1/2"	Std. Length	TVM-95-97	15 N-2-85	88	.5	44.0
TVM-Z	Hex. Hd. Cap Screws	"	1/2" - 13 x 1 1/4"	"	TVM-37-42	7 N-2-85	16	.15	2.4
TVM-AA	Hex. Hd. Cap Screws	"	3/4" - 10 x 1 1/2"	"	Limit Switch	6 N-2-85	16	.42	6.7
TVM-AB	Hollow Hd. Cap Screws	"	1/2" - 13 x 3/4"	Full Length	TVM-34	3 N-2-85	24	.09	2.2
TVM-AC	Round Hd. Machine Scrs.	Tobin Bronze	1/4" - 28 x 1/2"	" "	TVM-85	13 N-2-85	16	.014	.2
TVM-AD	Headless Set Screws	" "	5/8" - 16 x 5/8"	" "	TVM-38-40	7 N-2-85	16	.02	.3
TVM-AE	Flat Point Haless. Set Scrs.	Bolt Steel	3/4" - 10 x "	" "	TVM-10	5 N-2-85	16	.31	4.96
TVM-AF	Hex Nuts	"	1 1/4" - 7 Std.	7 U.S.S.	TVM-66	9 N-2-85	16	1.3	21.0
TVM-AG	Hex. Jam Nuts	"	1 1/4" - 7 Std.	7 U.S.S.	TVM-66-P	9 N-2-85	32	.7	22.4
TVM-AH	Hex. Jam Nuts	"	2 1/2" - 4 Std.	4 U.S.S.	TVM-53	8 N-2-85	16	1.7	27.2
TVM-AI	Hex. Jam Nuts	"	2 1/2" - 4 Std.	4 U.S.S.	TVM-74-75	11 N-2-85	8	1.7	13.6
TVM-AJ	Hex. Jam Nuts	"	2 1/2" - 4 Std.	4 U.S.S.	TVM-71	11 N-2-85	4	1.7	6.8
TVM-AK	Hex. Jam Nuts	"	3 1/2" - 3 1/4 Std.	3 1/4 U.S.S.	TVM-76	11 N-2-85	4	2.2	8.8
TVM-AL	Hex. Jam Nuts	"	3 1/2" - 3 1/4 Std.	3 1/4 U.S.S.	TVM-25	8 N-2-85	4	2.2	8.8
TVM-AM	Cut Washers	Str'd. Steel	1/2" Standard		TVM-Y	15 N-2-85	80	.05	4.0
TVM-AN	Cut Washers	"	1/4" Std.		TVM-66	9 N-2-85	16	.25	4.0
TVM-AO	Lock Washers	Spring Steel	5/8" Std.		TVM-B	8 N-2-85	288	.08	23.0
TVM-AP	Lock Washers	"	7/8" Std.		TVM-A	6 N-2-85	32	.08	2.6
TVM-AQ	Lock Washers	"	1" Std.		TVM-C	8 N-2-85	112	.11	12.3
TVM-AR	Lock Washers	"	1 1/4" Std.		TVM-D&E	6 N-2-85	56	.2	11.2
TVM-AS	Bevel Washers	Bolt Steel	For 1" Bolt		TVM-N	6 N-2-85	4	.2	.8
TVM-AT	Cotter Pins	Spring Steel	1/4" x 1 1/2" Lg.		TVM-69	11 N-2-85	4	.02	.1
TVM-AU	Cotter Pins	"	3/8" x 2 1/2" Lg.		TVM-47	7 N-2-85	8	.08	.6
TVM-AV	Cotter Pins	"	3/8" x 3" Lg.		TVM-53-75	8-11 N-2-85	20	.19	3.8
TVM-AW	Cotter Pins	"	1/2" x 4" Lg.		TVM-25	8 N-2-85	4	.22	.9
TVM-AX	Cotter Pins	"	1/2" x 4" Lg.		TVM-76	11 N-2-85	4	.22	.9
TVM-AY	Dowel Pins	Tobin Bronze	1/2" x 1" Lg.		TVM-26-27	5 N-2-85	32	.06	1.9
TVM-AZ	Dowel Pins	"	1/2" x 1" Lg.		TVM-20-21	5 N-2-85	32	.06	.9
TVM-BA	Dowel Pins	"	1/2" x 1 1/4" Lg.		TVM-18-19	5 N-2-85	32	.076	2.4
TVM-BB	N° Z-137-A Alemite Fittings	Lub. Fittings	1/4" - 18 Str.	Std. Pipe	TVM-3	3 N-2-85	16	.05	.8
TVM-BC	N° 1627 Hydraulic Alemite "	"	1/4" - 18 Str.	" "	TVM-22	4 N-2-85	8	.05	.4
TVM-BD	N° 1627 " " "	"	1/4" - 18 Str.	" "	TVM-27	4 N-2-85	8	.05	.4
TVM-BE	N° 1627 " " "	"	1/4" - 18 Str.	" "	TVM-19	4 N-2-85	8	.05	.4
TVM-BF	N° 1627 " " "	"	1/4" - 18 Str.	" "	TVM-82	13 N-2-85	8	.05	.4
TVM-BG	N° 1627 " " "	"	1/4" - 18 Str.	" "	TVM-83	13 N-2-85	4	.05	.2
TVM-BH	N° 1627 " " "	"	1/4" - 18 Str.	" "	TVM-BL	15 N-2-85	40	.05	2.0
TVM-BI	N° 1627 " " "	"	1/4" - 18 Str.	" "	TVM-BL	15 N-2-85	4	.05	.2
TVM-BJ	Carnegie Rail Clips	Str'd. Steel	N° 103		TVM-61	9 N-2-85	144	.58	83.5
TVM-BK	Grease Pipe (Ex. Heavy)	Brass Pipe	1/2" I.P.S.	Std. Pipe	TVM-95-97	15 N-2-85	2980	1.27#	3776.0
TVM-BL	Grease Pipe Reducers	Bronze	1/2 to 1/4 I.P.S.	" "	TVM-BK	15 N-2-85	44		
TVM-BM	Grease Pipe Elbow	"	1/2 x 90° I.P.S.	" "	TVM-BK	13 N-2-85	16		
TVM-BN	Grease Pipe Nipple	"	1/2 Short I.P.S.	" "	TVM-BM-BO	15 N-2-85	16		
TVM-BO	Grease Pipe Swing Joint	Bronze	1/2" I.P.S.	" "	TVM-BK-BN	15 N-2-85	16		
TVM-BP	Grease Pipe (Ex. Heavy)	Brass Pipe	1/2" I.P.S.	" "	Ladder	1 N-2-85	30-0	1.2#/ft.	36.0

NOTES:—

Swing Joints in Grease Pipes to be on ℄ of each Hinge Point. Seamless Extra Heavy Brass Pipe to be bent wherever possible to eliminate fittings.
All Pipe Fittings shall conform to Fed. Specs. WW-P-461 (Bronze 250%" Pressure)
Weights Given are for Single Pieces. Quantities shown are for four Taintor Valves.
An alternate scheme of lubrication piping may be presented to the Contracting Officer for Approval. Details shown on this sheet are TVM-95 to TVM-97 Inclusive. (TVM-99 OMITTED)

REFERENCES:—

For General Assembly see Sheet 1 N-2-85.
For Detail of Radius Frame " 8-N-2-85.
For Detail of Trunnion Hinge " 8 " .
① McCLINTIC MARSHALL CONT. No. CJ. 2070-4 DWG. SHEETS 12 & 15.

NO.	REVISION	DATE	APP'VL
1	REVISED TO AGREE WITH SHOP DRAWINGS	4/22/36	RMH
	ISSUED FOR CONSTRUCTION	9/10/35	

CONNEAUT DISTRICT NAVIGATION PROJECT
(36TH) CONTRACT W 694 ENG.-47
LOCK OPERATING EQUIPMENT

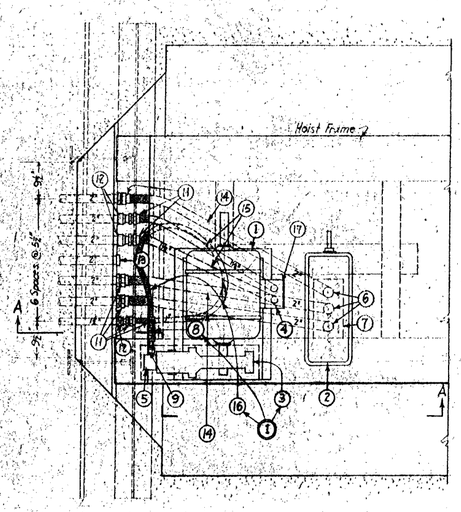
TAINTER VALVE MACHINERY
GREASING LAYOUT & PARTS LIST

SCALES AS SHOWN

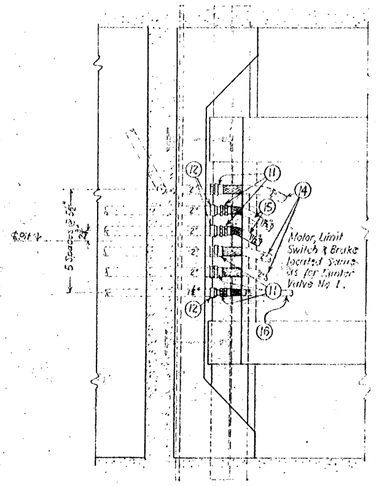
ENGINEER OFFICE — POWELL DISTRICT

SUBMITTED: R. M. Mackenzie, Asst. Engineer
RECOMMENDED: Senior Engineer
APPROVED: Wm. Williams, Lt. Col. Corps of Engineers
DESIGNED BY: AAO & FTD — DATE: 9-2-35
DRAWN BY: C.E.K.W. — TRACED BY: R.K.V. — CHECKED BY: F.T.D.

SHEET 15 N-2-85



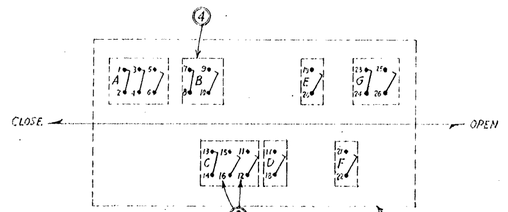
TAINTER VALVE NO. 1
(LOWER NORTH WALL)



TAINTER VALVE NO. 2
(LOWER SOUTH WALL)

SEQUENCE OF OPERATION OF VALVE LIMIT SWITCHES

SWITCH ELEMENT	NO. OF CIRCUITS	DUTY OF CIRCUIT	TERM NO.	POSITION OF VALVE: Full Close	1/8 Open	1/4 Open	1/2 open	3/4 Open	Full Open
A	1	Indicating Light - Green	1-2						
	1	Interlock Gates & Valves	3-4						
	1	Limit Close Travel	5-6						
B	1	Spare (4)	7-8						
	1	Stop High Speed Close (4)	9-10						
	1	Start Slow Speed Close	13-14						
C	1	Indicating Light, White (4)	15-16						
	1	Spare (4)	11-12						
D	1	Indicating Light - White	17-18						
E	1	" " " (4)	19-20						
F	1	" " " (4)	21-22						
G	1	Limit open Travel	23-24						
	1	Indicating Light - Red (4)	25-26						



ARRANGEMENT OF ELEMENTS

65 turns for full operating travel required

4 LIMIT SWITCHES REQUIRED

LEGEND

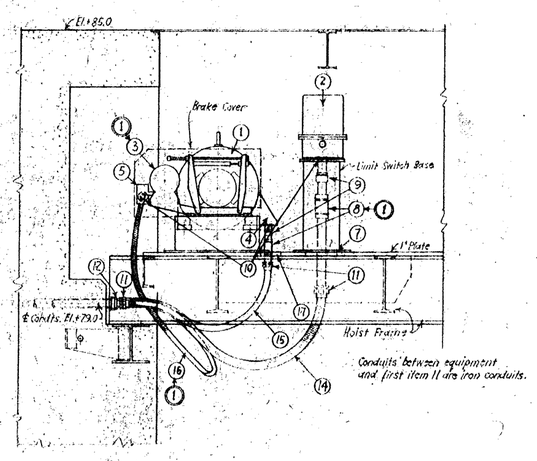
Shaded portion indicates Limit Switch closed

Limit Switch normally closed

" " " open

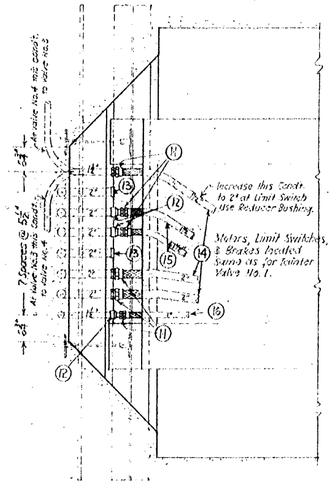
Normal position is assumed to be position of switch when valve is closed.

Limit switches for all Tainter Valves when opening rotate in clockwise direction when viewed from drive end.



SECTION A-A

This arrangement typical for all valves.



TAINTER VALVES NO. 3 & 4
(UPPER NORTH WALL)

SCHEDULE OF TAINTER VALVE CONDUITS & FITTINGS

No.	DESCRIPTION
(1)	Motor
(2)	Limit Switch
(3)	Brake, enclosed.
(4)	Terminal Box on Motor to receive 2-1½" Conduits watertight.
(5)	" " " Brake " 1-1" Conduit "
(6)	Drill & Tap Limit Switch for 3-2" Conduits
(7)	8"x16" Opening in Limit Switch Base and in 1" Hoist Frame Plate
(8)	G & W, Type A, 600 Volt, Sheath Clamp, Cable Potheads, or equal, with rigid conduit connection both ends for 1", 1½" and 2" conduit. (1)
(9)	Conduit Union
(10)	Watertight Connection
(11)	Std. Cast Threaded Unions similar to "Titeflex" Metal Hose Cos # U16-0, or equal, for 1" Hose # U24-0, " " " 1½" " # U32-0, " " " 2" "
(12)	Iron Conduit Reducers
(13)	Capped Spare Conduit
(14)	Titeflex Metal Hose "BS", or equal, metal hose to Limit Switch
(15)	" " " " Motor
(16)	" " " " Brake
(17)	5"x8" Opening in Hoist Frame Plate for Water Stops to Unit

(1) Numerals in double circles designate Revision Number

Note: See Drawings N-2-85 for Machinery Details.

NO	REVISION	DATE	BY	APV'D
4	Limit Switch Contacts & Contact Settings	5-13-36	JWH.	
3	Changed Limit Switch Contact Settings	2-7-36	JWH.	
2	Added Limit Switch Note Arrangement of Lt Sw. Elements	12-6-35	JWH.	
1	Changed Motor Brake Position, Items marked 8 from "ES" Fittings to G & W Potheads	11-7-35	JWH.	

BONNEVILLE POWER NAVIGATION PROJECT

(56-TH) CONTRACT W 694 ENG-47

LOCK OPERATING EQUIPMENT.

TAINTER VALVE MACHINERY

ELECTRICAL DETAILS

SCALE AS SHOWN:

U. S. ENGINEER OFFICE, SECOND PORTLAND DISTRICT (OREGON)

SUBMITTED: [signature] ASSOCIATE ENGINEER

APPROVED: [signature] LT. COL. CORPS OF ENGINEERS

RECOMMENDED: [signature] PRINCIPAL ENGINEER

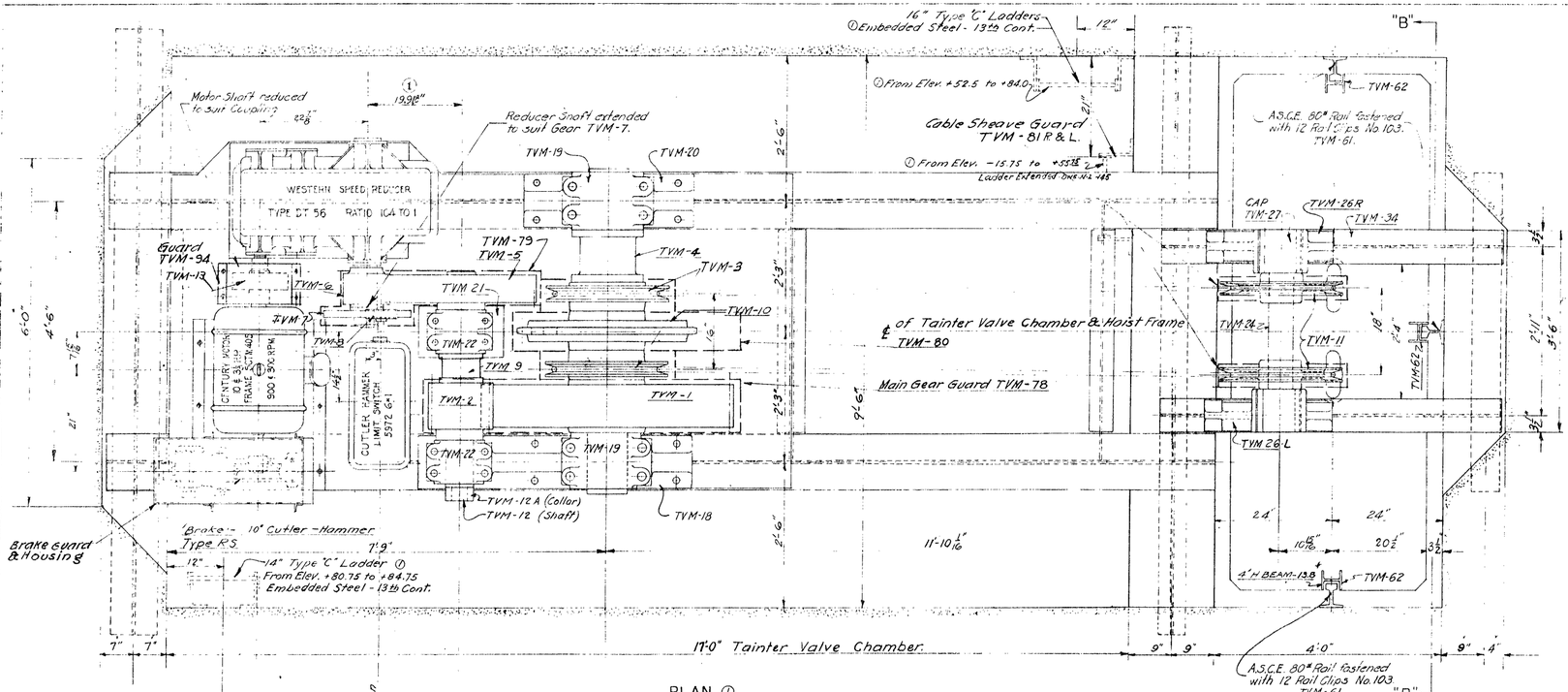
DESIGNED BY JWH DATE 10-31-35

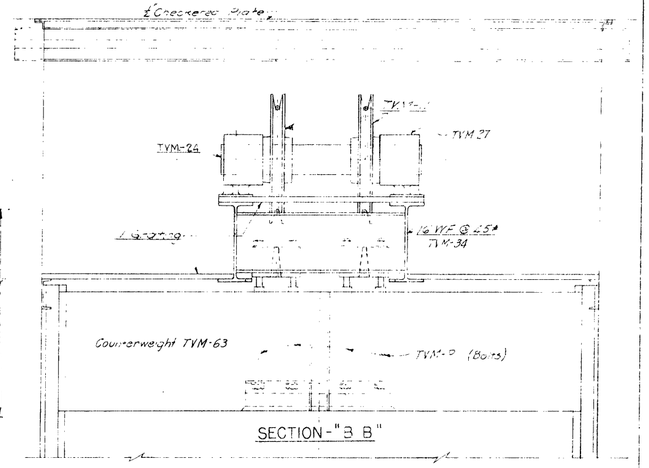
DR. BY JWH TR. BY JWH CHECKED BY

SCALE IN FEET

SHEET 16

N-2-85





SECTION - "B B"

GEAR TABLE

GEARS WITH 20° INVOLUTE CUT TEETH

MARK	AMOUNT	MATERIAL	NO. TEETH	PITCH	PITCH DIA.	FACE	HUB DIA.	HUB LGTH.
TVM-1		N.S.C.	65	2	32½	6	8½	15½
" -2		FRG. NI. ST.	5	2	2½	9	10	11½
" -5		N.S.C.	62	2	31	5½	9	14½
" -6		F.NI.ST.	18	2	9	6	7½	11½

GEARS WITH 14½° INVOLUTE CUT TEETH

MARK	AMOUNT	MATERIAL	NO. TEETH	PITCH	PITCH DIA.	FACE	HUB DIA.	HUB LGTH.
TVM-7	1	C.S.C.	121	8	15.125	2½	3	5½
" -8	1	BRONZE	39	8	4.875	2	1	2½

SPROCKETS

MARK	AMOUNT	MATERIAL	NO. TEETH	PITCH	PITCH DIA.	FACE	HUB DIA.	HUB LGTH.
TVM-0	1	IRON C.	28	4.04	36.228	12	9"	10½

SHEAVES

MARK	AMOUNT	MATERIAL	GROOVE	PITCH DIA.	OUT. DIA.	WIDTH	BORE	HUB DIA.	HUB LGTH.
TVM-3		C.S.C.	V				10Z		
" -11	2	C.S.C.	V				9Z		

SHAFTING

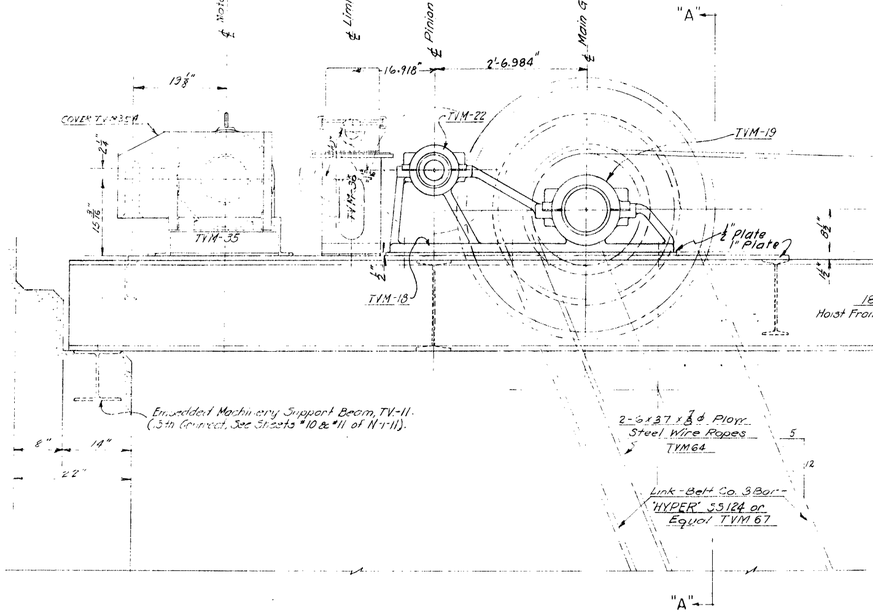
MARK	AMOUNT	MATERIAL	DIA.	APPROX. LENGTH	KEYWAYS	REMARKS
TVM-12	1	FRG. N. ST.	5¾"	3'-8½"	2	REQ'D. AT ENDS
" -17		FRG. N. ST.	9"	5'-7"		
" -24	1	MACH. ST.	5¾"	3'-5"	2	

PLAN ①

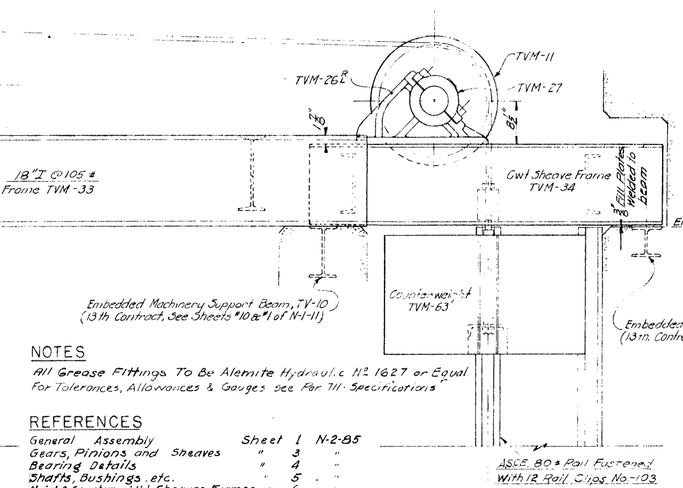
SCALE 1" = 1'-0"

SCALE IN FEET 0 1 2 3

"A"



ELEVATION ①



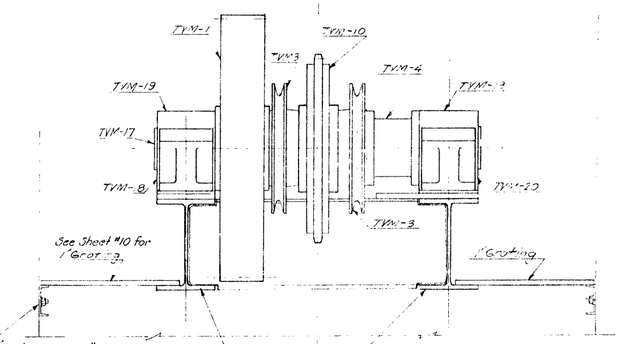
NOTES

All Grease Fittings To Be Alemite Hydraulic № 1627 or Equal
For Tolerances, Allowances & Gauges see Par III - Specifications

REFERENCES

General Assembly	Sheet	1	N-2-85
Gears, Pinions and Sheaves	"	3	"
Bearing Details	"	4	"
Shafts, Bushings, etc.	"	5	"
Hoist & Counterweight Sheaves Frames	"	6	"
Counterweight	"	9	"
Grating - Details	"	10	"
Gear Guards	"	12	"
Overload Clutch	"	13	"
For all commercial bolts & parts	"	15	"
Embedded Steel Details	Sheets #10 & #11 N-1-11.		
12' Ladder	"	2 & 6 N-1-77 - ① Commercial Iron Wks. Shop order #1641. - P40	
19' Ladder			

THIS DRAWING SUPERSEDES DRAWING OF SAME NUMBER NOT BEARING THIS CAPTION



SECTION - "A A"

NO	REVISION	DATE	BY	APV'D
①	Revised to agree to Shop Drawings. Added Ladders to Plan View.	7/22/36	EMA	
	ISSUED FOR CONSTRUCTION	8/12/36	EMA	RLM

BONNEVILLE POWER NAVIGATION PROJECT
(36-TH) CONTRACT W 694 ENG-47.
LOCK OPERATING EQUIPMENT.

TAINTER VALVE MACHINERY

HOIST ASSEMBLY

SCALE AS SHOWN

U.S. ENGINEER OFFICE SECOND PORTLAND DISTRICT (OREGON)

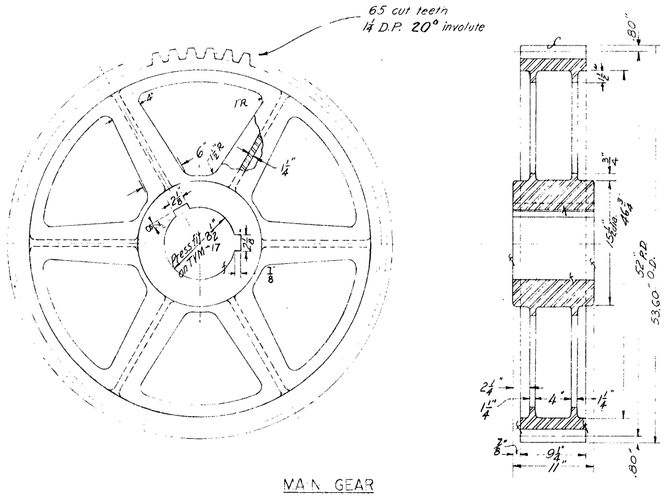
SUBM'D: R.L. Mackenzie, ENGINEER — APP'D: D. D. Williams, LT. COL., CORPS OF ENGINEERS

RECOMMENDED: H. M. Hewitt, SENIOR ENGINEER

DESIGNED BY A.A.J. & F.T.O. — DATE 9-9-35
DRAWN BY M.R.L. & T.M.O.
TRACED BY T.M.O. — CHECKED BY F.T.O.

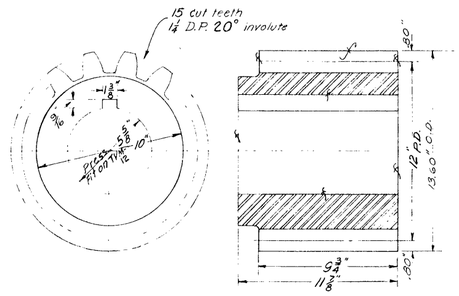
SHEET 2

N-2-85



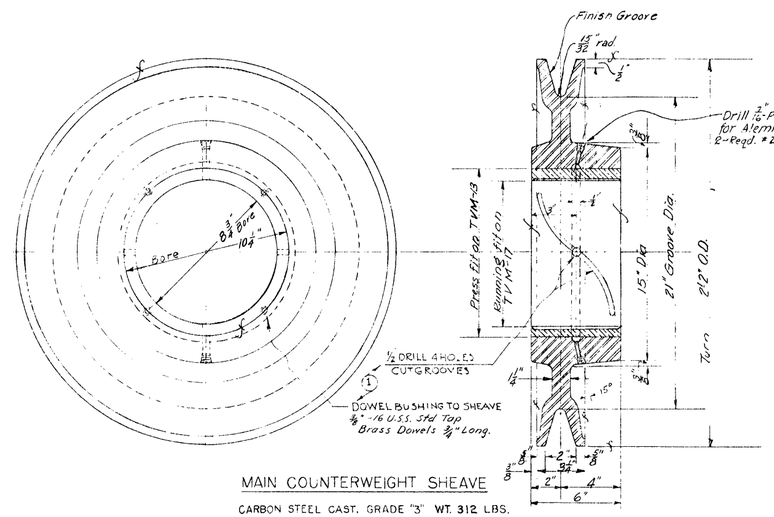
MAIN GEAR

CHROME NICKEL STEEL CASTING WEIGHT 2048 LBS
MARK TVM-1 MAKE 4
SCALE 1 1/2" = 1'-0"



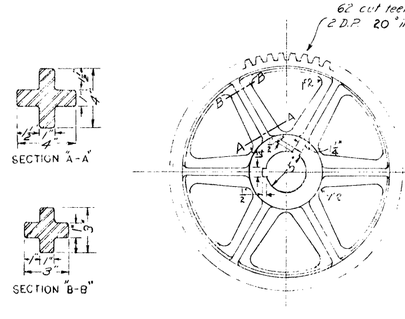
MAIN PINION

CHROME NICKEL STEEL FORGING WEIGHT 270 LBS.
MARK TVM-2 MAKE 4
SCALE 3"=1'-0"



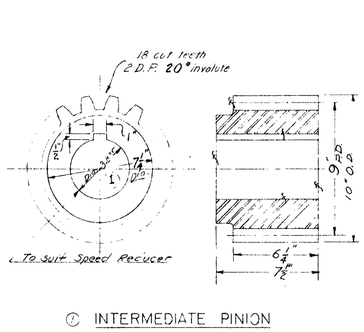
MAIN COUNTERWEIGHT SHEAVE

CARBON STEEL CAST. GRADE "3" WT. 312 LBS.
MARK TVM-3 MAKE 8
SCALE 3"=1'-0"



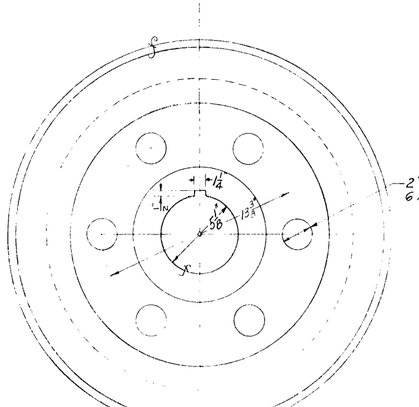
INTERMEDIATE GEAR

CHROME NICKEL STEEL CASTING WEIGHT 450 LBS
MARK TVM-5 MAKE 4
SCALE 1 1/2" = 1'-0"



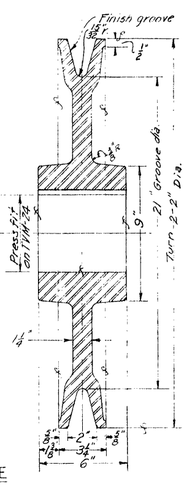
Ⓒ INTERMEDIATE PINION

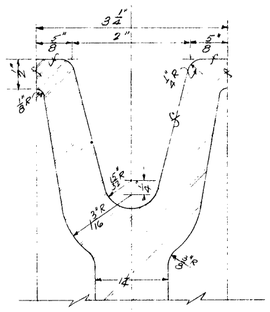
CHROME NICKEL STEEL FORGING WEIGHT 98 LBS.
MARK TVM-6 MAKE 4
SCALE 3"=1'-0"



COUNTERWEIGHT SHEAVE

CARBON STEEL CAST. GRADE "3" WT. 252 LBS.
MARK TVM-11 MAKE 8
SCALE 3"=1'-0"



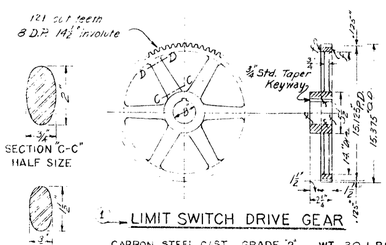


SHEAVE RIM & GROOVE

FULL SIZE SECTION

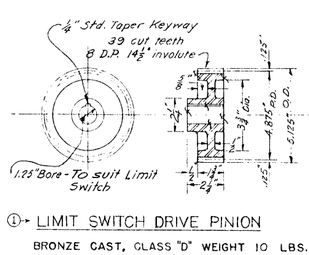
NOTES:
Number of pieces called for is for one complete installation of four valves.
Weights are for each piece.
Pitch circle to be scribed on both sides of all gears.
Details shown on this sheet are. TVM-1,2,3,4,5,6,7,8,9 & 11.

REFERENCES:
For General Assembly see sheet 1-N-2-85
For Hoist " " " 2-N-2-85
For Bushing & Shaft Details - 3-N-2-85
For Commercial Iron Works Shop Drawings
(1) See S.O. 14641 - Drawings R43 & R44



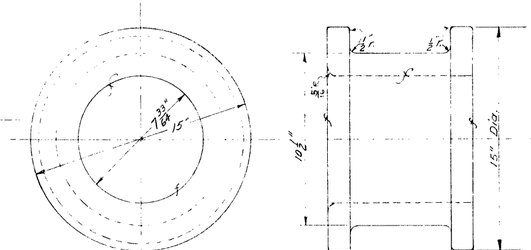
① LIMIT SWITCH DRIVE GEAR

CARBON STEEL CAST. GRADE '2' WT. 30 LBS.
MARK TVM-7 MAKE 4
SCALE 1 1/2" = 1'-0"



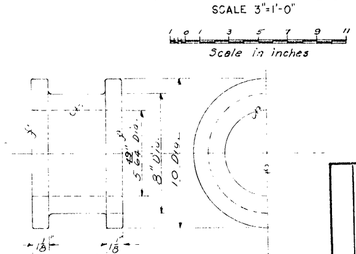
① LIMIT SWITCH DRIVE PINION

BRONZE CAST, CLASS "D" WEIGHT 10 LBS.
MARK TVM-8 MAKE 4
SCALE 3"=1'-0"



① SPACING COLLAR

CARBON STEEL CAST. GRADE '2' WT. 208 LBS.
MARK TVM-4 MAKE 4
SCALE 3"=1'-0"



SPACING COLLAR

CARBON STEEL CAST. GRADE '2' WT. 60 LBS.
MARK TVM-9 MAKE 4
SCALE 3"=1'-0"

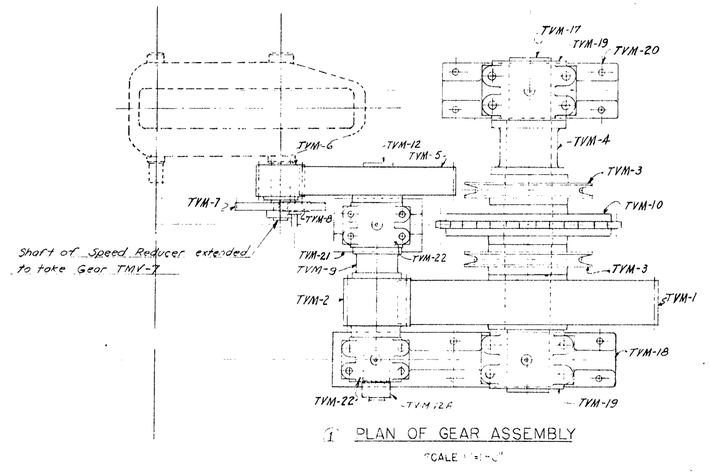
Scale in inches

NO.	REVISION	DATE	BY	APV'D
1	REVISED TO AGREE WITH SHOP DRAWINGS	11/22/35	[illegible]	
	ISSUED FOR CONSTRUCTION	12-18-35	[illegible]	

BONNEVILLE POWER NAVIGATION PROJECT
(36-TH) CONTRACT W 694 ENG-47
LOCK OPERATING EQUIPMENT
TAINTER VALVE MACHINERY
GEARS PINIONS & SHEAVES
SCALES AS SHOWN

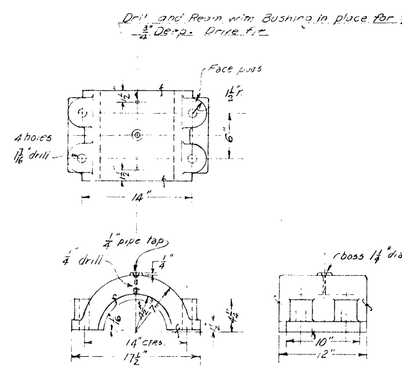
U.S. ENGINEER OFFICE, SECOND PORTLAND DISTRICT (OREGON)

SUBMITTED: [signature] ENGINEER
APPROVED: [signature] LT. COL., CORPS OF ENGINEERS
RECOMMENDED: [signature] SENIOR DRAWING
DESIGNED BY A.A.G. & F.E.S. DATE 9-9-35
DRAWN BY G.A.D.
TRACED BY G.A.D. CHECKED BY F.T.O.



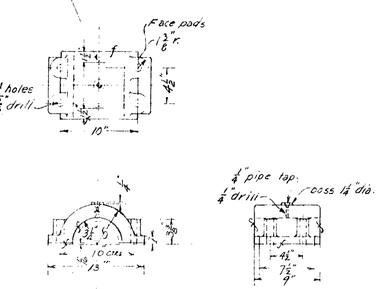
1 PLAN OF GEAR ASSEMBLY

SCALE 1"=1'-0"



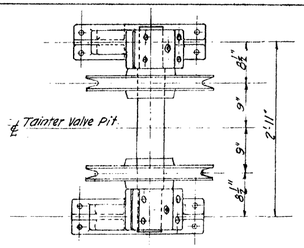
1 BEARING CAP

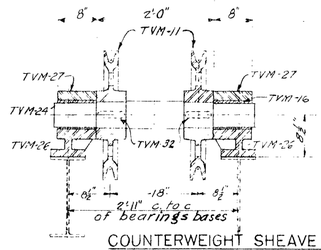
CARBON STEEL CAST. GRADE '2' WT. 62 LB.
MARK TVM-19 MAKE 8
SCALE 1½"=1'-0"

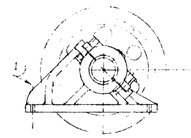


1 PINION BEARING CAP

CARBON STEEL CAST. GRADE '2' WT. 30 LBS.
MARK TVM-22 MAKE 8
SCALE 1½"=1'-0"

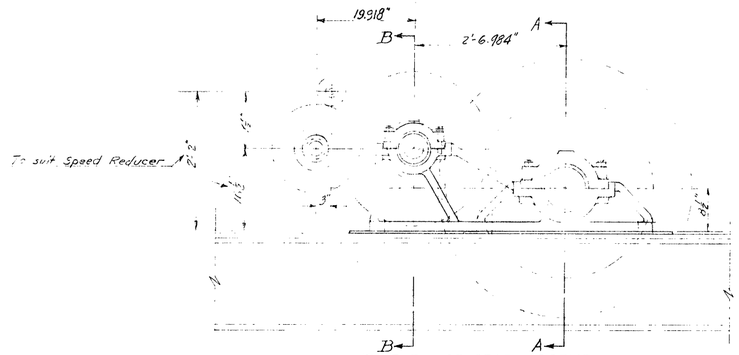






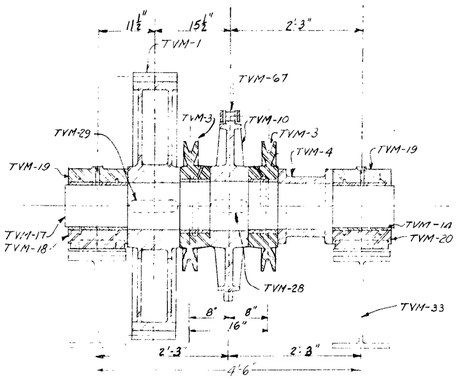
COUNTERWEIGHT SHEAVE ASSEMBLY

SCALE 1"=1'-0"



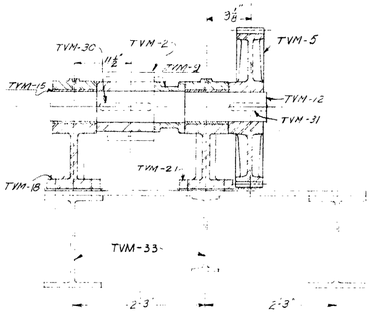
1 ELEV. OF GEAR ASSEMBLY

SCALE 1"=1'-0"



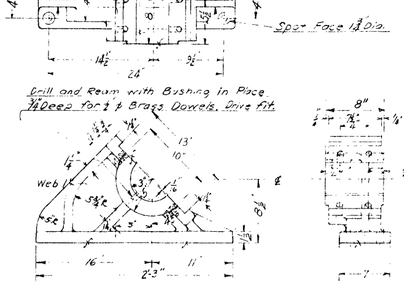
SECT. "A-A"

SCALE 1"=1'-0"



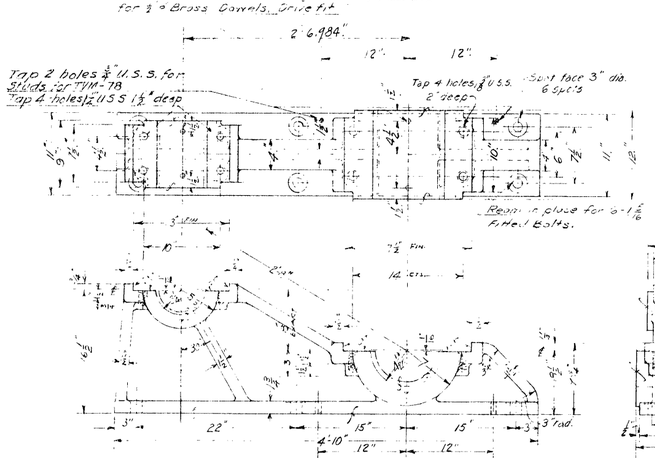
SECT "B-B"

SCALE 1"=1'-0"



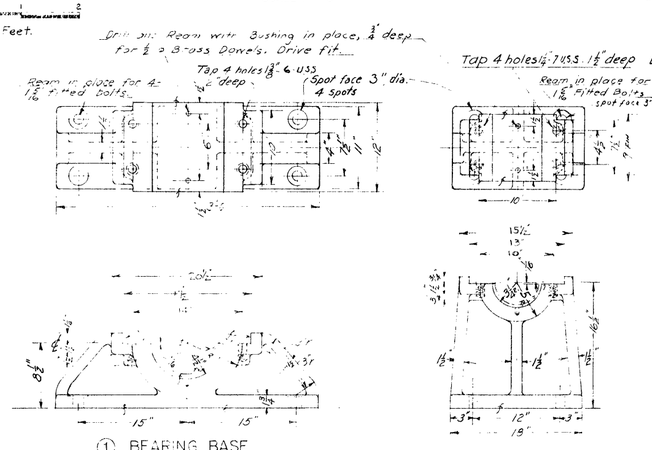
1 COUNTERWEIGHT SHEAVE BEARING

CARBON STEEL CAST. GRADE "2" WT. 160 LB.
MARK TVM-26 R L MAKE 4 EACH
SCALE 1½"=1'-0"



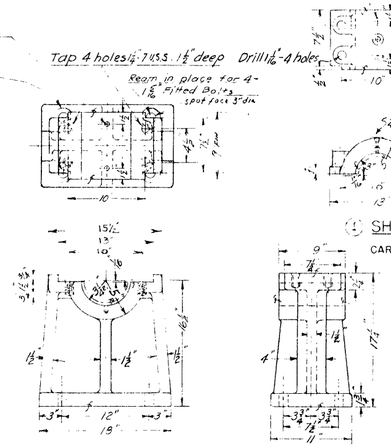
1 MAIN BEARING BASE

CARBON STEEL CAST. GRADE '2' WT. 660 LB.
MARK TVM-18 MAKE 4
SCALE 1½"=1'-0"



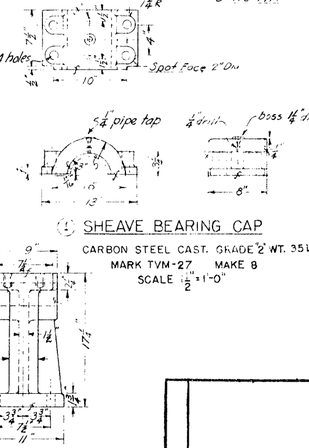
1 BEARING BASE

CARBON STEEL CAST. GRADE '2' WT. 440 LB.
MARK TVM-20 MAKE 4
SCALE 1½"=1'-0"



1 INTERMEDIATE SHAFT BEARING

CARBON STEEL CAST. GRADE '2' WT. 270 LB.
MARK TVM-21 MAKE 4
SCALE 1½"=1'-0"



1 SHEAVE BEARING CAP

CARBON STEEL CAST. GRADE '2' WT. 35 LB.
MARK TVM-27 MAKE 8
SCALE 1½"=1'-0"

Scale in Feet.

Scale in Feet

NOTES:

Studs for Bearings to have 2 full turns.
Number of pieces called for is for one complete installation of four valves.
Weights are for each piece.
For tolerances, allowances and gages see paragraph 711 of specifications.
Care to be taken in machining to maintain center lines of gears.
Details of turned and fitted bolts to be shown.
Bearing caps to be fitted with Aluminum shims.
Bearings to be bored for bushings with caps and shims in place.
Details shown on this sheet are:
TVM-18, 19, 20, 21, 22, 26 & 27. Thrust washers
Laminated Shims to be furnished for the Bearings

REFERENCES:

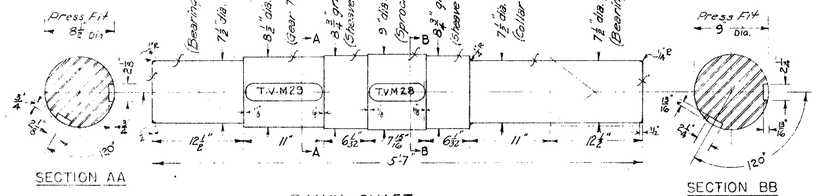
General Assembly see Sheet 1 N-2-85
For Hoist " " " 2 " "
For Bushings " " " 3 " "
(1) Contract Plans Miter Gate Drawings 38-694-MW-P&H-642

NO.	REVISION	DATE	BY	APV'D
1	REVISED TO AGREE WITH SHOP DRAWINGS	6/22/36	RHH	
	ISSUED FOR CONSTRUCTION	2-10-36		

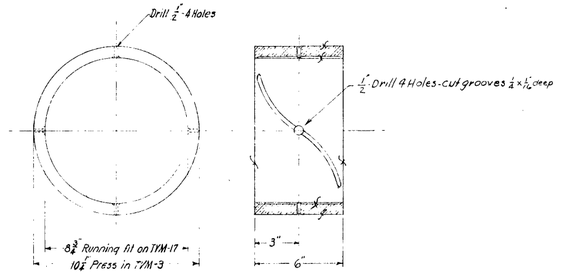
BONNEVILLE POWER NAVIGATION PROJECT
(36-TH) CONTRACT W 694 ENG-47
LOCK OPERATING EQUIPMENT
TAINTER VALVE MACHINERY
BEARING DETAILS
SCALES AS SHOWN

U. S. ENGINEER OFFICE, SECOND PORTLAND DISTRICT (OREGON)

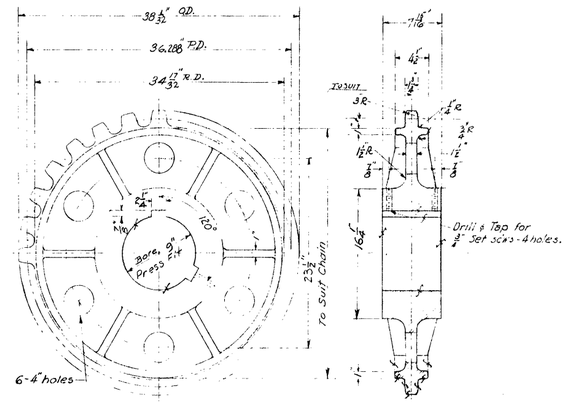
SUBMITTED: R. E. Mackenzie, ENGINEER — APPROVED: [illegible], LT. COL. CORPS OF ENGINEERS
RECOMMENDED: [illegible], SENIOR ENGINEER
DESIGNED BY A.A.P. & E.B. DATE 5-6-35
DRAWN BY G.A.D.
TRACED BY G.A.D. CHECKED BY E.T.C.



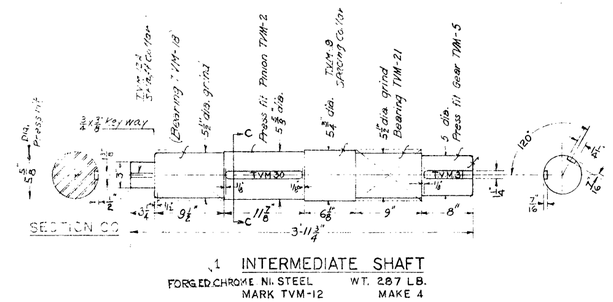
① MAIN SHAFT
FORGED. CHROME NI. STEEL WT.= 950 LB.
MARK TVM-17 MAKE 4



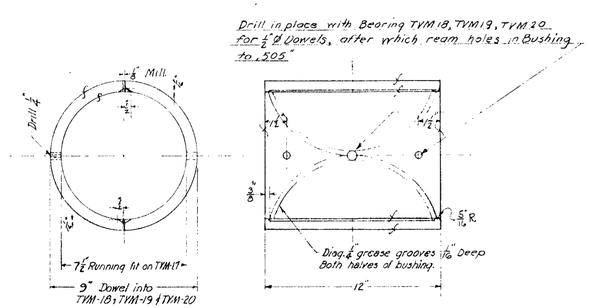
① SHEAVE BUSHING
PHOS. BRONZE WT=43 LB.
CLASS "C" MAKE 8
MARK TVM-13



① MAIN SPROCKET
CAST STEEL - CHILLED WT. 830 LB.
MARK TVM-10 MAKE 4
SCALE 1½" = 1 FT.



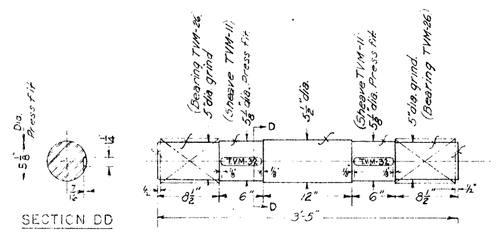
① INTERMEDIATE SHAFT
FORGED CHROME NI. STEEL WT. 287 LB.
MARK TVM-12 MAKE 4



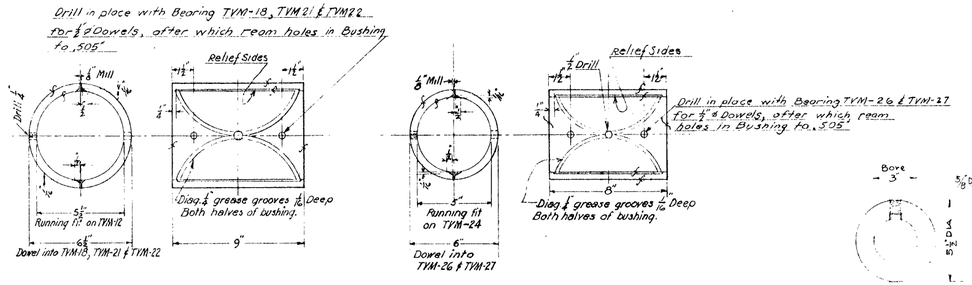
① MAIN BEARING BUSHING
PHOS. BRONZE WT. 75 LB. (2 HALVES)
CLASS "C" MAKE 8 PAIRS
MARK TVM-14

NOTES:
Number of pieces is for one complete installation of four valves.
Weights given are for one piece.
Chamfer ends of shafts
For tolerances, allowances and gages see paragraph 711 of Specifications.
Details shown on this sheet are: TVM-10, 12, 13, 14, 15, 16, 17, 24, 28, 29, 30, 31 & 32

REFERENCES:
For General Assembly see Sheet No. 1. N-2-85
For Hoist Assembly see Sheet No. 2. N-2-85
For Gear Details see Sheet 3 N-2-85
For Bearing Details See Sheet 4 N-2-85.
(1) Commercial Iron Works. Chas. P. 41-52-43 x P46-50 1464.



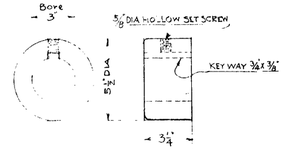
① IDLER SHAFT
MACHINE STEEL WT. 246 LB.
MARK TVM-24 MAKE 4
SCALE 1½" = 1 FT.



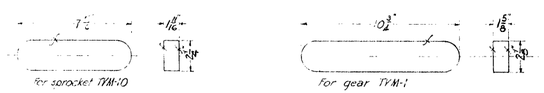
① INTERMEDIATE BEARING BUSHING
PHOS. BRONZE WT. 28. LB. (2 HALVES)
CLASS "C" MAKE 8 PAIRS
MARK TVM-15

① IDLER BEARING BUSHING
PHOS. BRONZE WT. 22. LB. (2 HALVES)
CLASS "C" MAKE 8 PAIRS
MARK TVM-16

SCALE 3" = 1 FT.

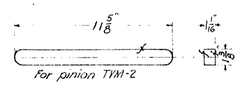


① SHAFT COLLAR
CAST IRON FINALLOY EP. WT. 16 LB
MARK TVM-24 MAKE 4



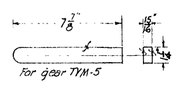
① SPROCKET KEY
KEY STEEL WT. 7.8 LB.
MARK TVM-28 MAKE 8

GEAR KEY
KEY STEEL WT. 10 LB.
MARK TVM-29 MAKE 8

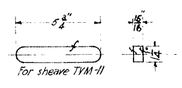


PINION KEY
KEY STEEL WT. 4.4 LB
MARK TVM-30 MAKE 4
SCALE 3" = 1 FT.

0 1 2 3 6 9 12
Scale in Feet.



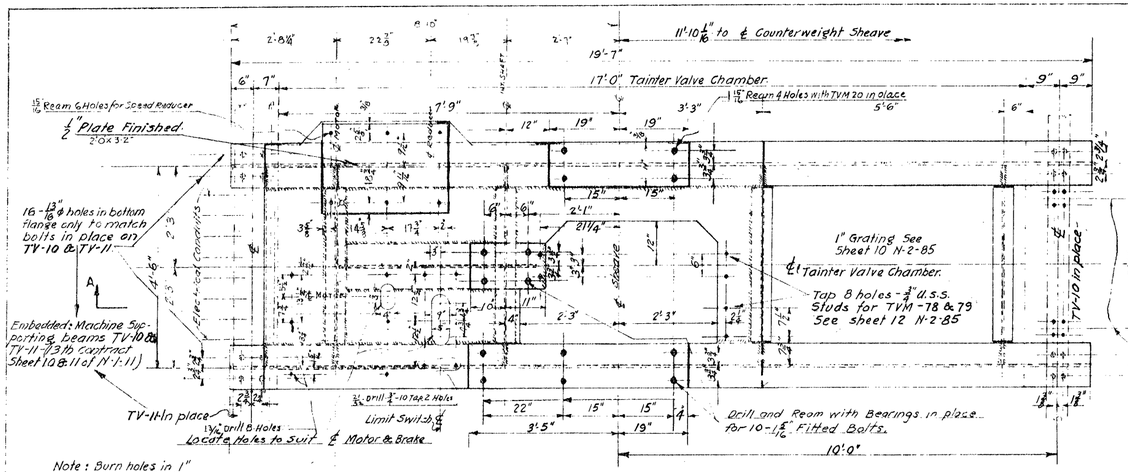
① GEAR KEY
KEY STEEL WT. 2.4 LB.
MARK TVM-31 MAKE 8



SHEAVE KEY
KEY STEEL WT. 1.8 LB.
MARK TVM-32 MAKE 8

NO.	REVISION	DATE	BY	APV'D
1	REVISED TO AGREE WITH SHOP DRAWINGS	4/22/36	RMH	
	ISSUED FOR CONSTRUCTION	2-28-36		

BONNEVILLE POWER NAVIGATION PROJECT
(36-TH) CONTRACT W 694 ENG.-47
LOCK OPERATING EQUIPMENT
TAINTER VALVE MACHINERY
SHAFTS, BUSHINGS, SPROCKET, ETC.
SCALES AS SHOWN
U. S. ENGINEER OFFICE, SECOND PORTLAND DISTRICT (OREGON)
SUBMITTED R.M. Mackenzie ENGINEER
APPROVED C. Williams LT. COL. CORPS OF ENGINEERS
RECOMMENDED Stan Cunniff SENIOR ENGINEER
DESIGNED BY A.A.D. & E.T.D. DATE 9-9-35
DRAWN BY A.S.D.
TRACED BY A.S.D. CHECKED BY R.M.M.

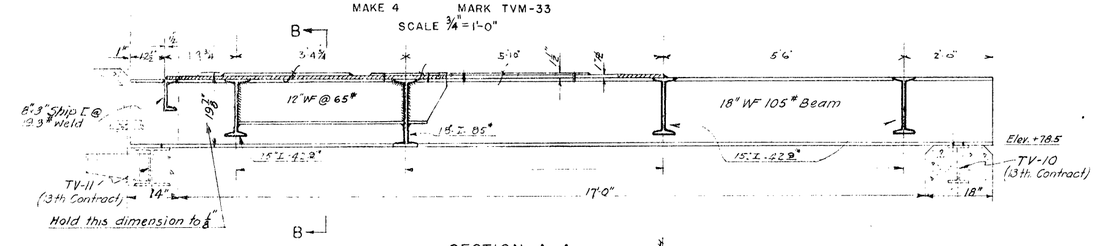


① PLAN - HOIST FRAME

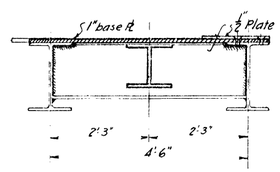
STRUCTURAL CARBON STEEL WEIGHT 8609 LBS

MAKE 4 MARK TVM-33

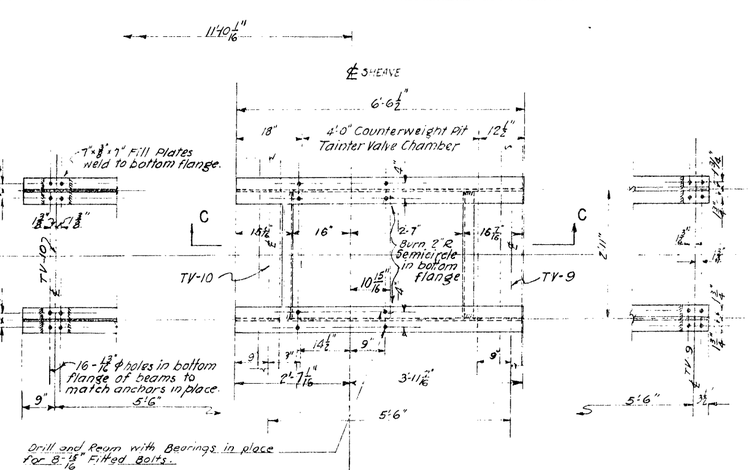
SCALE 3/4" = 1'-0"



SECTION A-A

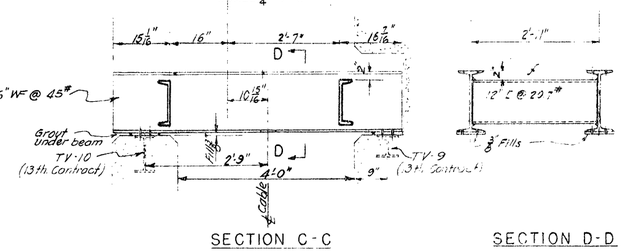


SECTION B-B



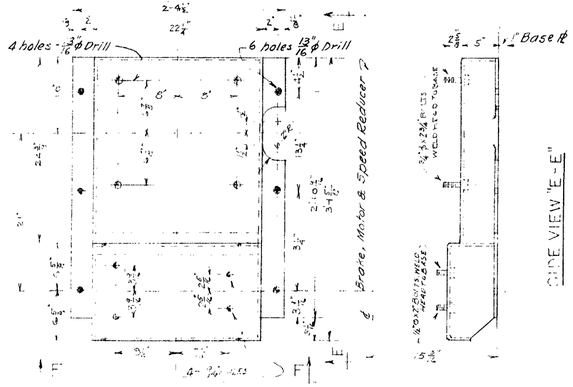
PLAN

SCALE 3/4" = 1'-0"



SECTION C-C

SECTION D-D



PLAN

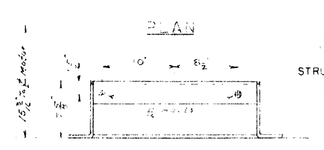
BASE F.B

① MOTOR & BRAKE

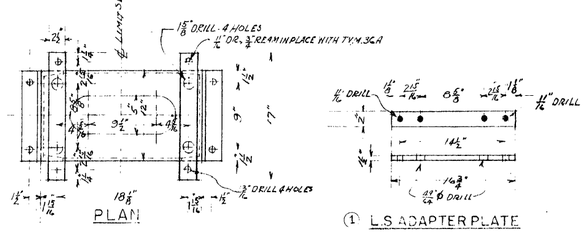
STRUCTURAL CARBON STEEL WEIGHT 200 LBS ±

MAKE 4 MARK TVM-35

SCALE 1" = 1'-0"



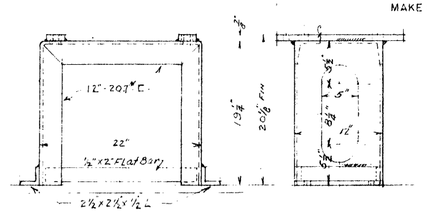
END VIEW "F-F"



① L.S ADAPTER PLATE

COLD ROLLED STEEL WEIGHT 4.5 LBS.

MAKE 8 MARK TVM-36A



① LIMIT SWITCH BASE

STRUCTURAL CARBON STEEL WEIGHT 140 LBS ±

MAKE 4 MARK TVM-36

SCALE 1 1/2" = 1'-0"

① COUNTERWEIGHT SHEAVE FRAME

STRUCTURAL CARBON STEEL WEIGHT 745 LBS

MAKE 4 MARK TVM-34

NOTES:

All members to be bolted together for Correct alignment. Scribe match lines before any welding is done. No twisted members, misalignment or warped surfaces will be allowed.

Frames shall be thoroughly annealed after welding and before machining operations are started.

All welds shall conform to American Welding Society Standards & shall pass Goverment Inspection. (See Paragraph 713)

Bases for Motor & Brake and Limit Switch are to show the Contractor the type of framing desired. Bases to be made to suit equipment Selected and approved by the contracting officer.

Details shown on this sheet are: TVM 33 to 36 Inclusive.

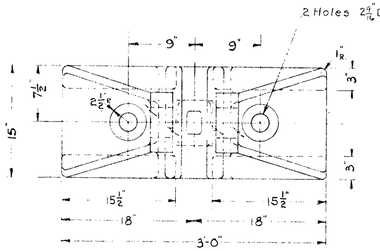
REFERENCES

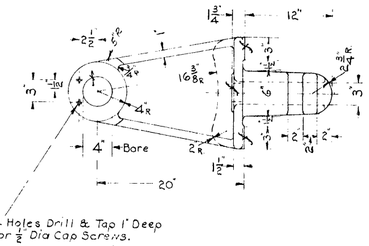
For Embedded Steel see Sheets 10 & 11 - N-1-11
For Concrete Recesses " " 1 N-1-16 & N-1-24
For General Assembly " " 1 N-2-85
For Hoist Assembly " " 2 " " "
For Commercial Parts " " 15 " " "
① Commercial Iron Works CMS 946-947. SO 453

NO.	REVISION	DATE	BY	APV'D
1	REVISED TO AGREE WITH SHOP DRAWINGS	4/12/36	RMH	
	ISSUED FOR CONSTRUCTION	3-10-35		

BONNEVILLE POWER NAVIGATION PROJECT
(36-TH) CONTRACT W 694 ENG-47.
LOCK OPERATING EQUIPMENT
TAINTER VALVE MACHINERY.
HOIST & COUNTERWEIGHT SHEAVE FRAMES
SCALES AS SHOWN
U. S. ENGINEER OFFICE, SECOND PORTLAND DISTRICT (OREGON)

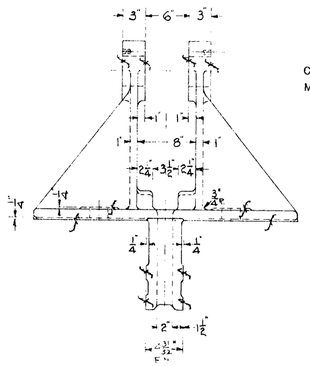
SUBMITTED: R.R. Mackenzie, ENGINEER
APPROVED: H. Williams, LT. COL. U.S.A. CORPS OF ENGINEERS
RECOMMENDED: Senior Engineer
DESIGNED BY A.A.S & T.T.O. DATE 9-9-35
DRAWN BY M.R.L. CHECKED BY A.T.O.
TRACED BY M.R.L. CHECKED BY J.B.K.

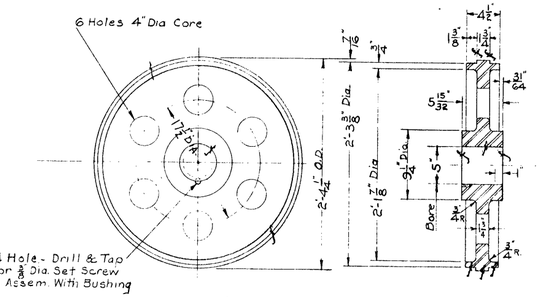




① CHAIN SHEAVE BRACKET

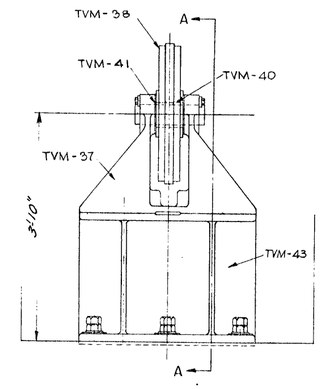
CARBON STEEL CAST. GRADE "2" WT. 602 LBS.
MARK TVM-37 MAKE-4
SCALE - 1½" = 1'-0"

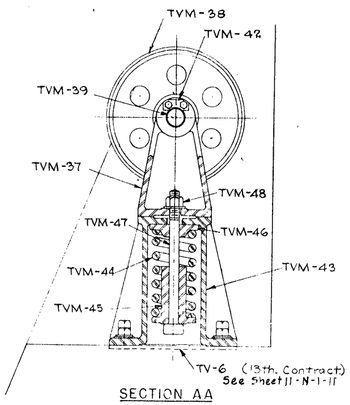




① CHAIN SHEAVE

CARBON STEEL CAST. GRADE "3" WT. 360 LBS.
MARK TVM-38 MAKE-4
SCALE - 1½" = 1'-0"

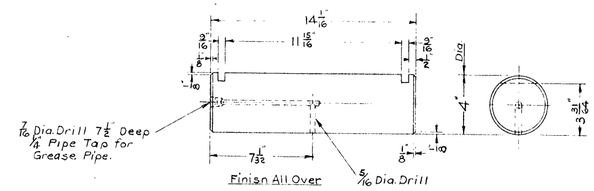




SECTION AA

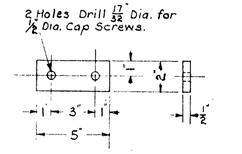
CHAIN SHEAVE MOUNTING

SCALE - 1" = 1'-0"



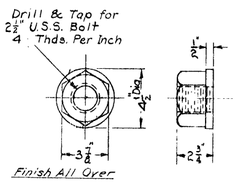
① CHAIN SHEAVE PIN

CHROME NICKEL STEEL FORGING WEIGHT 50 LBS.
MARK TVM-39 MAKE-4
SCALE - 3" = 1'-0"



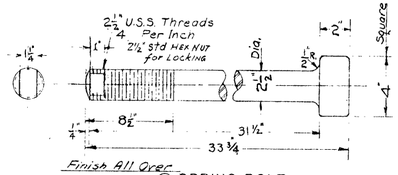
KEEPER PLATE

STR. CARBON STEEL WEIGHT 1.5 LBS.
MARK TVM-42 MAKE-8
SCALE - 3" = 1'-0"



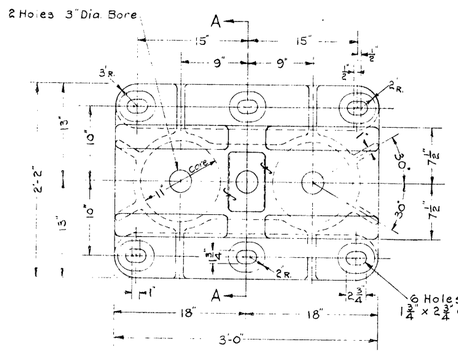
① NUT

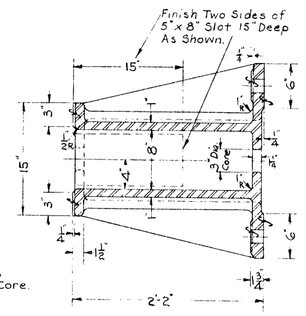
CHROME NICK. STEEL WEIGHT 6 LBS.
MARK TVM-48 MAKE-8
SCALE - 3" = 1'-0"



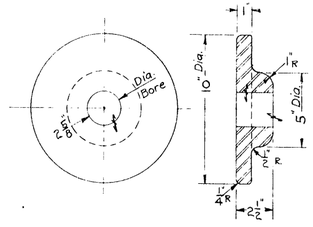
① SPRING BOLT

CHROME NICKEL STEEL WEIGHT 55 LBS.
MARK TVM-47 MAKE-8
SCALE - 3" = 1'-0"



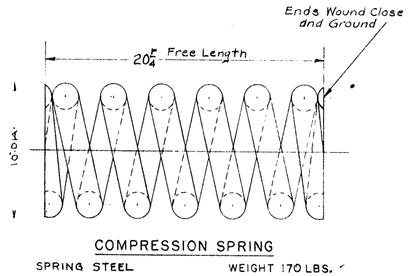


SECTION A-A



① SPRING WASHER

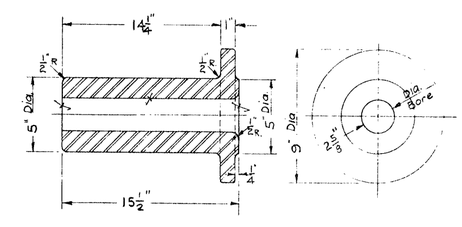
CARBON STEEL CAST. GRADE "2" WT. 35 LBS.
MARK TVM-46 MAKE-8
SCALE - 3" = 1'-0"



COMPRESSION SPRING

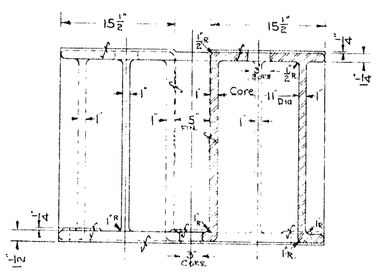
SPRING STEEL WEIGHT 170 LBS.
MARK TVM-44 MAKE-8
SCALE - 3" = 1'-0"

Nomenclature	Remarks
Outside Diameter	10"
Inside Diameter	6"
Diameter of Wire	2"
Total No. of Coils	8
No. of Active Coils	6
Working Deflection	4½"
Load for 4½" Working Deflection	31400#
Free Length	20¼"
Solid Length	15¾"
Load for Assembled Length at 20⅛"	875#



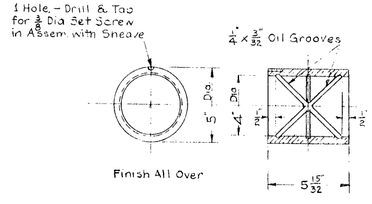
① SPRING SLEEVE

CARBON STEEL CAST. GRADE "2" WT. 95 LBS.
MARK TVM-45 MAKE-8
SCALE - 3" = 1'-0"



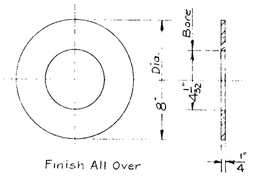
① SPRING HOUSING

CARBON STEEL CAST. GRADE "2" WT. 1300 LBS.
MARK TVM-43 MAKE-4
SCALE - 1½" = 1'-0"



① CHAIN SHEAVE BUSHING

PHOS. BRONZE CLASS "C" WEIGHT 12 LBS.
MARK TVM-40 MAKE-4
SCALE - 3" = 1'-0"



THRUST WASHER

PHOS. BRONZE CLASS "B" WEIGHT 3 LBS.
MARK TVM-41 MAKE-8
SCALE - 3" = 1'-0"

NOTES:-

Quantities Shown are for Four Tainter Valve Machines
Weights are for each piece
For tolerances, allowances & Gauges see Paragraph 711 Specifications
Details Shown on this Sheet are: TVM 37 to 48 Inclusive

REFERENCES:-

For Location and arrangement see Sheet 1 N-2-85

① COMMERCIAL IRON WORKS DRAWINGS P50-P51 3-0-N14441

12' 9' 6' 3' 0 1 2

Scale in Feet.

NO.	REVISION	DATE	BY	APV'D
1	REVISED TO AGREE WITH SHOP DRAWINGS	9/23/36	EMH	
	ISSUED FOR CONSTRUCTION	9-10-35		

BONNEVILLE POWER NAVIGATION PROJECT

(36-TH) CONTRACT W 694 ENG.-47.

LOCK OPERATING EQUIPMENT.

TAINTER VALVE MACHINERY

CHAIN SHEAVE DETAILS

SCALES AS SHOWN

U.S. ENGINEER OFFICE, SECOND PORTLAND DISTRICT (OREGON)

SUBMITTED: R.A. Markuson ENGINEER

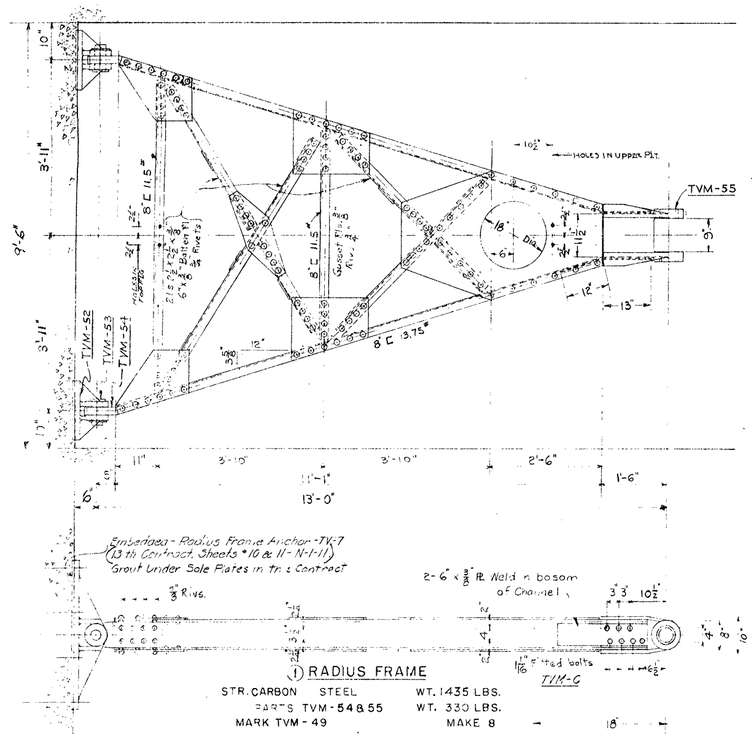
APPROVED: Chas. Williams LT. COL. CORPS OF ENGINEERS

RECOMMENDED: Geo. Bennett SENIOR ENGINEER

DESIGNED BY A.A.G. & E.T.D. DATE 9-6-35

DRAWN BY K.F.M. TRACED BY K.K.N. CHECKED BY F.F.D.

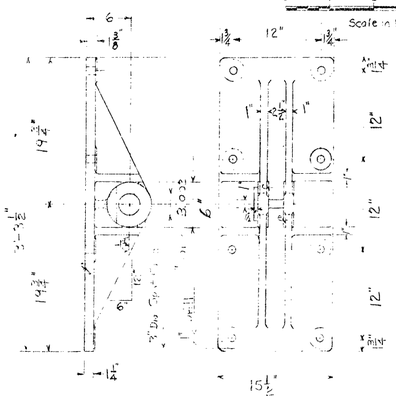
SHEET 7 N-2-85

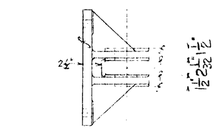


① RADIUS FRAME

STR. CARBON STEEL WT. 1435 LBS.
PARTS TVM-54 & 55 WT. 330 LBS.
MARK TVM-49 MAKE 8

Scale in Feet

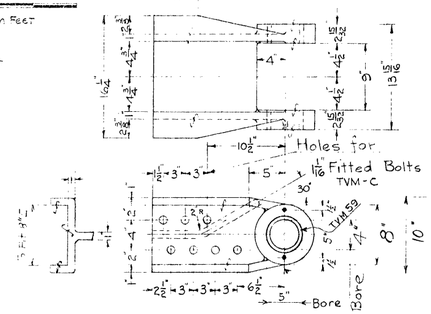




① BEARING

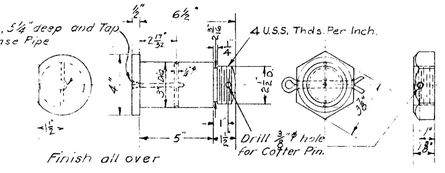
CARBON STEEL CASTING WT. 308 LBS.
GRADE "2" MAKE 16
MARK TVM-52 SCALE 1½" = 1'-0"

Scale in Feet.



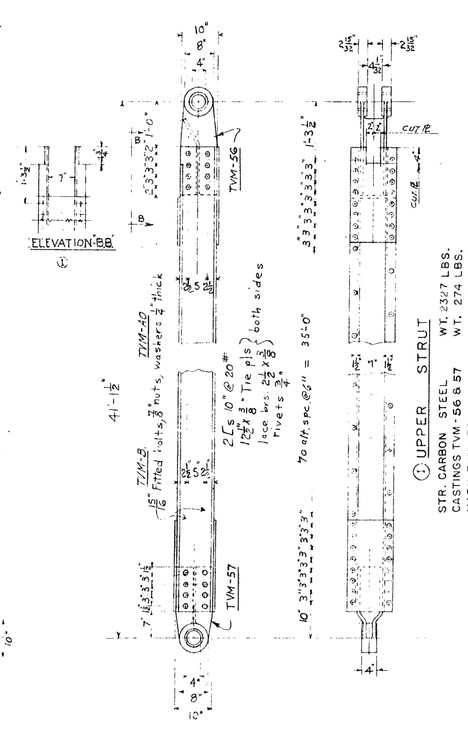
① RADIUS FRAME YOKE

CARBON STEEL CASTING WT. 198 LBS.
GRADE "2" MAKE 8
MARK TVM-55 SCALE 1½" = 1'-0"



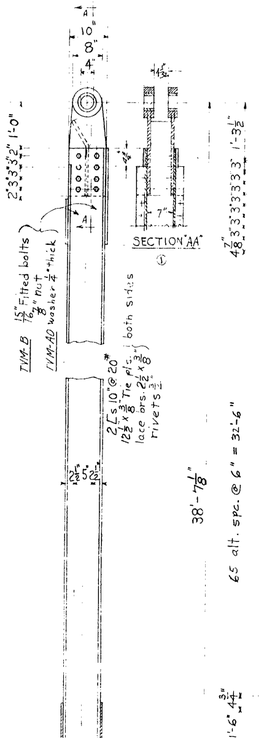
① BEARING PIN

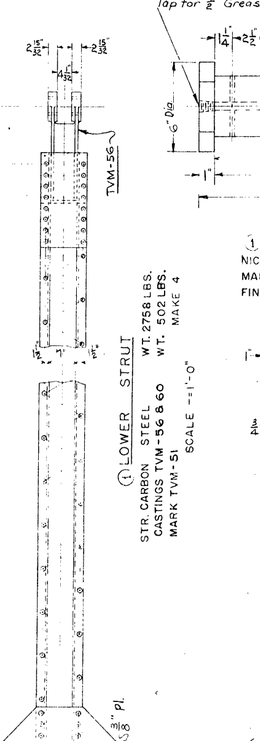
CARBON STEEL FORGING WT. 17.7 LBS.
MARK TVM-53 MAKE 17 (Incl. 1 Spare)
SCALE 3" = 1'-0"



① UPPER STRUT

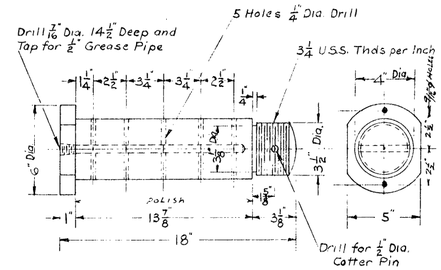
STR. CARBON STEEL WT. 2327 LBS.
CASTINGS TVM-56 & 57 WT. 274 LBS.
MARK TVM-50 MAKE 4
SCALE ¾" = 1'-0"





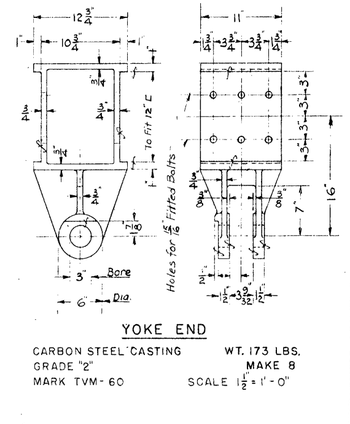
① LOWER STRUT

STR. CARBON STEEL WT. 2756 LBS.
CASTINGS TVM-56 & 60 WT. 502 LBS.
MARK TVM-51 MAKE 4
SCALE ¾" = 1'-0"



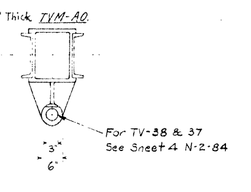
① STRUT CONNECTING PIN

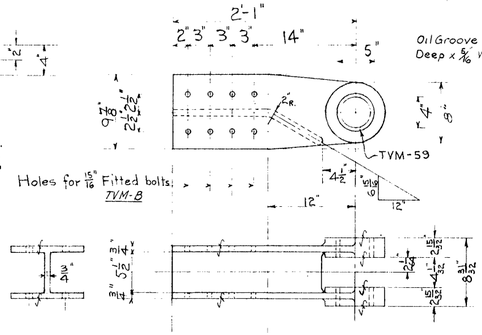
NICKEL STEEL FORGING WT. 63 LBS.
MARK TVM-25 MAKE 4
FINISH ALL OVER SCALE 3" = 1'-0"



YOKE END

CARBON STEEL CASTING WT. 173 LBS.
GRADE "2" MAKE 8
MARK TVM-60 SCALE 1½" = 1'-0"



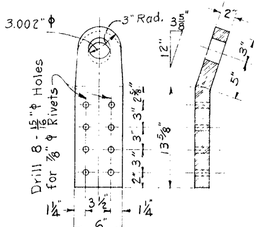


STRUT END

CARBON STEEL CASTING WT. 118 LBS.
GRADE "2" MAKE 4
MARK TVM-57 SCALE 1½" = 1'-0"

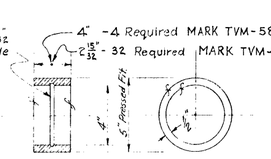
STRUT CLEVIS

CARBON STEEL CASTING WT. 156 LBS.
GRADE "2" MAKE 8
MARK TVM-56 SCALE 1½" = 1'-0"



RADIUS FRAME HINGE PLATE

CARBON STEEL FORGING WT. 66 LBS.
MARK TVM-54 MAKE 16
SCALE 1½" = 1'-0"



BUSHING

PHOS. BRONZE CLASS "A" MAKE 36
MARK TVM-58 WEIGHT 9 LBS.
MARK TVM-59 WEIGHT 5.6 LBS.

NOTES:—

Quantities Shown are for Four Tainter Valves
Weights given are for One piece.
For tolerances, Allowances and gages see paragraph 711 of Specifications.
All rivets to be ¾" unless otherwise shown.
Details shown on this sheet are TVM-25 and TVM-49 to 60 inclusive.

REFERENCES:—

For General Assembly see Sheet 1 N-2-85
For Hoist Assemoly see Sheet 2 N-2-85
For Tainter Valve Assem. see Sh. 2 N-2-84
For Embedded Steel see Sheet 10 & 11 N-1-11
For Commercial Parts See Sheet 15, N-2-85.
① McClintic-Marshall Corp. Contract 2004A, Sheet 6 & 7

NO.	REVISION	DATE	BY	APV'D
1	REVISED TO AGREE WITH SHOP DRAWINGS	4/22/36	RHM	
	ISSUED FOR CONSTRUCTION	9-10-35	RHM	

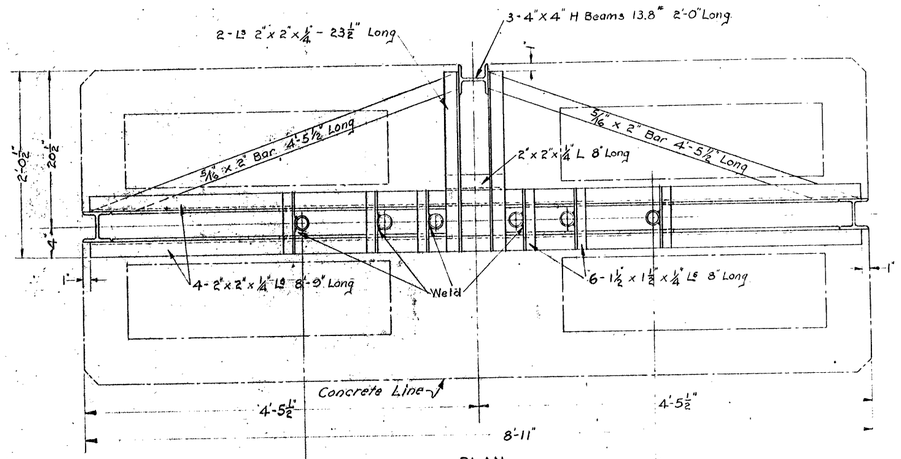
BONNEVILLE POWER NAVIGATION PROJECT
(36-TH) CONTRACT W 694 ENG-47.
LOCK OPERATING EQUIPMENT

TAINTER VALVE MACHINERY
RADIUS FRAME, STRUTS & YOKES

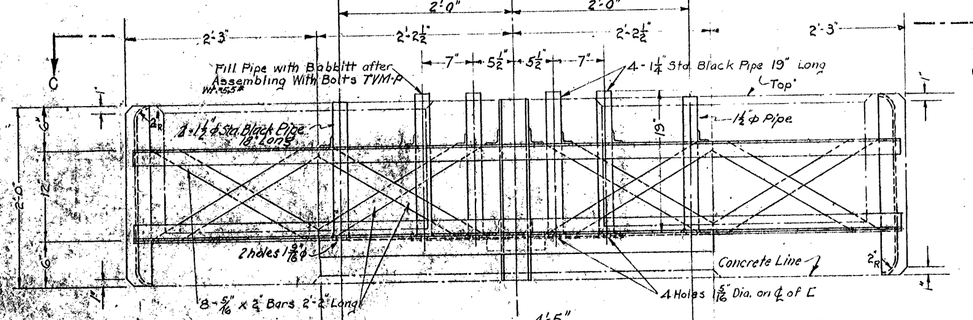
SCALES AS SHOWN

U. S. ENGINEER OFFICE, SECOND PORTLAND DISTRICT, OREGON

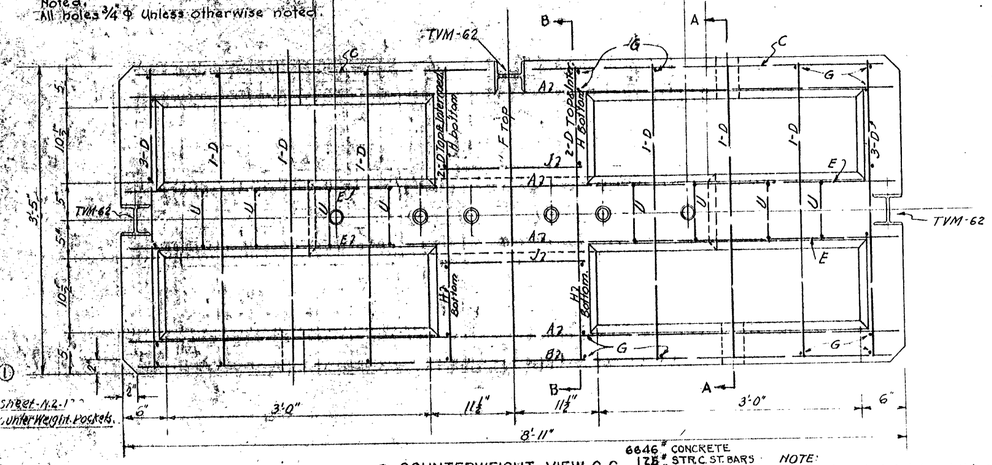
SUBMITTED: K. Mackenzie, ENGINEER
APPROVED: C. McNeil Williams, U.S.C.O.E. CORPS OF ENGINEERS
RECOMMENDED: Geo. Gleason, DIVISION ENGINEER
DESIGNED BY A.A.D. & F.T.O. DATE 9-9-35
DRAWN BY R.K.W. CHECKED BY F.T.O.
TRACED BY R.K.W. J.R.H.



PLAN



Notes:
Eccentric. Steel Moves Center of Gravity of Combined Steel & Concrete 8" from Symmetrical ℄.
¼" Fillet Welds on All Connections Unless Otherwise Noted.
All holes ¾" ϕ Unless otherwise noted.



See Sheet N-2-1 for Counterweight Pockets.

① COUNTERWEIGHT - VIEW C-C

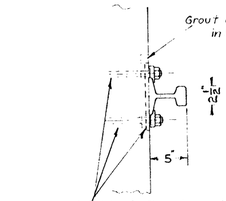
REINFORCED CONCRETE — 1.7 CU. YDS. = 7151 LBS. — MAKE - 4

MARK TVM-63

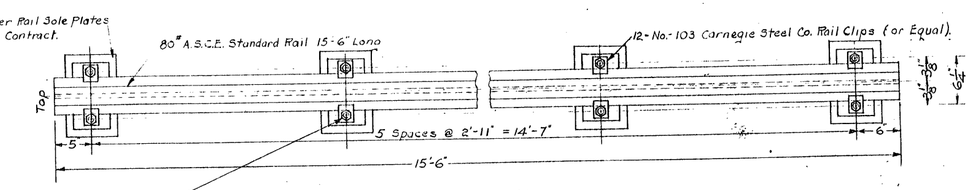
SCALE - 1½" = 1'-0"

6646# CONCRETE
175# STR.C.ST.BARS
380# STRUCT.C. STEEL

NOTE:
Estimated total weight of Counterweight 11,400 lbs. Pockets in Counterweight to be filled with Precast Concrete Blocks to obtain proper Weight. See paragraph 630 of Specifications for Concrete.



Embedded: Counterweight Guide Anchor Bolts and Sole Pl's. TV-8 (13th Contract Sheet 10 & 11 of N-1-11)

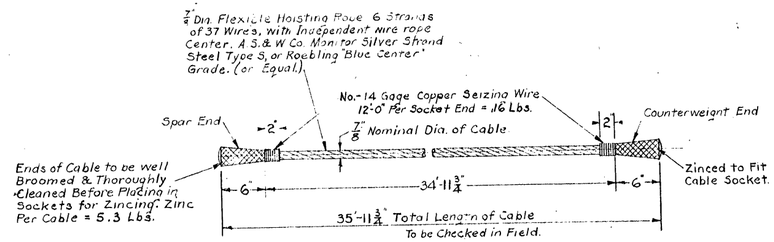


GUIDE RAIL

RAIL STEEL — WEIGHT 415 LBS.

MARK TVM-61 — MAKE - 12

SCALE - 1½" = 1'-0"

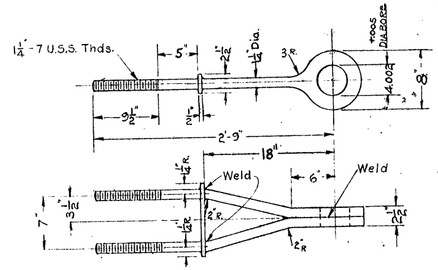


② CABLE

STEEL WIRE CABLE — WT. 50 LBS. EACH

MARK TVM-64 — MAKE - 8

SCALE - 1½" = 1'-0"

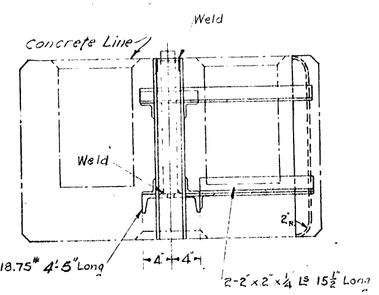


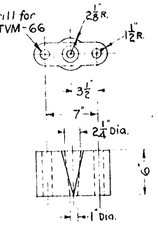
② EYE BOLT

BOLT STEEL — WEIGHT 50 LBS.

MARK TVM-66 — MAKE - 8

SCALE - 1½" = 1'-0"





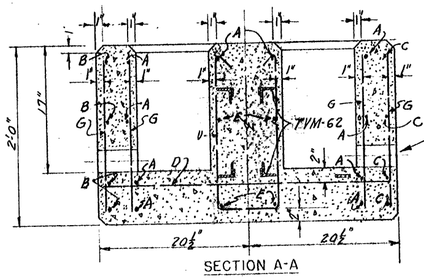
② American Bridge Co. Cast Steel Socket for ⅞" Dia. Cable, or Equal.

CABLE SOCKET

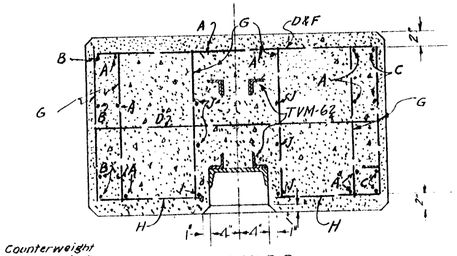
CARBON STEEL CAST. — WEIGHT 35 LBS.

MARK TVM-65 — MAKE-16

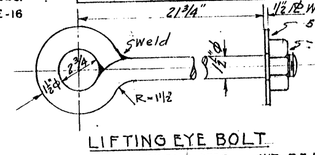
SCALE - 1½" = 1'-0"



SECTION A-A



SECTION B-B



LIFTING EYE BOLT

STRUC. CARBON STEEL — WT. 25 LBS.

MARK TVM-63A — MAKE 8

STRUCTURAL CARBON STEEL BARS

BAR	NO. REQD	SIZE	LENGTH	REMARKS	WT. EACH	TOTAL WT.
A	10	⅞" ϕ	8'-9"	Straight	3.32	33.20
B	4	"	8'-5"	"	3.20	12.80
C	8	"	3'-11"	"	1.49	11.92
D	16	"	3'-3"	"	1.27	20.32
E	8	"	3'-10"	"	1.17	4.68
F	1	"	3'-0"	"	1.14	1.14
G	32	"	1'-8"	"	.63	20.16
H	4	"	1'-3"	"	.47	1.88
J	6	"	1'-10"	"	.70	4.20
U	8	"	4'-9"	20" [20"	1.80	14.40
Total one Counterweight only						124.70

NOTES:—

Quantities Shown are for Four Tainter Valves (With the Exception of Reinforcing Steel.)

Weights Shown are for Each Piece.
For Tolerances, Allowances and gages see paragraph 711 of Specifications.
Details Shown on this Sheet are TVM-61 to 66 Inclusive
For Welding see Paragraph 713 - Specifications.
Wire all bars together at intersections.
Do not paint Metal Surfaces adjacent to, or embedded in concrete (See paragraph 801 of Spec.
Final Coat on all exposed surfaces to be of asphalt paint.

REFERENCES:—

For Embedded Steel see Sheets 10 & 11 N-1-11.
For General Assembly see Sheet 1 N-2-85.
For Hoist Assembly see Sheet 2 N-2-84
For Commercial Parts see Sheet 15-N-2-85

M.C. - NAC MARSHALL; CONC MFG. J.107; - - - - - COMMERCIAL IRON WKS DWG #52 - 50.1641

NO.	REVISION	DATE	BY	APP'D
2	[illegible]	9/25/35	P.K.W.	[illegible]
1	[illegible]	7/31/35	P.K.W.	[illegible]
	ISSUED FOR CONSTRUCTION	9/10/35	[illegible]	[illegible]

BONNEVILLE POWER NAVIGATION PROJECT

(36-TH) CONTRACT W 694 ENG- 47.

LOCK OPERATING EQUIPMENT.

TAINTER VALVE MACHINERY

COUNTERWEIGHT AND DETAILS

SCALES AS SHOWN.

U. S. ENGINEER OFFICE, SECOND PORTLAND DISTRICT (OREGON)

SUBMITTED: [illegible] ENGINEER

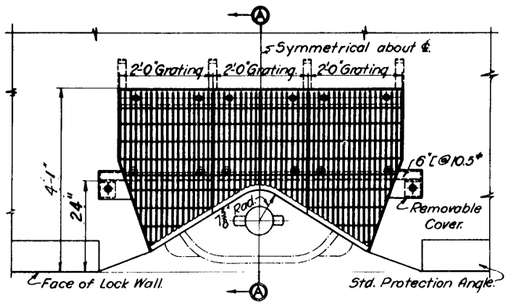
APPROVED: [illegible] LT. COL. CORPS OF ENGINEERS

RECOMMENDED: [illegible] SENIOR ENGINEER

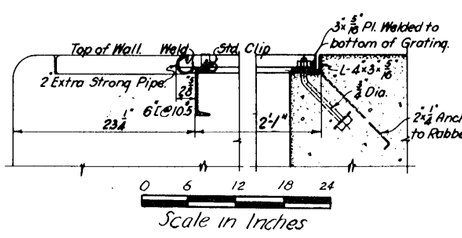
DESIGNED BY A.A.G. & F.J.D. DRAWN BY P.K.W. DATE 9-10-35

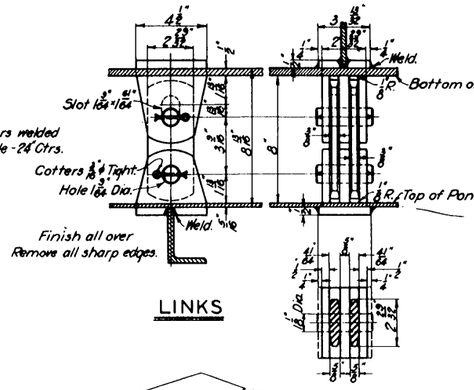
TRACED BY P.K.W. CHECKED BY F.J.D.

SHEET 9 N-2-85

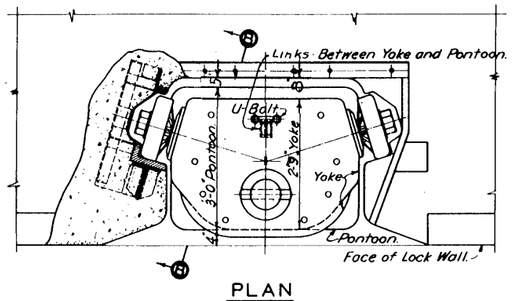


GRATING

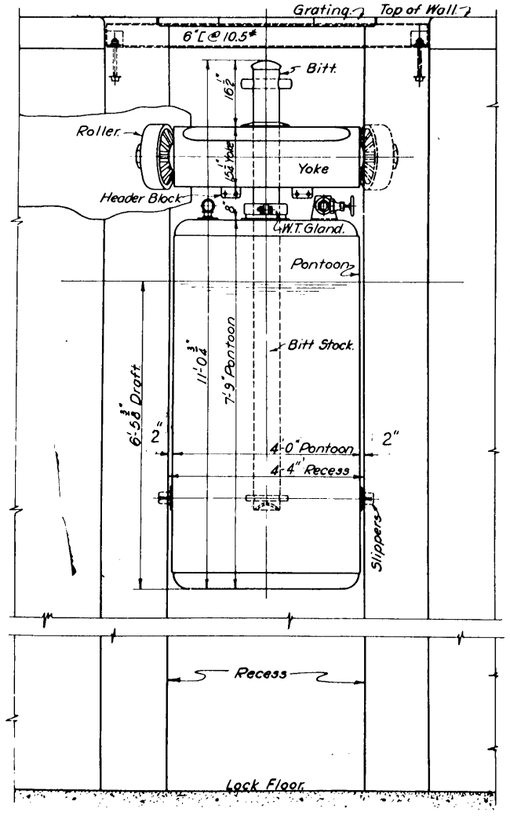




LINKS

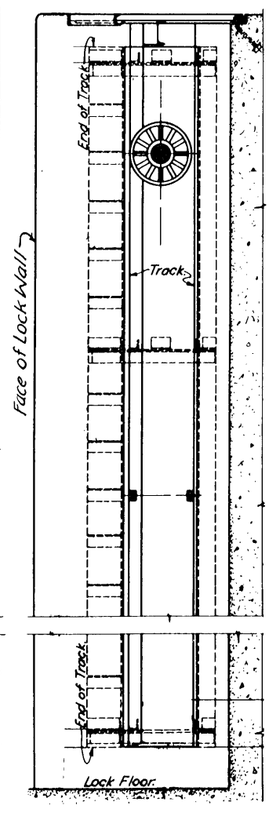


PLAN

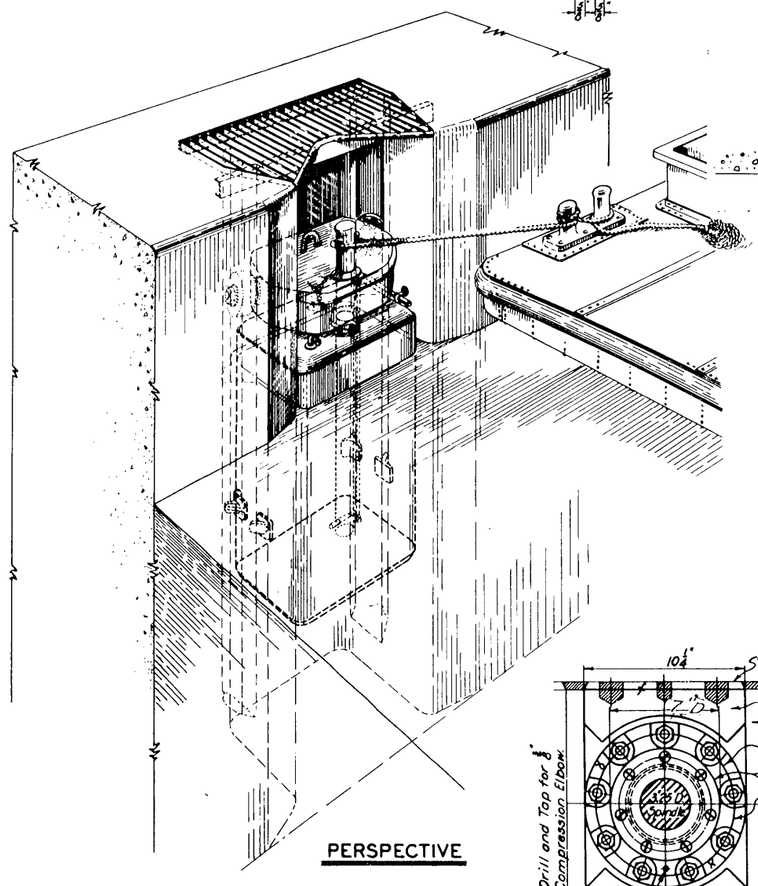


ELEVATION

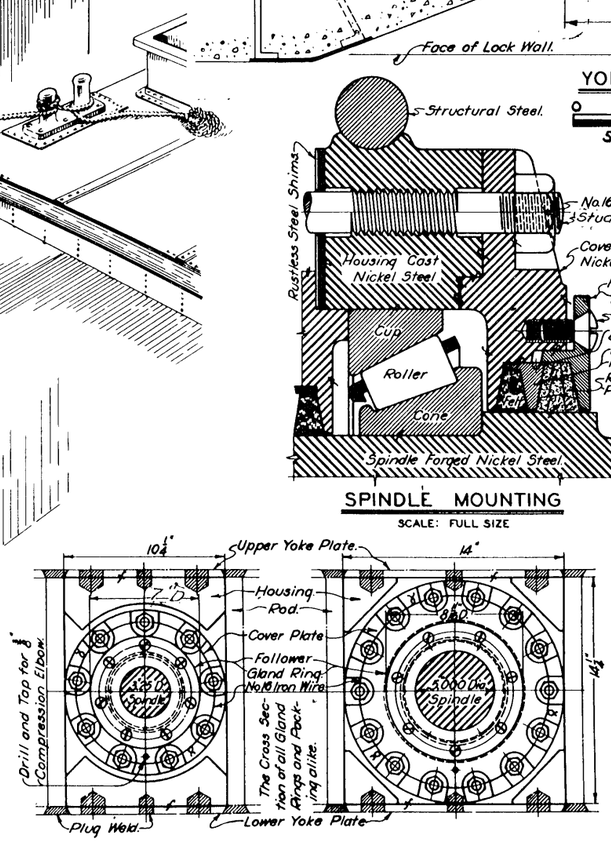
0 1 2 3 4
Scale in Feet



SECTION B-B



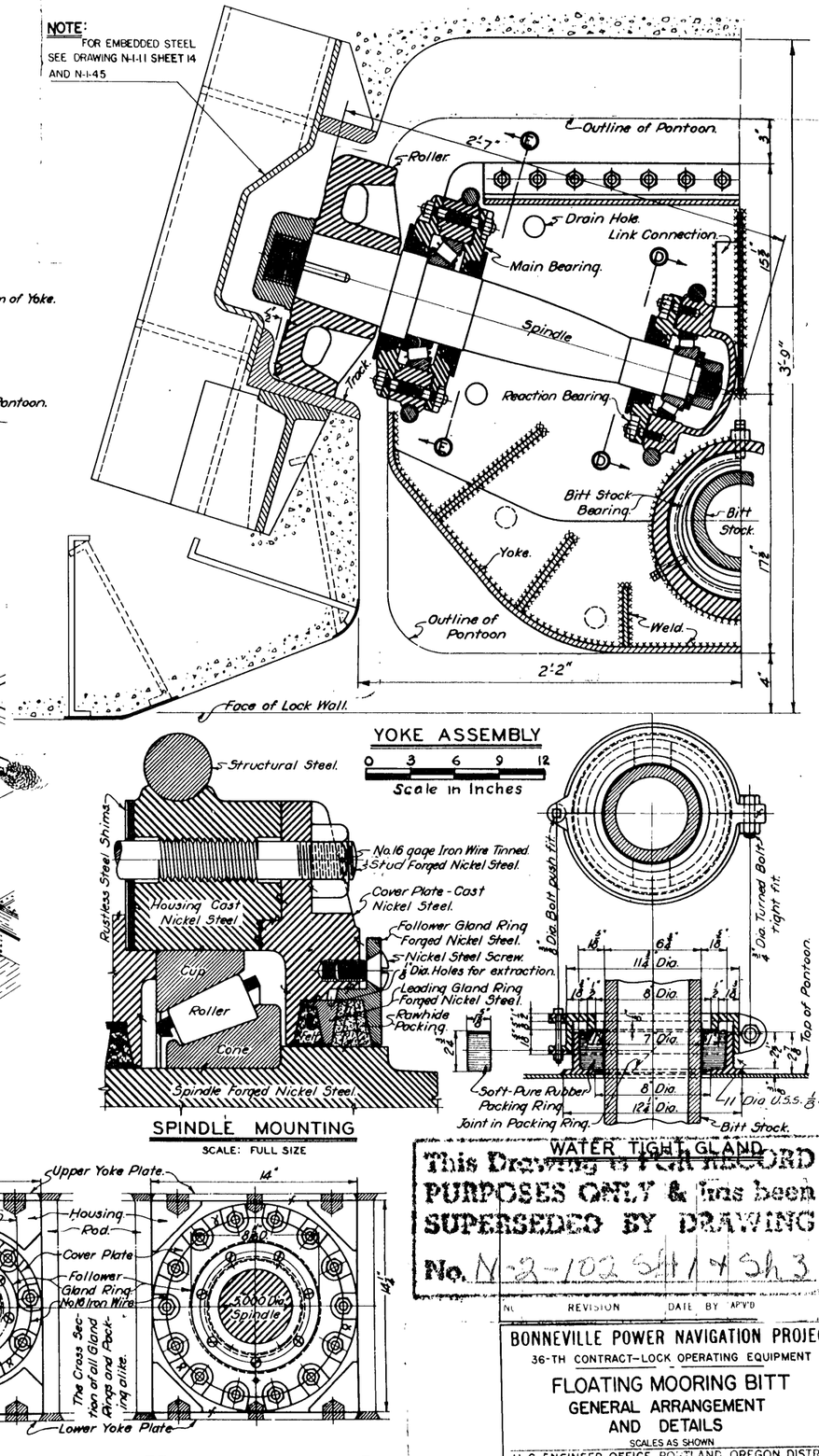
PERSPECTIVE



BEARING - SECTION D-D

BEARING - SECTION E-E

NOTE:
FOR EMBEDDED STEEL SEE DRAWING N-1-11 SHEET 14 AND N-1-45



YOKE ASSEMBLY

SPINDLE MOUNTING

SCALE: FULL SIZE

0 3 6 9 12
Scale in Inches

WATER TIGHT GLAND

This Drawing is FOR RECORD PURPOSES ONLY & has been SUPERSEDED BY DRAWING No. N-2-102 Sht 1 & Sh 3

No.	REVISION	DATE	BY	APV'D

BONNEVILLE POWER NAVIGATION PROJECT

36-TH CONTRACT—LOCK OPERATING EQUIPMENT

FLOATING MOORING BITT GENERAL ARRANGEMENT AND DETAILS

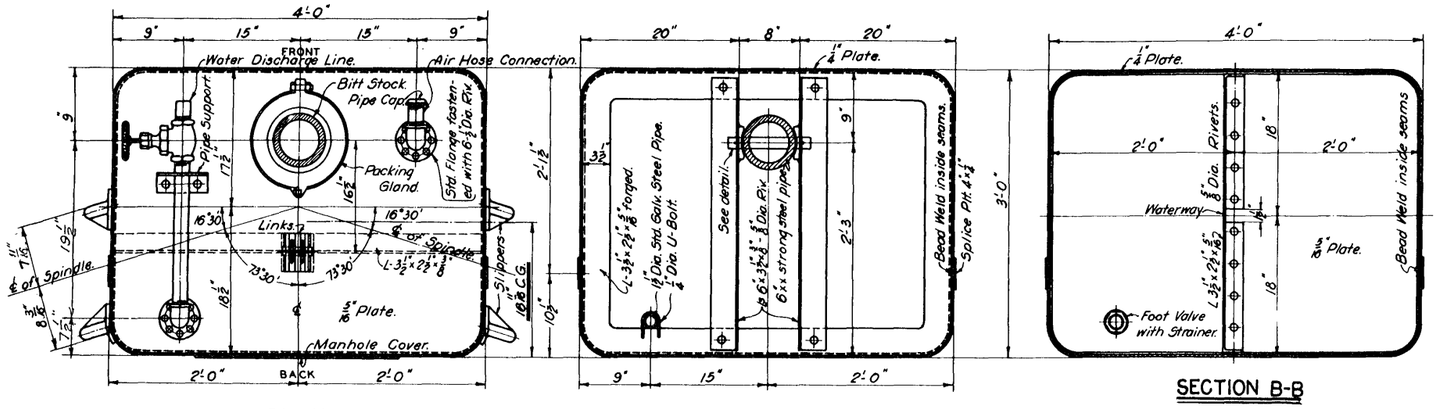
SCALES AS SHOWN

U S ENGINEER OFFICE PORTLAND OREGON DISTRICT

SUBMITTED: R. Mackenzie, LIEUT. CORPS OF ENGINEERS — APPROVED: H. Williams, MAJOR CORPS OF ENGINEERS

RECOMMENDED: [signature], DIST. ENGINEER

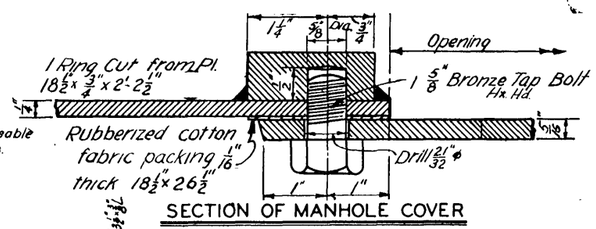
DRAWN BY J.M.G. TRACED BY J.M.G. CHECKED B. — DATE 6-17-35



PLAN

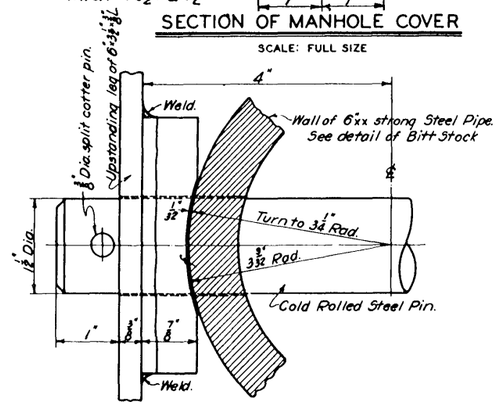
SECTION A-A

SECTION B-B



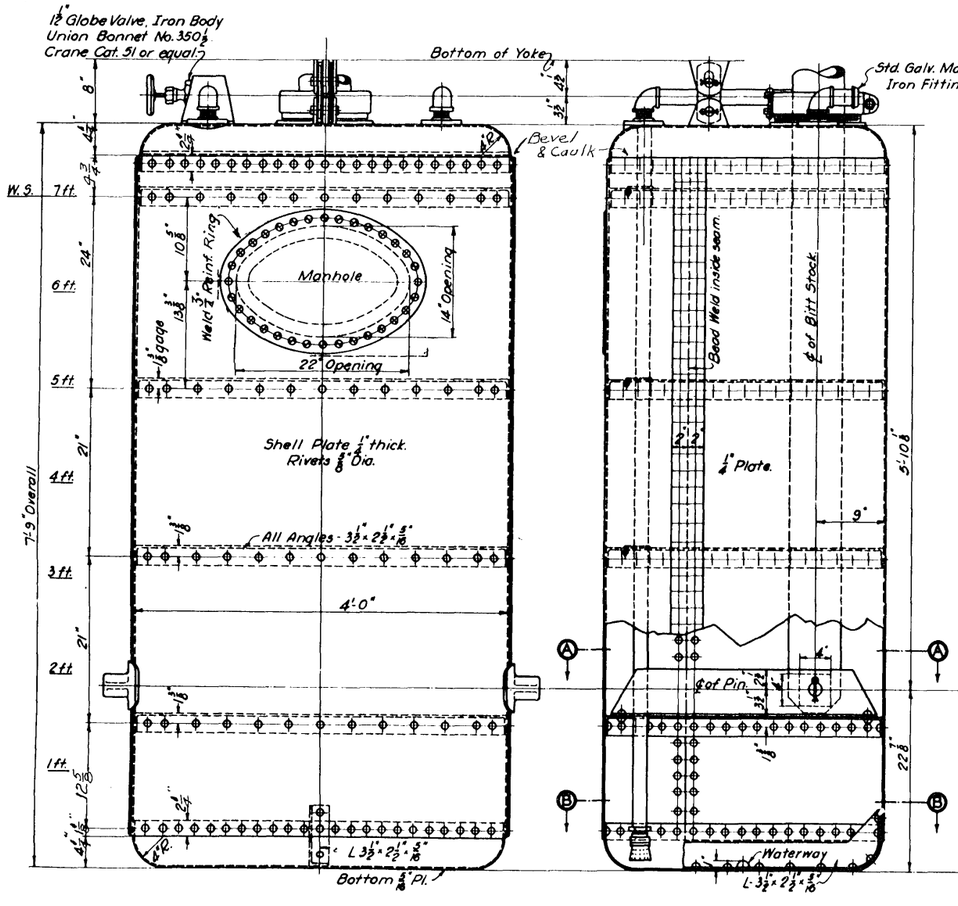
SECTION OF MANHOLE COVER

SCALE: FULL SIZE



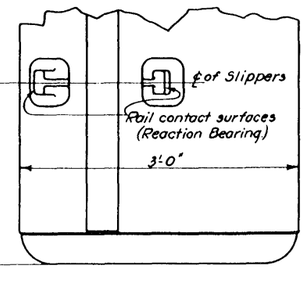
PIN CONNECTION OF BITT STOCK

SCALE: FULL SIZE

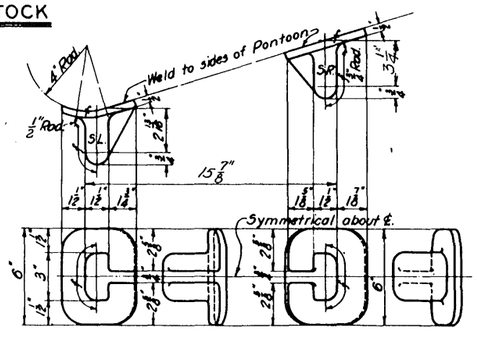


BACK ELEVATION

SIDE ELEVATION



PART SIDE ELEVATION

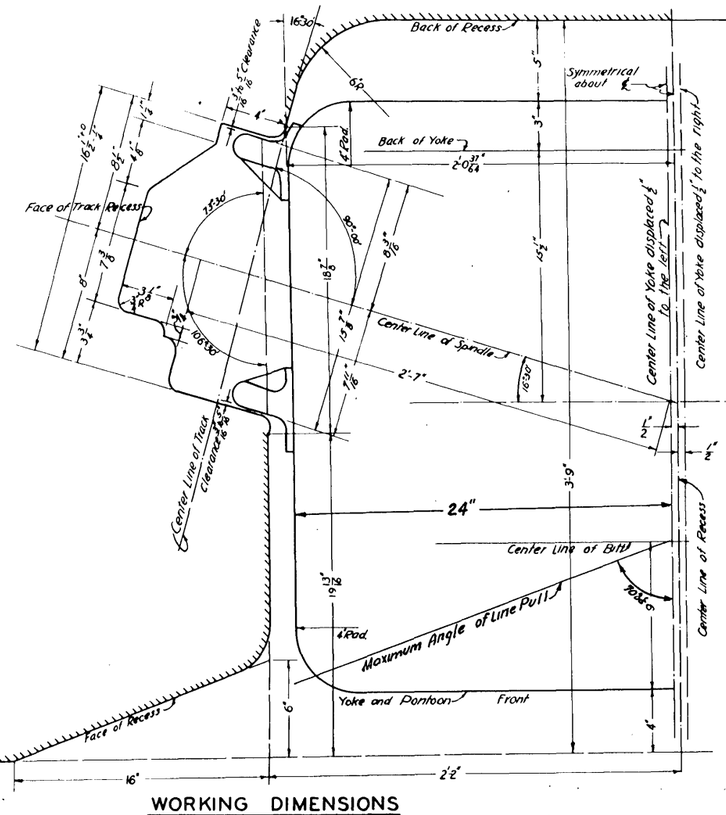


SLIPPERS

CAST NICKEL STEEL. MARK-SR. & SL.
MAKE 2 OF EACH. WT-SR 147 LBS. SL: 140 LBS.
SCALE: 3" = 1'-0"
0 3 6 9 12
Scale in Inches

PONTOON

STRUCTURAL STEEL. WT-1655.0 LBS.
PIPE & FITTINGS WT.- 78.5 LBS.
0 6 12 18 24
Scale in Inches



WORKING DIMENSIONS

0 3 6 9 12
Scale in Inches

General Notes:

The dimensions to the Center of Gravity of the Pontoon excludes.
Bitt Stock and Lower connecting Pin.
W.T. Gland at Bitt Stock.
Links and their connections.
Parts shown are for one Floating Mooring Bitt.

This Drawing is FOR RECORD PURPOSES ONLY & has been SUPERSEDED BY DRAWING No. N-1-102 Sh 2

NO.	REVISION	DATE	BY	APV'D

BONNEVILLE POWER NAVIGATION PROJECT
36TH CONTRACT—LOCK OPERATING EQUIPMENT

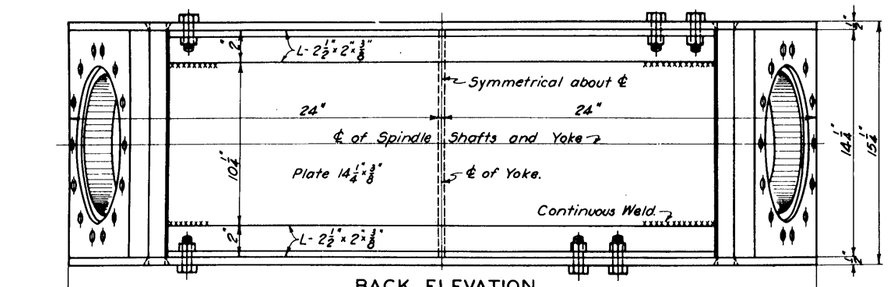
FLOATING MOORING BITT

PONTOON DETAILS

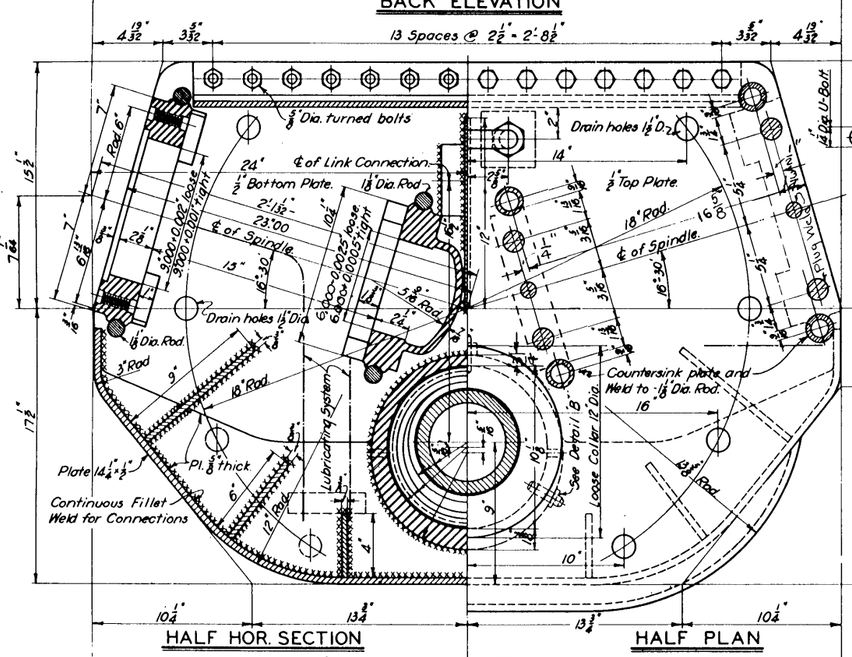
SCALES AS SHOWN

U.S. ENGINEER OFFICE, PORTLAND, OREGON DISTRICT

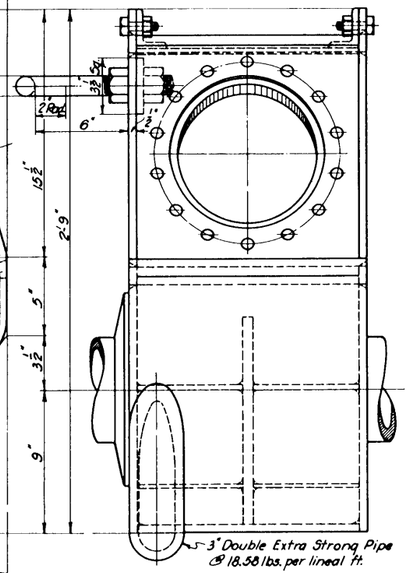
SUBMITTED: K.L. Mackenzie, ENGINEER
APPROVED: [illegible], MAJOR, CORPS OF ENGINEERS
RECOMMENDED: [illegible], HEAD ENGINEER
DESIGNED BY J.M.G. DATE 6-17-35
DR. BY J.M.G. CH. BY J.M.G. CHECKED BY



BACK ELEVATION

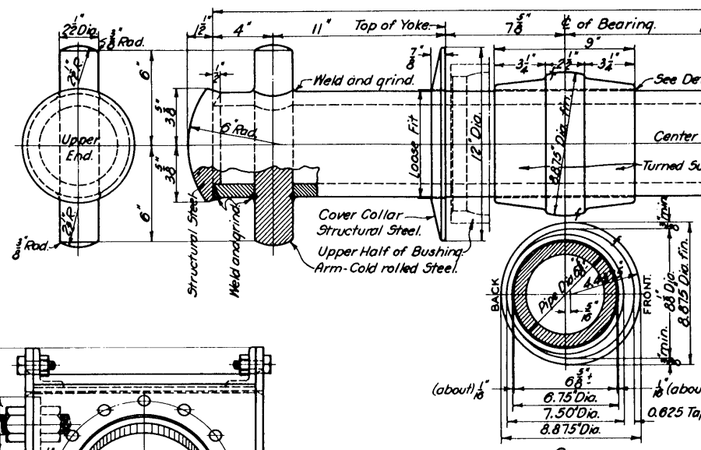


HALF HOR. SECTION

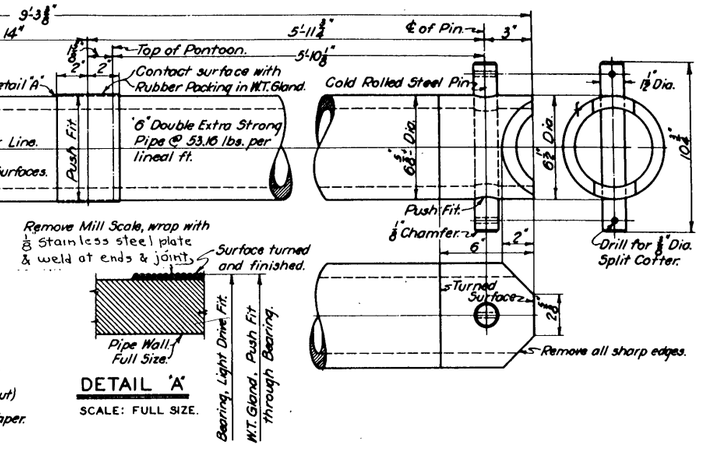


END ELEVATION

HALF PLAN

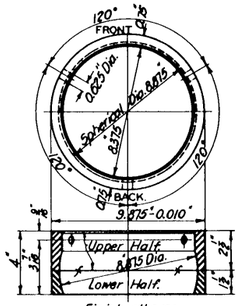


SECTION ON ℄ OF BEARING



DETAIL 'A'

SCALE: FULL SIZE.



BUSHING

BITT STOCK ASSEMBLY

Abreviations

C.R.S. = Cold Rolled Steel.		W.S. = Wrought Steel.	
C.N.S. = Cast Nickel "		S.S. = Structural "	
F.N.S. = Forged " "		G.S. = German Silver	
N.S. = Nickel Steel.		S.R. = Soft Rubber.	

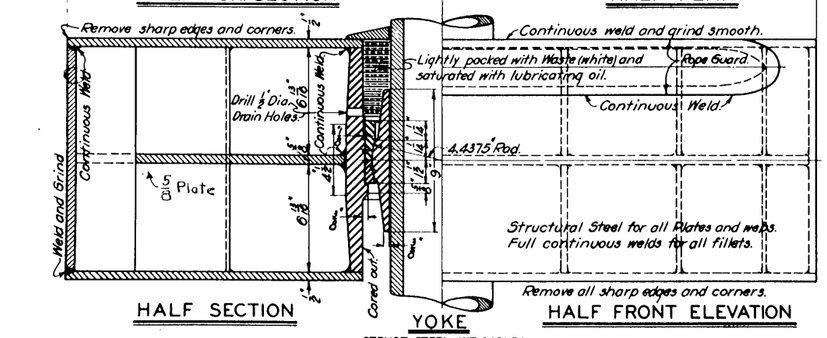
PARTS FOR ONE MOORING BITT.

Description	Pc's	Wt. of One	Total Wt.	Mat'l.
BITT STOCK.				
Stock	1.	486.3	486.3	W.S.
Pin	1.	5.3	5.3	C.R.S.
Band	1.	1.7	1.7	G.S.
"	1.	4.0	4.0	St. "
Collar	1.	14.8	14.8	S.S.
Arm	1.	17.0	17.0	C.R.S.
Cap	1.	11.2	11.2	S.S.
Cotter Pins	2	.09	.2	" "
	Weight		540.5 Lbs.	
BEARING-YOKE.				
Bearg. Casting.	1.	78.1	78.1	C.N.S.
Bushing	1.	23.4	23.4	" "
Bearing	1.	86.6	86.6	" "
Locking Pins	3	1.0	3.0	N.S.
Mach. Lock Bolt	3	0.12	0.4	" "
	Weight		191.5 Lbs.	
W.T. GLAND				
Base	1.	9.9	9.9	C.N.S.
Cap	1.	21.5	21.5	" "
Ring	1.	.93	.93	F.N.S.
Bolt	1.	.83	.83	" "
Bolt	1.	.18	.18	" "
Rubber Packing	1.	4.0	4.0	S.R.
	Weight		37.34 Lbs.	
LINKS				
Links	2.	2.54	5.08	F.N.S.
Pins	2.	1.0	2.0	" "
Conn. to Yoke	1.	15.4	15.4	" "
" " Pontoon	1.	11.4	11.4	" "
	Weight		33.88 Lbs.	

Note:-
80 Lineal Ft. ¼" Sq. Rawhide Packing.
6 Felt Rings and 6 Extra.
4 Sets of Steel Shims. (Rustless)

Description	Pc's	Wt. of One	Total Wt.	Mat'l.
SPINDLE				
Roller Spindle	2.	123.1	246.2	F.N.S.
Key	2.	.23	.46	" "
End Nut	2.	1.8	3.6	" "
Washer	2.	1.4	2.8	" "
Cap Nut	2.	13.4	26.8	" "
	Weight.		279.86 Lbs.	
ROLLER				
Roller	2.	175.8	351.6	C.N.S.
	Weight.		351.6 Lbs.	
BOXING (Main)				
Main Bearing	2	104.5	209.0	C.N.S.
Rods	4	4.0	16.0	S.S.
Anti-Friction R. Bearg.	2	18.63	37.26	—
Inside Cover Pl.	2	27.7	55.4	C.N.S.
" Leading G.R.	2	1.3	2.6	F.N.S.
" Follower G.R.	2	3.5	7.0	" "
Outside Cover Pl.	2	32.2	64.4	C.N.S.
" Leading G.R.	2	1.43	2.86	F.N.S.
" Follower " "	2	3.9	7.8	" "
Bolts and Nuts	28	.73	20.44	" "
	Weight.		422.76 Lbs.	
BOXING (Minor)				
Minor Bearing	2.	117.7	235.4	C.N.S.
Rods	4.	4.0	16.0	S.S.
Anti-Friction R. Bearg.	2	7.65	15.3	—
Cover Plate	2	20.3	40.6	C.N.S.
Leading Gland Ring	2	.77	1.54	F.N.S.
Follower " "	2	2.55	5.10	" "
Bolts and Nuts	18	2.76	43.68	" "
	Weight		363.62 Lbs.	
Pontoon	S.S.		1655.0 Lbs.	
Pipe and Fittings			76.5 "	
Slippers	C.N.S.		57.4 "	
Yoke	S.S.		845.0 "	

Total Weight all Moving Parts - 4,855. Lbs.

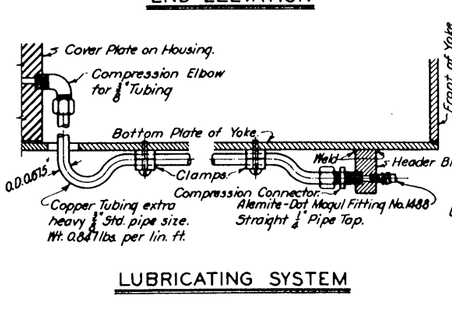


HALF SECTION

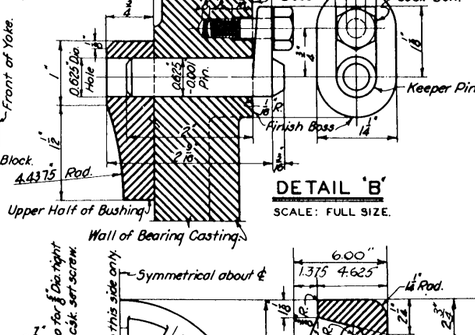
YOKE

STRUCT. STEEL WT. 645 LBS.

HALF FRONT ELEVATION

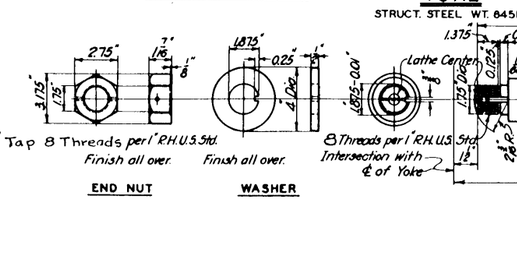


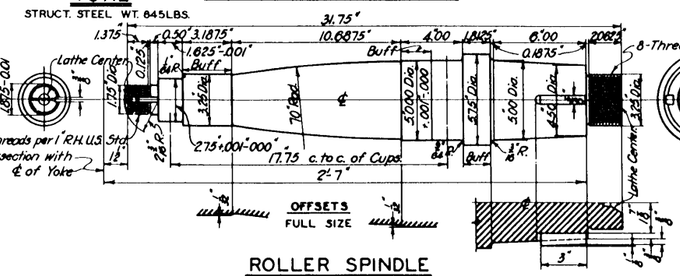
LUBRICATING SYSTEM



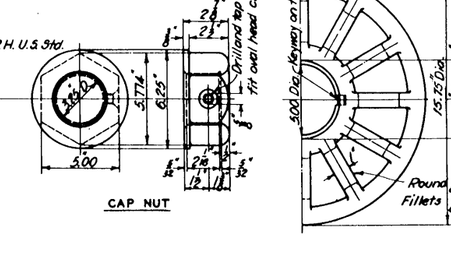
DETAIL 'B'

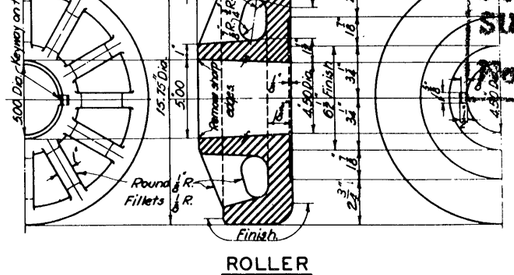
SCALE: FULL SIZE.





ROLLER SPINDLE





ROLLER

0 3 6 9 12

Scale in Inches

0 3 6 9 12

Scale in Inches

This Drawing is FOR RECORD PURPOSES ONLY & has been SUPERSEDED BY DRAWING No. N-2-102 Sht. 2 3 Ind. of

NO.	REVISION	DATE	BY	APV'D

BONNEVILLE POWER NAVIGATION PROJECT

36-TH CONTRACT-LOCK OPERATING EQUIPMENT

FLOATING MOORING BITT

DETAILS OF YOKE, BITT STOCK SPINDLE & ROLLER

SCALES AS SHOWN

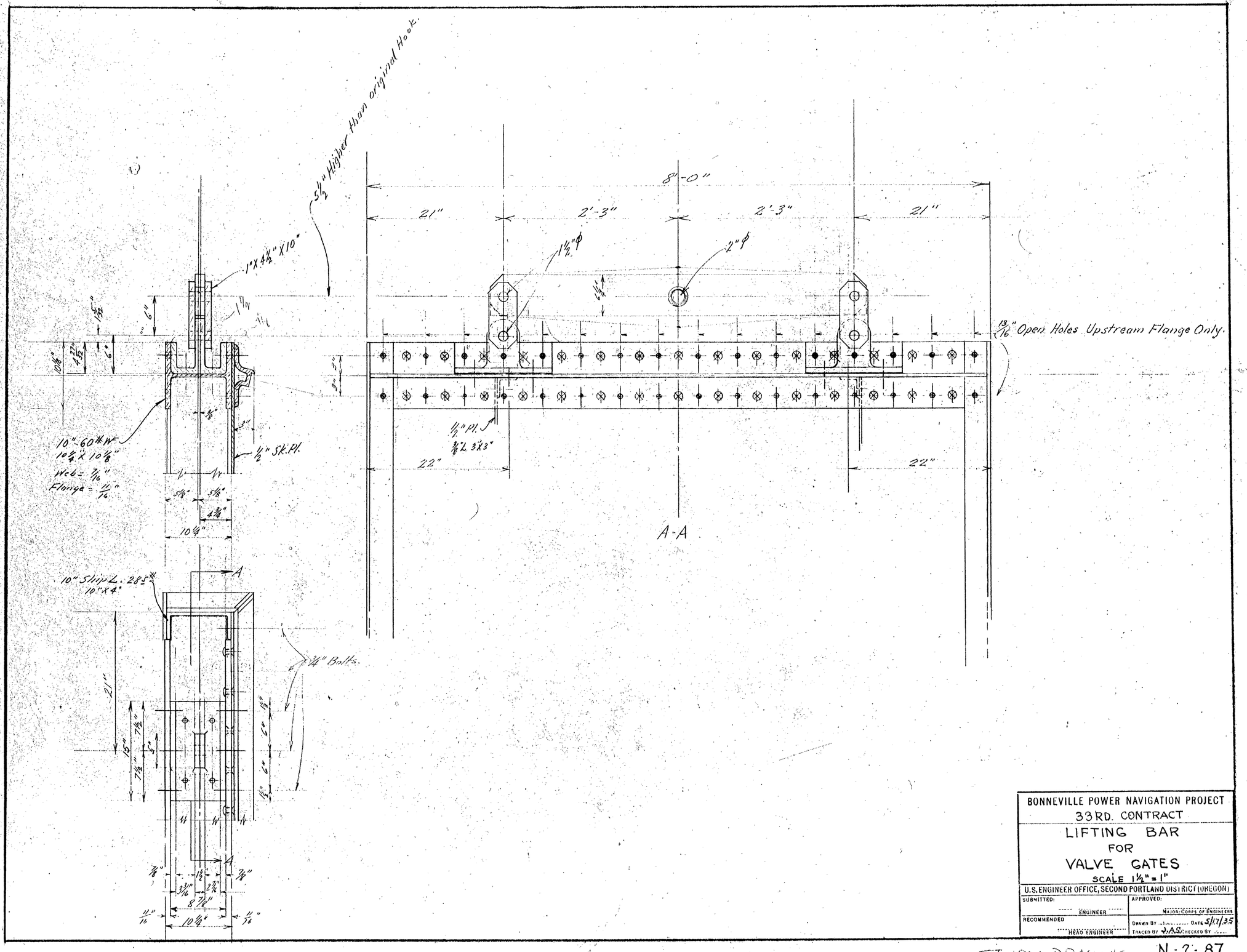
U. S. ENGINEER OFFICE PORTLAND OREGON DISTRICT

SUBMITTED: R. C. Mackenzie, Lieut. Col. C.E. — APPROVED: O. F. Williams, Major, Corps of Engineers

RECOMMENDED: [illegible] — DRAWN BY J.M.G. — DATE 6-17-35

TRACED BY J.M.G. — CHECKED BY [illegible]

SHEET 3 N-2-86

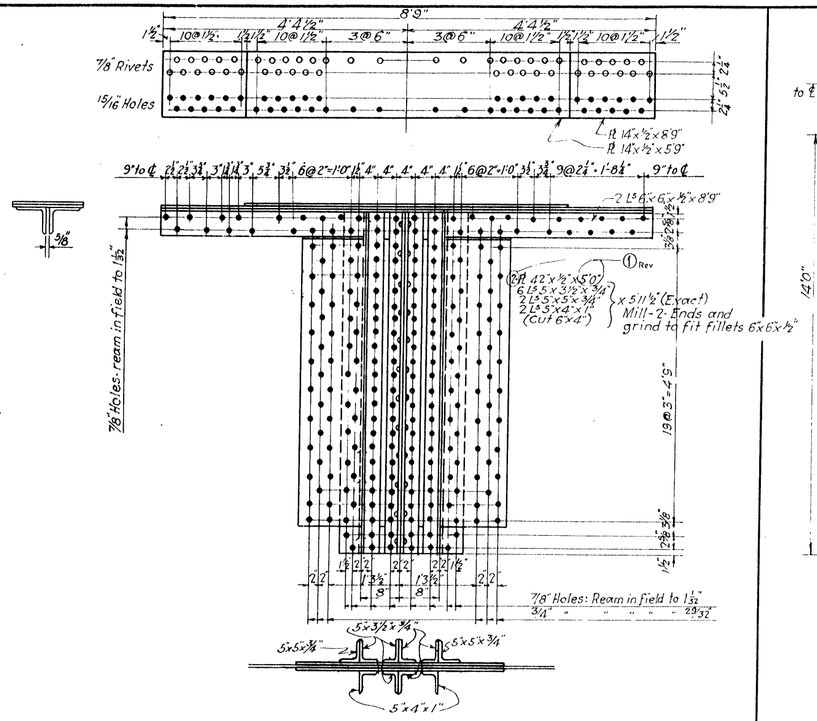


BONNEVILLE POWER NAVIGATION PROJECT	
33RD. CONTRACT	
LIFTING BAR FOR VALVE GATES	
SCALE 1½" = 1"	
U.S. ENGINEER OFFICE, SECOND PORTLAND DISTRICT (OREGON)	
SUBMITTED: ENGINEER	APPROVED: MAJOR, CORPS OF ENGINEERS
RECOMMENDED HEAD ENGINEER	DRAWN BY ... DATE 5/17/35 TRACED BY J.A.S. CHECKED BY ...

STUDY DRAWING N-2-87

WAR DEPARTMENT

CORPS OF ENGINEERS, U.S. ARMY



CROSS GIRDER (G-4)

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

Specification.

Contractor will furnish materials shown and fabricate in accordance with A.R.E.A. specifications, except as noted in the Contract, Specs. and special instructions following:-

The purpose of the operation is to strengthen the cross girder in order to develope additional carrying capacity, and as the change involves connecting to an existing structure already in place, precision of workmanship is of the first importance. The contractor will verify all dimensions in the field.

New materials shall be, as far as practicable, fitted up and reamed at the shop, but units to be riveted to existing holes shall be shipped sub-punched as noted.

After shop inspection and acceptance paint all materials one shop coat of red lead and linseed oil. Surfaces in contact to receive coat of paint before assembly.

Before cutting into the existing girders all external loads causing stress in the girder shall be removed, in so far as is practicable. This will be accomplished mainly by jacking the main girders directly from the pier on both sides of the cross girder. Only slight strain is necessary to accomplish this, but it must be balanced with precision to the satisfaction of the District Engineer. The contractor will be held solely responsible for the safety and protection from damage of all members.

All machinery, and such brackets, lugs, etc., as necessary to provide adequate clearances for workmanlike accomplishment shall be removed.

The existing top chord angles shall be removed first by taking out all rivets affected and the new chord fitted and riveted 75 ofo. Following this, the ten (10) bearing stiffeners and fillers shall be removed and replaced by the new material.

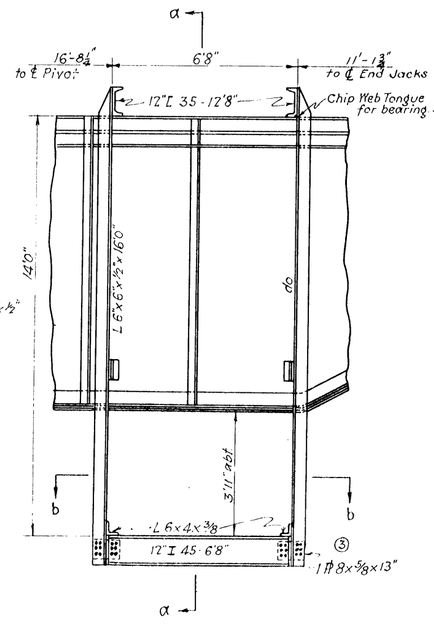
Rivets shall be backed out from the driven side. Driven heads shall be chipped clean and shanks drilled ⅞"ϕ to ½ depth before they are backed out.

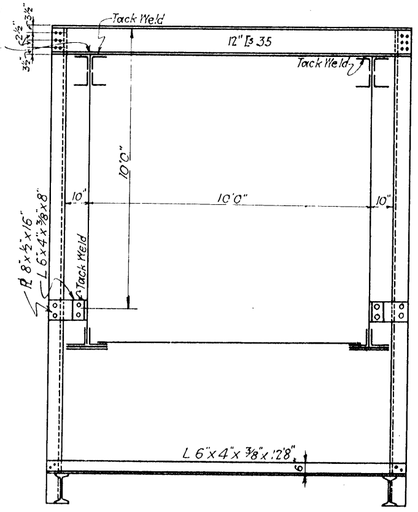
All rivets replacing those backed out shall be ⅛" larger in diameter. All holes shall be reamed after assembly to 1/32" greater diameter than the rivet. (In new work 1/16")

Rivets shall be driven cherry red (not hotter) and holes filled and inspected before heads are rolled. Where practicable, they shall be air-bucked, or double gunned, otherwise they shall be bucked with a 100# dolly fitted with a rivet snap of proper size.

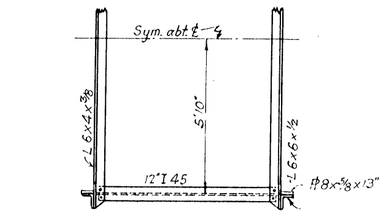
Stiffener angles must be a driving fit, with backs ground to fit fillets of chord angles. They shall have full bearing and shall be checked with feelers on both sides to insure against bearing at high spots only. They shall not be drifted.

Intermediate stiffeners and brackets shall be replaced in a workmanlike manner.





SECTION aa

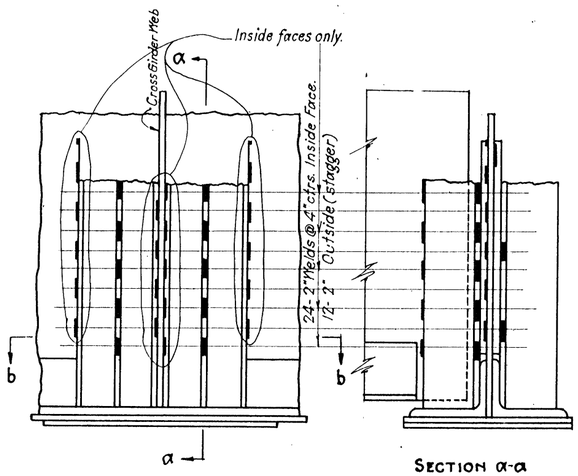


SECTION bb

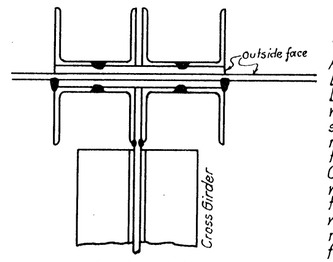
Note: Holes 13/16"ϕ
Rivets ¾"ϕ
Provide ¾"ϕ Turned Bolts, H.H.&N. for all open hole connections.
Paint all shop coat as specified.

CRADLE FOR TEMPORARY CONSTRUCTION COUNTERWEIGHT

Scale: ⅜"=1'0"



SECTION a-a



SECTION b-b

~ WELDING SPECIFICATIONS.

All welding rod to be "G.E.-W.20," bare rod or approved equal.
Beads to be ⅜" minimum. Linear welds occuring opposite each other shall be staggered so that no plate metal will be fused on two sides at the same place.
On continuous linear welds, metal within a radius of 1'0" shall be allowed to cool for one hour before further welding is done therein in order to reduce to a minimum any tendency for metal to distort.

Where the vertical leg of bottom chord angles has been sheared and welded at bends, weld top of angle leg to web (outside only) by 6-2" welds, 4" ctrs. each side of cut; spacings may be adjusted to miss stiffeners (See diagram below for location)

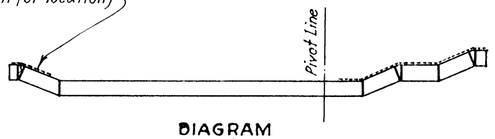


DIAGRAM
NOT TO SCALE

Counterweight Cradle approved June 15, 1935.
Welding System approved June 8 1935
Cross Girder approved June 3, 1935.

NO	REVISION	DATE	BY	APVD
3	Plate to cradle I beams	7/9/35	A.H.R.	
2	Location of Cradle	7-3-'35	T.M.O.	
1	C.G. Gusset plate to 2@ 5'0"	6/5/35	A.H.R.	

BONNEVILLE POWER, NAVIGATION PROJECT.
BRIDGE ACROSS NAVIGATION CANAL

SWING SPAN CHANGES

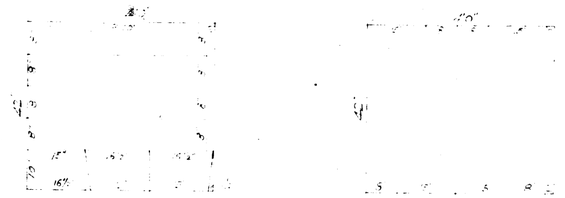
U.S. ENGINEERS OFFICE, 2ND. PORTLAND, DISTRICT (OREGON)

SUBMITTED R.R. Mackenzie ENGINEER
APPROVED H. J. Ollinger MAJOR, CORPS OF ENGINEERS
RECOMMENDED S. A. Thomas HEAD ENGINEER
DRAWN BY
TRACED BY T.H.W. CHECKED BY A.H.R.

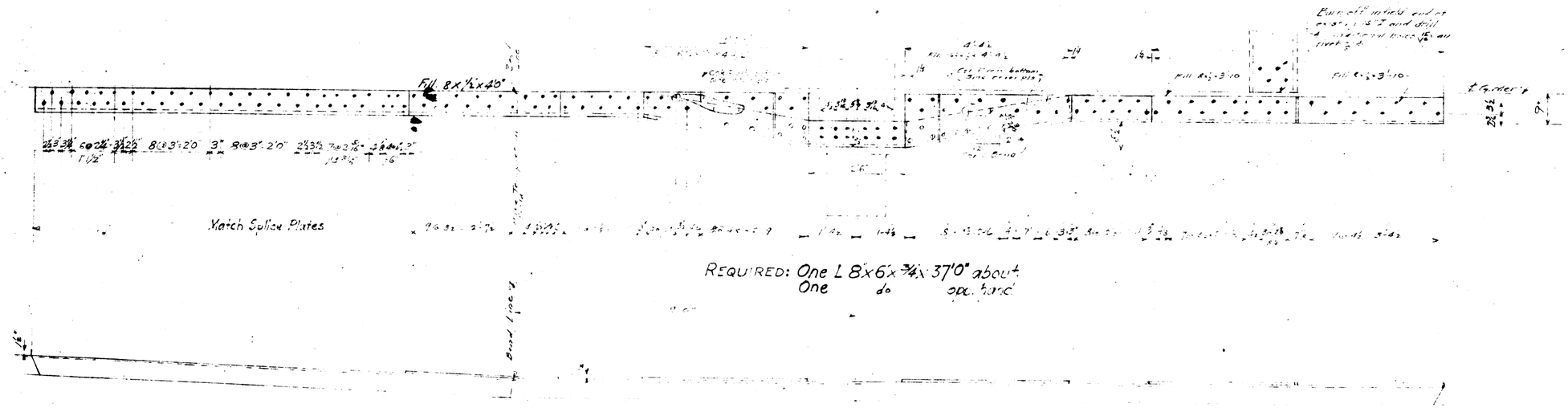
N-2-89

WAR DEPARTMENT

CORPS OF ENGINEERS, U.S. ARMY



Cut as shown from pls. marked with Cross girder stiffener.



REQUIRED: One L 8"x6"x⅜"x37'0" about
One do opp. hand

Note: Cut filler plates from 2 pls. 42"x½"x4'0"

Holes: ⅞" Ream in field to 1 3/32"
Rivets: 1"ϕ
Heat and force all bends.
Ship L Unpunched and center punch in field.

NEVILLE ISLAND PROJECT
28th CONTRACT
SWING BRIDGE CHANGES IN
LOWER FLANGE GIRDER

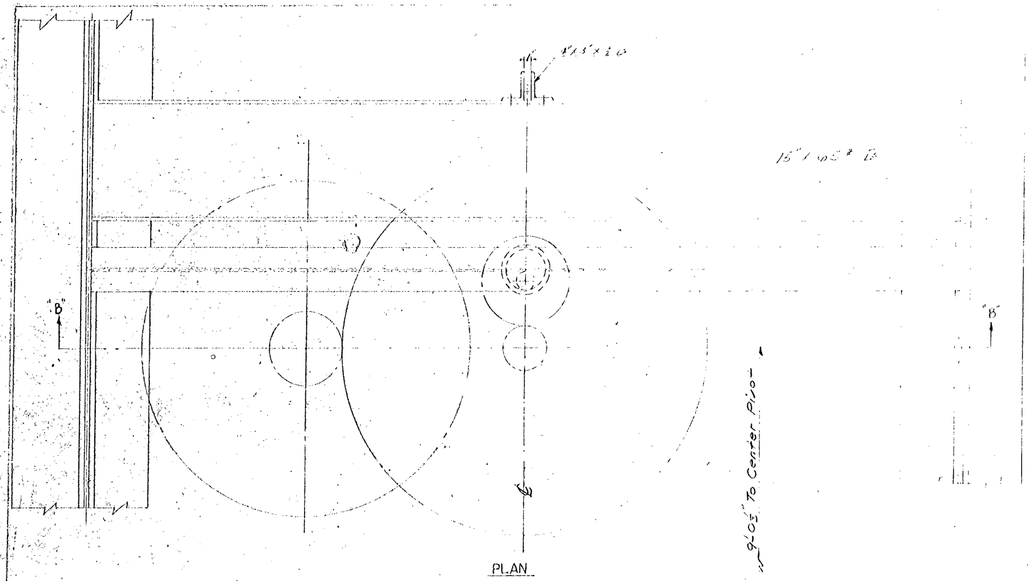
Scale 3/8"=1'0"

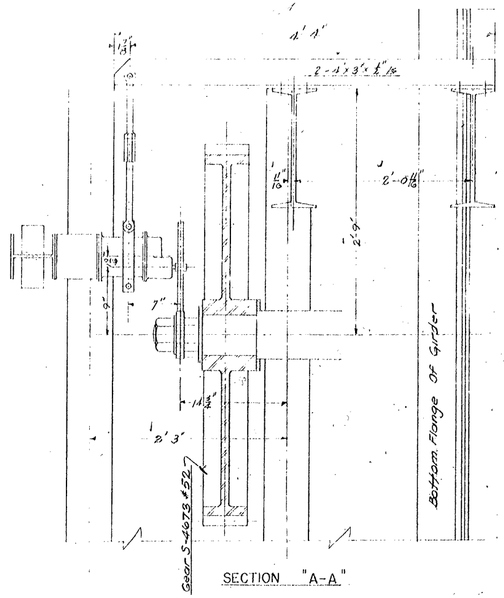
R. MacKenzie H. Williams
A.H.R. 6-17-35
A.H.R.

N-2-90

WAR DEPARTMENT

CORPS OF ENGINEERS U.S. ARMY



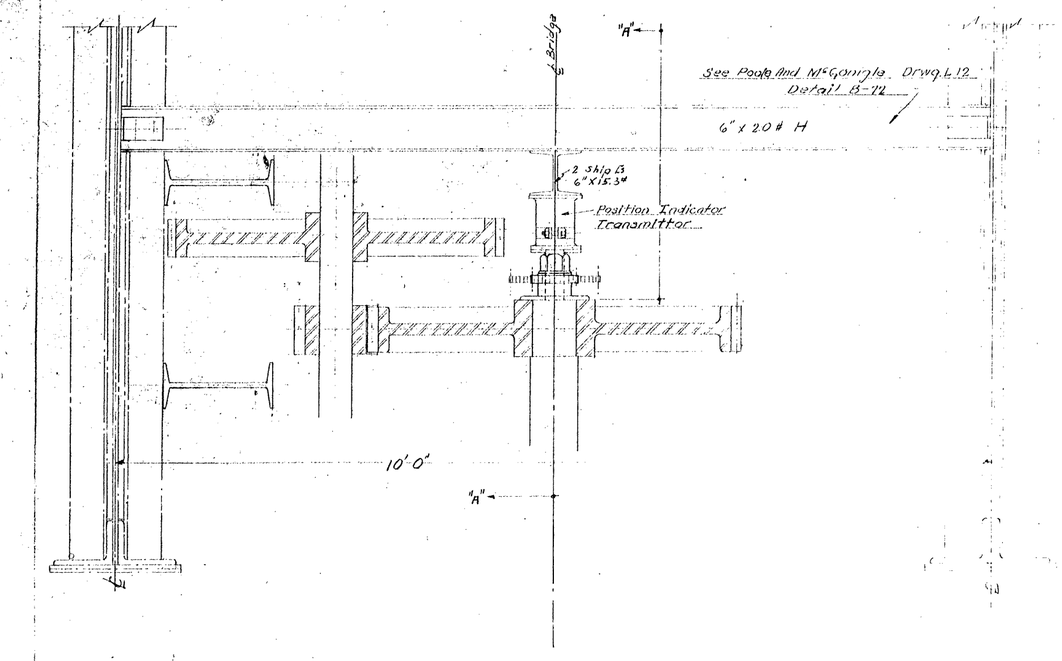


SECTION "A-A"

SCALE ½" = 1'-0"

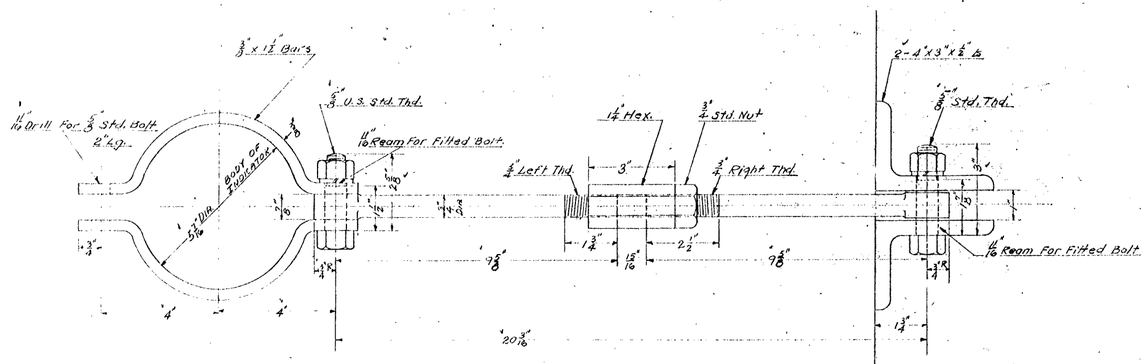
SCALE IN FEET

MATERIAL		Total Wts.
2 @ 4"x3"x⅜" x 4'-4" Lg.	Str. St.	96.20 Lbs.
2 Bars ⅜" x 1½" x 11¼" Lg.	Hot Rolled St.	3.07 "
1 - 1¼" Hex. Bar Stock 3" Lg.	C.R. St.	.78 "
2 - ⅝" Eye Bolts 9⅜" Lg.	H.R. St.	2.92 "
1 - ⅝" x 3" Lg. Std. Bolt - Hex. Head	"	.40 "
1 - ⅞" Fitted Bolt - 2⅝" Lg.	"	.52 "
1 - ⅞" " " - 3" Lg.	"	.56 "
1 - ⅝" Std. Hex. Nut	"	.19 "
3 - ⅝" Std. Hex. Nuts	"	.42 "
3 - ⅜" Lock Washers	(Spring St.)	.23 "
8 - ¾" Rivets - 2⅜" Lg.	Str. St.	5.84 "



SECTION "B-B"

View Looking North



DETAILS OF INDICATOR SUPPORT

SCALE 6" = 1'-0"

SCALE IN INCHES

GENERAL NOTES

REFERENCES

For Bridge Turning Machinery See Drwg. N-2-61 Sheet 4, And For Pacific Iron And Steel Works Drwg. S.D. 3506.
For Design Of Indicator Support Beam See Poole & McGonigle Drwg. L-12 - B-12.

NO.	REVISION	DATE	BY	APV'D

APPROVED FOR CONSTRUCTION ... Major, C. of E. 7-18-35

BONNEVILLE POWER NAVIGATION PROJECT

28-TH CONTRACT

BRIDGE ACROSS NAVIGATION CANAL

SWING SPAN

INDICATOR SUPPORT

SCALE AS SHOWN

U. S. ENGINEER OFFICE, SECOND PORTLAND DISTRICT (OREGON)

SUBMITTED: ... ENGINEER

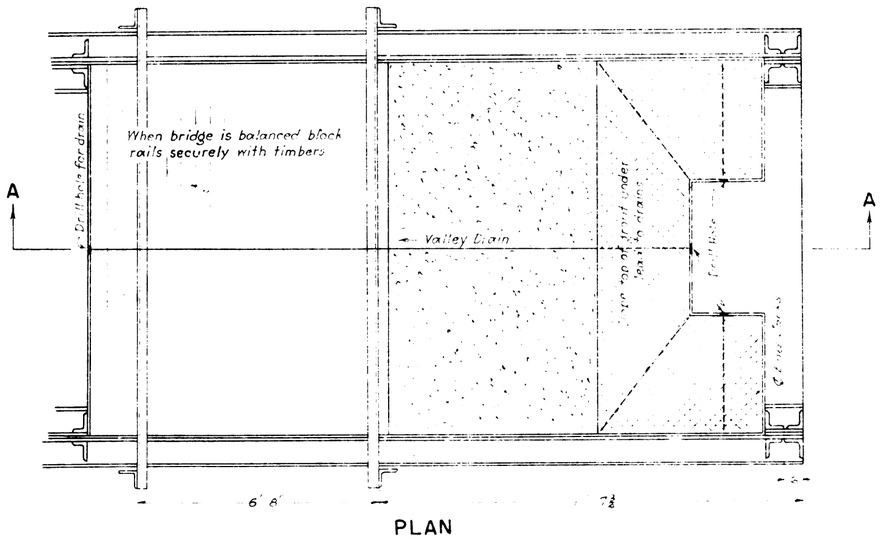
APPROVED: ... MAJOR, CORPS OF ENGINEERS

RECOMMENDED ... HEAD ENGINEER

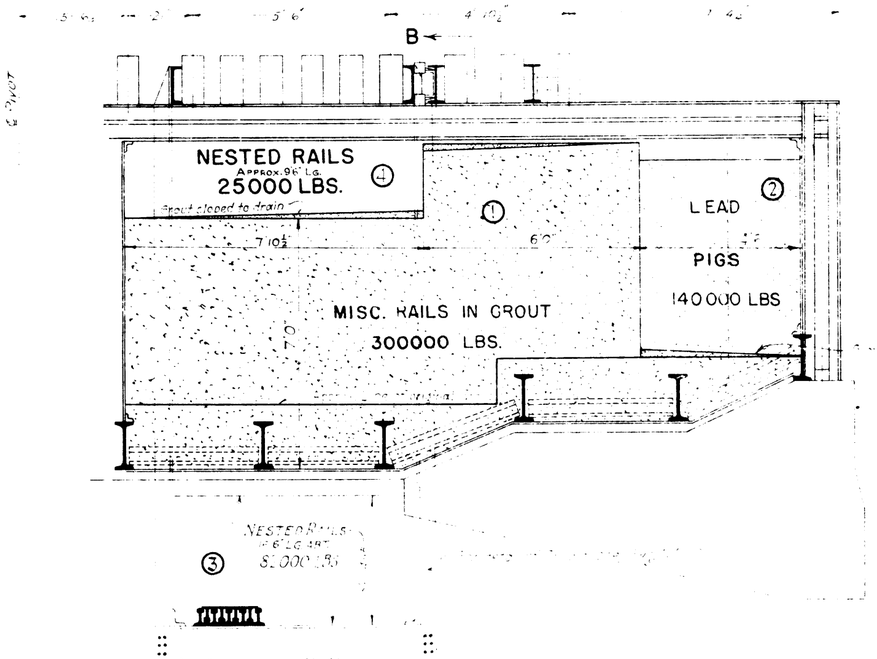
DRAWN BY A.C.O. & I.P.L. DATE 6-29-35

TRACED BY ... CHECKED BY ...

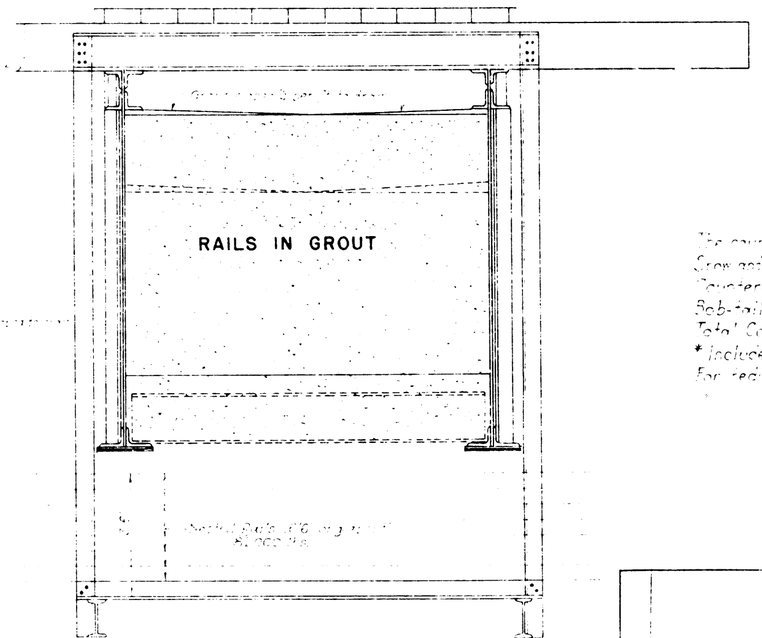
N-2-91



PLAN



SECTION AA

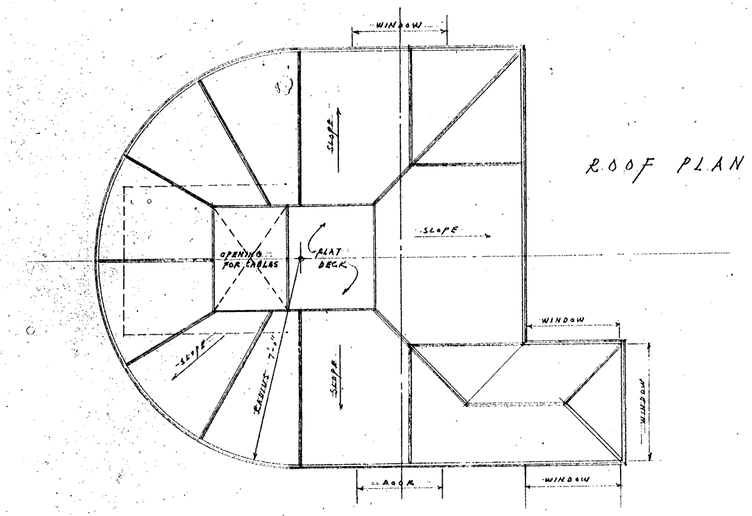


SECTION BB

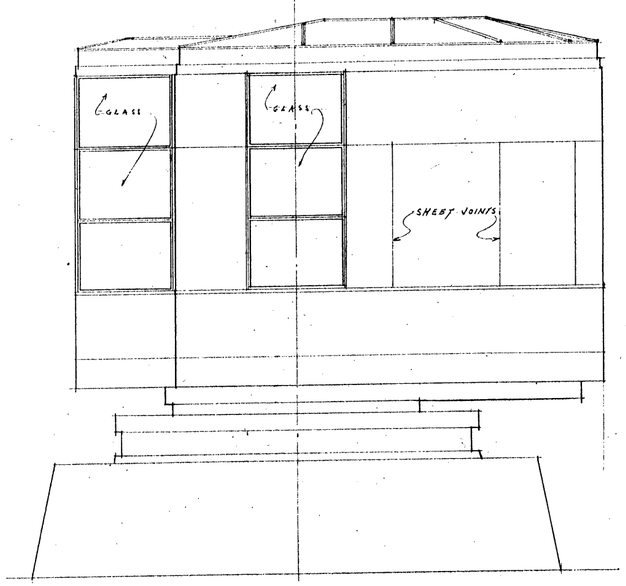
The counterweight ... as a composite dead load ... for span ...
Snow and ice are not ... reduction
Counterweight Moment ... ft lbs *
Sub-tail Load and Moment ... ft lbs
Total Cantilever Moment ... ft lbs
* Includes 5% for adjustment
For reduction of ... weight and to provide ... the top rail ③ only
... single thickness ... ③ and ④

BONNEVILLE POWER, NAVIGATION PROJECT
BRIDGE ACROSS NAVIGATION CANAL
SWING SPAN
COUNTERWEIGHT
SCALE ...

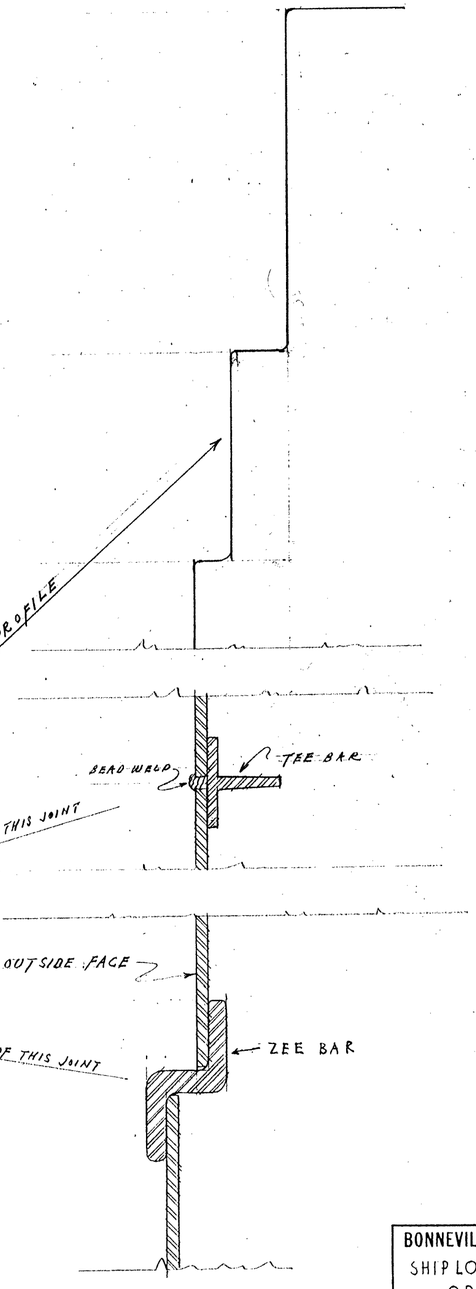
N-2-32



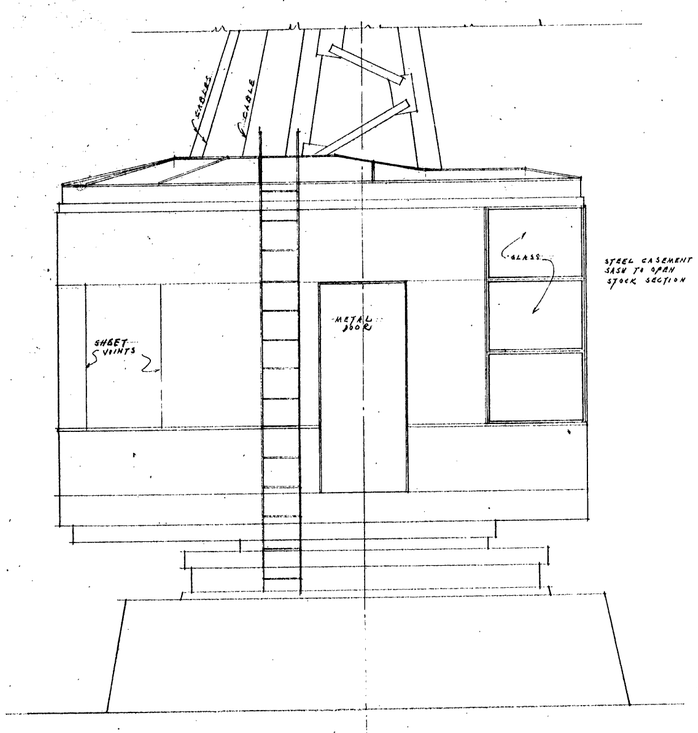
ROOF PLAN



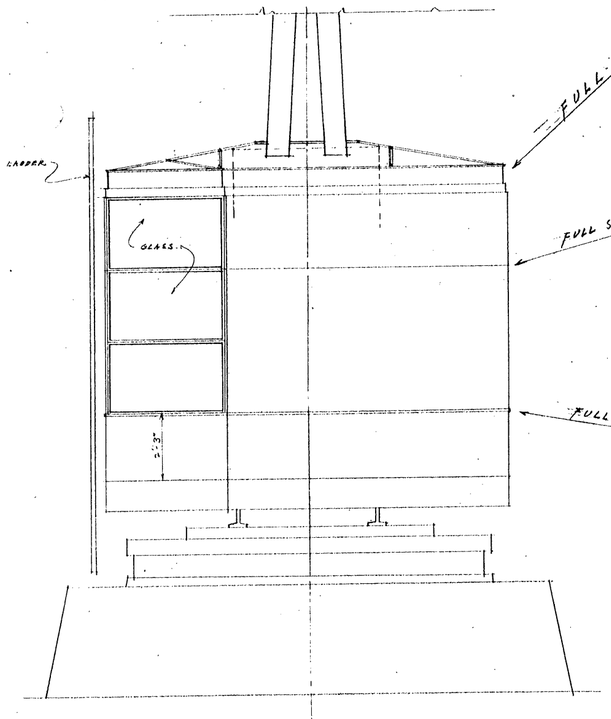
SIDE ELEVATION



SUGGESTED JOINT SEC.
FULL SIZE



SIDE ELEVATION
SCALE $\frac{1}{2}$" = 1'-0"



FRONT ELEVATION
SCALE $\frac{1}{2}$" = 1'-0"

BONNEVILLE POWER NAVIGATION PROJECT

SHIP LOCK EMERGENCY DAM DERRICK

OPERATOR'S CAB

33 RD CONTRACT

SCALE AS NOTED

U. S. ENGINEER OFFICE, SECOND PORTLAND DISTRICT (OREGON)

SUBMITTED: ..... SENIOR ARCHITECT

APPROVED: ..... MAJOR, CORPS OF ENGINEERS

RECOMMENDED: ..... MAJOR, CORPS OF ENGINEERS

DRAWN BY R. O. M. DATE 6-13-35

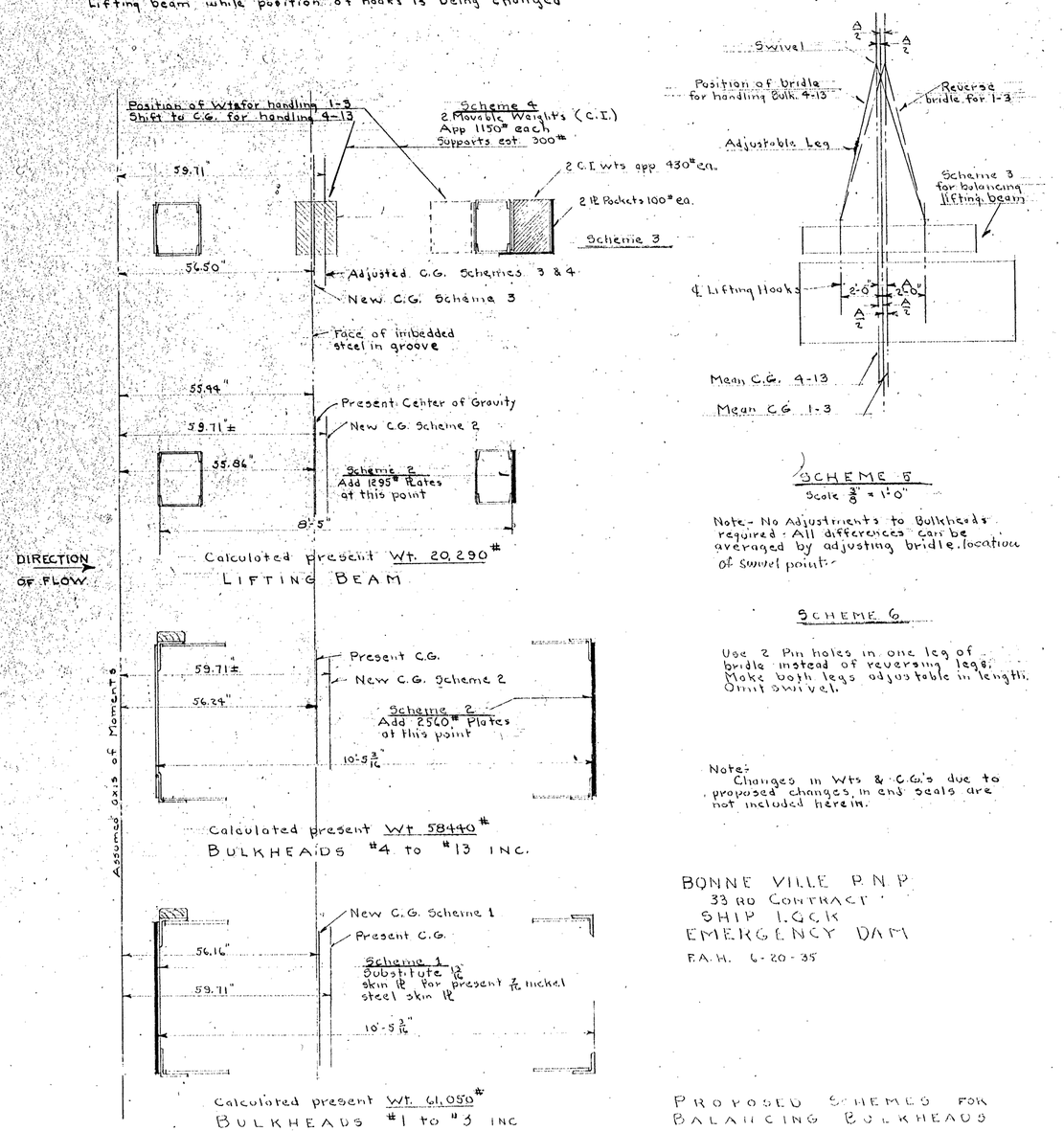
TRACED BY R. O. M. CHECKED BY .....

N-2-94

RECAPITULATION

Scheme 1 Bulk. 1-3	Substitute ½" skin Pl. for 7/16 ni steel skin Pl - Bulkheads 1-3 No changes in Bulkheads 4-13 or lifting beam	Carb St	Ni steel +13800	C.I	Total +13800	Mo Last for Condition 85940	Bulkheads 1-3 & Lift Bm.
Scheme 2 Bulk 4-13	Add 2560# carb steel Pls to face of lower chord Bulk 9-13 Add 1295# " " " " " Lifting beam No changes Bulkheads 1-3	+26895			+26895	82645	Bulkheads 1-3 & Lift Bm
Scheme 3 Lift Beam	Add 200# pockets and 860# removable C.I wts to lower chord of lifting beam - No other changes		200	860	+ 1060	82400	" 1-3 & Lift Beam
Scheme 4 Lift Beam	Add 2300# C.I. Movable Wts & 300# S.S. to Lifting beam No other changes		+300	2300	+ 2600	83,940	" 1-3 & Lift Beam
5 & 6 Lift Beam	Use reversible lifting bridle and use removable weights to balance lifting beam. Fix lifting hooks in predetermined position. No other changes.		+200	860	+1060	82400	" 1-3 & Lift Beam

Note - Using Schemes 3 & 4 a special place must be provided on which to rest Lifting beam while position of hooks is being changed



SCHEME 5

Scale 3/8" = 1'-0"

Note - No Adjustments to Bulkheads required - All differences can be averaged by adjusting bridle location of swivel point.

SCHEME 6

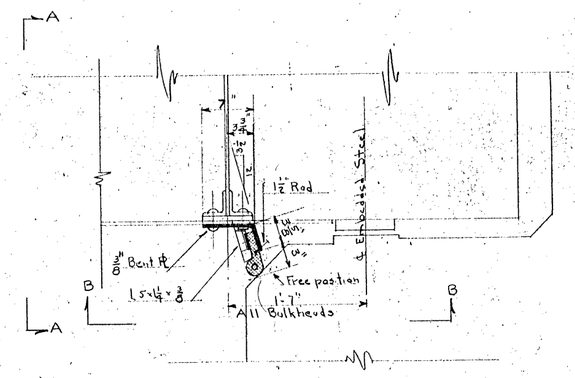
Use 2 Pin holes in one leg of bridle instead of reversing legs. Make both legs adjustable in length. Omit swivel.

Note:
Changes in Wts & C.G.'s due to proposed changes in end seals are not included herein.

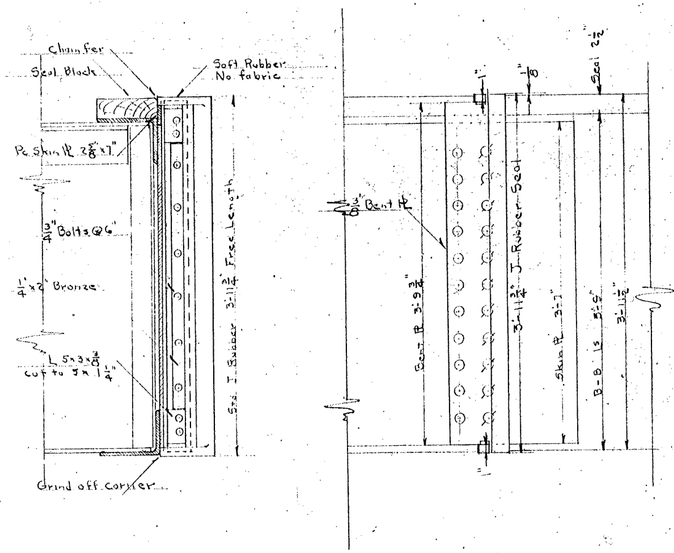
BONNE VILLE P N P
33 RD CONTRACT
SHIP LOCK
EMERGENCY DAM
F.A.H. 6-20-35

PROPOSED SCHEMES FOR BALANCING BULKHEADS

N-2-95 SHEET 1



TYPICAL SECTIONAL PLAN



SECTION A-A

ELEVATION B-B

PROPOSED END SEALS

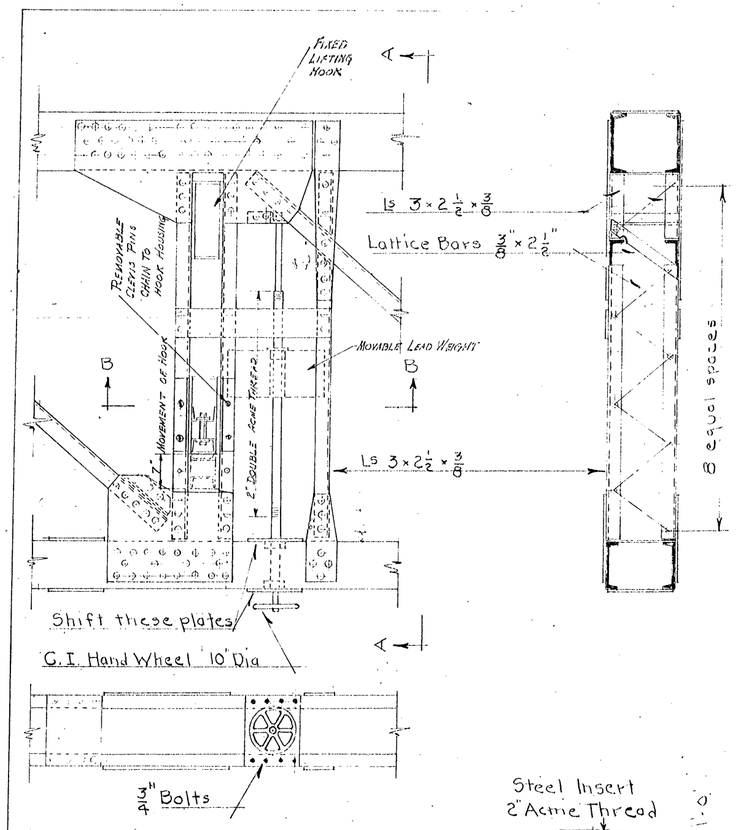
Scale 1½" = 1'-0"

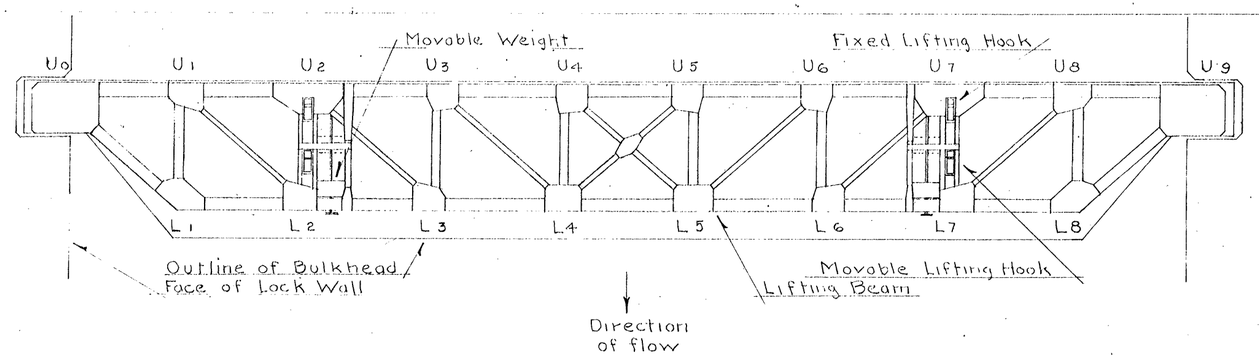
BONNEVILLE POWER NAVIGATION PROJECT
33 RD CONTRACT
SHIP LOCK - EMERGENCY DAM
PROPOSED CHANGES IN BULKHEADS ETC.

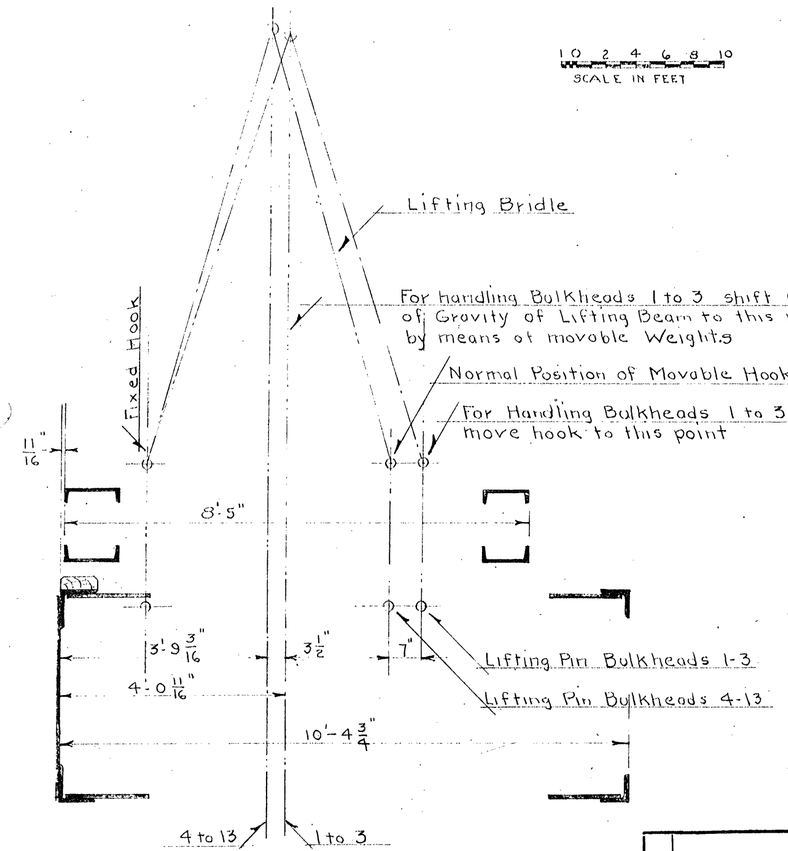
U. S. ENGINEER OFFICE, SECOND PORTLAND DISTRICT, OREGON

SUBMITTED ..... ENGINEER	APPROVED ..... MAJOR, CORPS OF ENGINEERS
RECOMMENDED ..... HEAD ENGINEER	DRAWN BY F.A.H. DATE 6-13-35
	TRACED BY ..... CHECKED BY .....

N-2-95 SHEET 1







PRELIMINARY

NO.	REVISION	DATE	BY	APV'D

BONNEVILLE POWER NAVIGATION PROJECT

33 RD CONTRACT
SHIP LOCK - EMERGENCY DAM

LIFTING BEAM
CENTER OF GRAVITY ADJUSTMENT

U. S. ENGINEER OFFICE, SECOND PORTLAND DISTRICT (OREGON)

SUBMITTED ..... ENGINEER

APPROVED ..... MAJOR, CORPS OF ENGINEERS

RECOMMENDED ..... HEAD ENGINEER

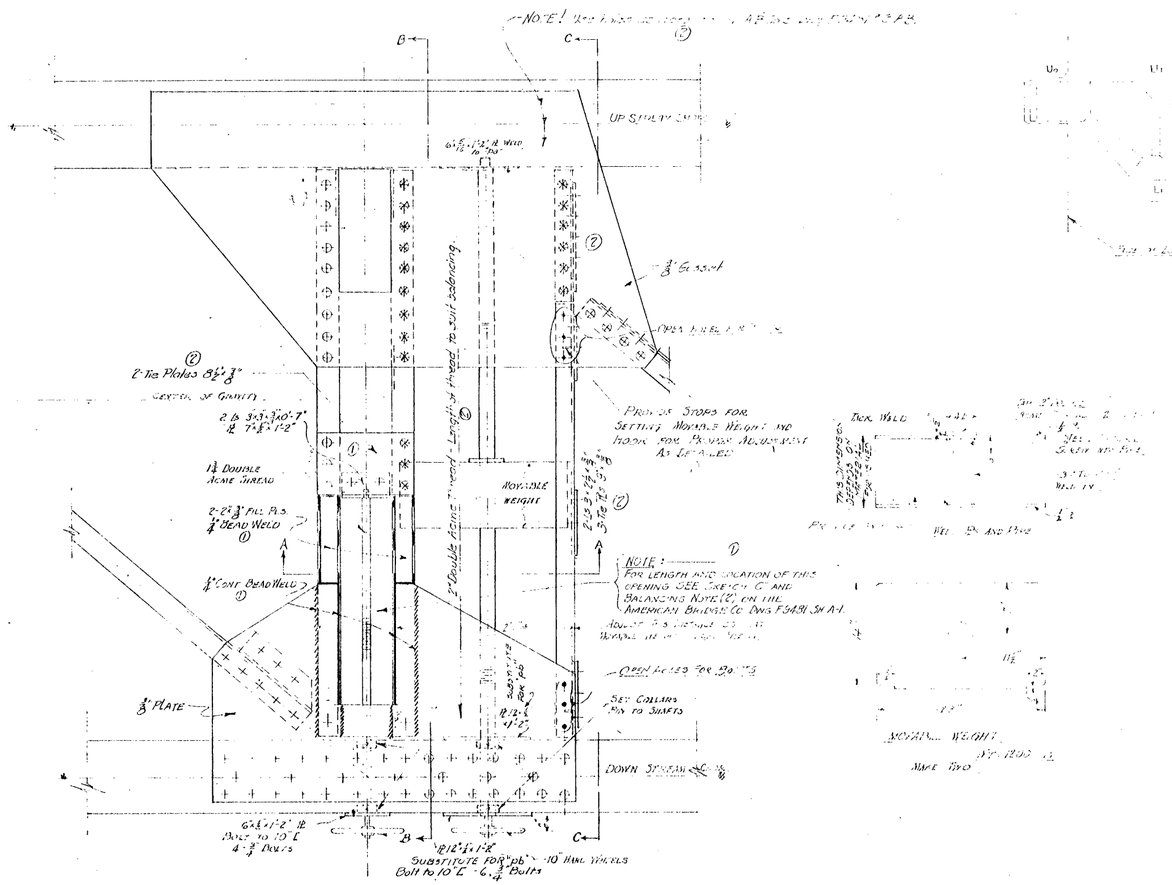
DRAWN BY: FAH & ACD. DATE 7/10-35

TRACED BY ..... CHECKED BY .....

N-2-97

WAR DEPARTMENT

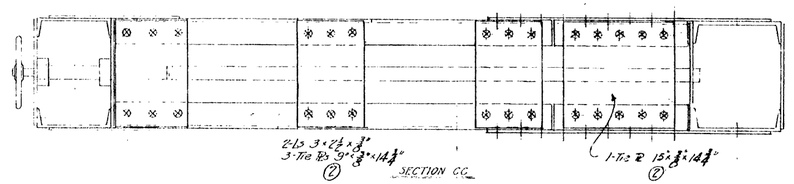
CORPS OF ENGINEERS U.S. ARMY



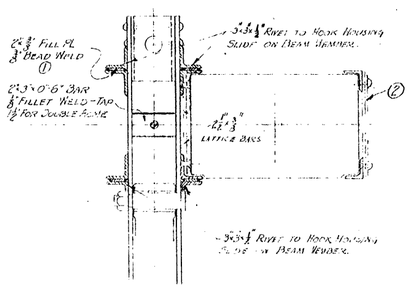
PLAN VIEW - ALTERATION OF JOINT U_2L_2 U_2L_3

PLAN OF LIFTING BEAM

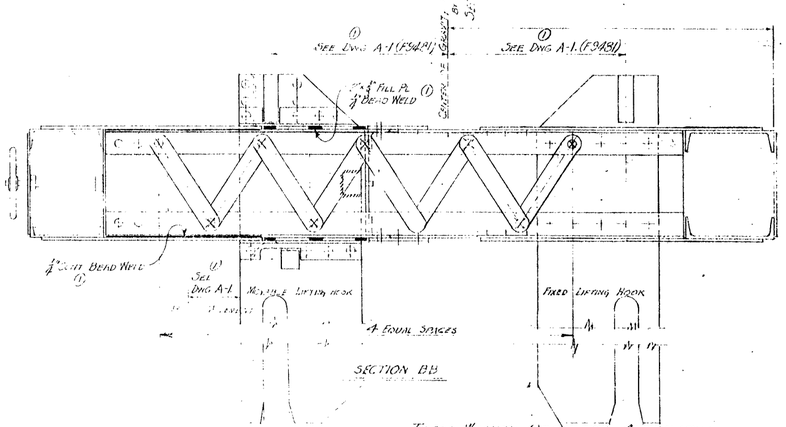
Scale in Feet



SECTION CC



SECTION AA



SECTION BB

Alternate Joint U_2L_2 U_2L_3

Scale in Feet

TOTAL WEIGHTS REQ'D FOR ALTERATION

Struct. Nickel Steel -	1450	① ②
Mach. Steel (Acme Nut) -	250#	①
Movable Wt. Fillers (To suit balancing scheme).		②
② Cast Iron *	55#	(Hand Wheels)
Grand Total	1755#	Plus Weight Fillers ②

* Fed. Spec. QQ-I-656 Class B.

General Notes

Material for Alteration - Nickel Steel - Except As Noted
¾" Rivets
13/16" Holes Except As Noted
Open Holes for Bolts.

References

See Sheet 11-N-2-60 For Lifting Beam

NO.	REVISION	DATE	BY	APV'D
②	Gusset at U_2 & U_3 Changed B.M. 35, Ag. Bars, U_2L_3 & U_3L_4 Corrected Heights.	8-6-35	V.C.H.	
①	Gusset at L_2 & L_3 Changed 8-6-35, Tie Pls, Fill Pls and Welding Notes - W.H.'s Corrected.	7-18-35	V.C.H.	

APPROVED FOR CONSTRUCTION — H.D. — 7/18/35 — Major, C. of E.

BONNEVILLE POWER NAVIGATION PROJECT

33 RD CONTRACT
SHIP LOCK - EMERGENCY DAM

CENTER OF GRAVITY ADJUSTMENT FOR LIFTING BEAM

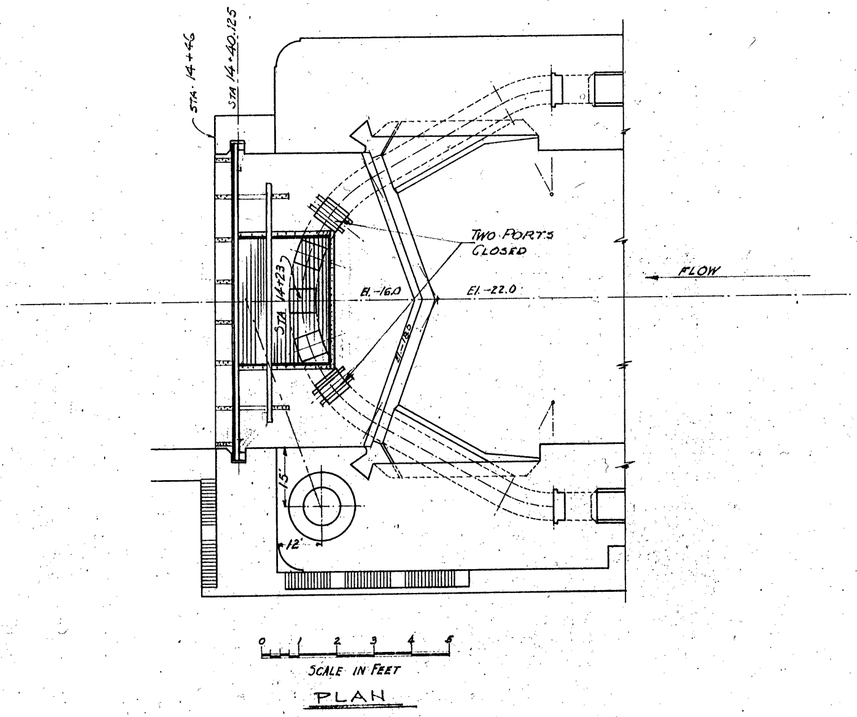
U. S. ENGINEER OFFICE, SECOND PORTLAND DISTRICT, OREGON

SUBMITTED: K.H. Mackenzie, Engineer — APPROVED: Major, Corps of Engineers

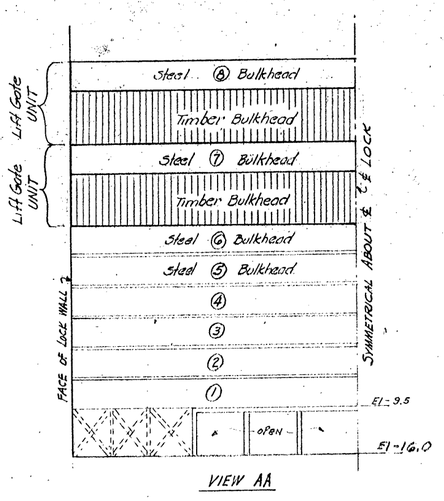
RECOMMENDED: C.O. Sharp, Asst. Engineer — DRAWN BY: Brown — DATE: 7-12-35

TRACED BY: — CHECKED BY:

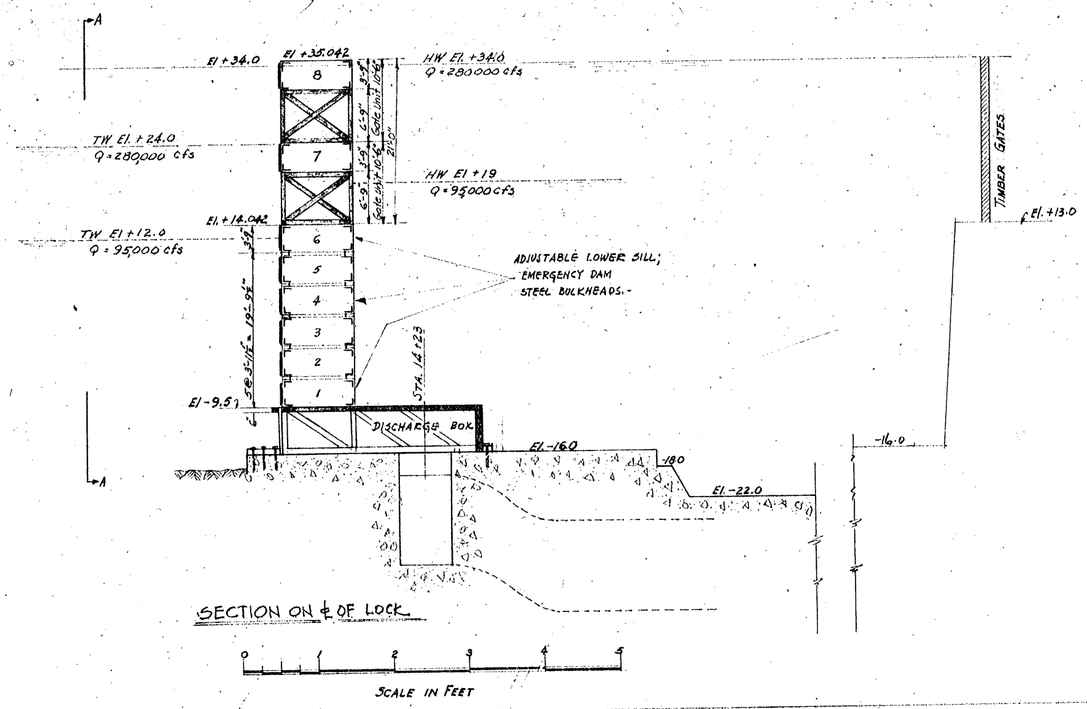
N-2-98



PLAN



VIEW AA



SECTION ON ℄ OF LOCK

0 1 2 3 4 6
SCALE IN FEET

REFERENCES:

N-2-99, Sheet #2. Timber Discharge Box and Culvert Plugs
N-2-99, Sheet #3 Timber Attachments to Steel Bulkheads Number 7 and 8, also Details of Guide Plates and Seal Plates for Steel Bulkheads Number 4 to 8 inclusive.
N-2-99, Sheet #4, Details of minor Field Adjustments.
N-1-28, Sheet #1 Details of Culvert Outlets.
N-1-19 Lower Emergency Dam Recess.
American Bridge Co. Bulkhead Drawings for Location of bolt holes.
N-2-99, Sheet #5 Details for Storage of Bulkheads.

MATERIAL ESTIMATE:

Item #1 - Timber ---------- 31.2 M.F.I. B.M.
Item #2 - Structural Carbon Steel ---------- 3190 Lbs.
Item #3 - Hardware and Anchor Bolts ---------- 6000 Lbs.

BONNEVILLE POWER NAVIGATION PROJECT

PROVISIONS FOR TEMPORARY LIFT GATES

U.S. ENGINEER OFFICE, SECOND PORTLAND DISTRICT (OREGON)

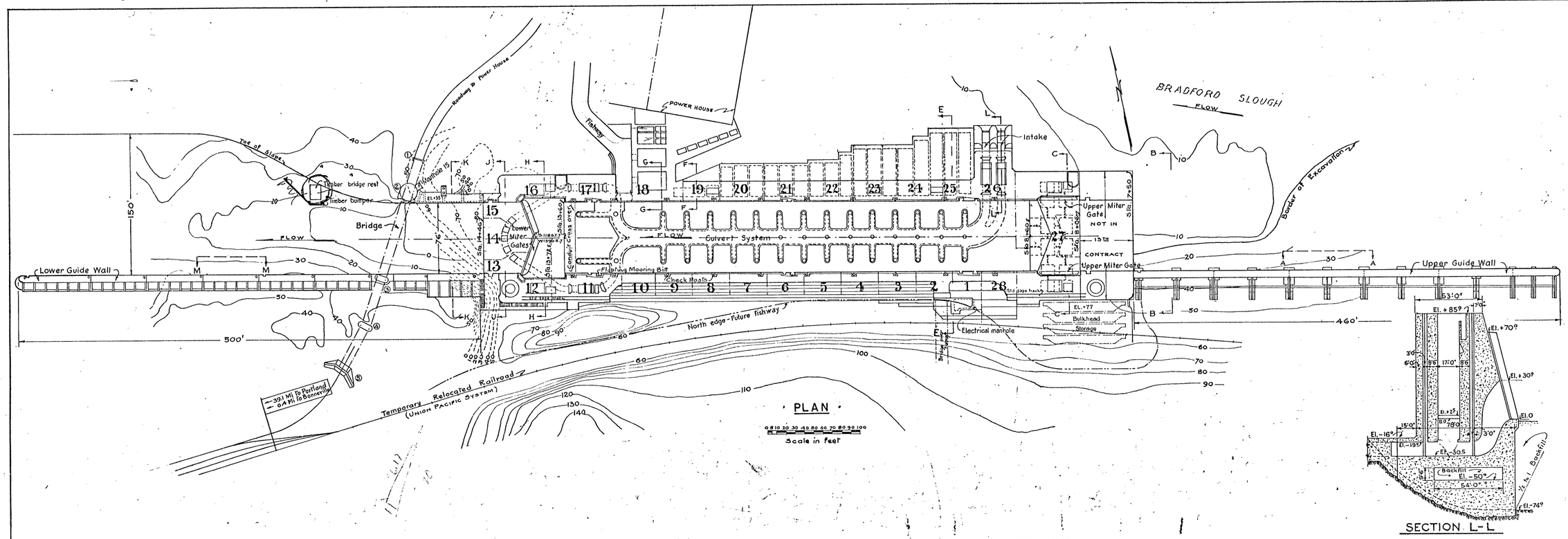
SUBMITTED: R. H. Mackenzie, Lt. Col. C.E.
APPROVED: Chief of Engineers
RECOMMENDED:
DRAWN BY: A.G.D. & W.H. 10-10-35
TRACED BY
CHECKED BY

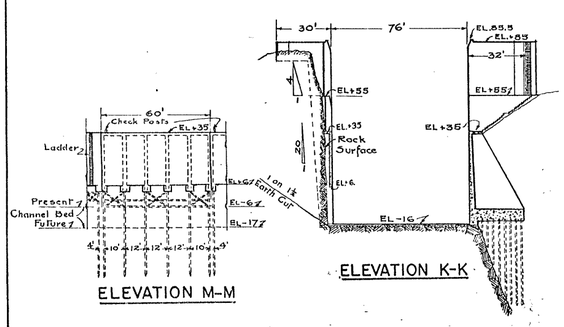
SHEET 1 N-2-99.

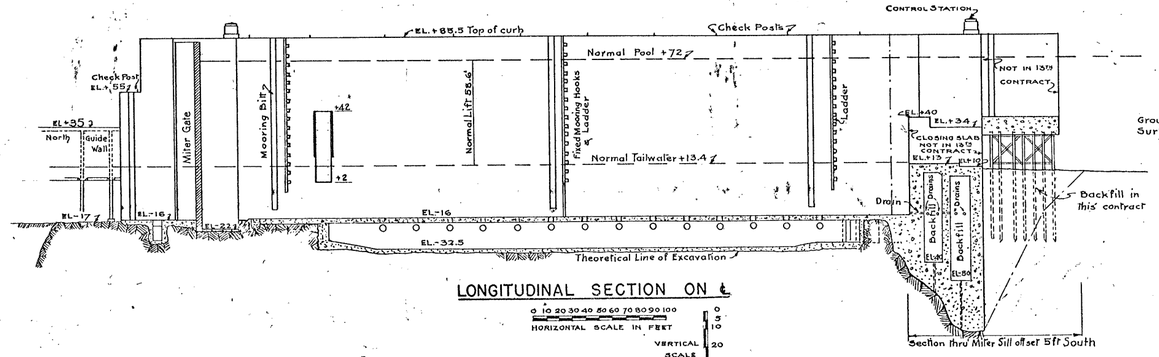
This supercedes Preliminary Issue.

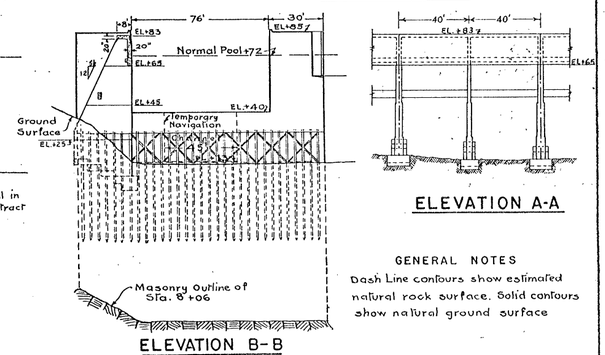
WAR DEPARTMENT

CORPS OF ENGINEERS U.S.ARMY



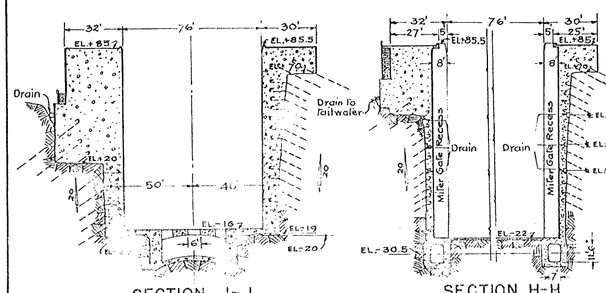


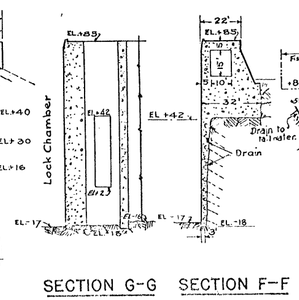


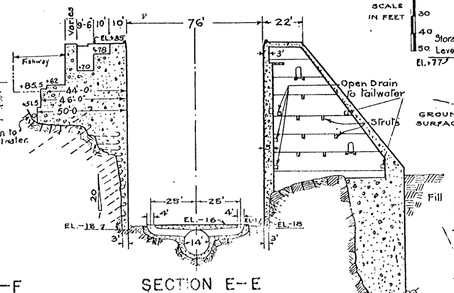


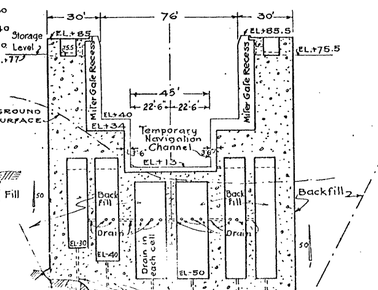
GENERAL NOTES

Dash Line contours show estimated natural rock surface. Solid contours show natural ground surface









Horizontal Drains lead to Lower Pool and have outlets as follows:-
North Wall at Sta. 12+90
South Wall at Sta. 14+40.1

NO.	REVISION	DATE	BY	APP'D
D	Concrete Floor Added To Lower Gate Recess	5-22-42	FHA	A.S.F.
C	Added Wall West of Mon.15, Added Fishway Mon.18, Added Storage Area Sta 8+06, Revised Mons.1-2 & 28, Revised Mon.11, Removed Bar Sta 8+03	1-24-36	ACD	Mtc
B	Culvert, Monolith 11; Corrected & Recesses, Monoliths 12 & 13 Added Sect L-L; Revised Upper Guide Wall; Fishway Sec G-G	3-13-35	J.R.R.	R.L.W.
A	Revised & Traced	11-28-34	C.B.M.	R.

BONNEVILLE POWER NAVIGATION PROJECT
13TH CONTRACT — CONCRETE
POWER HOUSE SUBSTRUCTURE & NAVIGATION LOCK
SHIP LOCK
GENERAL DRAWING
SCALES AS SHOWN
U.S. ENGINEER OFFICE PORTLAND, OREGON DISTRICT
SUBMITTED A.P. Mazzini
APPROVED Hugh L. Williams
DRAWN A.P.S. 8-17-34
TRACED C.B.M. 11-28-34
CHECKED J.R.R.

SECTION ON ℄ OF LOCK
SHOWING NORTH WALL
0 10 20 30 40 50 60 70
SCALE IN FEET

ELEVATION OF SOUTH WALL LOOKING NORTH
0 10 20 30 40 50 60 70
SCALE IN FEET

SECTION ON ℄ OF LOWER SILL
0 1 2 3 4 5 6 7
SCALE IN FEET

SECTION "E-E" LOWER SILL
0 1 2 3 4 5 6 7
SCALE IN FEET

PLAN OF MITER GATE ANCHOR RECESSES
0 1 2 3 4 5 6 7
SCALE IN FEET

SECTION C-C UPPER SILL
0 1 2 3 4 5 6 7
SCALE IN FEET

SECTION F-F
0 5 10 15 20 25
SCALE IN FEET

SECTION D-D

TYPICAL ANCHOR SPACING

DETAIL OF OPENING THRU BUTTRESSES RIVER WALL
0 1 2 3 4 5
SCALE IN FEET

DRAIN DETAIL

HOOK DETAIL FOR ANCHORS

ANCHOR DETAIL

NO.	REVISION	DATE	BY	APV'D
C	Concrete Floor Added To Lower Gate Recess	5-12-41	T.H.J.	
B	Fish Gate & Lower Sill Rev.	1-8-35	J.R.R.	
A	Revised & Traced	12-6-34	C.B.M.	

BONNEVILLE POWER NAVIGATION PROJECT

13TH CONTRACT — CONCRETE

POWER HOUSE SUBSTRUCTURE & NAVIGATION LOCK

SHIP LOCK

WALLS & LONGITUDINAL ELEVATIONS

SCALE AS SHOWN

U.S. ENGINEER OFFICE PORTLAND, OREGON DISTRICT

SUBMITTED: N. Mackenzie, ENGINEER

APPROVED: H. Williams, MAJOR, CORPS OF ENGINEERS

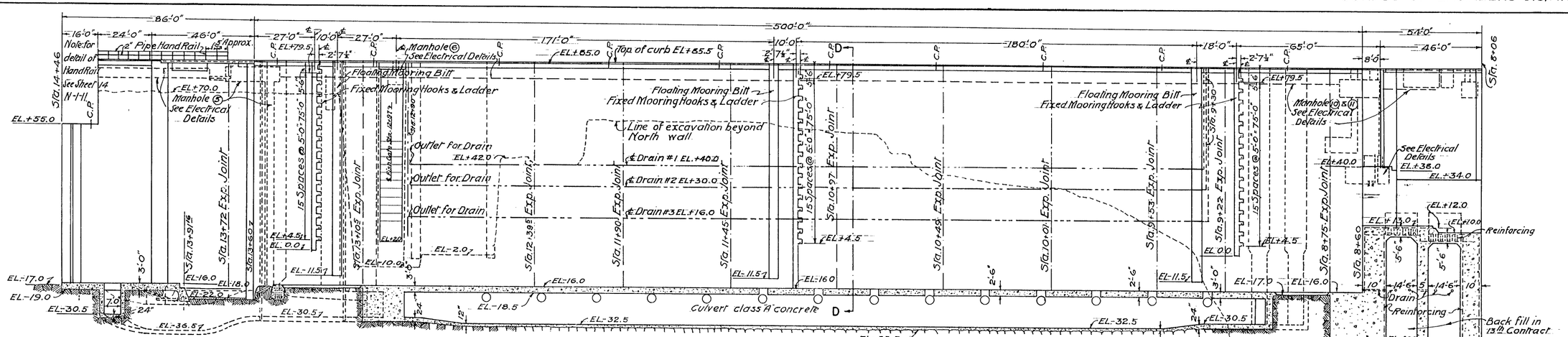
RECOMMENDED: HEAD DRAFTSMAN

DRAWN BY R. S. D. DATE 11-23-34

TRACED BY C. B. M. CHECKED BY M.K.C.

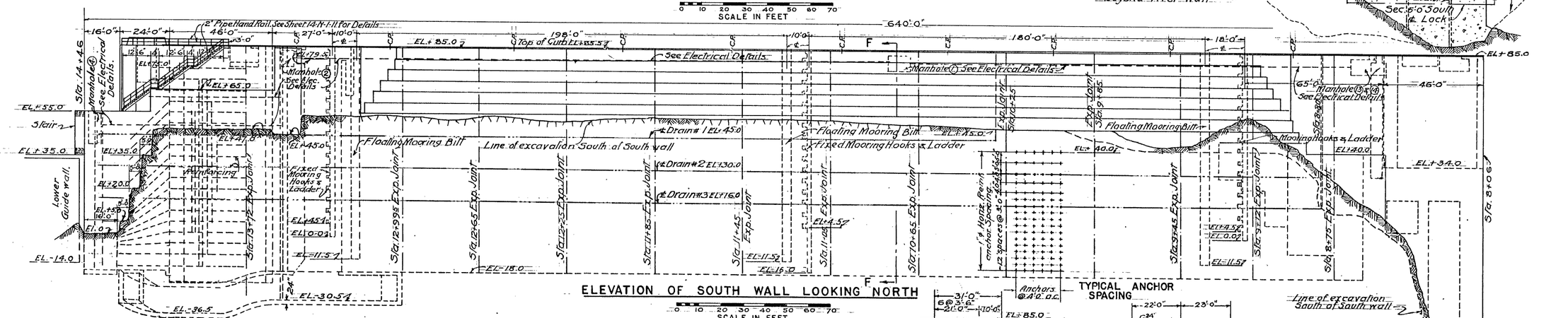
WAR DEPARTMENT

CORPS OF ENGINEERS U.S. ARMY



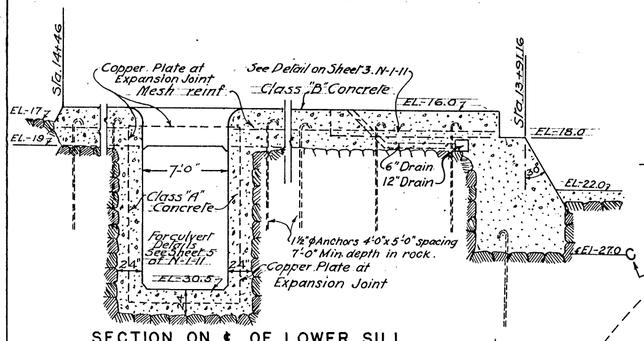
SECTION ON ℄ OF LOCK SHOWING NORTH WALL

SCALE IN FEET



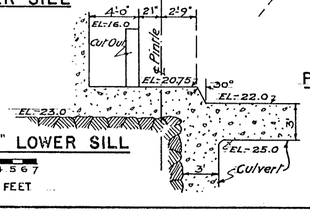
ELEVATION OF SOUTH WALL LOOKING NORTH

SCALE IN FEET



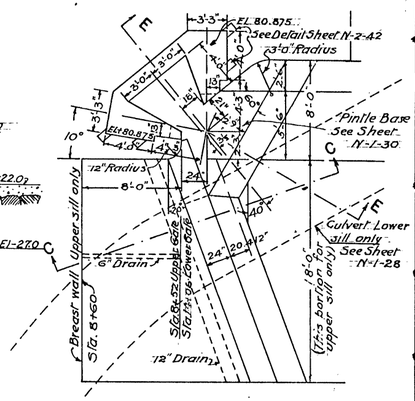
SECTION ON ℄ OF LOWER SILL

SCALE IN FEET



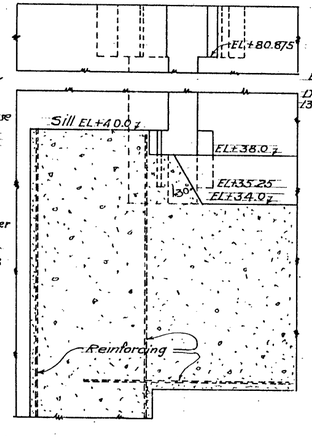
SECTION "E - E" LOWER SILL

SCALE IN FEET



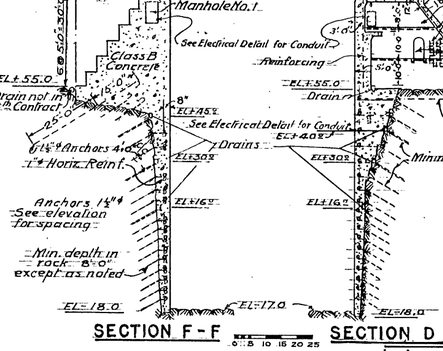
PLAN OF MITER GATE ANCHOR RECESSES

SCALE IN FEET



SECTION C - C UPPER SILL

SCALE IN FEET

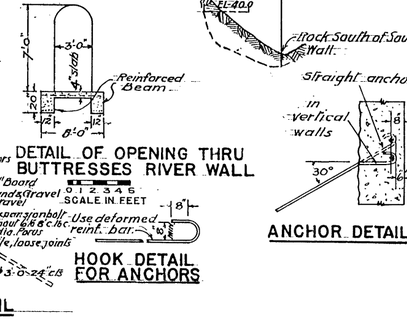


SECTION F - F

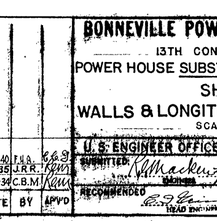
SECTION D - D

SCALE IN FEET

TYPICAL ANCHOR SPACING



DRAIN DETAIL



HOOK DETAIL FOR ANCHORS

SCALE IN FEET

DETAIL OF OPENING THRU BUTTRESSES RIVER WALL

ANCHOR DETAIL

NO.	REVISION	DATE	BY	APP'D
C	Concrete Floor Added To Lower Gate Recess	5-22-40	T.H.A.	G.G.S.
B	Fish Gate & Lower Sill Rev.	1-8-35	J.R.R.	
A	Revised & Traced	12-6-34	C.B.M.	

BONNEVILLE POWER NAVIGATION PROJECT

13TH CONTRACT — CONCRETE

POWER HOUSE SUBSTRUCTURE & NAVIGATION LOCK

SHIP LOCK

WALLS & LONGITUDINAL ELEVATIONS

SCALE AS SHOWN

U.S. ENGINEER OFFICE PORTLAND, OREGON DISTRICT

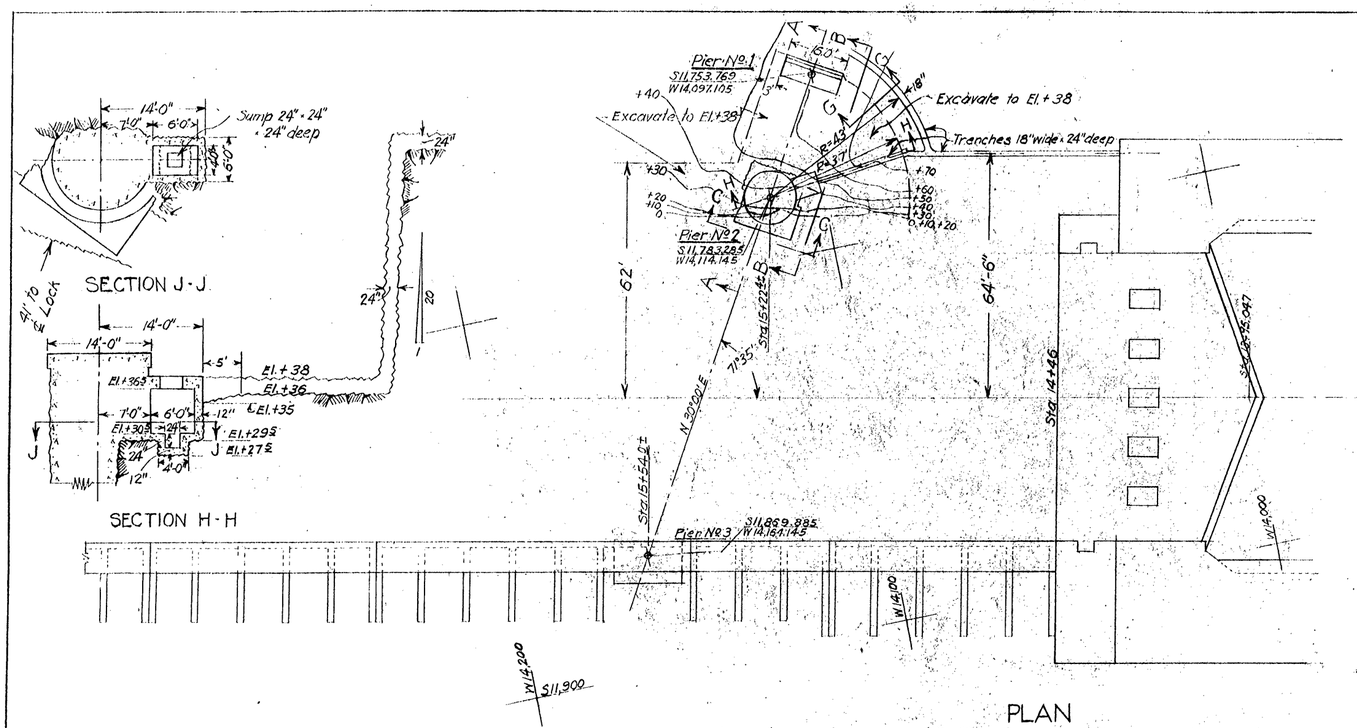
SUBMITTED: L. MacKenzie, MAJOR, CORPS OF ENGINEERS

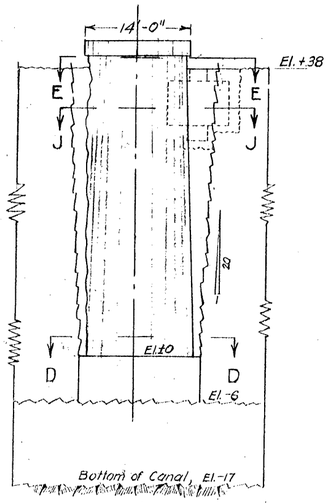
APPROVED: Chas. D. Williams, MAJOR, CORPS OF ENGINEERS

RECOMMENDED: [illegible], HEAD DIVISION

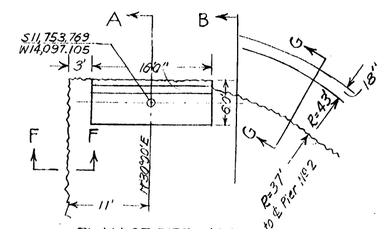
DRAWN BY R.S.D. DATE 11-23-34

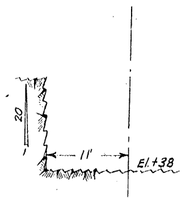
TRACED BY C.B.M. CHECKED BY M.K.C.

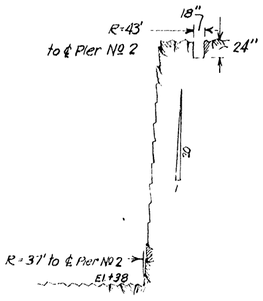




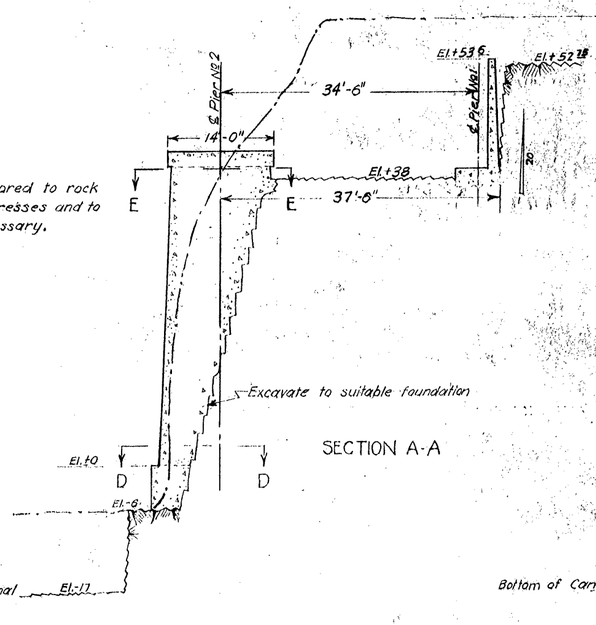
ELEVATION C-C

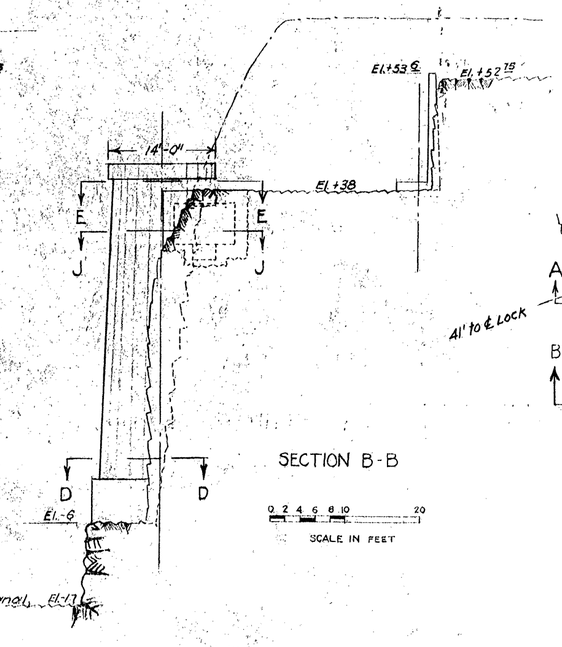


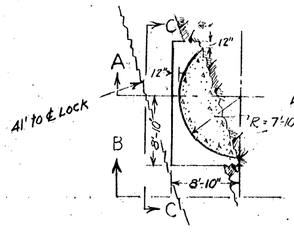


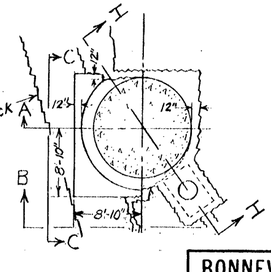


NOTE: Foundation to be anchored to rock where directed as work progresses and to be pressure grouted if necessary.









NO	REVISION	DATE	BY	APVD
2	Excavation between piers 1 & 2 changed. Excavation for manhole and trenching added.	10/2/34	A.R.S.	
1	Excavation between piers 1 & 2 changed.	9/12/34	A.R.S.	

BONNEVILLE POWER NAVIGATION PROJECT

13TH CONTRACT - CONCRETE

POWER HOUSE SUBSTRUCTURE & NAVIGATION LOCK

· SHIP LOCK ·

EXCAVATION

FOR SWING BRIDGE PIERS Nos 1 & 2

SCALES AS SHOWN

U. S. ENGINEER OFFICE, PORTLAND, OREGON DISTRICT

SUBMITTED: R.H. MacKenzie, ENGINEER

APPROVED: H. Williams, MAJOR, CORPS OF ENGINEERS

RECOMMENDED: HEAD ENGINEER

DRAWN BY: A.R.S. DATE: 9/8/34

TRACED BY: A.R.S. CHECKED BY:

N-1-13

WAR DEPARTMENT

CORPS OF ENGINEERS U.S.ARMY

PLAN

DETAIL PLAN SECTION OF RETAINING WALL

RETAINING WALL PLAN

RETAINING WALL ELEVATION

SECTION "BB"

SECTION "AA"

SECTION "CC"

DETAILS OF 1⅛" BARS

SCHEDULE OF REINFORCING STEEL FOR 60-FT RETAINING WALL

LOCATION	NO.	SIZE	LENGTH	MARK	REMARKS
BASE	100	3/4	43'-8"	A.661	
"	321	"	11'-10"	A.662	
"	12	"	18'-4"	C.674 b	
"	12	"	20'-2"	C.675 b	
"	12	"	22'-0"	C.676 b	
"	12	"	23'-10"	C.677 b	
"	12	"	25'-10"	C.678 b	
"	12	"	27'-8"	C.679 b	
"	12	"	29'-6"	C.680 b	
"	12	"	31'-6"	C.681 b	
(TOE)	60	"	12'-2"	C.682 b	
"	27	"	20'-8"	B.660	
(DOWELS)	184	7/8	3'-0"	C.960 b	
"	46	"	23'-8"	A.560	
"	92	1	11'-10"	A.561	
"	98	1¼	22'-6"	C.962 b	
"	120	"	8'-0"	C.460	
COUNTERFORTS	24	1⅛	49'-2"	C.960 b	SEE DETAIL
"	24	"	48'-4"	C.961 b	
"	24	"	32'-8"	C.962 b	
"	24	"	18'-0"	C.963 b	
"	8	7/8	24'-8"	B.660 b	
"	12	"	21'-10"	B.661 b	
"	12	"	23'-8"	B.662 b	
"	12	"	25'-8"	B.663 b	
"	12	"	27'-6"	B.664 b	
"	12	"	29'-5"	B.665 b	
"	12	"	31'-4"	B.666 b	
"	12	"	33'-3"	B.667 b	
"	12	"	35'-2"	B.668 b	
"	12	"	37'-1"	B.669 b	
"	12	"	39'-0"	B.670 b	
"	12	"	40'-10"	B.671 b	
"	12	"	42'-9"	B.672 b	
"	12	"	44'-8"	B.673 b	
"	12	"	46'-7"	B.674 b	
"	12	"	48'-6"	B.675 b	
"	12	"	50'-5"	B.676 b	
"	12	"	52'-4"	B.677 b	
"	12	"	54'-3"	B.678 b	
"	12	"	56'-2"	B.679 b	
"	12	"	58'-1"	B.680 b	
"	12	"	60'-0"	B.681 b	
"	12	"	61'-10"	B.682 b	
"	12	"	63'-9"	B.683 b	
"	12	"	65'-8"	B.684 b	
"	12	"	67'-7"	B.685 b	
"	12	"	69'-6"	B.686 b	
"	12	"	71'-5"	B.687 b	
"	12	"	73'-4"	B.688 b	
"	12	"	75'-3"	B.689 b	
"	12	"	77'-2"	B.690 b	
"	12	"	79'-1"	B.691 b	
"	12	"	81'-0"	B.692 b	
"	60	"	14'-0"	C.546	
"	12	"	41'-4"	C.561	
"	12	"	33'-8"	C.562	
"	12	"	37'-6"	C.563	
"	12	"	28'-0"	C.564	
"	12	"	83'9"	C.565	
"	12	"	21'-11"	C.566	
"	12	"	30'-0"	C.567	
"	12	"	26'-4"	B.668	
KEY-WAY	4	7/8	12'-6"	C.569	
"	86	1¼	3'-10"	A.467	
WALL	64	7/8	11'-10"	A.760	
"	96	"	23'-8"	A.761	
"	96	"	23'-8"	A.762	
"	3	"	16'-7"	A.760 b	
"	3	"	16'-7"	A.761 b	
"	3	"	16'-7"	A.762 b	
"	3	"	16'-7"	A.763 b	
"	3	"	16'-7"	A.764 b	
"	3	"	16'-7"	A.765 b	
"	3	"	16'-7"	A.766 b	
"	3	"	16'-7"	A.767 b	
"	3	"	16'-7"	A.768 b	
"	3	"	16'-7"	A.769 b	
"	3	"	16'-7"	A.770 b	
"	3	"	16'-7"	A.771 b	
"	3	"	20'-01"	A.772 b	
"	3	"	19'-10"	A.773 b	
"	3	"	19'-10"	A.774 b	
"	3	"	19'-8"	A.775 b	
"	3	"	19'-6"	A.776 b	
"	3	"	19'-6"	A.777 b	
"	3	"	19'-4"	A.778 b	
"	3	"	19'-2"	A.779 b	
"	3	"	19'-0"	A.780 b	
"	49	5/8	23'-8"	A.560	
"	49	"	28'-10"	A.562	
"	49	"	11'-10"	A.561	
"	129	1¼	42'-6"	C.461	
"	96	"	4'-0"	A.460	
"	10	"	8'-6"	A.468	
CHECK SLAB (NOTE 3)	3/4	9	11'-10"	A.662	
" INTERIOR	15	"	12'-2"	A.663	
" (TOE)	10	"	12'-2"	A.664	
" INTERIOR	15	"	18'-2"	A.665	
" TOP	60	7/8	21'-6"	A.761	
"	2	"	24'-9"	A.762	
"	2	"	24'-9"	A.763	
"	2	"	24'-0"	A.764	
"	2	"	23'-3"	A.765	
"	2	"	22'-6"	A.766	
"	2	"	21'-9"	A.767	
"	2	"	21'-0"	A.768	
"	2	"	20'-3"	A.769	
"	2	"	19'-6"	A.770	
"	2	"	18'-9"	A.771	
"	2	"	18'-0"	A.772	
"	2	"	17'-3"	A.773	
"	2	"	16'-6"	A.774	
"	2	"	15'-9"	A.775	
"	2	"	15'-0"	A.776	
"	2	"	14'-3"	A.777	
"	2	"	13'-6"	A.778	
"	2	"	12'-9"	A.779	
"	2	"	12'-0"	A.780	
"	12	1¼	8'-0"	C.460	

LOCATION	NO.	SIZE	LENGTH	MARK	REMARKS
COUNTERFORTS	12	7/8	9'-1"	A.668 b	
"	12	"	9'-7"	A.669 b	
"	12	"	10'-1"	A.670 b	
"	12	"	10'-8"	A.671 b	
"	12	"	11'-2"	A.672 b	
"	12	"	11'-8"	A.673 b	
"	12	"	12'-3"	A.674 b	
"	12	"	12'-9"	A.675 b	
"	12	"	13'-4"	A.676 b	
"	12	"	13'-10"	A.677 b	
"	12	"	14'-4"	A.678 b	
"	12	"	15'-0"	A.679 b	
"	12	"	15'-5"	A.680 b	
"	12	"	16'-0"	A.681 b	
"	12	"	16'-6"	A.682 b	
"	12	"	17'-1"	A.683 b	
"	12	"	17'-7"	A.684 b	
"	12	"	18'-2"	A.685 b	
"	12	"	18'-7"	A.686 b	
"	12	"	19'-3"	A.687 b	
"	12	"	19'-8"	A.688 b	
"	12	"	20'-3"	A.689 b	
"	12	"	20'-10"	A.690 b	
"	12	"	21'-4"	A.691 b	
"	12	"	21'-9"	A.692 b	
"	60	"	14'-0"	C.546	
"	12	"	41'-4"	C.561	
"	12	"	33'-8"	C.562	
"	12	"	37'-6"	C.563	
"	12	"	28'-0"	C.564	
"	12	"	83'9"	C.565	
"	12	"	21'-11"	C.566	
"	12	"	30'-0"	C.567	
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"	3	"	16'-7"	A.761 b	
"	3	"	16'-7"	A.762 b	
"	3	"	16'-7"	A.763 b	
"	3	"	16'-7"	A.764 b	
"	3	"	16'-7"	A.765 b	
"	3	"	16'-7"	A.766 b	
"	3	"	16'-7"	A.767 b	
"	3	"	16'-7"	A.768 b	
"	3	"	16'-7"	A.769 b	
"	3	"	16'-7"	A.770 b	
"	3	"	16'-7"	A.771 b	
"	3	"	20'-01"	A.772 b	
"	3	"	19'-10"	A.773 b	
"	3	"	19'-10"	A.774 b	
"	3	"	19'-8"	A.775 b	
"	3	"	19'-6"	A.776 b	
"	3	"	19'-6"	A.777 b	
"	3	"	19'-4"	A.778 b	
"	3	"	19'-2"	A.779 b	
"	3	"	19'-0"	A.780 b	
"	49	5/8	23'-8"	A.560	
"	49	"	28'-10"	A.562	
"	49	"	11'-10"	A.561	
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CHECK SLAB (NOTE 3)	3/4	9	11'-10"	A.662	
" INTERIOR	15	"	12'-2"	A.663	
" (TOE)	10	"	12'-2"	A.664	
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"	2	"	24'-9"	A.763	
"	2	"	24'-0"	A.764	
"	2	"	23'-3"	A.765	
"	2	"	22'-6"	A.766	
"	2	"	21'-9"	A.767	
"	2	"	21'-0"	A.768	
"	2	"	20'-3"	A.769	
"	2	"	19'-6"	A.770	
"	2	"	18'-9"	A.771	
"	2	"	18'-0"	A.772	
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"	2	"	14'-3"	A.777	
"	2	"	13'-6"	A.778	
"	2	"	12'-9"	A.779	
"	2	"	12'-0"	A.780	
"	12	1¼	8'-0"	C.460	

NO	DETAILS COMPLETED	DATE	BY	APVD

BONNEVILLE POWER NAVIGATION PROJECT

13TH CONTRACT – CONCRETE

POWER HOUSE SUBSTRUCTURE & NAVIGATION LOCK

SHIP LOCK

LOWER GUIDE WALL DETAILS, GENERAL PLAN & RETAINING WALL

SCALES AS SHOWN

U. S. ENGINEER OFFICE, PORTLAND, OREGON DISTRICT

SUBMITTED: R.W. Mackenzie, ENGINEER — APPROVED: MAJOR, CORPS OF ENGINEERS

RECOMMENDED: HEAD ENGINEER — DRAWN BY L.D.H. TRACED BY L.D.H. DATE 9.28.34 CHECKED BY M.K.C.

NO	REVISION	DATE	BY	APVD

SHEET 6 OF 15 N-1-11

WAR DEPARTMENT

CORPS OF ENGINEERS, U.S. ARMY

PLAN
Scale 1"=20'

LONGITUDINAL SECTION 1-1
44'-6" South of Lock ℄ Scale 1"=20'

LONGITUDINAL SECTION 2-2
54' South of Lock ℄ Scale 1"=20'

LONGITUDINAL SECTION 3-3
64' South of Lock ℄ Scale 1"=20'

SECTION 4-4
STA. 14+43.5
Scale 1"=20'

SECTION 5-5
STA. 12+13
Scale 1"=20'

SECTION 6-6
STA. 13+05
Scale 1"=20'

SECTION 9-9
Scale 1"=10'

SECTION 10-10
Scale 1"=10'

SECTION 11-11
Scale 1"=10'

SECTION 13-13
Scale 1"=10'

GENERAL NOTES:
Elevations given for Suitable foundation & first allowable elevations.

No.	Details Completed	By	Date Appr.
6	Sta. 11+90 to Sta. 12+49 - North Wall	J.R.R.	11-23-37
5	Sta. 9+39.75 to Sta. 11+90 - North Wall	J.R.R.	11-23-37
4	Sta. 8+75 to Sta. 13+16 - South Wall	J.R.R.	11-23-37
3	East of Sta. 9+39.75 - North Wall	J.R.R.	11-23-37
2	East of Sta. 8+75 - South Wall	J.R.R.	11-23-37
1	Sta. 13+16 to Sta. 14+46	J.R.R.	10-23-37

No.	Revision	Date	By	Ck'd
5	Sta. 12+95.75 to 13+57 Culvert	1-28-38	J.R.R.	
4	Sta. 12+97 to 13+28.5 N. Wall	1-28-38	J.R.R.	
3	Fishway Details, Sta. 12+49 to Sta. 13+05. Miter Sill recess, Sta. 13+88 to Sta. 14+12. Culvert (South Wall) Sta. 12+99.5 to Sta. 13+28 as per Drawing N-3-408	1-5-38	J.R.R.	
3	Cable Out of Fishway Excavation Sta. 12+95 to Sta. 13+05 North Wall	12-5-38	J.R.R.	
2	Buttress Exc. Sta. 10+50.5 to Sta. 10+66.5 North Wall	11-18-37	J.R.R.	
1	Culvert Excavation Sta. 13+57 to Sta. 14+23	11-9-37	J.R.R.	

BONNEVILLE POWER NAVIGATION PROJECT

13TH CONTRACT - EXCAVATION

POWER HOUSE SUBSTRUCTURE & NAVIGATION LOCK

SHIP LOCK

EXCAVATION DETAILS

SCALE AS SHOWN

U. S. ENGINEER OFFICE, PORTLAND, OREGON DISTRICT

SUBMITTED: K.B. Mackenzie, ENGINEER — APPROVED: Wm. D. Williams, MAJOR, CORPS OF ENGINEERS

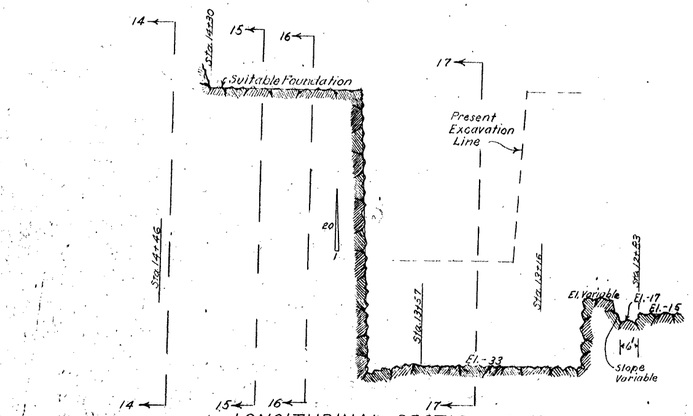
RECOMMENDED: HEAD ENGINEER — DRAWN BY J.R.R. DATE 10/8/37

TRACED BY J.R.R. CHECKED BY

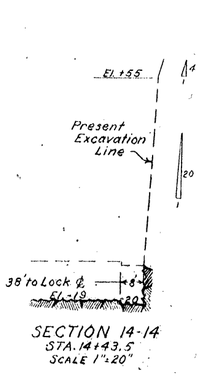
SHEET 1 OF N-1-14

WAR DEPARTMENT

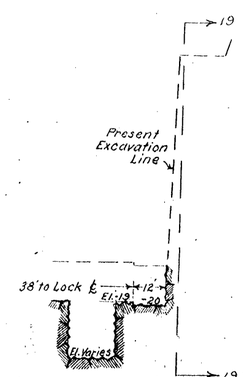
CORPS OF ENGINEERS, U.S. ARMY



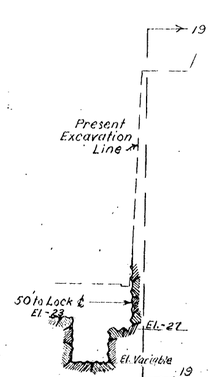
LONGITUDINAL SECTION 19-19
54' North of Lock ℄ SCALE: 1" = 20'



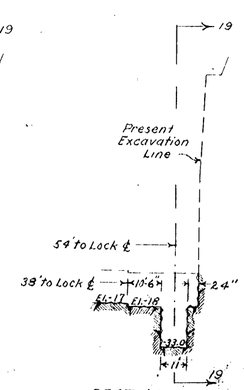
SECTION 14-14
STA. 14+43.5
SCALE 1" = 20'



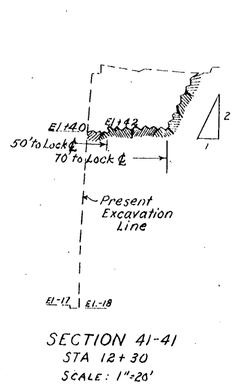
SECTION 15-15
STA. 14+12.5
SCALE 1" = 20'



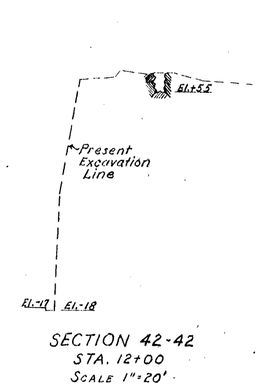
SECTION 16-16
STA. 13+95.5
SCALE: 1" = 20'



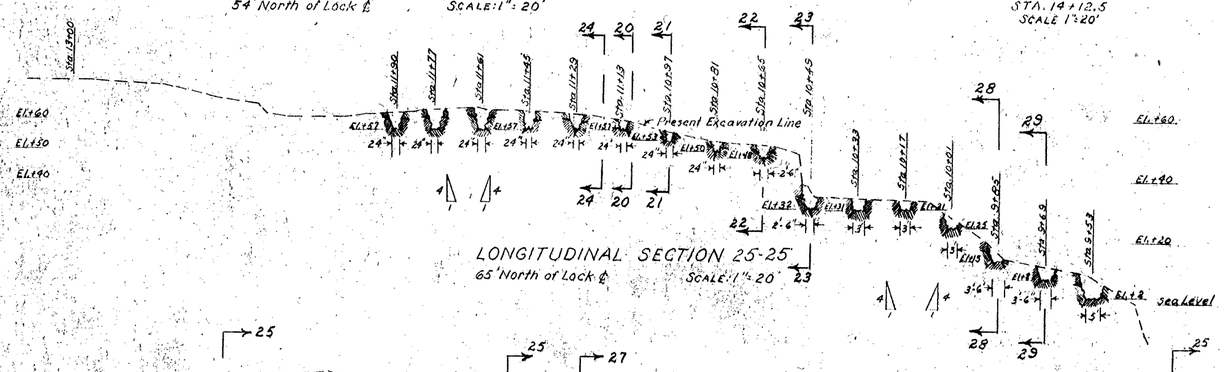
SECTION 17-17
STA. 13+38
SCALE: 1" = 20'



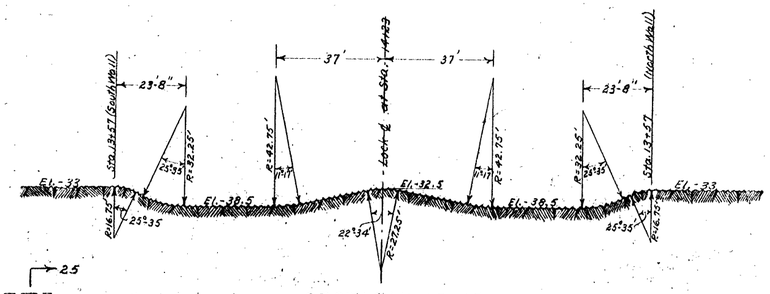
SECTION 41-41
STA 12+30
SCALE: 1" = 20'



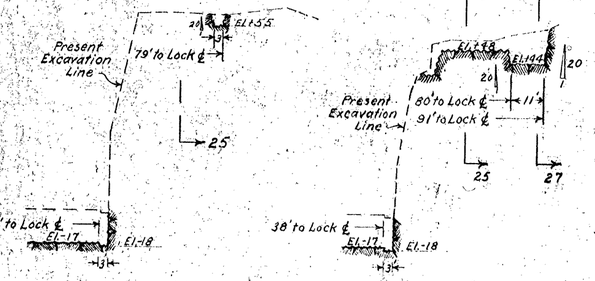
SECTION 42-42
STA. 12+00
SCALE 1" = 20'



LONGITUDINAL SECTION 25-25
65' North of Lock ℄ SCALE: 1" = 20'

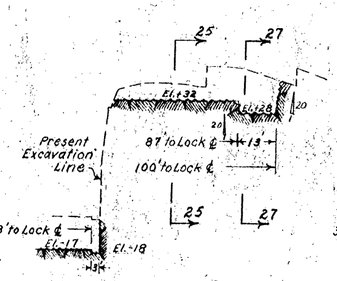


SECTION 18-18
STRAIGHT LINE PROFILE ALONG ℄ OF CULVERT STA. 13+25 TO STA. 14+23
SCALE: 1" = 20'

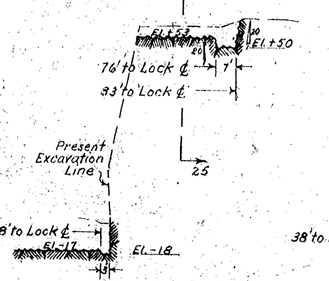


SECTION 20-20
STA. 11+10
SCALE: 1" = 20'

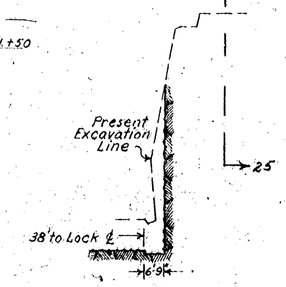
SECTION 22-22
STA. 10+65
SCALE: 1" = 20'



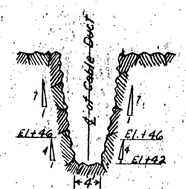
SECTION 23-23
STA. 10+49
SCALE: 1" = 20'



SECTION 21-21
STA. 10+97
SCALE 1" = 20'

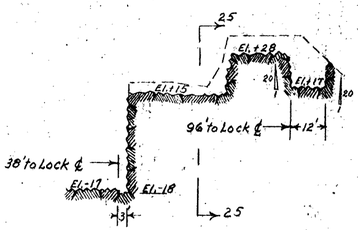


SECTION 24-24
STA. 11+20
SCALE: 1" = 20'

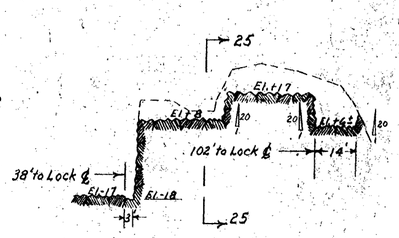


SECTION 43-43
SCALE: 1" = 10'

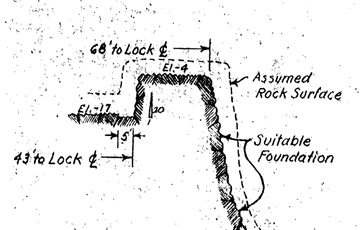
SECTION 27-27
89' North of Lock ℄
SCALE: 1" = 20'



SECTION 28-28
STA. 9+85
SCALE: 1" = 20'



SECTION 29-29
STA 9+69
SCALE: 1" = 20'



SECTION 30-30
STA. 9+37
SCALE 1" = 20'

No.	Details Completed	By	Date	Appr.
6	Sta. 11+90 to Sta. 12+49 - North Wall	J.R.R.	11-29-34	RLMcK
5	Sta 9+39.75 to Sta 11+90 - North Wall	J.R.R.	11-29-34	RLMcK
4	Sta: 8+75 to Sta. 13+16 - South Wall	J.R.R.	11-29-34	RLMcK
3.	East of Sta. 9+39.75 - North Wall	J.R.R.	11-7-34	RLMcK
2.	East of Sta. 8+75 - South Wall	J.R.R.	11-7-34	RLMcK
1.	Sta. 13+16 to Sta. 14+46	J.R.R.	9-15-34	RLMcK

No.	Revision	Date	By	Apv'd
6	Section 18-18 Revised	1-28-35	J.R.R.	RLMcK
5	Section 19-19 Revised	1-24-35	J.R.R.	RLMcK
4	Section 16-16 Revised	1-8-35	J.R.R.	RLMcK
3	Cable Duct & Roadway Excav. Sta 12+15 to Sta. 13+05 - North Wall	12-5-34	J.R.R.	RLMcK
2	Buttress Exc. Sta. 10+50.5 to Sta. 10+66.5 - North Wall	11-28-34	J.R.R.	RLMcK
1	Culvert Excavation Sta. 13+57 to Sta. 14+23	11-9-34	J.R.R.	C.I.G.

BONNEVILLE POWER NAVIGATION PROJECT

13TH CONTRACT - EXCAVATION

POWER HOUSE SUBSTRUCTURE & NAVIGATION LOCK

SHIP LOCK EXCAVATION DETAILS

SCALE AS SHOWN

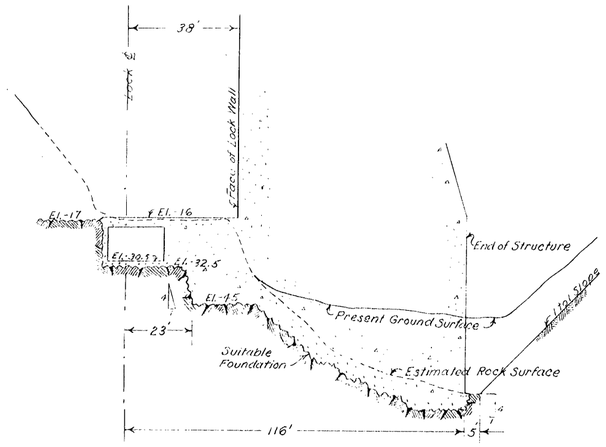
U. S. ENGINEER OFFICE PORTLAND, OREGON DISTRICT

SUBMITTED: R.L. MacKenzie, ENGINEER — APPROVED: Hal Williams, MAJOR, CORPS OF ENGINEERS

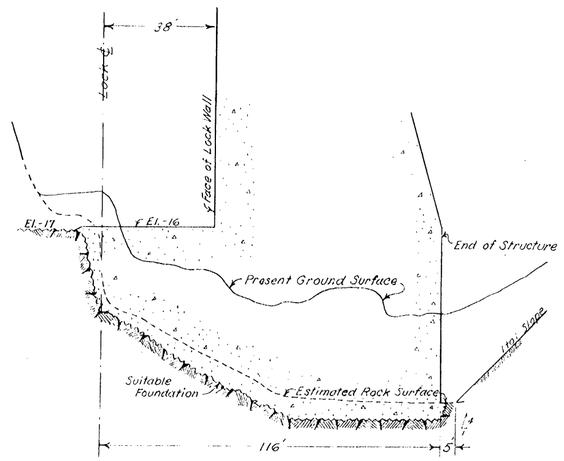
RECOMMENDED: Emil Schram, HEAD ENGINEER

DRAWN BY J.R.R. DATE 11/9/34 — TRACED BY J.R.R. CHECKED BY RLMcK

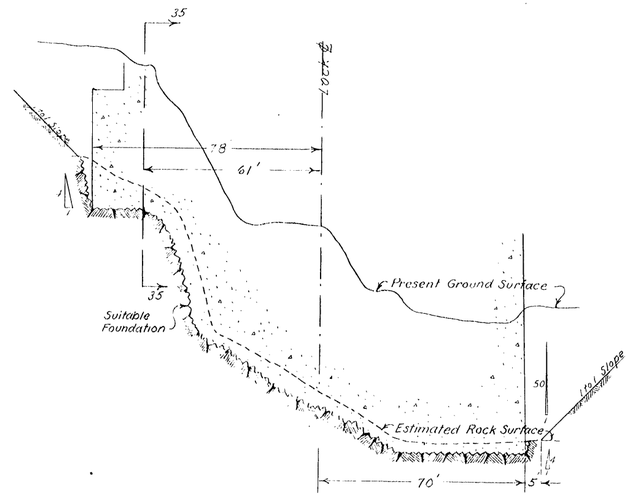
SHEET 2 OF N-1-14



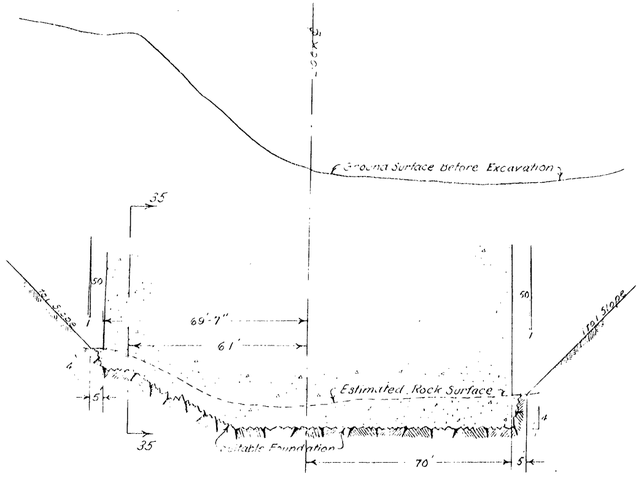
SECTION 31-31
SCALE: 1"=20'



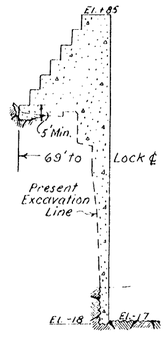
SECTION 32-32
SCALE: 1"=20'



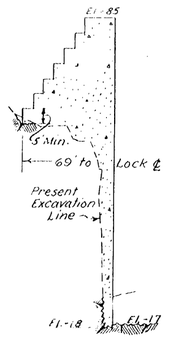
SECTION 33-33
SCALE: 1"=20'



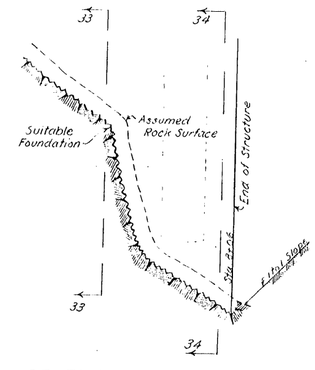
SECTION 34-34
SCALE: 1"=20'



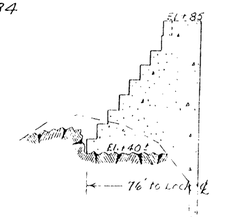
SECTION 40-40
SCALE: 1"=20'
Sta. 13+00



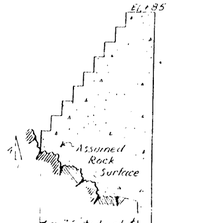
SECTION 39-39
SCALE: 1"=20'
Sta. 10+90



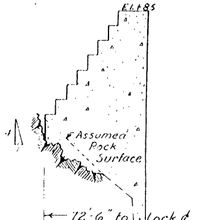
SECTION 35-35
SCALE 1"=20'



SECTION 36-36
SCALE



SECTION 37-37
Sta. 9+50
SCALE 1"=20



SECTION 38-38
Sta. 9+80
SCALE 1"=20

No.	Details Completed	By	Date Appr.
6	Sta. 11+90 to Sta. 12+49 - North Wall	J.R.R.	11-23-38
5	Sta. 9+39.75 to Sta. 11+90 - North Wall	J.R.R.	11-23-38
4	Sta. 8+75 to Sta. 13+16 - South Wall	J.R.R.	11-23-38
3	East of Sta. 9+39.75 North Wall	J.R.R.	11-23-38
2	East of Sta. 8+75 South Wall	J.R.R.	11-23-38
1	Sta. 13+16 to Sta. 14+46	J.R.R.	11-23-38

BONNEVILLE POWER NAVIGATION PROJECT

13th CONTRACT - EXCAVATION

POWER HOUSE SUBSTRUCTURE & NAVIGATION LOCK

SHIP LOCK

EXCAVATION DETAILS

SCALE AS SHOWN

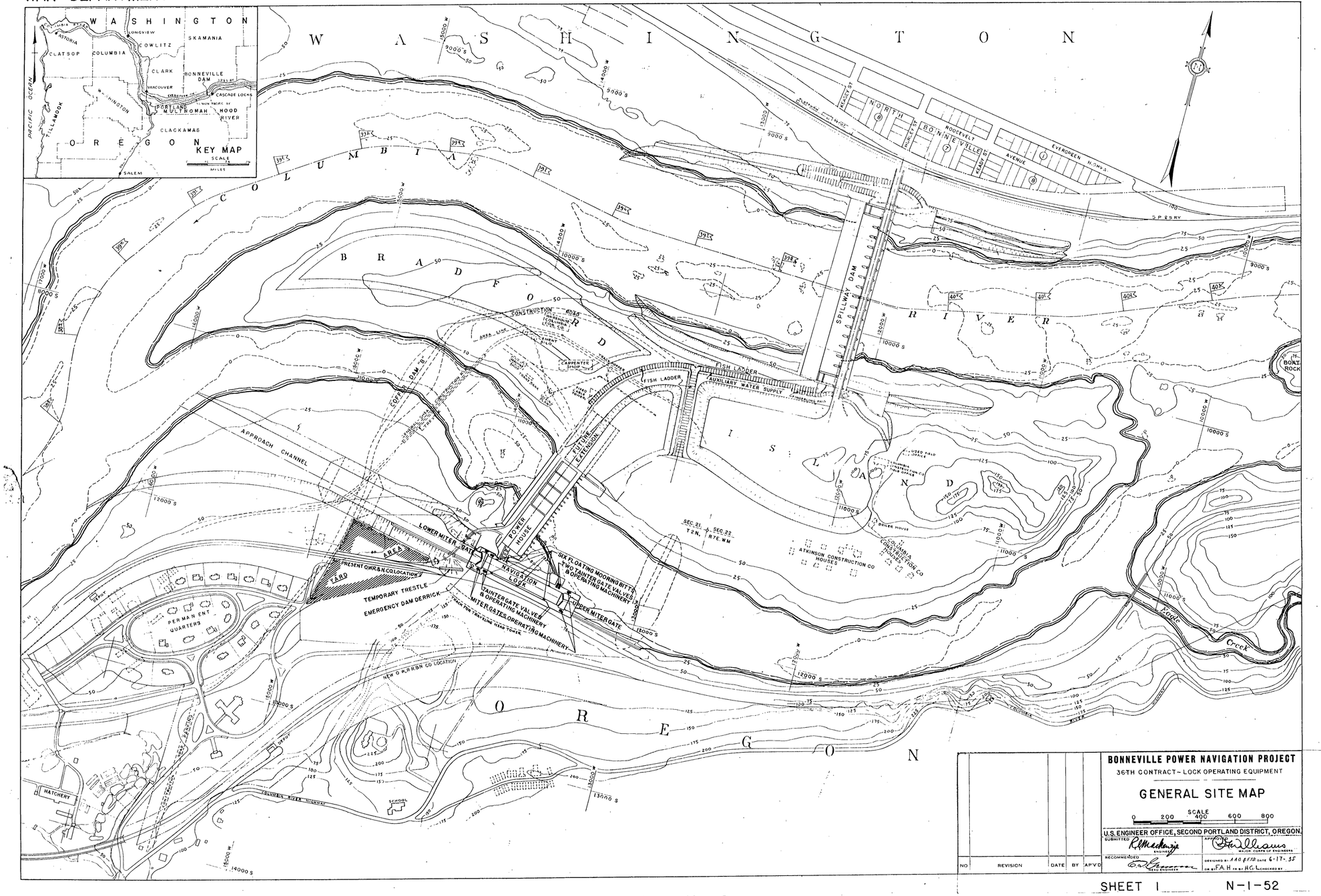
U. S. ENGINEER OFFICE PORTLAND, OREGON, DISTRICT

SUBMITTED: Roy Mackenzie, ENGINEER — APPROVED: Chas. D. Wilson, MAJOR, CORPS OF ENGINEERS

RECOMMENDED: HEAD OF SECTION — DRAWN BY: J. R. R. — TRACED BY: — DATE 11-7-38 — CHECKED BY:

WAR DEPARTMENT

CORPS OF ENGINEERS U.S. ARMY



NO	REVISION	DATE	BY	APV'D

BONNEVILLE POWER NAVIGATION PROJECT

36TH CONTRACT - LOCK OPERATING EQUIPMENT

GENERAL SITE MAP

SCALE 0 200 400 600 800

U.S. ENGINEER OFFICE, SECOND PORTLAND DISTRICT, OREGON.

SUBMITTED R.H. Mackenzie ENGINEER

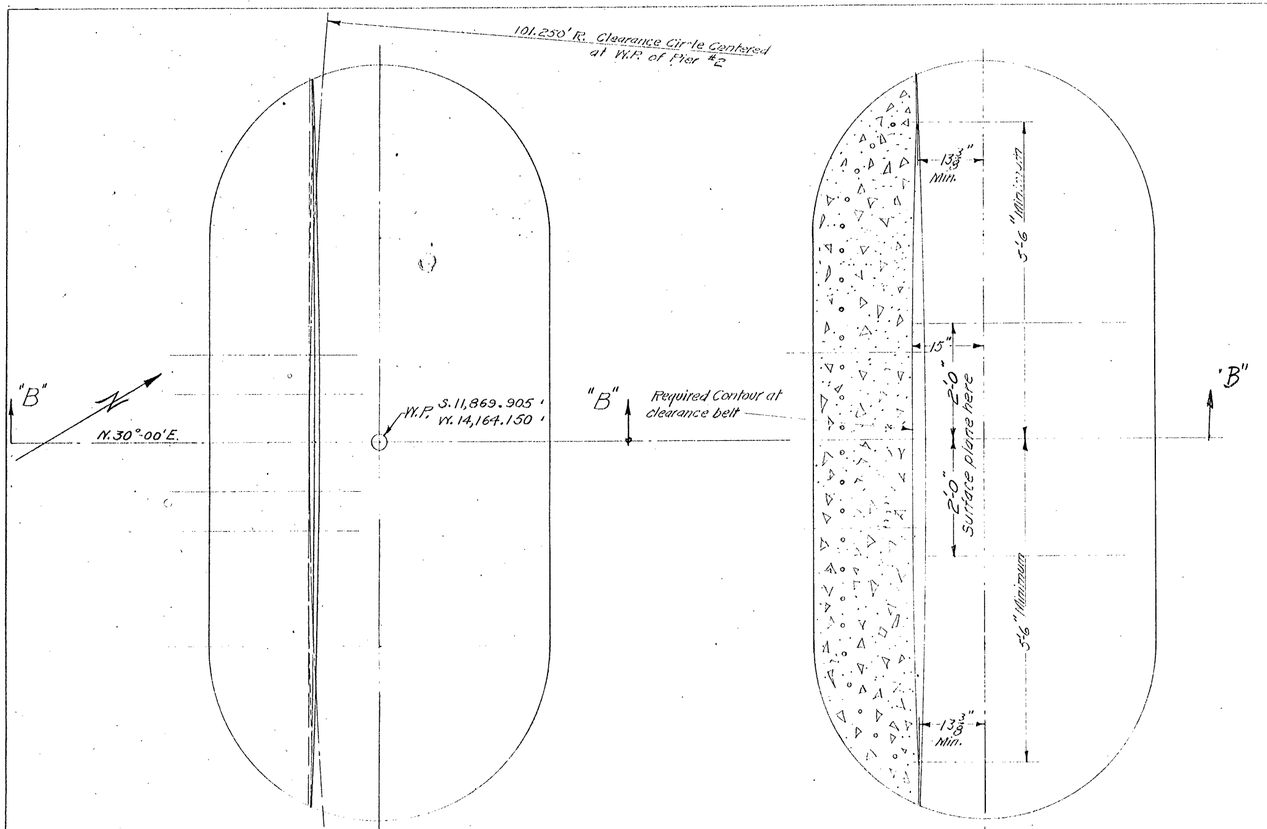
APPROVED Ed Williams MAJOR CORPS OF ENGINEERS

RECOMMENDED [signature] HEAD ENGINEER

DESIGNED BY AAG & FIB DATE 6-17-55

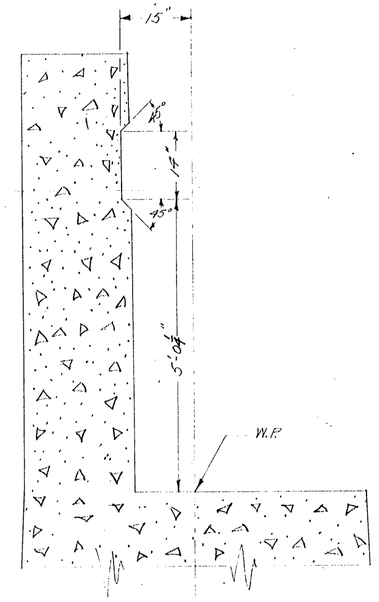
DR BY F.A.H. CH BY H.G.L. CHECKED BY

SHEET 1 N-1-52

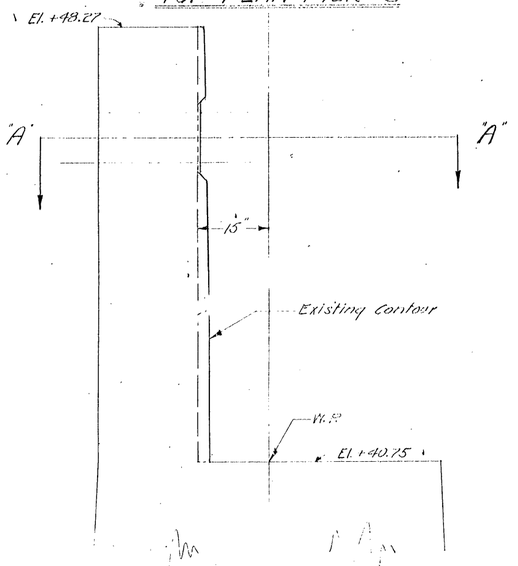


TOP PLAN PIER #3

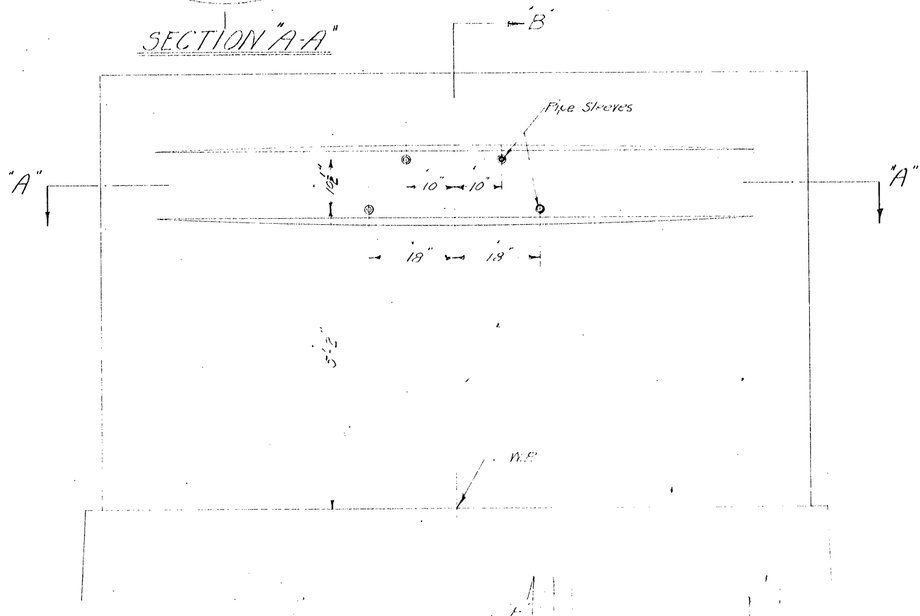
SECTION "A-A"



SECTION "B-B"



SIDE ELEVATION



END ELEVATION

General Notes:

The northerly plane surface of Pier No. 3 extending above elevation +40.75 is sufficiently distorted to encroach upon the required clearance for installation of the Latch Casting for the Swing Span centering latch.

To permit installation and proper functioning of the latch casting and associated mechanism it is required that the encroaching surface be chipped to provide a clearance belt as indicated.

The chipped surfaces are to be grouted for finish.

The embedded pipe sleeves are to be trimmed flush with the surface of the clearance belt, and the accessory threads are to be checked for length of threaded portion and rechased if necessary.

References:

For basic dimensions and co-ordinates of Warning Points see Drawings N-1-11 Sheet 8, and N-2-61 Sheet 11.

BONNEVILLE POWER NAVIGATION PROJECT

13 TH CONTRACT - CONCRETE.

POWER HOUSE SUBSTRUCTURE & NAVIGATION LOCK

SHIP LOCK - SWING BRIDGE

CORRECTIONS TO PIER Nº 3

SCALE 3/4" = 1'-0"

U S ENGINEER OFFICE, PORTLAND, OREGON DISTRICT

SUBMITTED R.E. Mackenzie ENGINEER

APPROVED [illegible] MAJOR, CORPS OF ENGINEERS

RECOMMENDED [illegible] HEAD ENGINEER

DRAWN BY: H.G.L. DATE 4-3-35

TRACED BY H.G.L. CHECKED [illegible]

WAR DEPARTMENT

CORPS OF ENGINEERS U.S. ARMY

Log of Test Pits

Log of Borings, Continued

NOTE: Logs of additional drill holes may be seen at the office

BRADFORD ISLAND

FLOW

TRUE NORTH

DISPOSAL AREA

SLOUGH

UNION PACIFIC SYSTEM MAIN TRACK

BONNEVILLE POWER-NAVIGATION PROJECT
CONSTRUCTION EXCAVATION AND ROADWAY
FOR POWERHOUSE AND LOCK

GENERAL PLAN

5th CONTRACT

U.S. ENGINEER OFFICE, PORTLAND, OREGON, DISTRICT

SUBMITTED | APPROVED

ENGINEER | MAJOR, CORPS OF ENGINEERS, U.S.A.

PRINCIPAL ENGINEER

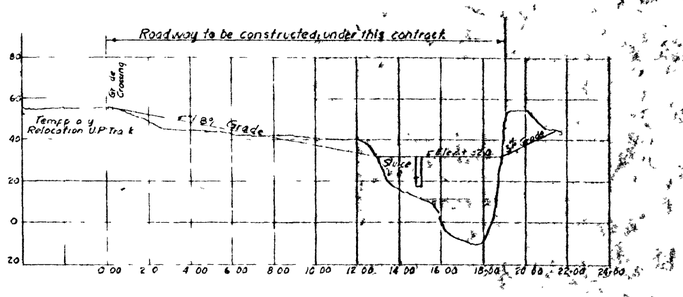
SCALE 1"=100' | JULY 25, 1934

DRAWN BY G.A.D. | CHECKED BY

SUBJECT NO. N-2-10

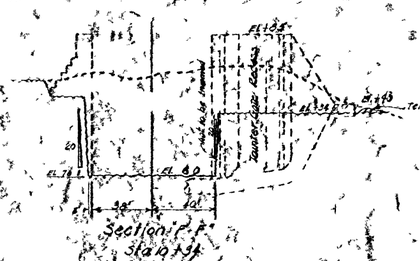
WAR DEPARTMENT

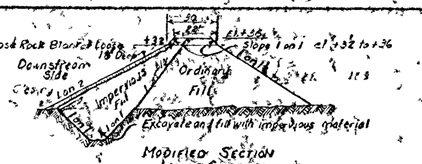
CORPS OF ENGINEERS, U.S. ARMY



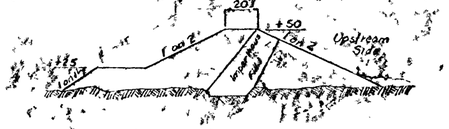
ROADWAY PROFILE

Scale 1" 30' Vertical
1" 300' Horizontal

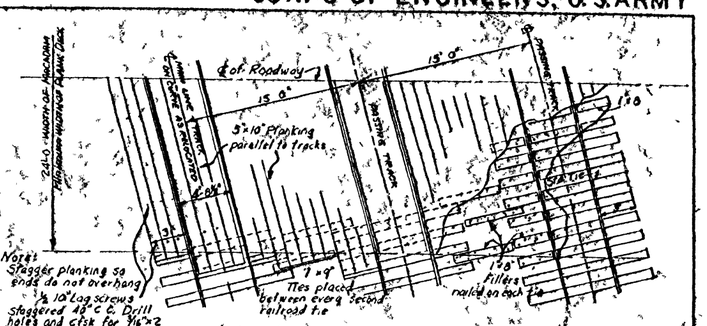




MODIFIED SECTION
LOWER COFFERDAM
Scale 1"=40'

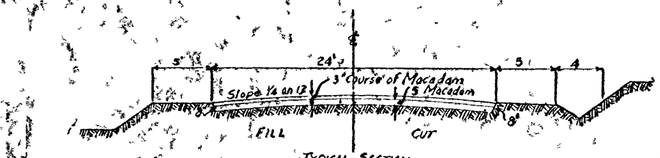


MODIFIED SECTION
UPPER COFFERDAM
Scale 1"=40'

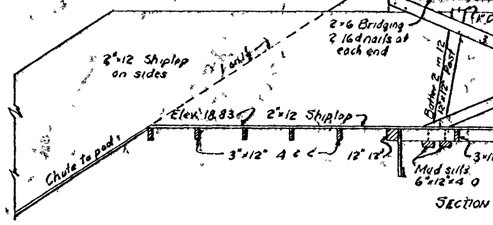


HALF PLAN OF GRADE CROSSING
Scale 3/16"=1'-0"

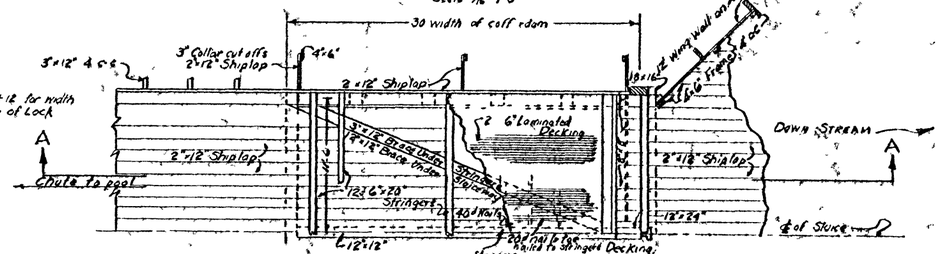
TYPICAL SECTION THRU GRADE CROSSING
Scale 3/4"=1'-0



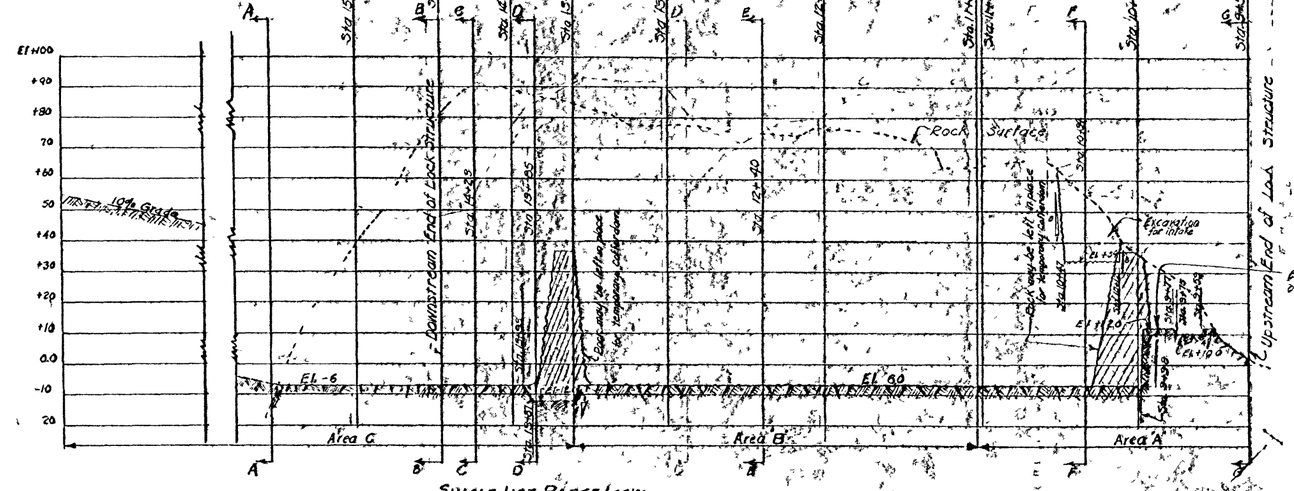
TYPICAL SECTION OF ROAD
Scale 3/16"=1'-0"



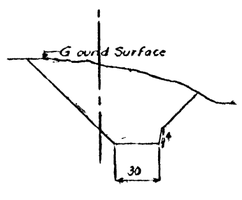
SECTION A A THRU SLUICEWAY
Scale 3/16" 1'-0"



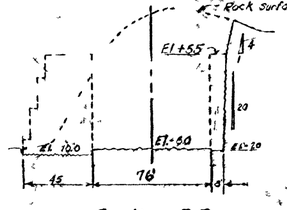
HALF PLAN OF SLUICEWAY
Scale 3/16" 1'-0"



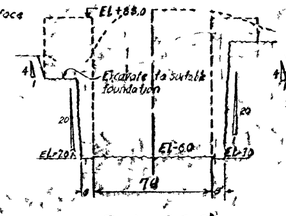
SINGLE LIFT BARGE LOCK
Longitudinal Section on ℄ of Lock
Scale 1"=20' Vertical
1"=40' Horizontal



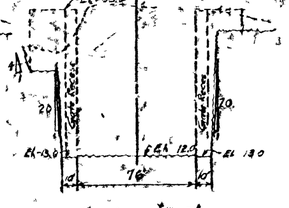
Section A A
Scale 1"=40'



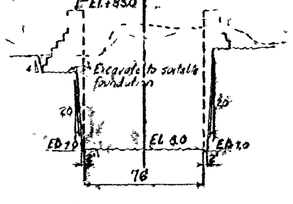
Section-B-B
Sta 14+46



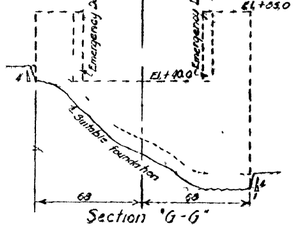
Section-C-C
Sta. 14+23



Section-D-D
Sta 13+85

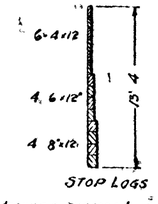


Section-E-E
Sta 12+40



Section "G-G"
Sta 9+50

Note
Stringers dapped to make 1" crown in deck.



STOP LOGS

Note This drawing supersedes No N 2-5

BONNEVILLE POWER-NAVIGATION-PROJECT
COFFERDAMS, EXCAVATION, AND ROADWAY FOR POWER HOUSE AND LOCK.

LOCK EXCAVATION, COFFERDAM & ROADWAY DETAILS 5TH CONTRACT

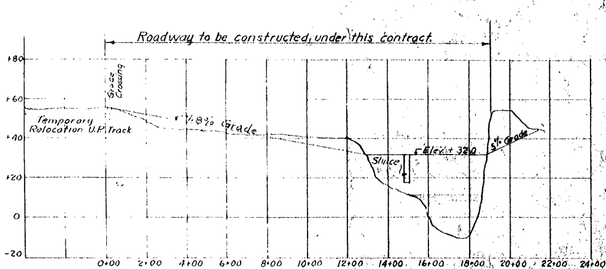
US ENGINEER OFFICE, PORTLAND, OREGON DISTRICT

Change	Revision	Date	Checked
2	Cofferdam Details, Longitudinal Section, Section A A & Section G-G Added	4-28-36	R.D.M.
1	Revised Sluice & Dimension for Excavation Fill in Upper Cofferdam & Location of Upper Cofferdam	1-7-36	R.D.M.

Submitted: R.D. Mackenzie, Engineer
Approved: Chas. H. Williams, Major Corps of Engineers U.S.A.
Recommended: [illegible], Engineer
Scale: As shown. Date: JAN 22 1934
Drawn by: R.S.D. Checked by: F.E.M.

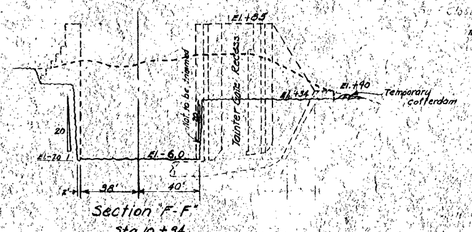
SHEET 3 OF 3 N-2-10

WAR DEPARTMENT — CORPS OF ENGINEERS, U.S. ARMY.

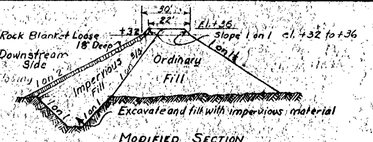


ROADWAY PROFILE

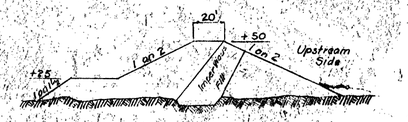
Scale: 1"=30' Vertical
1"=300' Horizontal



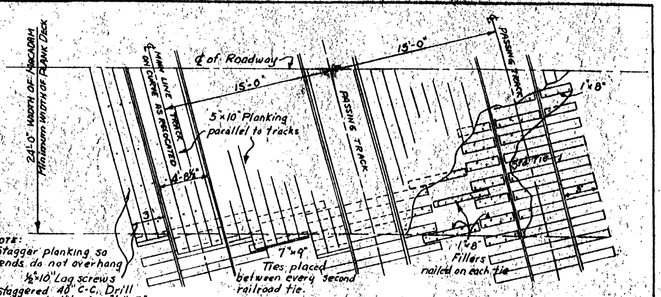
Section "F-F"
Sta. 10+94



MODIFIED SECTION
LOWER COFFERDAM
Scale: 1"=40'

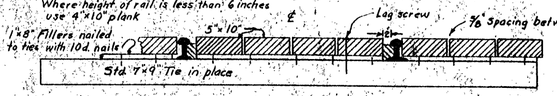


MODIFIED SECTION
UPPER COFFERDAM
Scale: 1"=40'

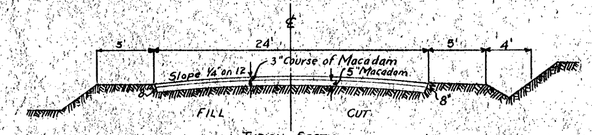


HALF PLAN OF GRADE CROSSING
Scale: ⅜"=1'-0"

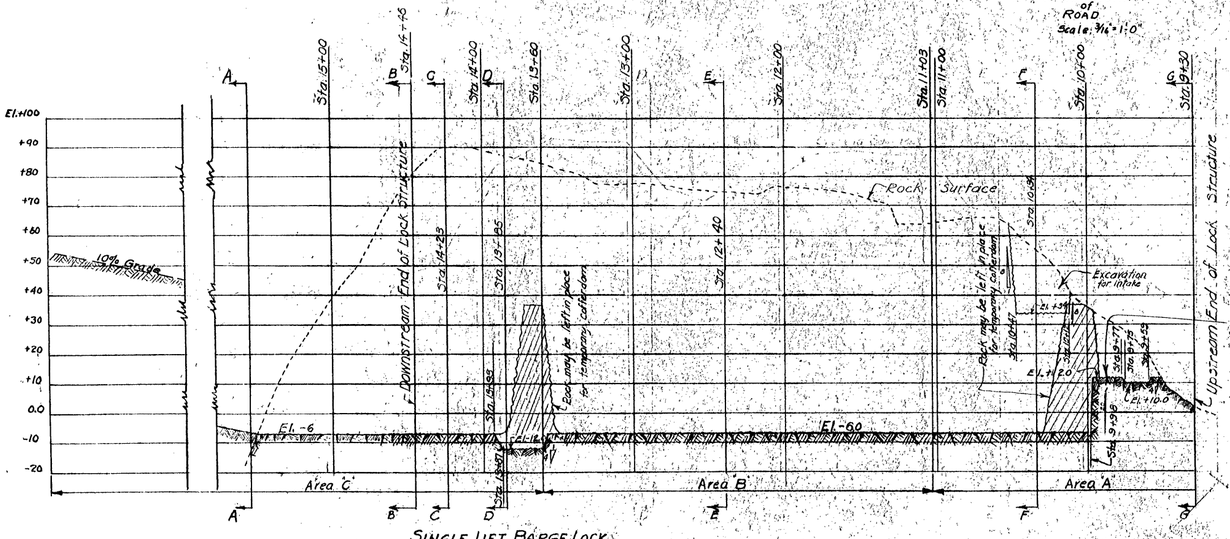
Note: Where height of rail is less than 6 inches use 4"x10" plank



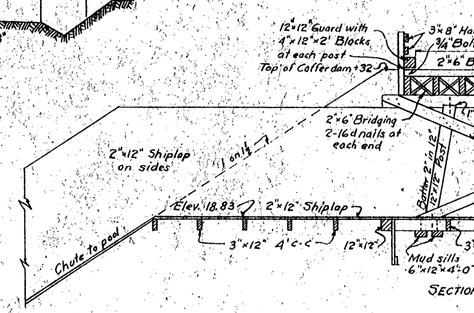
TYPICAL SECTION THRU GRADE CROSSING
Scale: ¾"=1'-0"



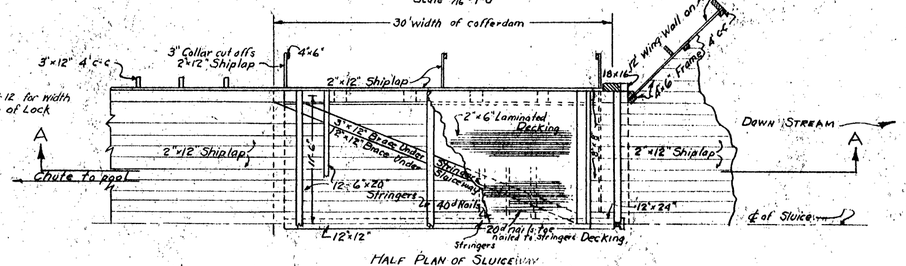
TYPICAL SECTION OF ROAD
Scale: ¾"=1'-0"



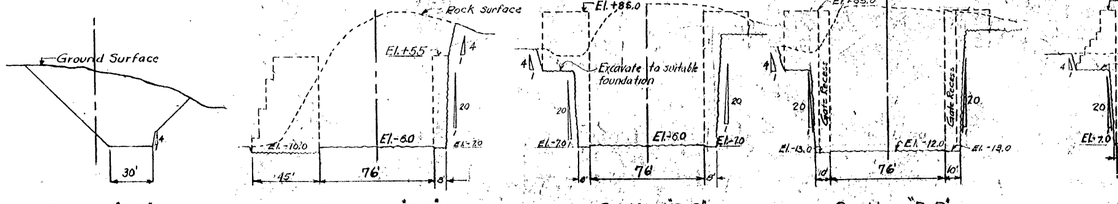
SINGLE LIFT BARGE LOCK
Longitudinal Section on ℄ of Lock
Scale: 1"=20' Vertical
1"=40' Horizontal



SECTION A-A THRU SLUICEWAY
Scale ⅜"=1'-0"



HALF PLAN OF SLUICEWAY
Scale: ⅜"=1'-0"



Section "A-A"
Scale: 1"=40'

Section "B-B"
Sta. 14+46

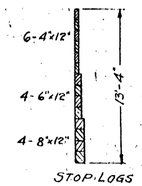
Section "C-C"
Sta. 14+29

Section "D-D"
Sta. 13+85

Section "E-E"
Sta. 12+40

Section "G-G"
Sta. 9+30

Note: Stringers dapped to make 1" crown in deck.



STOP-LOGS

Note: This drawing supersedes No. N-2-5

BONNEVILLE POWER-NAVIGATION PROJECT
COFFERDAMS, EXCAVATION, AND ROADWAY FOR POWER HOUSE AND LOCK.

LOCK EXCAVATION, COFFERDAM & ROADWAY DETAILS.

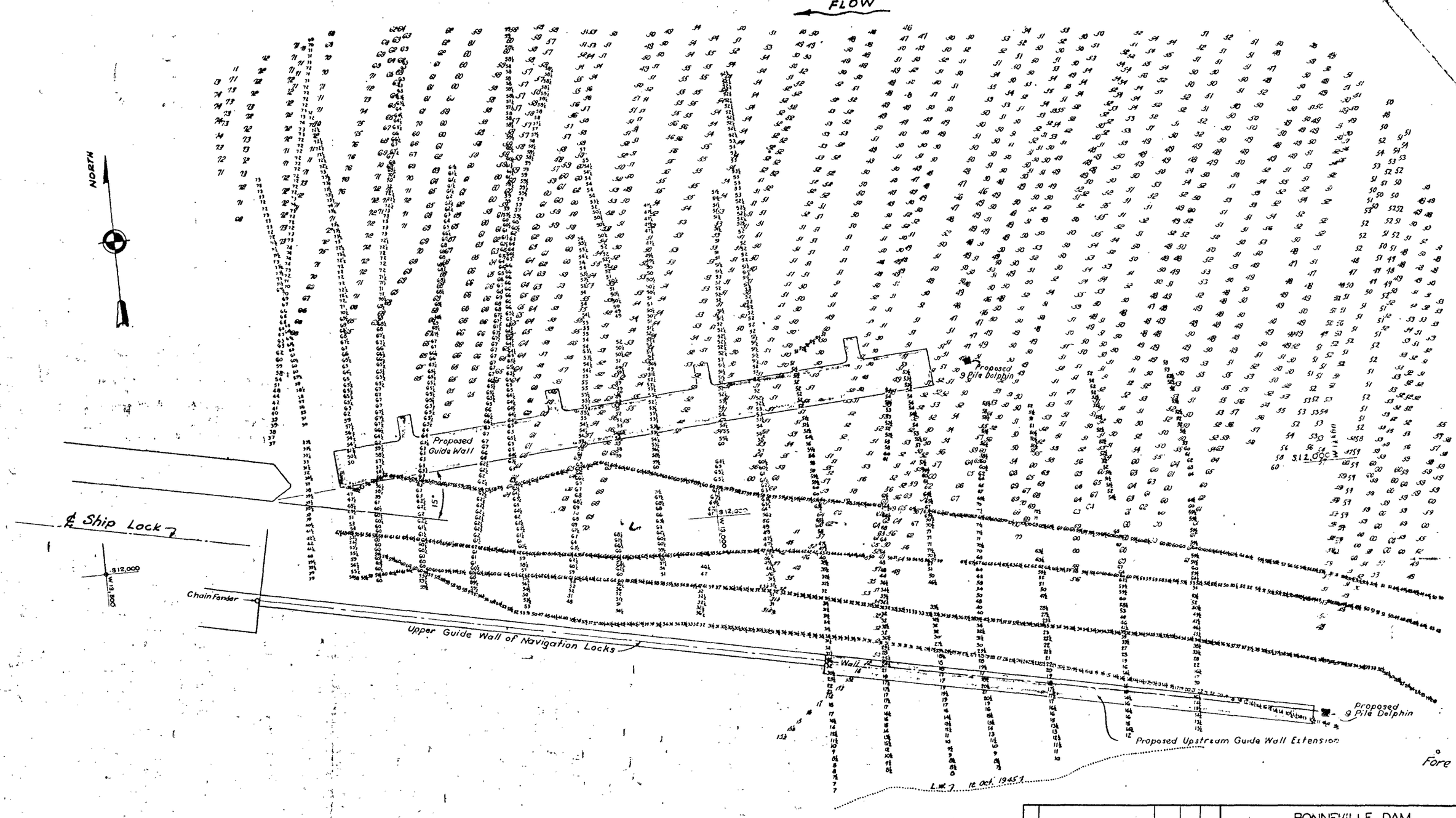
5TH CONTRACT

US ENGINEER OFFICE, PORTLAND, OREGON DISTRICT

CHANGE	REVISION	CHECKED
2	Changed Cofferdams Longitudinal Sec. Sta. 7 Sections A-C, D-E & F-G to Sta. 7+8	4-9-31 R.E.M.
1	Removed Slopes & Dimension for Impervious Fill in Typical Sections of Lower & Upper Cofferdams & Cut off Trench	R.E.M.

SUBMITTED: K.D. Mackenzie, ENGINEER
APPROVED: H. Williams, MAJOR CORPS OF ENGINEERS U.S.A.
RECOMMENDED: [illegible], PRINCIPAL ENGINEER
SCALE AS SHOWN DATE JAN 22 1931
DRAWN BY R.S.D. CHECKED BY R.E.M.

SHEET 3 OF 3 N-2-10



Note

Soundings shown in small vertical figures are from 12 Oct. 1945 survey and from 4 Jan. 1946 survey. Others are from survey of 10 May 1943.

All soundings taken from El. +72.0

NO.	REVISION	DATE	BY	APP.

BONNEVILLE DAM
NAVIGATION LOCK
SOUNDINGS AT PROPOSED GUIDE WALL

SCALE 1:480

500 0 500 1000 FT

U.S. ENGINEER OFFICE, PORTLAND, OREGON, DISTRICT

SUPERVISED: ---------- SENIOR ENGINEER

APPROVED

SUBMITTED: ---------- PRINCIPAL ENGINEER

---------- COL. CORPS OF ENGINEERS DISTRICT ENGINEER

RECOMMENDED ---------- CHIEF ENGINEER

SURVEYED 20 Feb 46 DATE ---

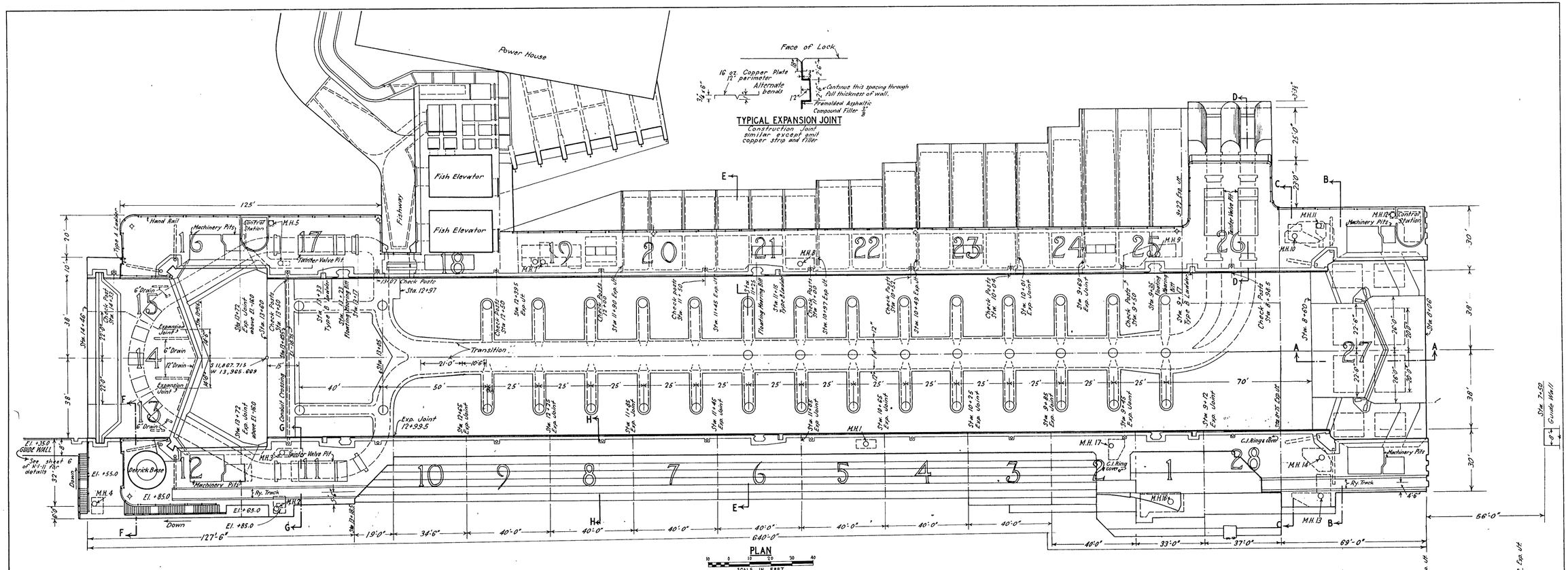
TRACED BY ---------- CHECKED BY ----

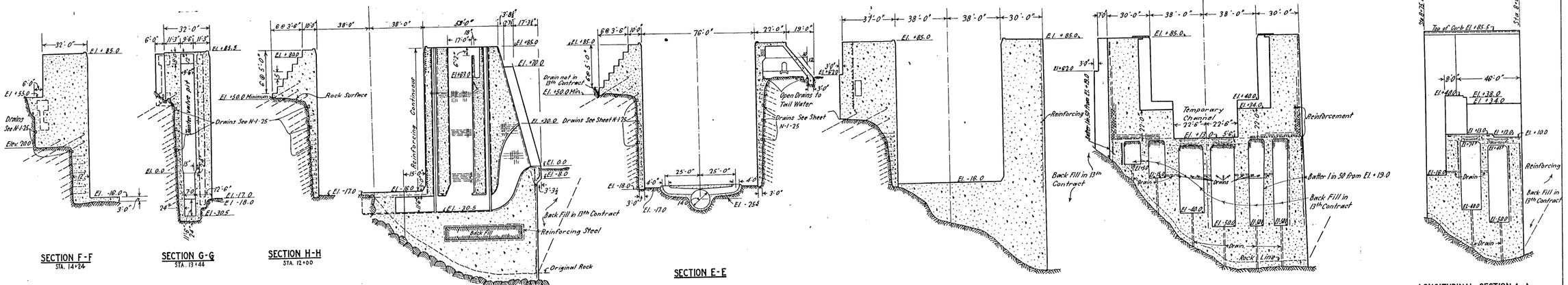
Incl 1 2

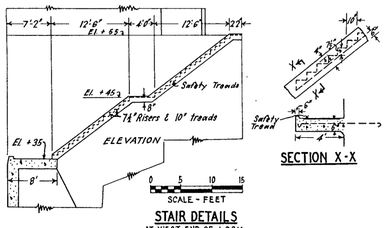
N-2-160

WAR DEPARTMENT

CORPS OF ENGINEERS U. S. ARMY







NO.	REVISION	DATE	BY	AP'V'D
3	Concrete Floor Added To Lower Gate Recess	3-12-40	F.H.R.	R.G.S.
	Revised & traced	5-11-35	J.S.W.	
2	Revised to date	12-17-34	J.S.W.	
1	Intake changed	9-20-34	O.A.D.	
1	Curb & batter added on walls	9-20-34	O.A.D.	
1	Sheet size, plan & details changed	9-20-34	O.A.D.	
1	Buttress section of lock wall changed	9-20-34	O.A.D.	

BONNEVILLE POWER NAVIGATION PROJECT

13TH CONTRACT — CONCRETE

POWER HOUSE SUBSTRUCTURE & NAVIGATION LOCK

SHIP LOCK

MASONRY PLAN & CROSS SECTIONS

SCALES AS SHOWN

U. S. ENGINEER OFFICE, PORTLAND, OREGON DISTRICT

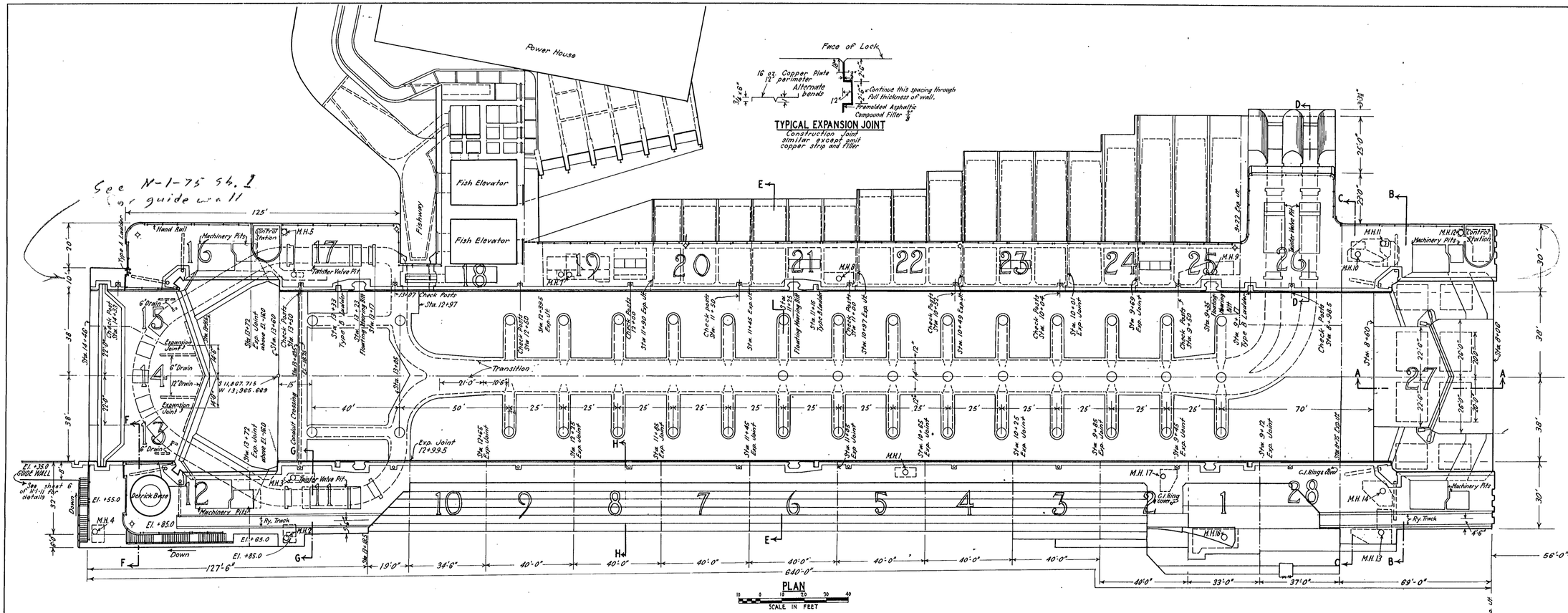
SUBMITTED R. L. Mackenzie, ENGINEER — APPROVED H. Williams, MAJOR, CORPS OF ENGINEERS

RECOMMENDED, HEAD ENGINEER — DESIGNED BY ..... DATE 8/23/35

DR. BY A.R.S. TR. BY J.S.W. CHECKED

This Drawing supercedes Drawing No. 3-N-1-11 dated 8/17/34.

SHEET 3 OF N-1-11



NO.	REVISION	DATE	BY	APV'D
3	Concrete Floor Added To Lower Gate Recess	5-22-40	F.H.R.	R.B.M.
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2	Revised to date	12-20-34	J.B.W.	
1	Intake changed	9-20-34	O.A.B.	
1	Curb & batter added on walls	9-20-34	O.A.B.	
1	Culvert size, plan & details changed	9-20-34	O.A.B.	
1	Buttress section of lock wall changed	9-20-34	O.A.B.	

BONNEVILLE POWER NAVIGATION PROJECT

13TH CONTRACT — CONCRETE

POWER HOUSE SUBSTRUCTURE & NAVIGATION LOCK

SHIP LOCK

MASONRY PLAN & CROSS SECTIONS

SCALES AS SHOWN

U. S. ENGINEER OFFICE, PORTLAND, OREGON DISTRICT

SUBMITTED R. L. Mackenzie, ENGINEER — APPROVED H. Williams, MAJOR, CORPS OF ENGINEERS

RECOMMENDED, HEAD ENGINEER — DESIGNED BY ..... DATE 7/22/35 — DR. BY ARS TR. BY J.B.W. CHECKED BY

This Drawing supercedes Drawing "3-N-1-11 dated 8/17/34

SHEET 3 OF N-1-11