LAKE PONTCHARTRAIN, LOUISIANA AND VICINITY

CHALMETTE AREA PLAN

BAYOU BIENVENUE CONTROL STRUCTURE

PERIODIC INSPECTION REPORT NO. 1

OCTOBER 1973

DEPARTMENT OF THE ARMY

NEW ORLEANS DISTRICT, CORPS OF ENGINEERS

NEW ORLEANS, LOUISIANA

LMVED-G (NOD 14 Mar 74) 3d Ind
SUBJECT: Flood Control, Mississippi River and Tributaries, Bayou Bienvenue Control Structure, Report No. 1, 31 October 1973

DA, Lower Mississippi Valley Division, Corps of Engineers, Vicksburg, Miss. 39180 18 Oct 74

TO: District Engineer, New Orleans, ATTN: LMNED-DG

Actions indicated in the previous indorsement are satisfactory.

FOR THE DIVISION ENGINEER:

Richard C. Ginsburg
for R. H. RESTA
Chief, Engineering Division

wd incl

CF:
HQDA (DAEN-CWE-B) w incl
& cy 2d Ind

ED-G

DEPARTMENT OF THE ARMY
NEW ORLEANS DISTRICT, CORPS OF ENGINEERS
P. O. BOX 60267
NEW ORLEANS, LOUISIANA 70160

IN REPLY REFER TO
LMNED-DG

14 March 1974

SUBJECT: Flood Control, Mississippi River and Tributaries, Bayou Bienvenue Control Structure, Report No. 1, 31 October 1973.

President
Mississippi River Commission
ATTN: LMVED-G

1. Periodic inspection report no. 1, in compliance with ER 1110-2-100, is submitted herewith for review and approval.

2. The submission of this report has been delayed because of the district effort in the current flood fight.

3. Approval of the report is recommended.

FOR THE DISTRICT ENGINEER

1 Incl (quad)
as

Walter S Mask
for JEROME C. BAEHR
Chief, Engineering Division

LMVED-G (NOD 14 Mar 74) 1st Ind
SUBJECT: Flood Control, Mississippi River and Tributaries, Bayou Bienvenue Control Structure, Report No. 1, 31 October 1973

DA, Mississippi River Commission, Corps of Engineers, Vicksburg, Miss. 39180 17 Apr 74

TO: District Engineer, New Orleans, ATTN: LMNED-DG

The periodic inspection report is approved subject to the following comments:

a. During the first periodic inspection of the Bayou Dupre Control Structure on 22 Feb 1974, it was found that the stiffeners for the vertical girder-horizontal rib connections on the gates were constructed in such a manner as to allow water to be trapped behind the stiffeners and it was planned to remedy this problem by drilling drainage holes through the plates. Recent telecon with Mr. Boyd of your General Engineering Section indicates this possible problem area will also be checked at the Bayou Bienvenue Control Structure and similar remedial action taken if required.

b. Minor annotations marked in red on pages II-1 and V-5 and Plates III-2, III-3, III-8 and III-9.

FOR THE PRESIDENT:

for Robert J Kaufman
R. H. RESTA
Chief, Engineering Division

1 Incl (dupe)
2 cy incl 1 wd

CF:
HQDA (DAEN-CWE-B) w cy incl
& bsc ltr

LMNED-DG (14 Mar 74) 2nd Ind
SUBJECT: Flood Control, Mississippi River and Tributaries, Bayou Bienvenue Control Structure, Report No. 1, 31 October 1973

DA, New Orleans District, Corps of Engineers, P. O. Box 60267, New Orleans, Louisiana 70160 10 October 1974

TO: Division Engineer, Lower Mississippi Valley, ATTN: LMVED-G

1. The problem of trapped water behind the stiffeners between the vertical girder and the horizontal rib connections was corrected during fabrication of the gates.

2. Revisions were made in the text, and the plates in Section III were renumbered (as per Bayou Dupre inspection report) to correct the minor annotations. Copies of the revised pages and plates are included herein for your files.

FOR THE DISTRICT ENGINEER:

Walter S Mask
for JEROME C. BAEHR
Chief, Engineering Division

2 Incl
wd incl 1
Added 2 incl (dupe)
2. Revised dwgs.
3. Revised sheets

LAKE PONTCHARTRAIN, LOUISIANA AND VICINITY

CHALMETTE AREA PLAN

BAYOU BIENVENUE CONTROL STRUCTURE

PERIODIC INSPECTION REPORT NO. 1

OCTOBER 1973

*Revised September 1974

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS

CORPS OF ENGINEERS

NEW ORLEANS, LOUISIANA

BAYOU BIENVENUE CONTROL STRUCTURE

CHECKLIST FOR PERIODIC INSPECTION

1. General. At the time of the inspection, the structure was dewatered and the entire structure was accessible for inspection. Construction of the structure had not yet been completed.

2. Checklist. The following checklist was used in conducting the inspection:

a. Reinforced concrete.

(1) Structural cracks (record location, size, and leakage).

(2) Exposed reinforcement.

(3) General condition of concrete surfaces (spalls, pop-outs, weathering, corrosion, stains).

(4) Condition of horizontal and vertical joints.

(5) Visual horizontal and vertical alinement of walls.

(6) Evidence of structure damage.

b. Gates.

(1) Evidence of difficulty in opening and closing.

(2) Evidence of damage to skin plate, ribs, girders, framing, walkway, handrails.

(3) Condition of paint.

(4) Corrosion.

c. Operating Machinery.

(1) Adequacy of machinery to open and close gates.

(2) Condition of machinery and controls.

(3) Condition of generator (operated during the inspection).

d. Earthwork.

(1) Excavation slopes in approach channels (cracks, settlement, sloughing, erosion, and riprap deficiencies).

(2) Backfill behind walls.

e. Guide Walls and Fenders. General condition of timber and connections.

f. Engineering measuring devices.

(1) Condition of existing reference marks.

(2) Need for additional devices.

g. Safety provisions.

(1) Safety precautions for personnel.

(2) Need for additional safety precautions.

BAYOU BIENVENUE CONTROL STRUCTURE

PERIODIC INSPECTION REPORT NO. 1

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SECTION VI - CONCLUSIONS AND PROPOSED REMEDIAL ACTION

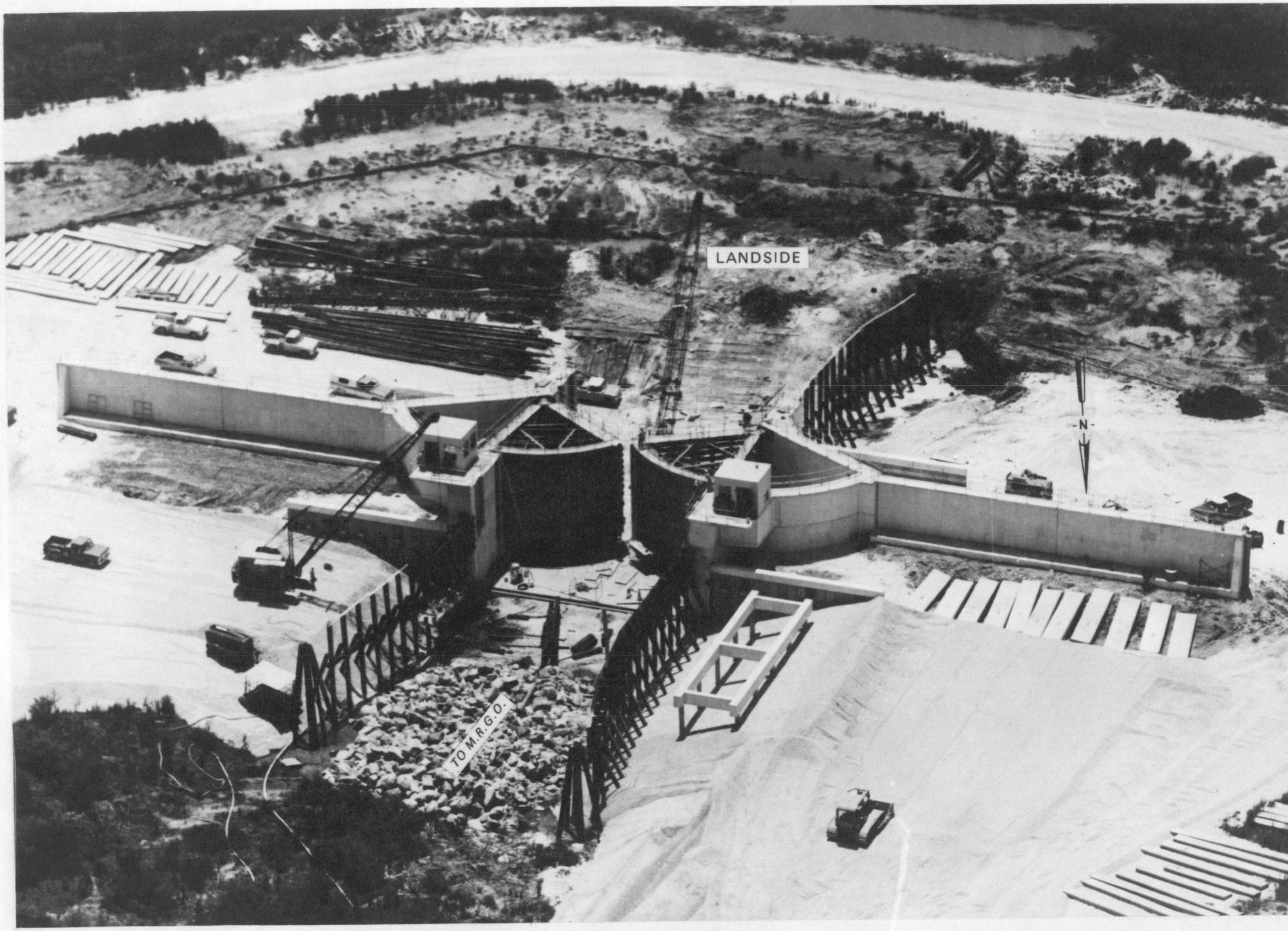

PHOTO TAKEN 8 AUGUST 1973

SECTION I - INTRODUCTION

1-01 Authority. Authority for this report is ER 1110-2-100, dated 26 February 1973, subject "Periodic Inspection and Continuing Evaluation of Completed Civil Works Structures."

1-02 Purpose and Scope. This report presents the results and conclusions of the initial inspection of the Bayou Bienvenue control structure conducted under the above referenced ER. The inspection was made near completion of construction before the structure was flooded.

1-03 Datum Plane. All elevations in connection with the control structure, unless otherwise specified, refer to feet mean sea level.

SECTION II - PROJECT DESCRIPTION AND BACKGROUND

2-01 Project Authorization. The Bayou Bienvenue control structure is a feature of the Chalmette Area Plan of the Lake Ponchartrain, Louisiana, and Vicinity hurricane protection project authorized by Public Law 298, 89th Congress, 1st Session, approved 27 October 1965. On 29 November 1966, it was recommended that the *approved plan of hurricane protection for the Chalmette area contained* in Design Memorandum No. 3, General Design, for Lake Pontchartrain, Louisiana and Vicinity, Chalmette Area Plan, be modified, under the discretionary authority of the Chief of Engineers, to provide for enlargement of the protected area by construction of a levee from the Mississippi River levee near Caernarvon, Louisiana to the vicinity of *Verret, Louisiana, thence to and along the Mississippi River-Gulf* Outlet (MR-GO) spoil bank to a junction with the approved plan levee at Bayou Lawler; and elimination of the levee in the approved plan from *Bayou Lawler to Violet. See Plates II-1 and I-1. This recommendation* was approved by OCE on 31 January 1967.

2-02 Purpose of Structure. Upon completion of the levees in the modified Chalmette Area Plan, the Bayou Bienvenue control structure will serve as part of the hurricane protection for the general area and will allow water traffic to proceed normally to and from the MR-GO via Bayou Bienvenue. In addition, the structure, together with the Bayou Dupre control structure, will provide drainage for the area

*Revised September 1974

inclosed by the levees. In addition to handling runoff from within the area, the Bayou Bienvenue Control structure will be required to pass drainage from the City of New Orleans.

2-03 Location. The structure is located at the eastern edge of Orleans Parish, Louisiana, near the intersection of Bayou Bienvenue and the MR-GO. The structure is located at station 367+60.25 on the MR-GO base line, approximately 400 feet west of the original intersection of * Bayou Bienvenue and the MR-GO. See plates II-1 and I-1. *

2-04 Local Interests. When construction of the structure is completed, the structure will be turned over to local interests for maintenance and operation in accordance with the conditions of local cooperation, as specified by the authorizing law.

2-05 Description. a. General. The Bayou Bienvenue control structure consists of a reinforced concrete sector gate bay supported on untreated timber piles, welded steel sector gates, treated timber guide walls, pile supported inverted "tee" and "I" type floodwalls connecting the gate bay to the earthen levee on each side, and access channels. See plates II-2 and II-3. The gate bay is 76 feet in length and has a channel width of 56 feet. The elevation of the top of the gates and floodwalls is 17.5 feet, and the sill is at -10.78 feet. The sector gates are operated by electric motors with provisions for manual operation.

b. Foundation. The gate bay structure is supported on untreated timber piling driven into the Pleistocene clays to a tip elevation of -67.0 as shown on plate no. II-7. The pilings were all driven on a batter of 4V on 1H to compensate for unbalanced lateral forces. Steel sheet pile cutoff walls are provided beneath the gate bay structure and

*Revised September 1974

beneath the inverted "tee" floodwall as shown on plates II-7 and II-21 to prevent piping beneath the structure in the event roofing occurs below the slab.

c. Gate bay. The gate bay was designed as a reinforced concrete "U" frame, 76 feet in length with a channel clearance of 56 feet as shown in plates II-8 thru II-14. The top of the gates, the gate bay walls and the inverted "tee" floodwalls are at elevation 17.5 and the sill is at -10.78 feet. The "I" floodwalls will be driven after the final levee lift is placed and the levee settlement has stabilized. Slots for the needle girder and needles have been provided so that the gate bay can be dewatered for repair or painting of the gates. At the ends of the gate bay there are concrete sheet pile wingwalls installed with tie backs to retain the adjacent backfill. See plate II-21. Two small control houses constructed of reinforced concrete are located above the machinery space on each side of the gate bay. Control House No. 1 contains the engine driven generator and the electrical switch gear. Both control houses contain the machinery for manual operation and control panels to start the generator and to operate the gate electrically from either side. Each leaf may be manually operated from its respective control house. See plates II-15 and II-16.

d. Dewatering. Dewatering of the gate bay is accomplished by the use of needle dams consisting of vertical reinforced concrete needles supported at the bottom in a slot in the base slab and at the top by a single span steel girder having two vertical supports to minimize bending and deflection due to the weight of the girder. One set of 2 girders and

22 needles have been fabricated and are stored atop a reinforced concrete rack located on the floodside of the Bayou Bienvenue control structure for dewatering that structure and the Bayou Dupre control structure. See Plates II-19 and II-20.

e. Sector Gates. The gates are steel sector type gates with welded connections. The gate consists of two identical gate leaves with a central angle of 60 degrees, with rubber seals at the bottom and both sides of the gates. The radius to the inside of the skin plate is 34 feet 7-5/16 inches and the height of the gate leaf is 28 feet 2-3/8 inches. Each leaf has two vertical trusses which carry the load to the hinge and pintle. See plates II-25 through II-33. Vertical dead load reaction is carried by the pintle alone. The operation of the gate leaves is by means of a pull cable storing on a cable drum, as shown on plate II-34. The cable centerline is 2 feet 6 inches below the top of the gate leaves and the operating machinery is mounted in the gate wall. The walkways mounted on top of the gates provide access across the gate bay.

f. Gate operating machinery. The operating machinery for the sector gates consists of drums and cable drives actuated either by electric motors or emergency hand cranks. Each gate leaf is provided with an electric motor (2HP, 460-volt, 3 Ø, 60 HZ, 1,800 RPM); a solenoid brake; a concentric shaft speed reducer with a 7.59:1 ratio; a parallel shaft speed reducer with a 657:1 ratio; limit switches; a cable drum attached to the output shaft of the parallel shaft speed reducer; wire rope and sheaves, as shown on plate II-34. Gate control panels are located adjacent to each gate leaf allowing the gate leaves to be operated individually or simultaneously from either side of the structure. Gate operating time is approximately 15 minutes for normal operation. See plate II-35 for control room plan.

g. Power generator. Electric power is furnished for gate operating and interior lighting by a diesel engine driven generator. The generator is rated at 15 KW (18.75 KVA @ .8pf, 480-volt, 3 Ø, 60 HZ). The power plant is a 4-cyliner, 4-stroke cycle, 120-cubic inch, radiator-cooled, diesel engine; and is rated at 30.4 HP at 1,800 RPM.

h. Floodwalls. There are two types of floodwalls constructed between the gate bay and the adjacent levees. An inverted "tee" floodwall commences at the gate bay wall and extends approximately 95 feet toward the levee on each side of the structure. The inverted "tee" type of floodwall consists of a pile-supported concrete base slab and stem, with a sheet pile cutoff wall. The "tee" wall is supported against settlement and overturning by battered, prestressed concrete piles with tip elevations at about -65.0. The "I" type floodwall will extend from the end of the "tee" wall to the levee on each side of the structure. The "I" wall will consist of prestressed concrete sheet pile with full length tongue and groove with plastic interlocks. The elevation of the top of the floodwall is 17.5 feet. A 4-foot wide concrete access walkway forms the top of the inverted "tee" floodwall. A walkway will also be constructed on top of the "I" floodwall. See plates II-5, II-6, II-21, II-22.

i. Concrete sheet pile wingwalls. Concrete sheet pile wingwalls were constructed on each end of the gate bay to retain earth and shell backfill at the entrance and exit of the gate chamber.

j. Timber guide walls. A timber guide wall 96 feet long has been constructed at each end of the gate bay and a timber fender 72 feet long has been constructed opposite each guide wall. The walls consist of treated timber piles, vertical and battered, and treated timber wales. A 7-pile timber dolphin is located at the end of each guide wall and fender. See plates II-5, II-6, and II-23.

k. Dock and loading ramp. The unloading dock is constructed of treated timbers on treated timber piles as shown on Plate II-24. The ramp from the dock to the top of the levee is shell.

l. Approach channels. Upon completion of all construction and placement of the shell blanket, riprap, derrick stone and shell backfill in the dry, the approach channels will be dredged to project depth by hydraulic dredge. See plates II-2 and II-3.

2-06 Gate Operating Criteria. The control structure gate will be closed when rising tides, in advance of an approaching hurricane, exceed elevation 2.0. The gates will be kept closed until such time as the tides in the MR-GO are equal to or lower than the water elevation on the landside and are falling.

2-07 Subsurface Conditions. The subsurface soils in the vicinity of the Bayou Bienvenue control structure are indicated in the log of boring B-1U and shown on plate no. II-4. From existing ground at elevation 5.5 to elevation about -8.0, the soil is a very soft, dark gray and dark brown clay with peat, wood and fine rootlets, and has a water content which ranges up to 310 percent. From elevation -8.0 to elevation -28.0 the stratum consists of soft to very soft gray clay with silt pockets, sandy silt pockets and shell fragments having a water content between 50 and 80 percent. From elevation -28.0 to elevation -35.0, there is a stratum of gray sand ranging from loose to dense. From elevation -35.0 to elevation -63.0 there is a soft to stiff gray clay with silt pockets and occasional small shell fragments. From elevation -63.0 (top of the Pleistocene) to elevation -78.0 (limit of boring), the soil consists of soft to medium gray clays, green clays with silt and sand lenses. See plates II-2 and II-4.

The upper soils, in general, at the control structure location have low shear strength, high sensitivity and are compressible, indicating the need for bearing piles under the gate structure.

2-08 Instrumentation. a. Settlement. Permanent settlement reference marks have been placed on the top of the gate bay structure and the floodwalls as shown on plate II-5. The initial elevation of each reference mark was determined when the structure was completed. Observations will be made quarterly for the first 2 years after completion of the structure and annually thereafter.

b. Scour survey. Scour surveys will be made in the approach channels at each end of the structure at the same time the settlement measurements are made until it has been determined that the channel bottom has become stabilized.

BAYOU BIENVENUE CONTROL STRUCTURE

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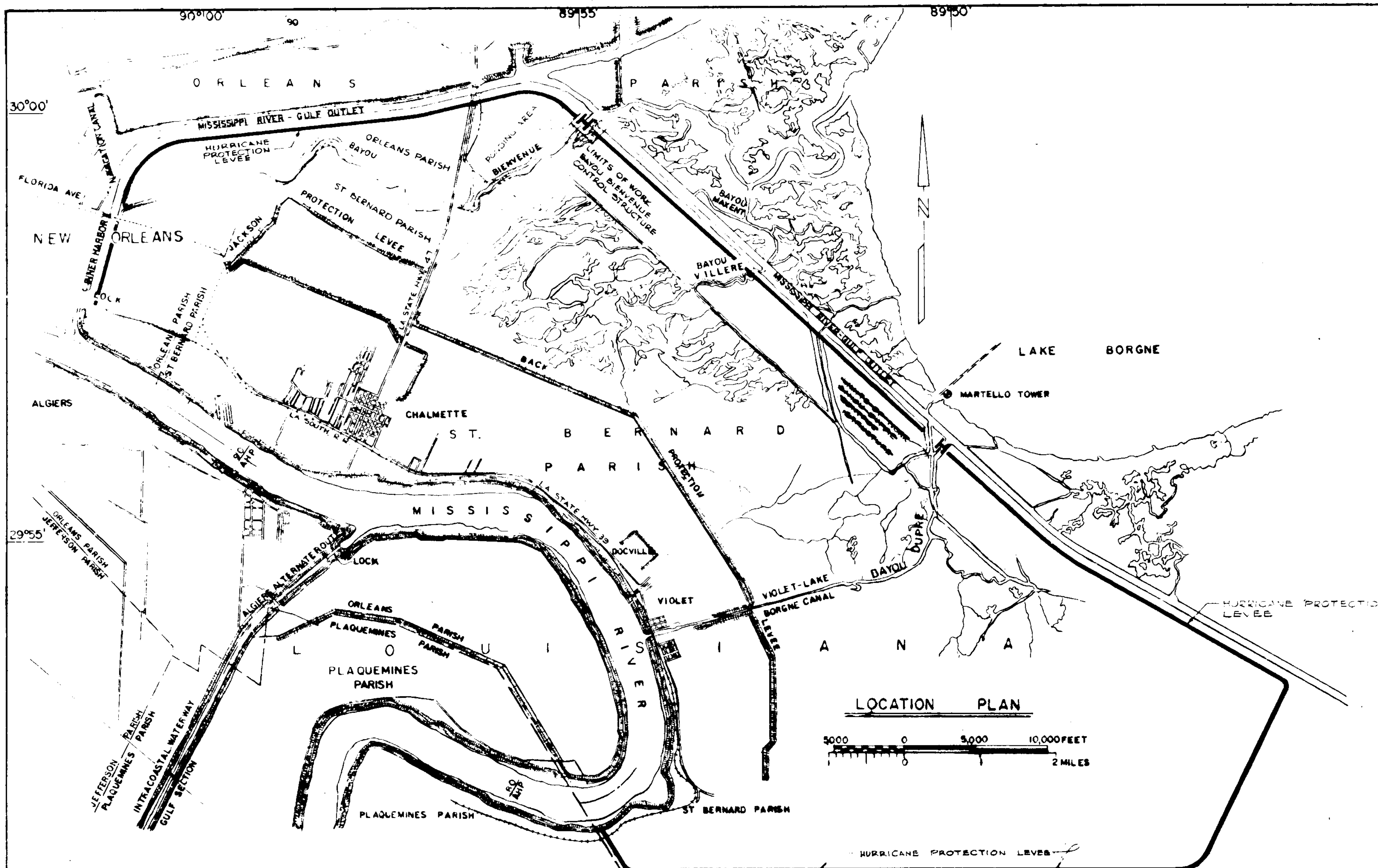
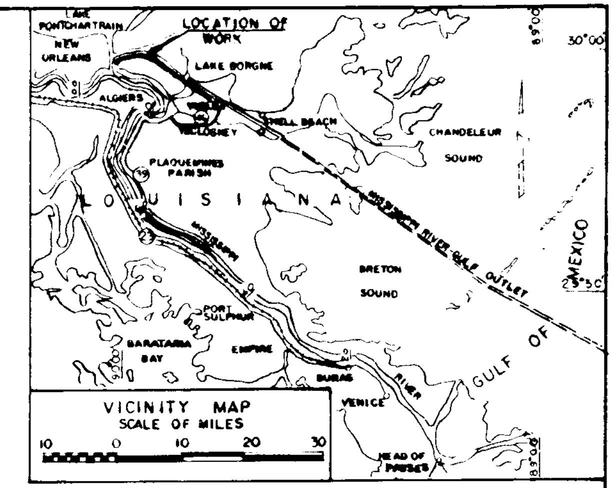
SELECTED CONSTRUCTION DRAWINGS





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NOTE:
ALL REFERENCES IN THIS SET OF DWGS. TO THE BAYOU DUPRE CONTROL STRUCTURE ARE TO BE DELETED.

THIS PLAN ACCOMPANIES MODIFICATION P00007 TO CONTRACT NO. DACW29-72-C-0064

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REVISION	DATE	DESCRIPTION	BY	APPVD.
△3	5-2-73	Added new dwg. 64A mod. #7	R.G.S.	
△2	4-3-72	Added new dwg. 4A and 4B and deleted dwg. No. 4 Mod 5	EHA	
△1	11-17-71	Added new dwg. 1A Amend. No. 1	PLO	

WALDEMAR S. NELSON AND COMPANY
ENGINEERS AND ARCHITECTS
NEW ORLEANS, LA

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS, U.S. ARMY
NEW ORLEANS, LA

DESIGNED: WSNCO | DRAWN: WSNCO | CHECKED: WSNCO

SUBMITTED: [signature] ASST. VICE PRES.
APPROVED: [signature] PRESIDENT
DATE: October, 1971
SUBMITTED: [signature] CHIEF, DESIGN BRANCH
APPROVED: [signature] CHIEF, ENGINEERING DIVISION
APPROVED: [signature] COL., C. of E., DISTRICT ENGINEER

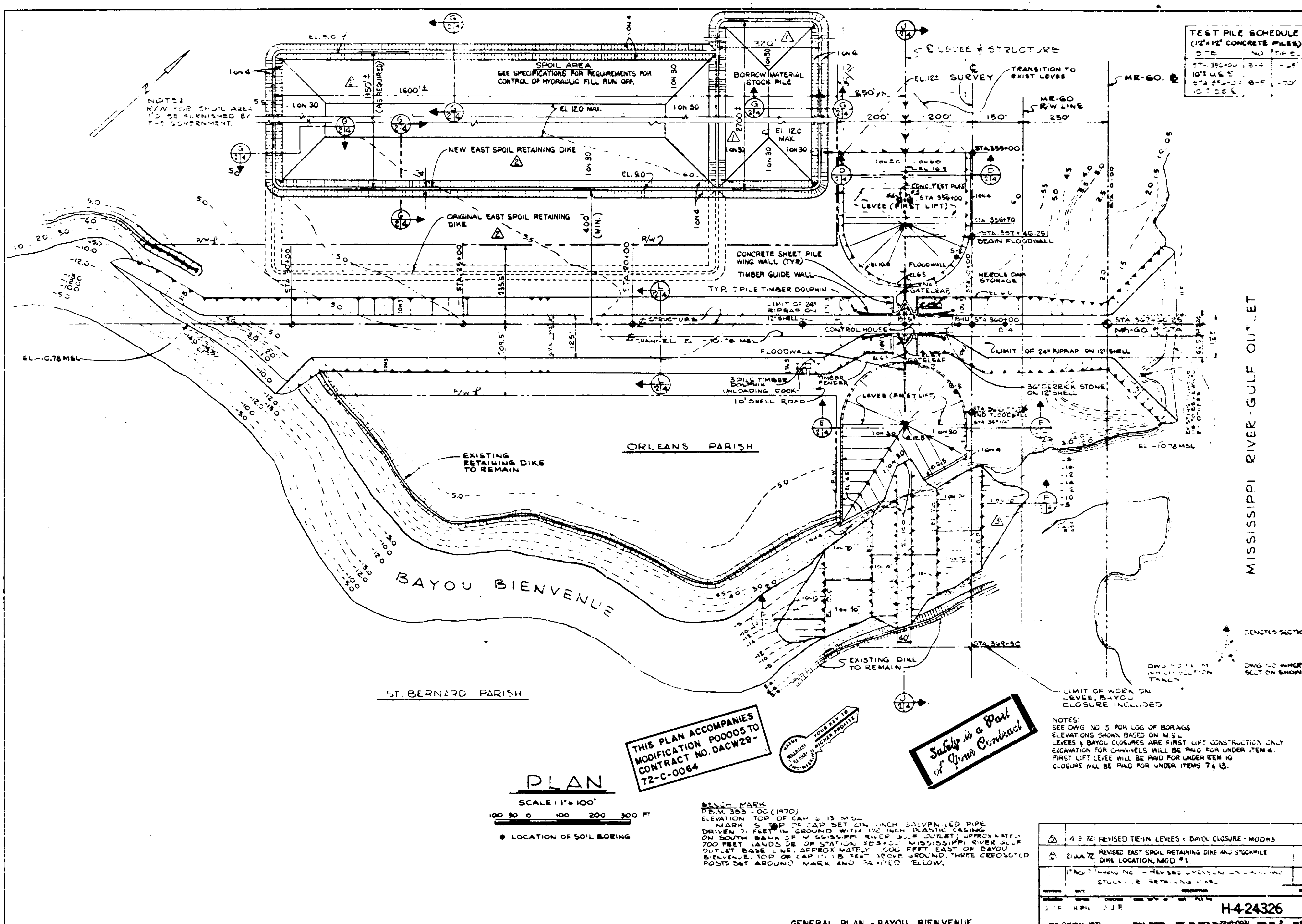
LAKE PONTCHARTRAIN, LA AND VICINITY

CHALMETTE AREA PLAN

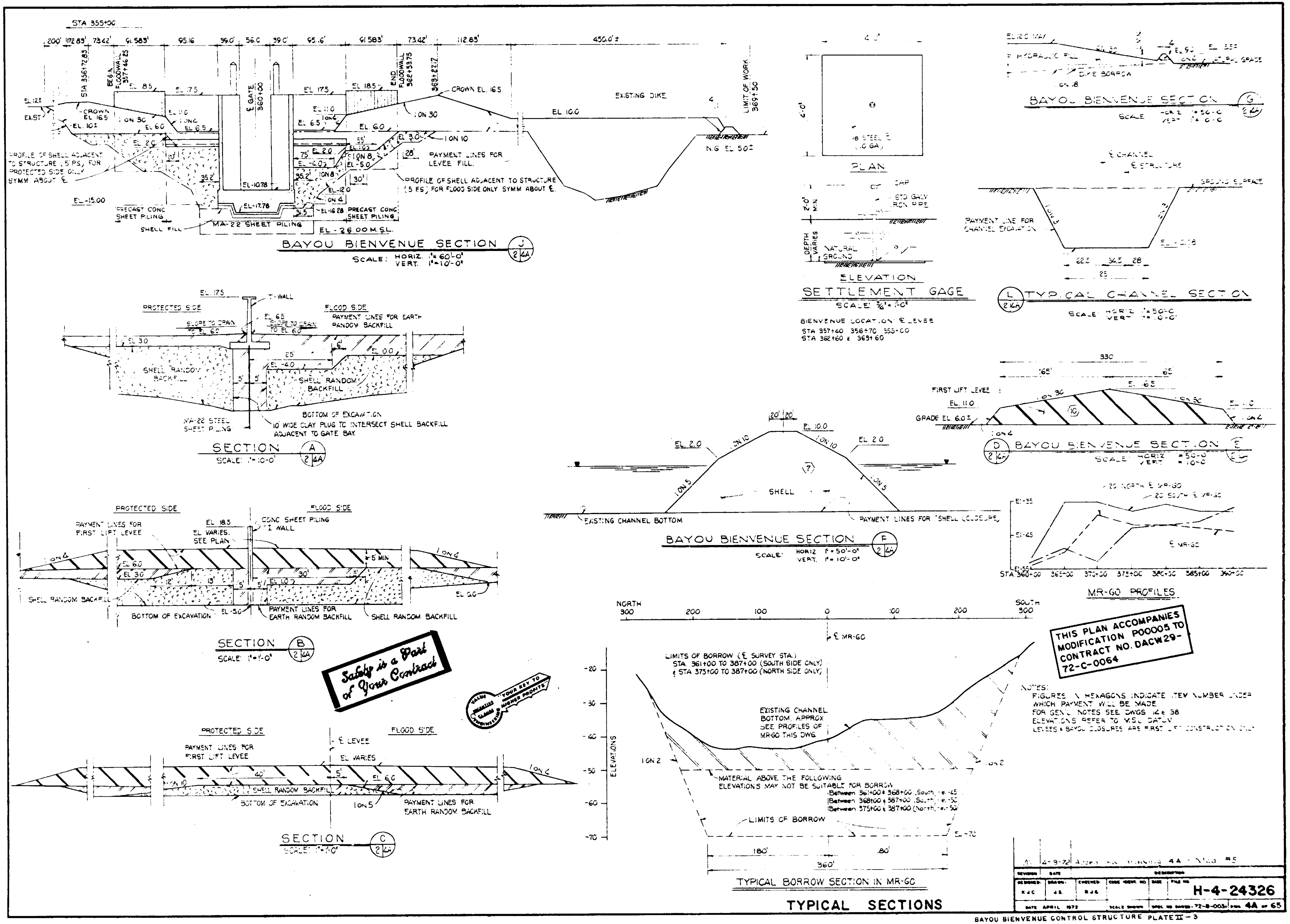
LOCATION PLAN AND INDEX TO DRAWINGS

CODE IDENT. No. | SIZE | FILE No. H-4-24326

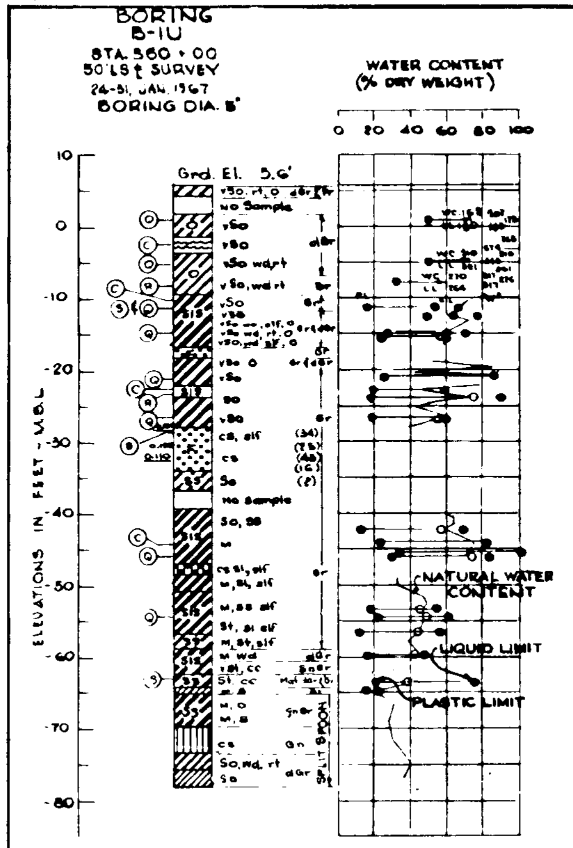
SCALE: AS SHOWN | SPEC. No. DACW 29-72-B-0031 | DWG. No. 1 of 65

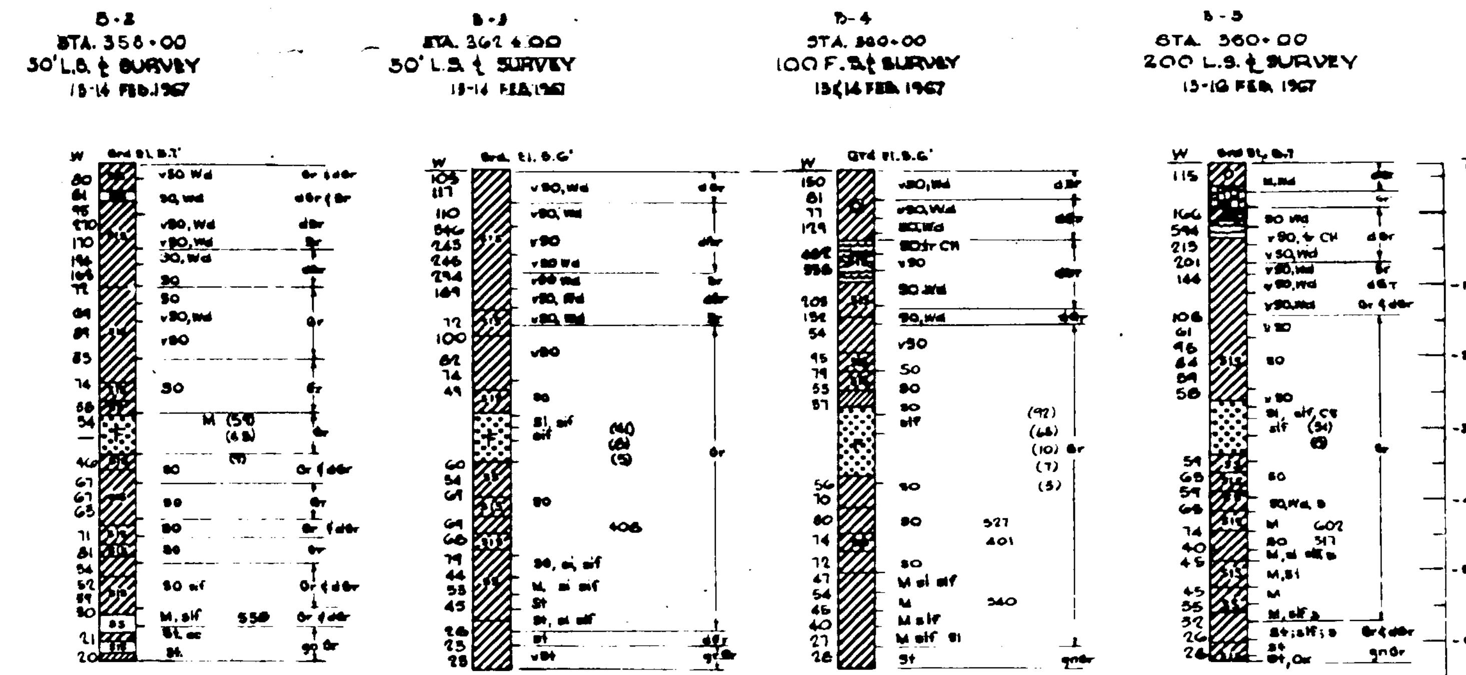


BAYOU BIENVENUE CONTROL STRUCTURE PLATE II-2

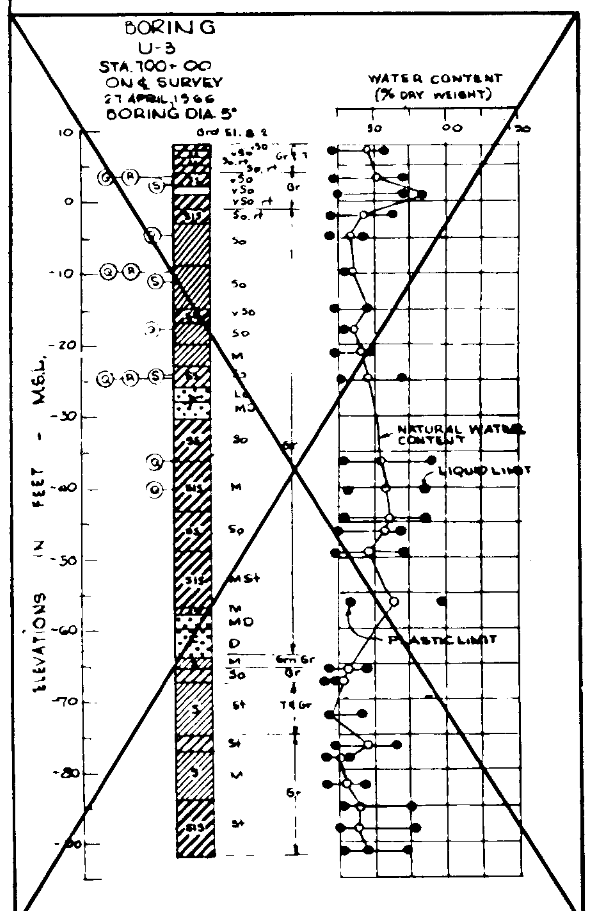


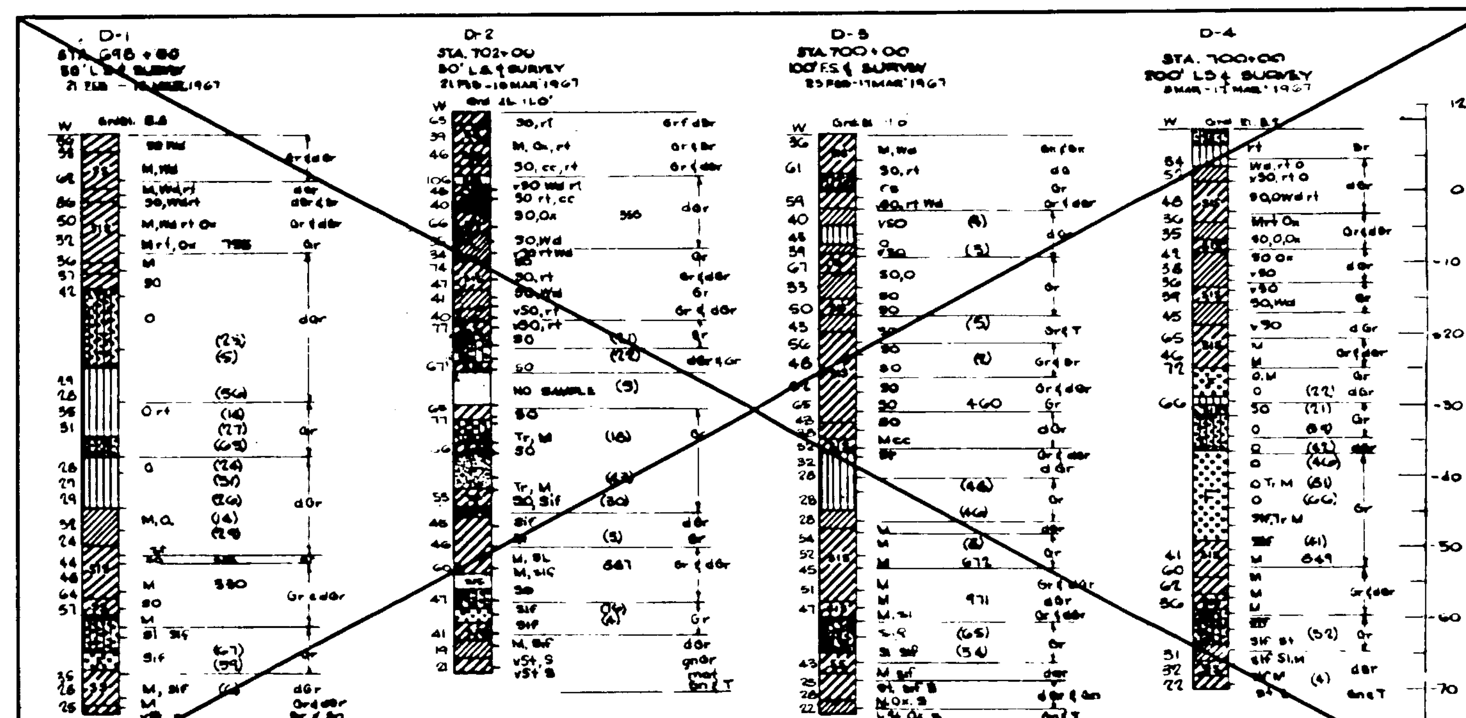
BAYOU BIENVENUE SECTION J
SCALE: HORIZ. 1"=60'-0" VERT. 1"=10'-0"
STA 355+00
EXISTING DIKE
CROWN EL 16.5
LIMIT OF WORK 369+50
N.G. EL 5.0±
PAYMENT LINES FOR LEVEE FILL
PROFILE OF SHELL ADJACENT TO STRUCTURE (5 FS) FOR FLOOD SIDE ONLY SYMM ABOUT ℄
PROFILE OF SHELL ADJACENT TO STRUCTURE (5 PS) FOR PROTECTED SIDE ONLY SYMM ABOUT ℄
PRECAST CONC SHEET PILING
SHELL FILL
MA-22 SHEET PILING
EL -26.00 M.S.L.
SECTION A
SCALE: 1"=10'-0"
PROTECTED SIDE
FLOOD SIDE
T-WALL
PAYMENT LINES FOR EARTH RANDOM BACKFILL
SHELL RANDOM BACKFILL
BOTTOM OF EXCAVATION
10' WIDE CLAY PLUG TO INTERSECT SHELL BACKFILL ADJACENT TO GATE BAY
MA-22 STEEL SHEET PILING
SECTION B
SCALE: 1"=1'-0"
PAYMENT LINES FOR FIRST LIFT LEVEE
CONC SHEET PILING "I" WALL
EL VARIES, SEE PLAN
SHELL RANDOM BACKFILL
PAYMENT LINES FOR EARTH RANDOM BACKFILL
SECTION C
SCALE: 1"=1'-0"
℄ LEVEE
EL VARIES
Safety is a Part of Your Contract
VALUE ENGINEERING YOUR KEY TO HIGHER PROFITS
SETTLEMENT GAGE
PLAN
ELEVATION
SCALE: 3/4"=1'-0"
STD GALV IRON PIPE
NATURAL GROUND
DEPTH VARIES
BIENVENUE LOCATION ℄ LEVEE
STA 357+60 356+70 355+00
STA 362+60 & 363+60
BAYOU BIENVENUE SECTION G
HYDRAULIC FILL
DIKE BORROW
℄ CHANNEL
℄ STRUCTURE
GROUND SURFACE
PAYMENT LINE FOR CHANNEL EXCAVATION
TYPICAL CHANNEL SECTION L
FIRST LIFT LEVEE
GRADE EL 6.0±
BAYOU BIENVENUE SECTION E
BAYOU BIENVENUE SECTION F
SCALE: HORIZ 1"=50'-0" VERT. 1"=10'-0"
SHELL
EXISTING CHANNEL BOTTOM
PAYMENT LINES FOR SHELL CLOSURE
MR-GO PROFILES
℄ MR-GO
THIS PLAN ACCOMPANIES MODIFICATION P00005 TO CONTRACT NO. DACW29-72-C-0064
NOTES:
FIGURES IN HEXAGONS INDICATE ITEM NUMBER UNDER WHICH PAYMENT WILL BE MADE
FOR GEN'L NOTES SEE DWGS 1K & 38
ELEVATIONS REFER TO M.S.L. DATUM
LEVEES & BAYOU CLOSURES ARE FIRST LIFT CONSTRUCTION ONLY
NORTH 300 200 100 0 100 200 SOUTH 300
ELEVATIONS
LIMITS OF BORROW (℄ SURVEY STA.)
STA. 361+00 TO 387+00 (SOUTH SIDE ONLY)
& STA 375+00 TO 387+00 (NORTH SIDE ONLY)
EXISTING CHANNEL BOTTOM APPROX SEE PROFILES OF MR-GO THIS DWG
MATERIAL ABOVE THE FOLLOWING ELEVATIONS MAY NOT BE SUITABLE FOR BORROW
LIMITS OF BORROW
TYPICAL BORROW SECTION IN MR-GO
TYPICAL SECTIONS
H-4-24326
BAYOU BIENVENUE CONTROL STRUCTURE PLATE II-3





GENERAL TYPE BORINGS
BAYOU BIENVENUE





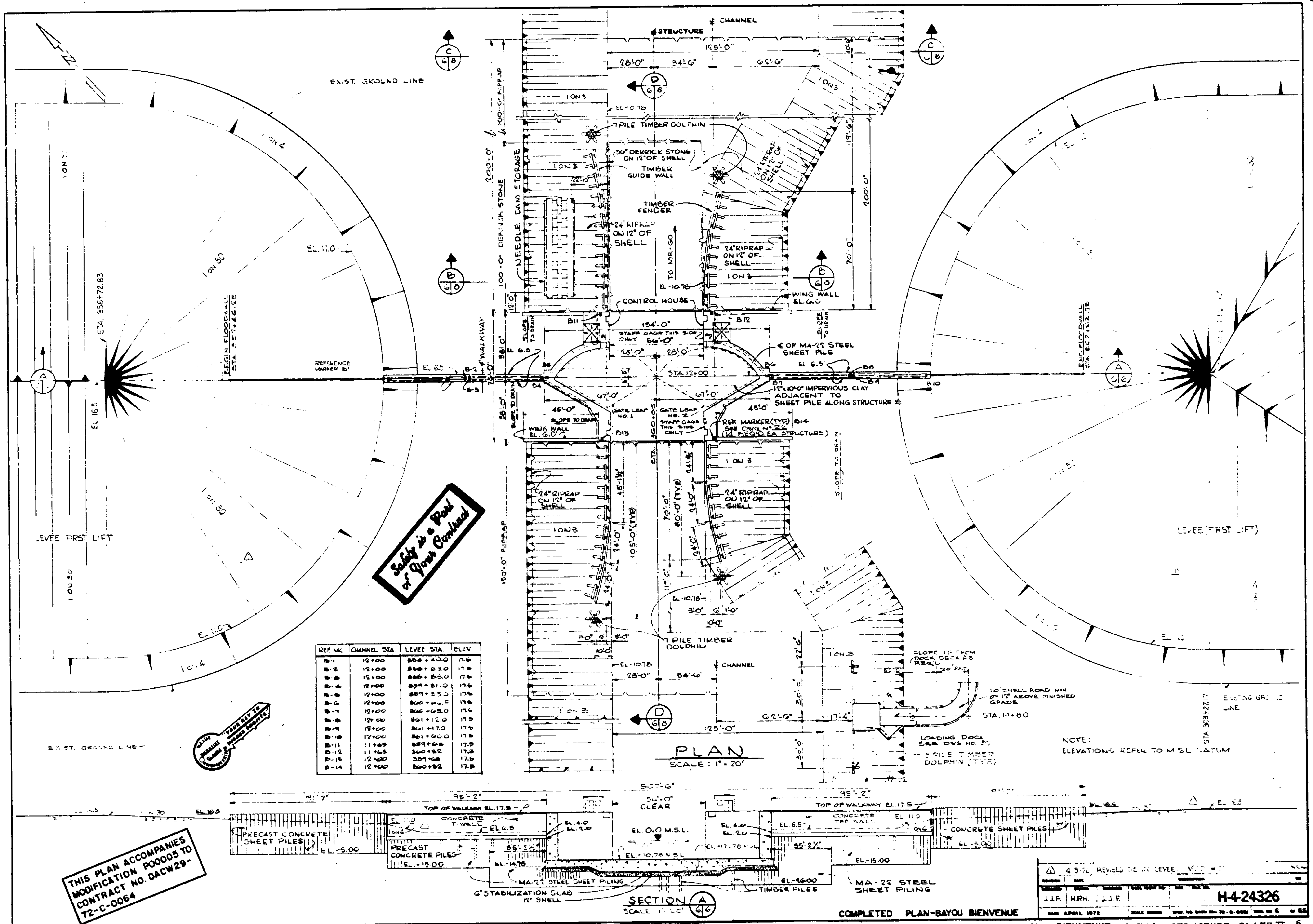
GENERAL TYPE BORINGS
BAYOU DUPRE

NOTES:
1-FOR LOCATION OF BORINGS SEE DWGS. NO. 2 & ~~NO. 3~~
2-FOR SOIL BORING LEGEND SEE DWG. FILE NO. H-2-21800.
3-GENERAL TYPE SOIL SAMPLES WERE TAKEN WITH A 1⅞" I.D. CORE BARREL SAMPLER. COHESIONLESS SAMPLES WERE TAKEN WITH 1⅜" I.D., 2" O.D. SPLIT SPOON SAMPLER USING A 140 LB. HAMMER WITH A 30" DROP.
4. UNDISTURBED SOIL SAMPLES WERE TAKEN WITH A 5" I.D. STEEL TUBE PISTON-TYPE SAMPLER.
5. ELEVATIONS REFER TO M.S.L. DATUM.

LOG OF BORINGS

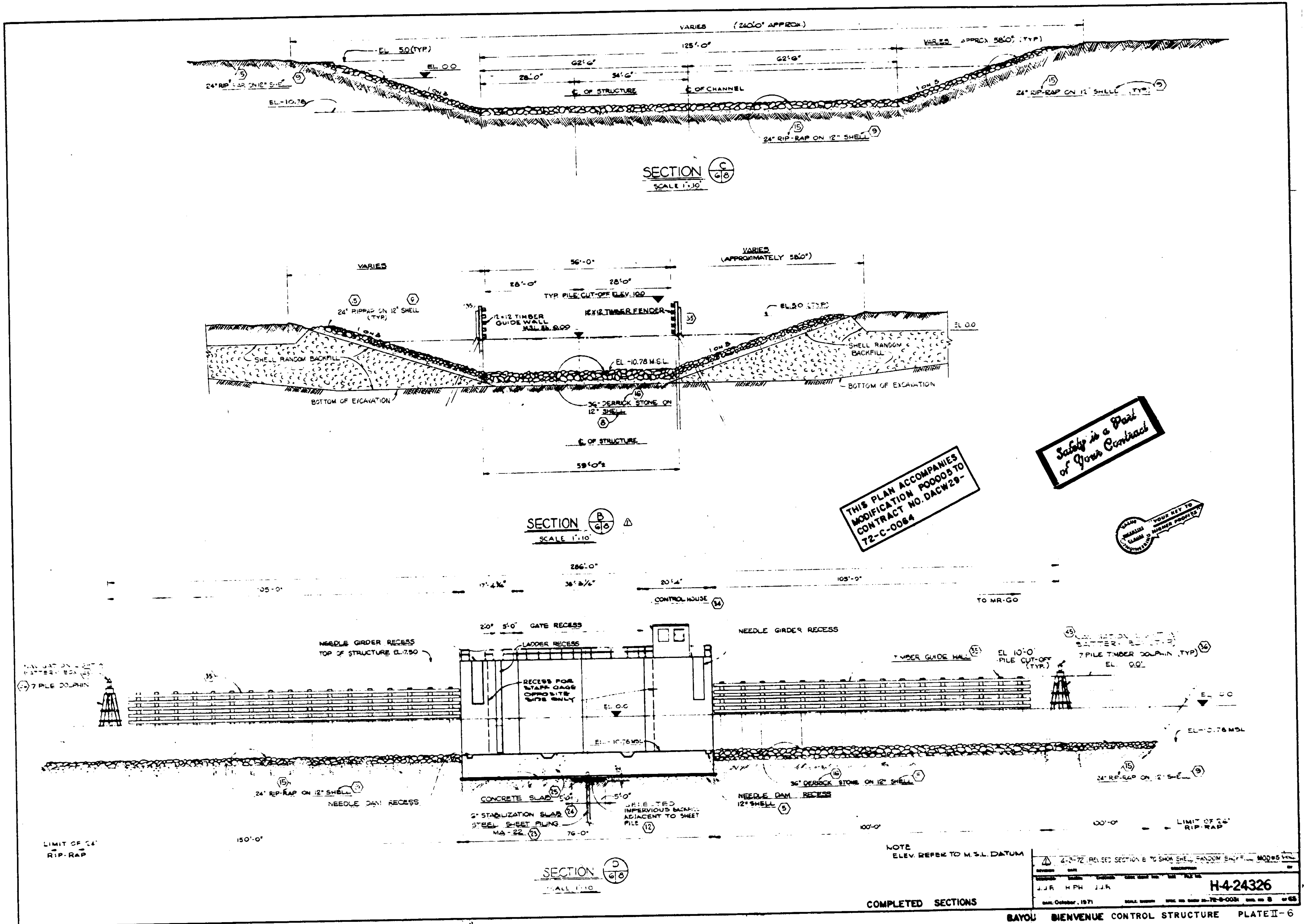
Designed	Drawn	Checked			File No.
J.J.F.	H.P.H.	J.J.F.			H-4-24326
Date October, 1971			Scale Shown	72-8-0031	Dwg. No. 5 of 85

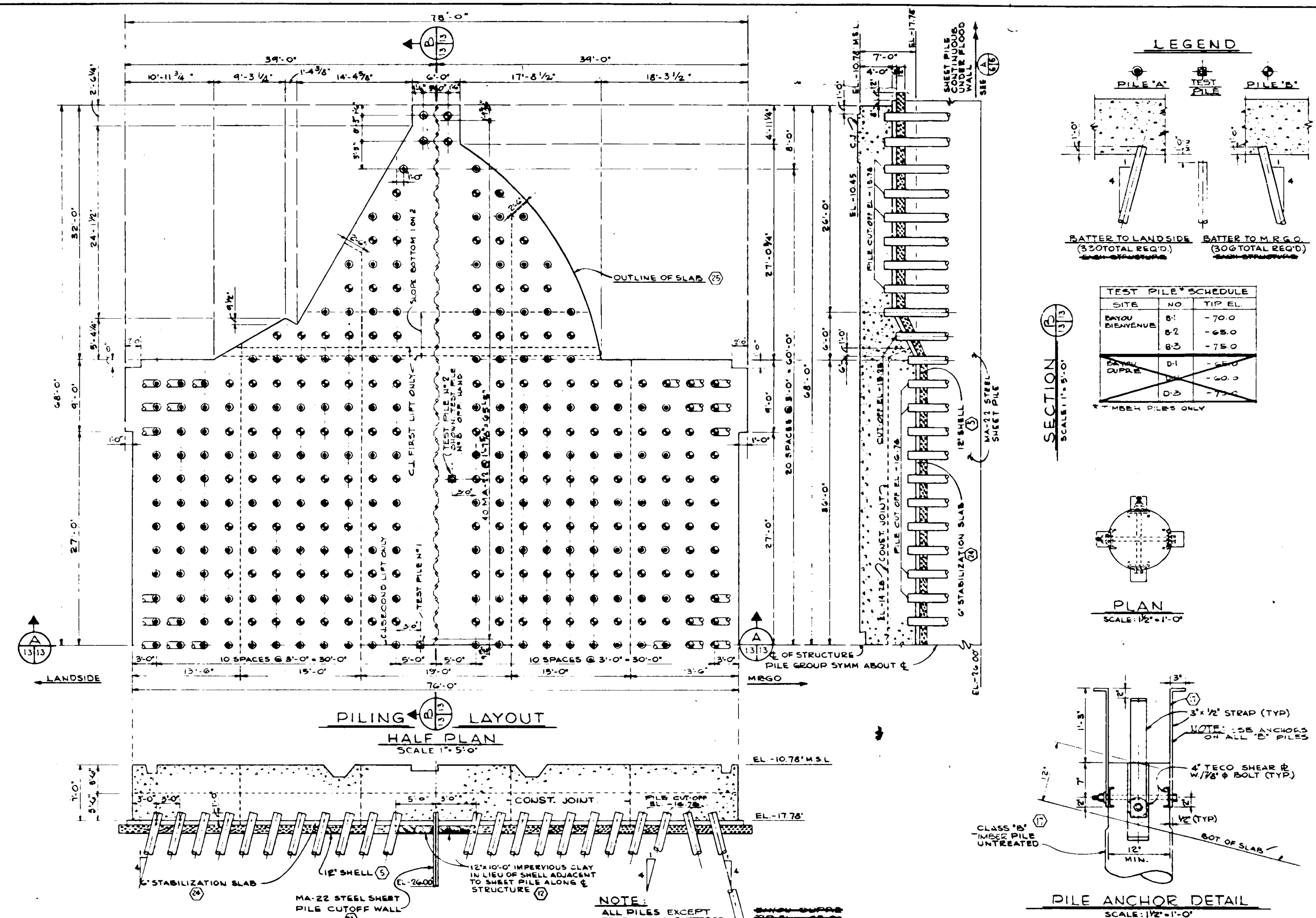
BAYOU BIENVENUE CONTROL STRUCTURE PLATE II-4



REF MK.	CHANNEL STA.	LEVEE STA.	ELEV.
B-1	12+00	358+40.0	17.6
B-2	12+00	358+83.0	17.6
B-3	12+00	358+85.0	17.6
B-4	12+00	359+81.0	17.6
B-5	12+00	359+35.0	17.6
B-6	12+00	360+66.5	17.6
B-7	12+00	360+69.0	17.6
B-8	12+00	361+12.0	17.5
B-9	12+00	361+17.0	17.5
B-10	12+00	361+60.0	17.5
B-11	11+65	359+68	17.9
B-12	11+65	360+32	17.8
B-13	12+00	359+68	17.5
B-14	12+00	360+32	17.3

BAYOU BIENVENUE CONTROL STRUCTURE PLATE II-5


VARIES (240'0" APPROX.)
125'-0"
VARIES APPROX 58'0" (TYP)
EL 5.0 (TYP)
EL 0.0
62'-6"
62'-6"
28'-0"
34'-6"
℄ OF STRUCTURE
℄ OF CHANNEL
1 ON 3
24" RIP-RAP ON 12" SHELL
EL -10.78
24" RIP-RAP ON 12" SHELL (TYP)
24" RIP-RAP ON 12" SHELL
SECTION C/6|8
SCALE 1"=10'
VARIES
56'-0"
VARIES (APPROXIMATELY 58'0")
28'-0"
28'0"
TYP PILE CUT-OFF ELEV. 10.0
24" RIPRAP ON 12" SHELL (TYP)
12x12 TIMBER GUIDE WALL
M.S.L. EL 0.00
12x12 TIMBER FENDER
EL 5.0 (TYP)
EL 0.0
1 ON 3
SHELL RANDOM BACKFILL
EL -10.78 M.S.L.
BOTTOM OF EXCAVATION
36" DERRICK STONE ON 12" SHELL
℄ OF STRUCTURE
59'-0"±
SECTION B/6|8
SCALE 1"=10'
THIS PLAN ACCOMPANIES MODIFICATION P00005 TO CONTRACT NO. DACW29-72-C-0064
Safety is a Part of Your Contract
286'-0"
105'-0"
17'-4¾"
38'-3¼"
20'-4"
105'-0"
CONTROL HOUSE
TO MR-GO
2'0" 5'-0" GATE RECESS
LADDER RECESS
NEEDLE GIRDER RECESS
TOP OF STRUCTURE EL 17.50
NEEDLE GIRDER RECESS
TIMBER GUIDE WALL
EL 10'-0" PILE CUT-OFF (TYP.)
7 PILE TIMBER DOLPHIN (TYP)
EL 0.0'
7 PILE DOLPHIN
RECESS FOR STAFF GAGE OPPOSITE SIDE ONLY
EL 0.0
EL -10.76 MSL
EL -10.78 MSL
24" RIP-RAP ON 12" SHELL
NEEDLE DAM RECESS
CONCRETE SLAB
2" STABILIZATION SLAB
STEEL SHEET PILING MA-22
5'-0"
SELECTED IMPERVIOUS BACKFILL ADJACENT TO SHEET PILE
36" DERRICK STONE ON 12" SHELL
NEEDLE DAM RECESS
12" SHELL
24" RIP-RAP ON 12" SHELL
LIMIT OF 24" RIP-RAP
150'-0"
76'-0"
100'-0"
100'-0"
LIMIT OF 24" RIP-RAP
NOTE
ELEV. REFER TO M.S.L. DATUM
SECTION D/6|8
COMPLETED SECTIONS
4-3-72 REVISED SECTION B TO SHOW SHELL RANDOM BACKFILL MOD#5
JJR HPH JJR
H-4-24326
October, 1971
BAYOU BIENVENUE CONTROL STRUCTURE PLATE II-6



TEST PILE* SCHEDULE

SITE	NO.	TIP EL.
BAYOU BIENVENUE	B-1	-70.0
	B-2	-65.0
	B-3	-75.0
~~BAYOU DUPRE~~	~~D-1~~	~~-65.0~~
	~~D-2~~	~~-60.0~~
	~~D-3~~	~~-75.0~~

* TIMBER PILES ONLY

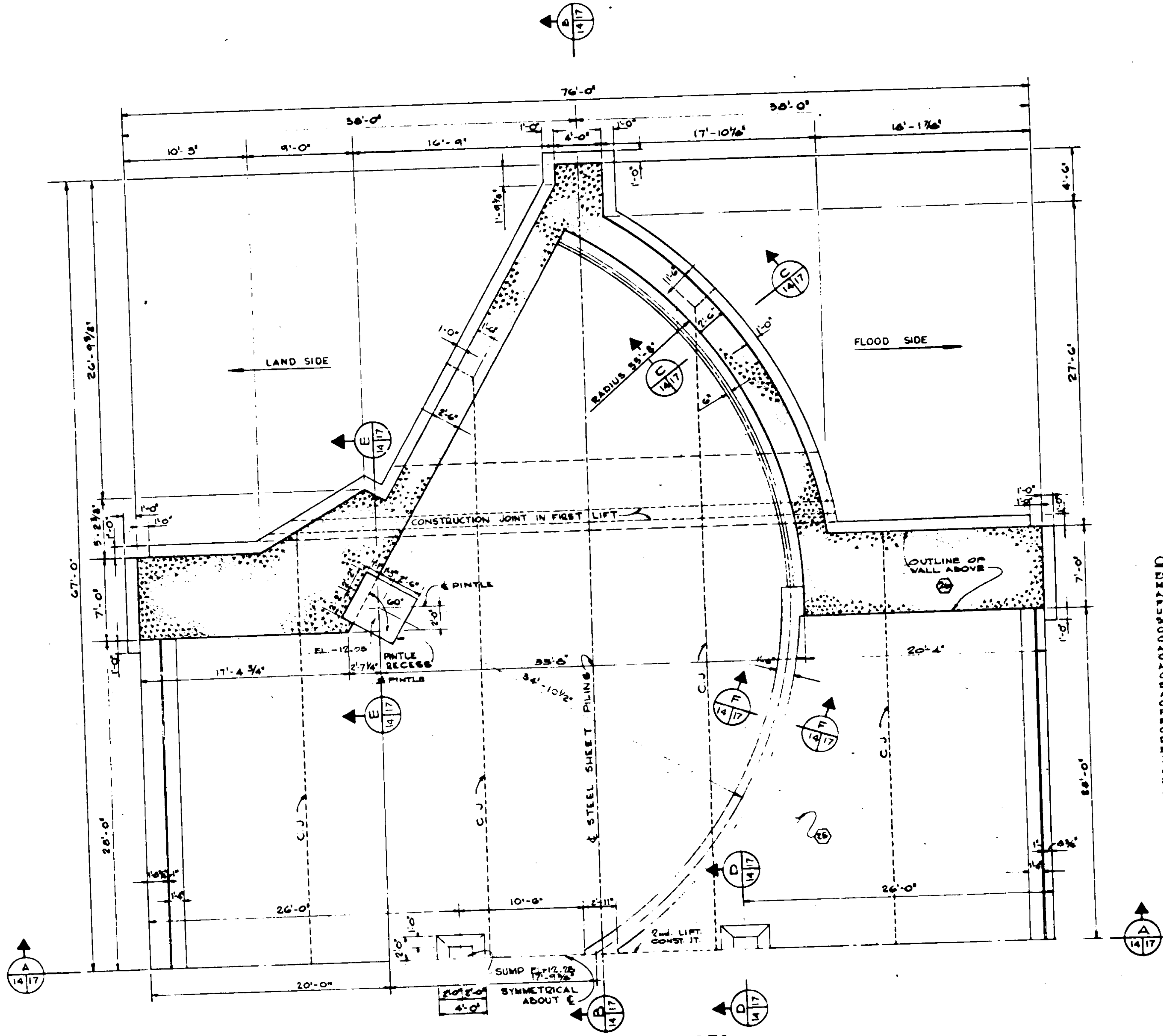
UNTREATED TIMBER PILING WILL BE PAID FOR UNDER ITEM 17.
PILE LOADING TEST WILL BE PAID FOR UNDER ITEM 18.

NOTES
PILES WILL BE UNTREATED TIMBER PILES, CLASS "B". LENGTHS OF PILES SHOWN ARE FOR ESTIMATING PURPOSES ONLY. REQUIRED LENGTHS OF PILES WILL BE DETERMINED FROM RESULTS OF PILE TESTS.
ELEVATIONS REFER TO M.S.L. DATUM

DESIGNED: J.J.F.	DRAWN: H.P.H.	CHECKED: J.J.F.	H-4-24326
DATE: October, 1971	SCALE: SHOWN	SPEC. NO. DACW 29-72-B-0031	DWG. NO. 13 OF 65

GATE BAY PILING LAYOUT AND STABILIZATION SLAB

BAYOU BIENVENUE CONTROL STRUCTURE PLATE II-7



HALF PLAN AT ELEVATION - 10.78

SCALE: ¼" = 1'-0"

CONCRETE GENERAL NOTES:

ELEVATIONS ARE EXPRESSED IN FEET AND REFER TO MEAN SEA LEVEL.
ALL UNFORMED SURFACES SHALL BE GIVEN A WOOD FLOAT FINISH.
UNLESS OTHERWISE INDICATED ALL EXTERIOR FORMED SURFACES NOT TO BE COVERED BY BACKFILL SHALL BE CLASS "B" FINISH. ALL EXTERIOR SURFACES TO BE COVERED BY BACKFILL SHALL BE CLASS "D" FINISH.
ALL EXPOSED CORNERS OF CONCRETE SHALL BE CHAMFERED 1 INCH UNLESS OTHERWISE INDICATED.
ALL PRIMARY REINFORCEMENT SHALL HAVE A MINIMUM COVER OF 4" UNLESS OTHERWISE NOTED. THE COVER FOR SECONDARY REINFORCEMENT MAY BE REDUCED FROM THE ABOVE BY THE DIAMETER OF THE BAR.
CLEAR DISTANCE BETWEEN ADJACENT LAYERS OF REINFORCEMENT SHALL BE 4" UNLESS OTHERWISE NOTED.
REINFORCING BAR DESIGNATION NUMBERS CONFORM TO THE CURRENT NUMBERING SYSTEM OF THE "CONCRETE REINFORCING STEEL INSTITUTE".
FOR ADDITIONAL GENERAL NOTES SEE DWG NO 3B
LAP SPLICE LENGTHS FOR REINFORCING STEEL SHALL BE IN ACCORDANCE WITH ACI - "MANUAL OF STANDARD PRACTICE FOR DETAILING REINFORCED CONCRETE STRUCTURES" ACI 315-65. AS SHOWN IN TABLE BELOW:

MINIMUM LAP LENGTH

f'_c = 3,000 PSI f_s = 20,000 PSI

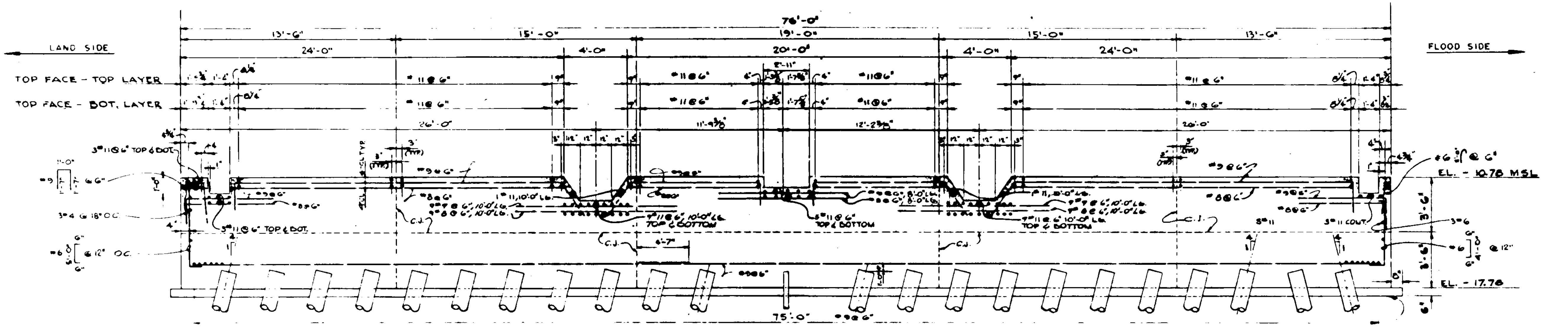
BAR NO.	TOP BARS	OTHER BARS
3	12"	12"
4	14"	14"
5	18"	18"
6	24"	22"
7	33"	25"
8	43"	30"
9	25"	39"
10	68"	49"
11	85"	60"

REVISION	DATE	DESCRIPTION	BY

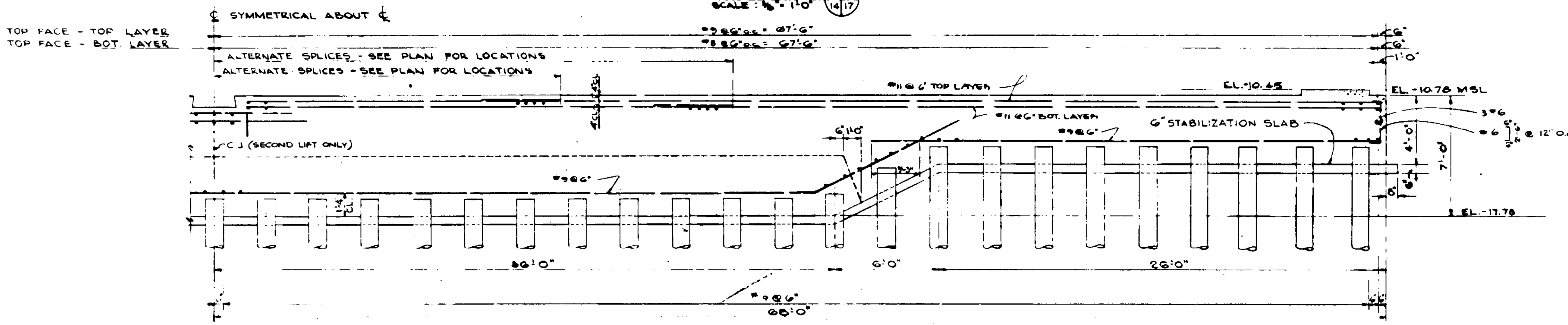
DESIGNED	DRAWN	CHECKED	CODE IDENT NO.	SIZE	FILE NO.
J.J.F.	H.P.H.	J.J.F.			H-4-24326
DATE: October, 1971			SCALE: SHOWN	SPEC. NO. DACW 29-72-B-0081	SHEET 14 OF 65

GATE BAY BASE SLAB - MASONRY PLAN

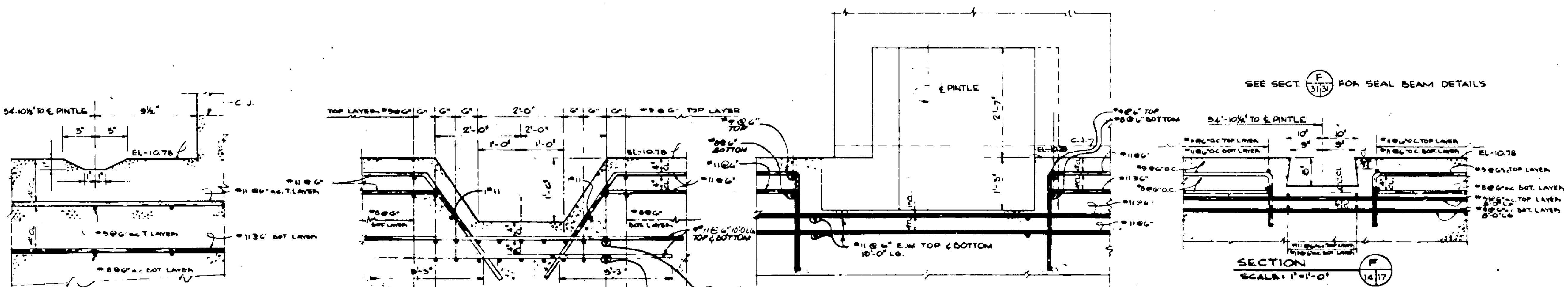
BAYOU BIENVENUE CONTROL STRUCTURE PLATE II-8



SECTION (A 14/17)
SCALE: 1/8" = 1'-0"



SECTION (B 14/17)
SCALE: 1/8" = 1'-0"



SECTION (C 14/17)
SCALE: 3/8" = 1'-0"

SECTION (D 14/17)
SCALE: 1" = 1'-0"

SECTION (E 14/17)
SCALE: 1" = 1'-0"

SECTION (F 14/17)
SCALE: 1" = 1'-0"

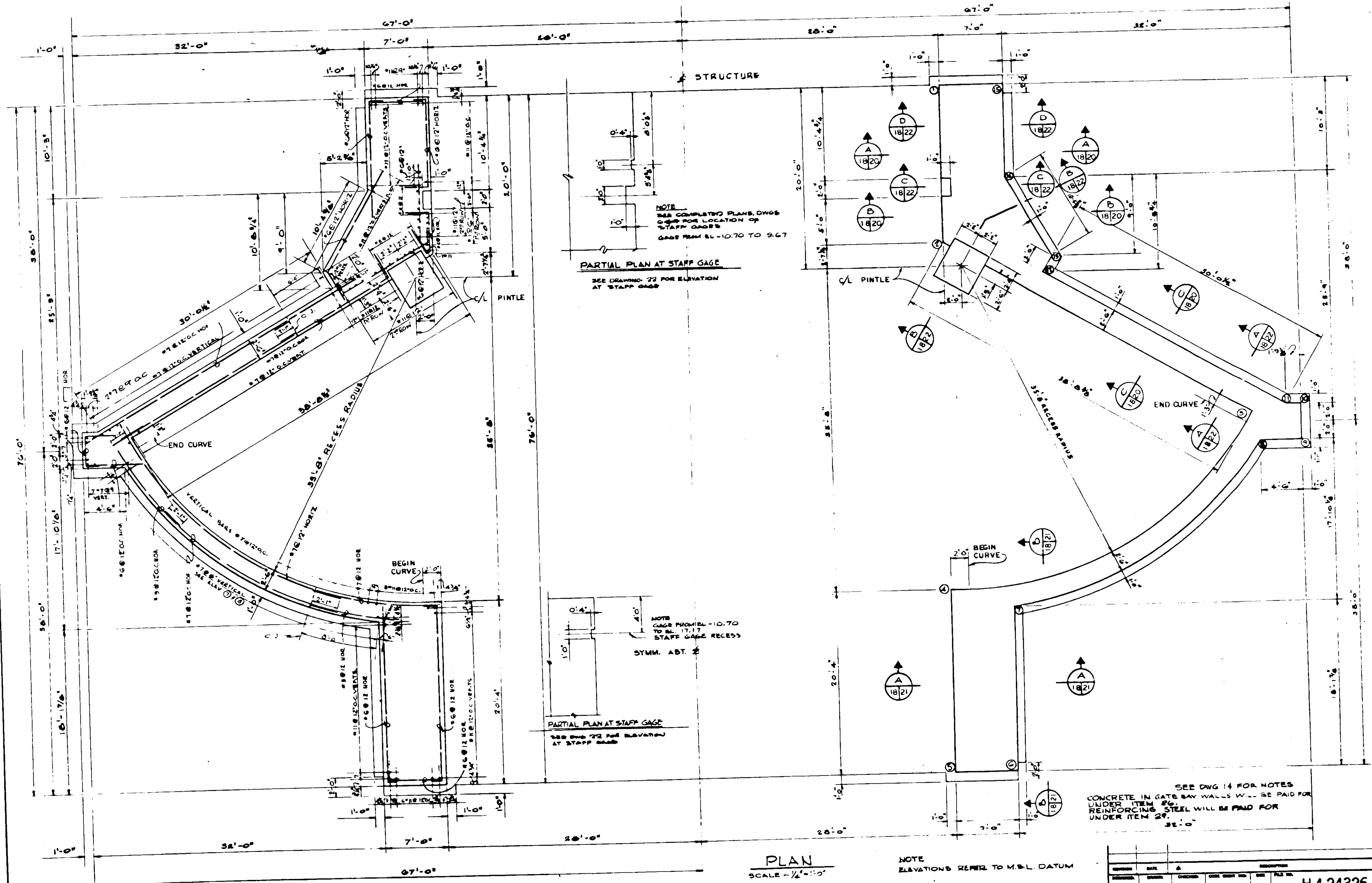
SEE DWG 14 FOR NOTES
ELEVATIONS REFER TO M.S.L. DATUM

BASE SLAB CONCRETE WILL BE PAID FOR UNDER ITEM 25
REINFORCING STEEL WILL BE PAID FOR UNDER ITEM 29.

DESIGNED	DRAWN	CHECKED			FILE NO.
R.J.M.	R.A.S.	J.J.F.			H-4-24326
DATE October, 1971			SCALE: SHOWN	SPEC. NO. DACW 29-72-B-0031	DWG. NO. 17 OF 65

GATE BAY BASE SLAB - SECTIONS

BAYOU BIENVENUE CONTROL STRUCTURE PLATE II-9



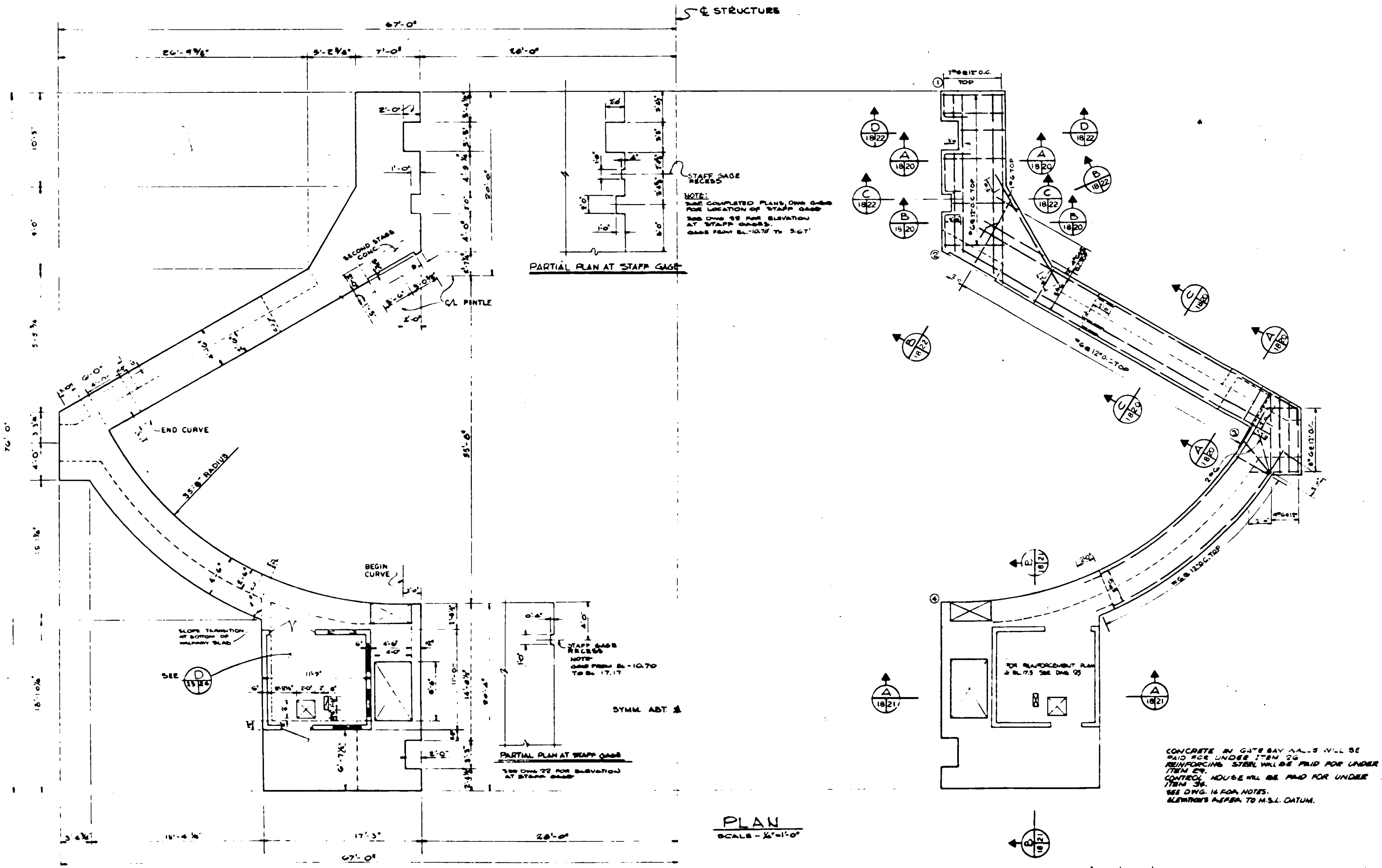
PLAN
SCALE - 1/4" = 1'-0"

NOTE
ELEVATIONS REFER TO M.S.L. DATUM

GATE BAY WALL MASONRY AND REINFORCEMENT PLAN AT EL.-10.45

R.J.M.	R.A.S.	J.J.F.		H-4-24326
DATE: October, 1971		SCALE: SHOWN	SPEC. NO. DACW 29-72-B-0031	SHEET NO. 18 of 65

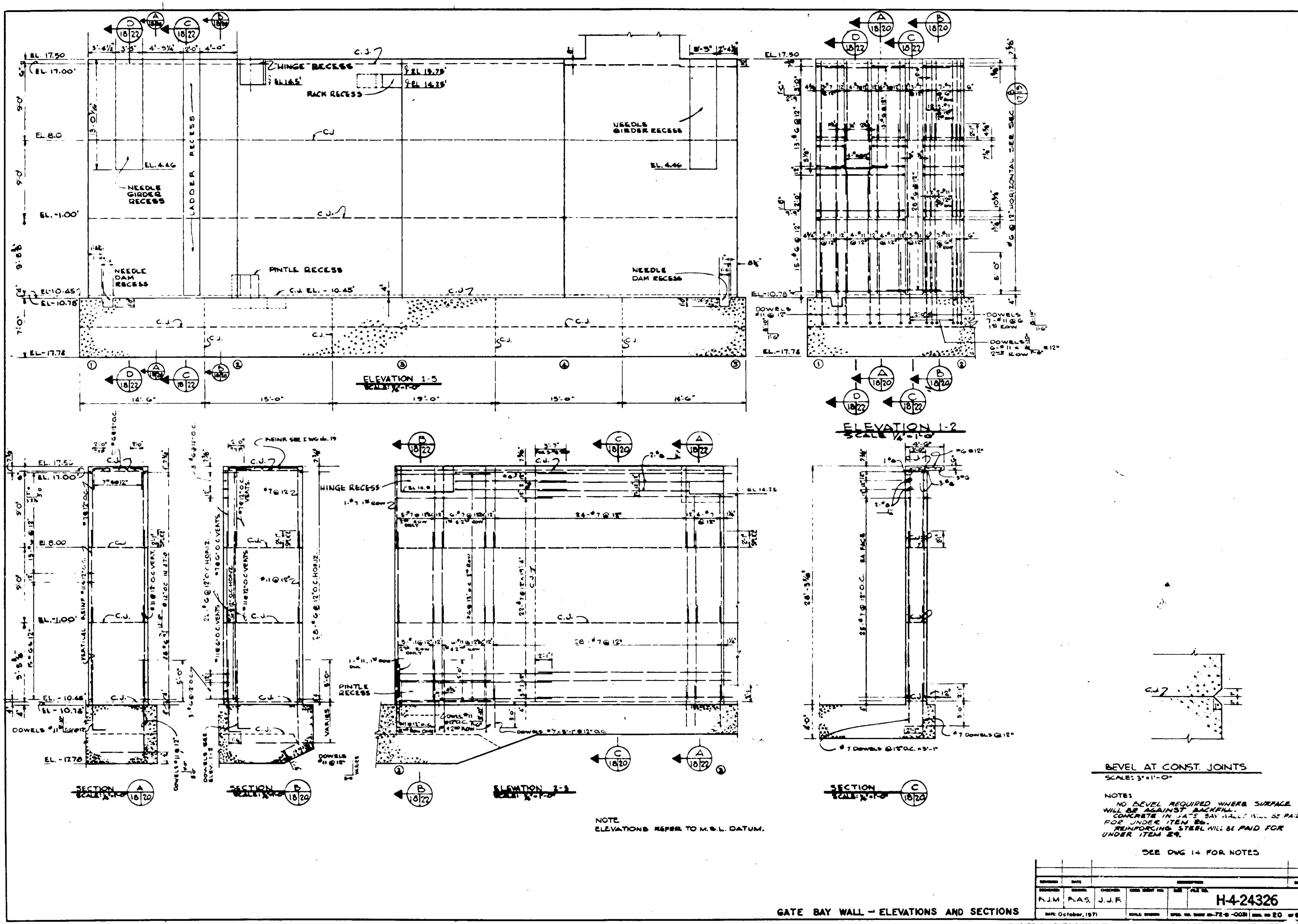
BAYOU BIENVENUE CONTROL STRUCTURE PLATE II-10



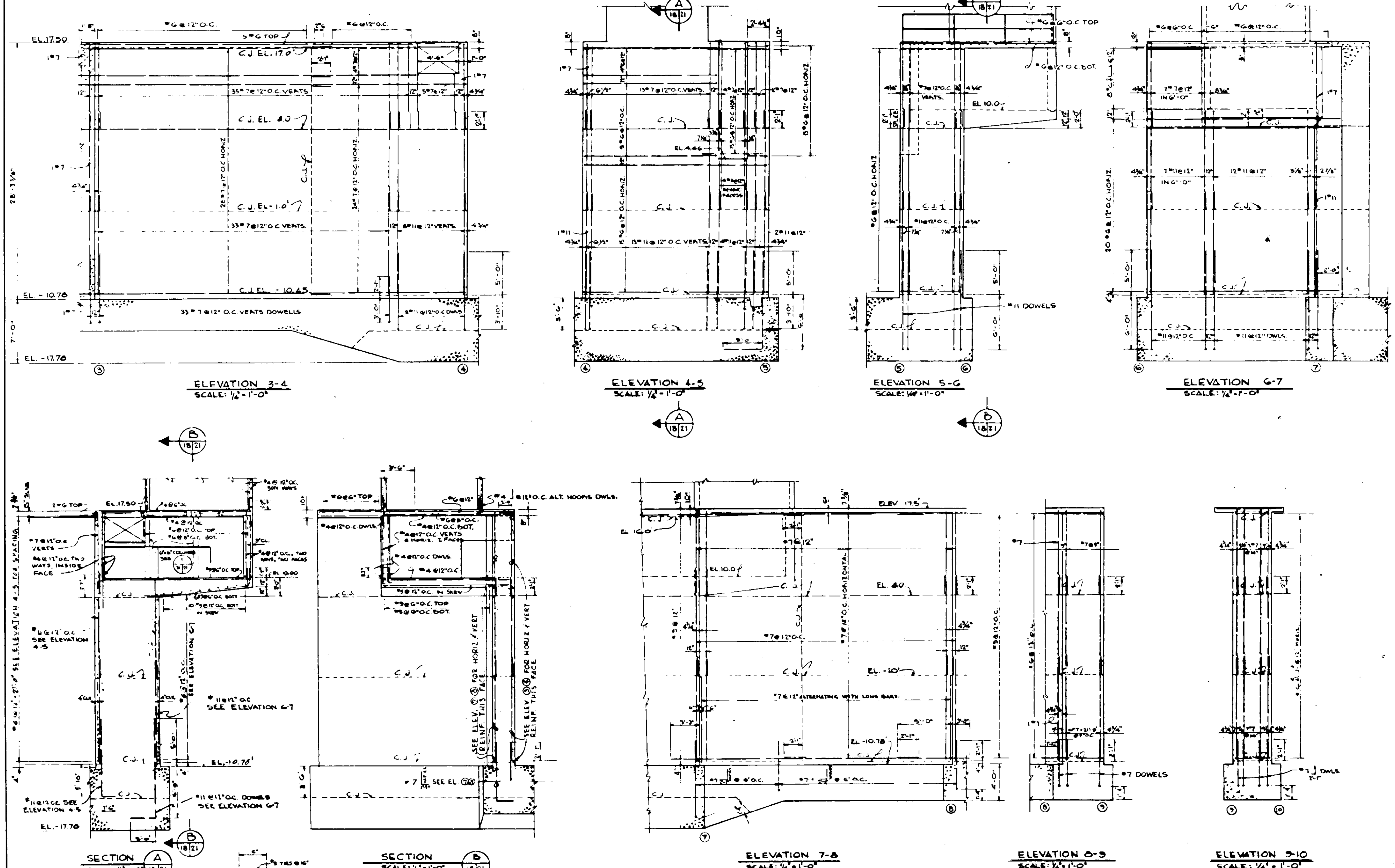
R.J.M.	R.A.S.	J. J. F.			H-4-24326
October, 1971					19 of 65

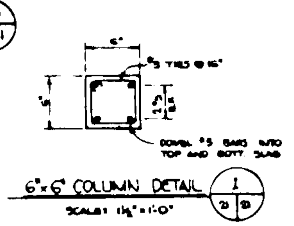
GATE BAY WALL MASONRY AND REINFORCEMENT PLAN AT EL. 17.5

BAYOU BIENVENUE CONTROL STRUCTURE PLATE II - 11



BAYOUS BIENVENUE CONTROL STRUCTURE PLATE II - 12





SEE DWG. 14 FOR NOTES

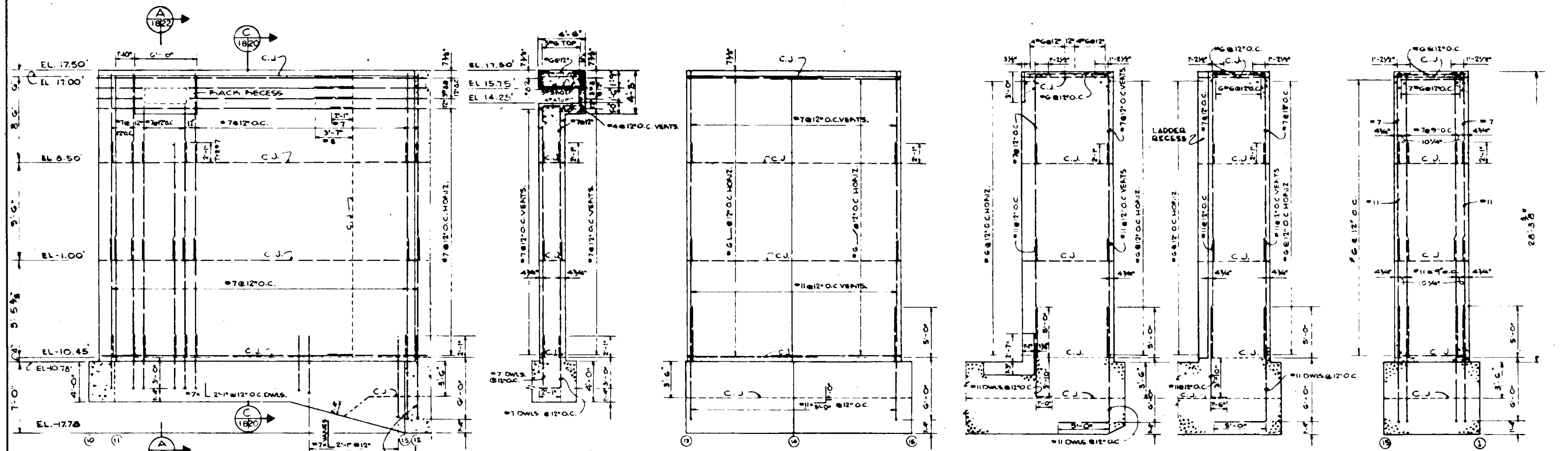
NOTE

ELEVATIONS REFER TO MSL DATUM.
CONCRETE IN GATE BAY WALLS WILL BE PAID FOR UNDER ITEM 26
REINFORCING STEEL WILL BE PAID FOR UNDER ITEM 29.
CONTROL HOUSE WILL BE PAID FOR UNDER ITEM 34.

GATE BAY WALL- ELEVATIONS AND SECTIONS

DESIGNED	DRAWN	CHECKED	FILE NO.
R.J.M.	R.A.S.	J.J.F.	H-4-24326
DATE: October, 1971			SHEET NO. 21 of 65

BAYOU BIENVENUE CONTROL STRUCTURE PLATE. II -13



ELEVATION 10-13
SCALE: 1/4" = 1'-0"

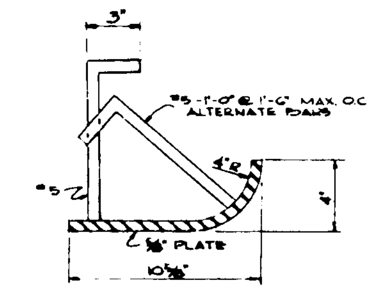
SECTION A 18/22
SCALE: 1/4" = 1'-0"

ELEVATION 13-15
SCALE: 1/4" = 1'-0"

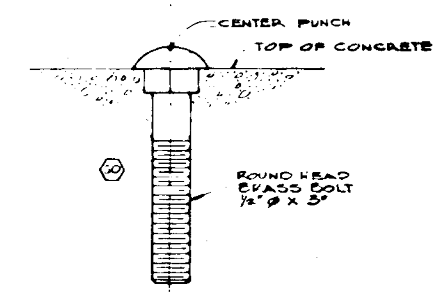
SECTION B 18/22
SCALE: 1/4" = 1'-0"

SECTION C 18/22
SCALE: 1/4" = 1'-0"

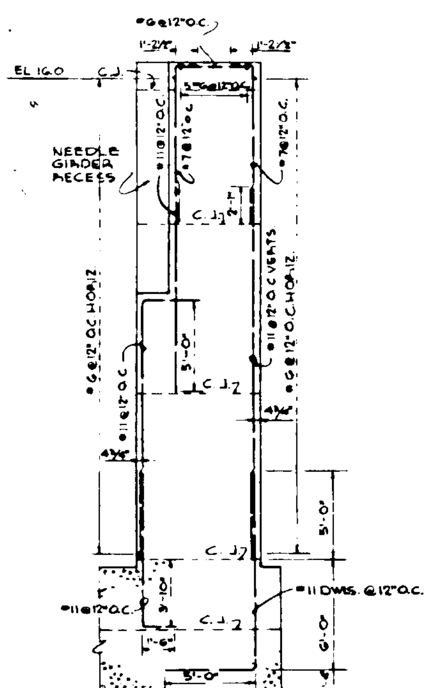
ELEVATION 15-1
SCALE: 1/4" = 1'-0"



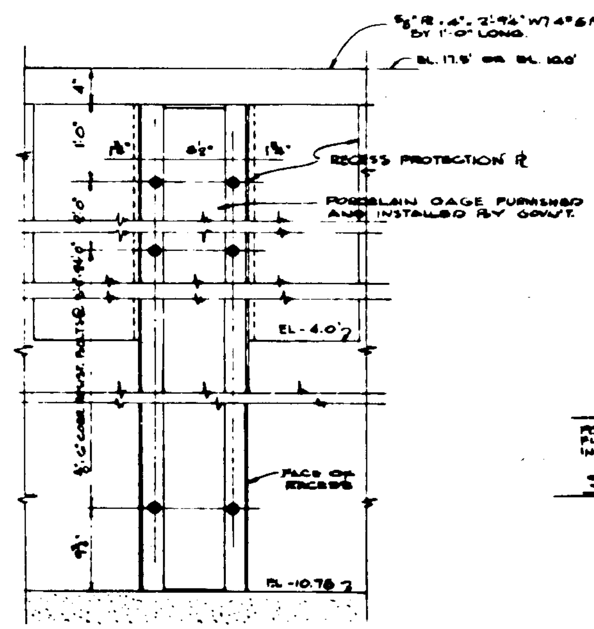
STAFF GAGE RECESS PROTECTION PL
SCALE: 3" = 1'-0"



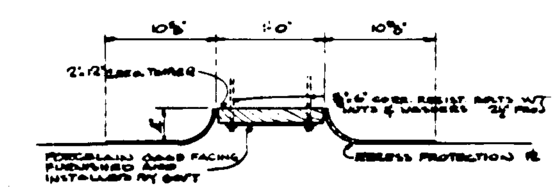
REFERENCE MARKER
FULL SIZE
14 REQ'D ~~(14 PER STRUCTURE)~~



SECTION D 18/22
SCALE: 1/4" = 1'-0"



STAFF GAGE ELEVATION
SCALE 1 1/2" = 1'-0"



STAFF GAGE RECESS DETAIL
SCALE 1 1/2" = 1'-0"

NOTE:
FOR LOCATION OF REFERENCE MARKERS SEE DWGS 6 & 8
ELEVATIONS REFER TO M.S.L. DATUM

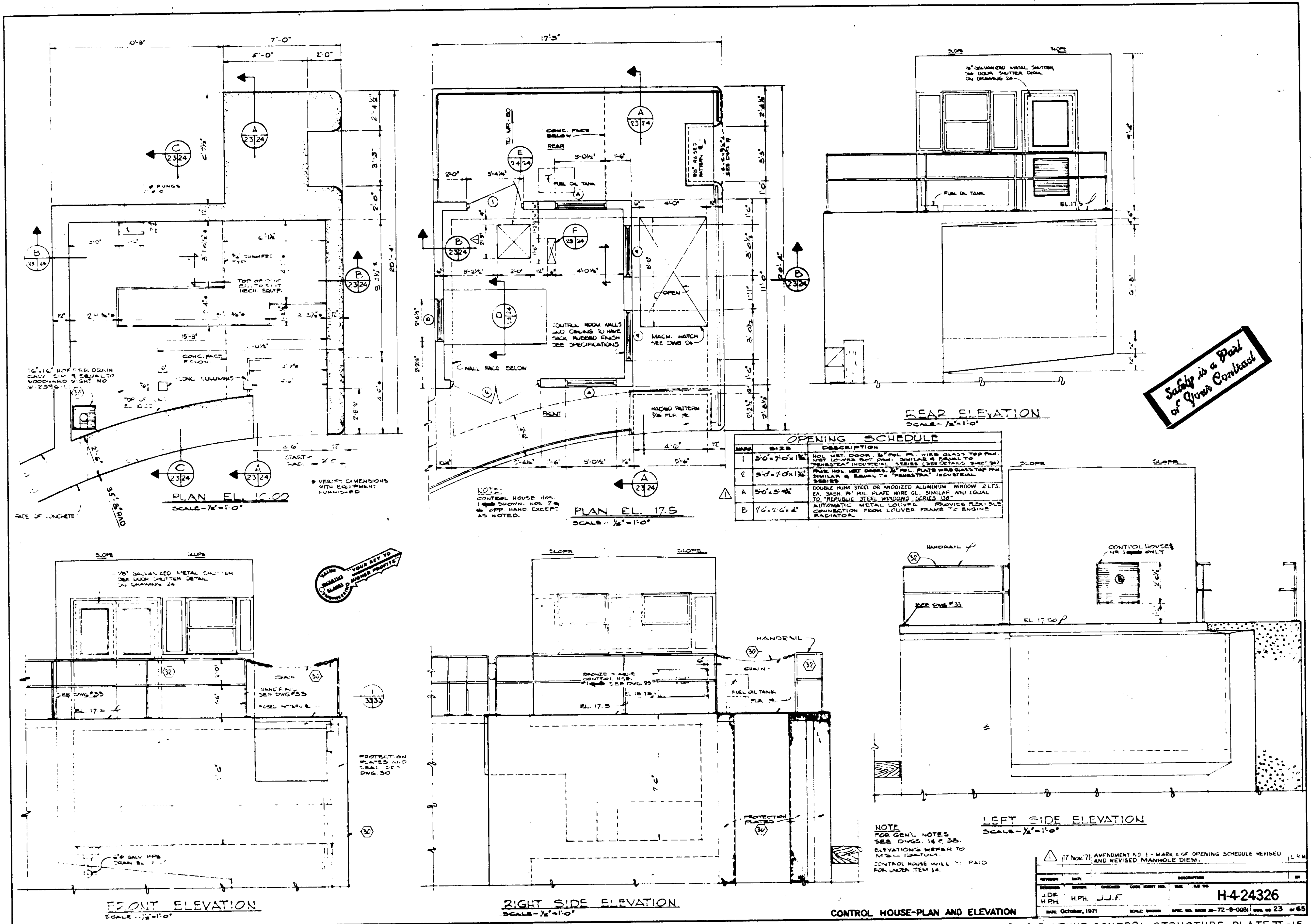
CONCRETE IN GATE BAY WALLS WILL BE PAID FOR UNDER ITEM 26
REINFORCING STEEL WILL BE PAID FOR UNDER ITEM 29.

SEE DWG 14 FOR NOTES

DESIGNED	DRAWN	CHECKED			FILE NO.
R.J.M.	R.A.S.	J.J.F.			H-4-24326
DATE October, 1971				SPEC. NO. DACW 29-72-B-0031	DWG. NO. 22 OF 66

GATE BAY WALL - ELEVATIONS AND SECTIONS

BAYOU BIENVENUE CONTROL STRUCTURE PLATE II - 14



OPENING SCHEDULE

MARK	SIZE	DESCRIPTION
1	3'-0"×7'-0"×1¾"	HOL. MET. DOOR. ¼" POL. PL. WIRE GLASS TOP PAN. MET. LOWER BOT. PAN. SIMILAR & EQUAL TO "FENESTRA" INDUSTRIAL SERIES (SEE DETAILS SHEET 24)
2	5'-0"×7'-0"×1¾"	PAIR HOL. MET. DOORS. ¼" POL. PLATE WIRE GLASS TOP PAN. SIMILAR & EQUAL TO "FENESTRA" INDUSTRIAL SERIES
A	3'-0"×3'-9¾"	DOUBLE HUNG STEEL OR ANODIZED ALUMINUM WINDOW 2 LTS. EA. SASH. ¼" POL. PLATE WIRE GL. SIMILAR AND EQUAL TO "REPUBLIC STEEL WINDOWS SERIES 138"
B	2'-6"×2'-6"×4"	AUTOMATIC METAL LOUVER. PROVIDE FLEXIBLE CONNECTION FROM LOUVER FRAME TO ENGINE RADIATOR

NOTE
FOR GEN'L NOTES SEE DWGS. 14 & 38.
ELEVATIONS REFER TO M.S.L. DATUM.
CONTROL HOUSE WILL [illegible] PAID FOR UNDER ITEM 34.

△1 17 Nov. '71 AMENDMENT NO. 1 - MARK A OF OPENING SCHEDULE REVISED AND REVISED MANHOLE DIEM. L.R.M.

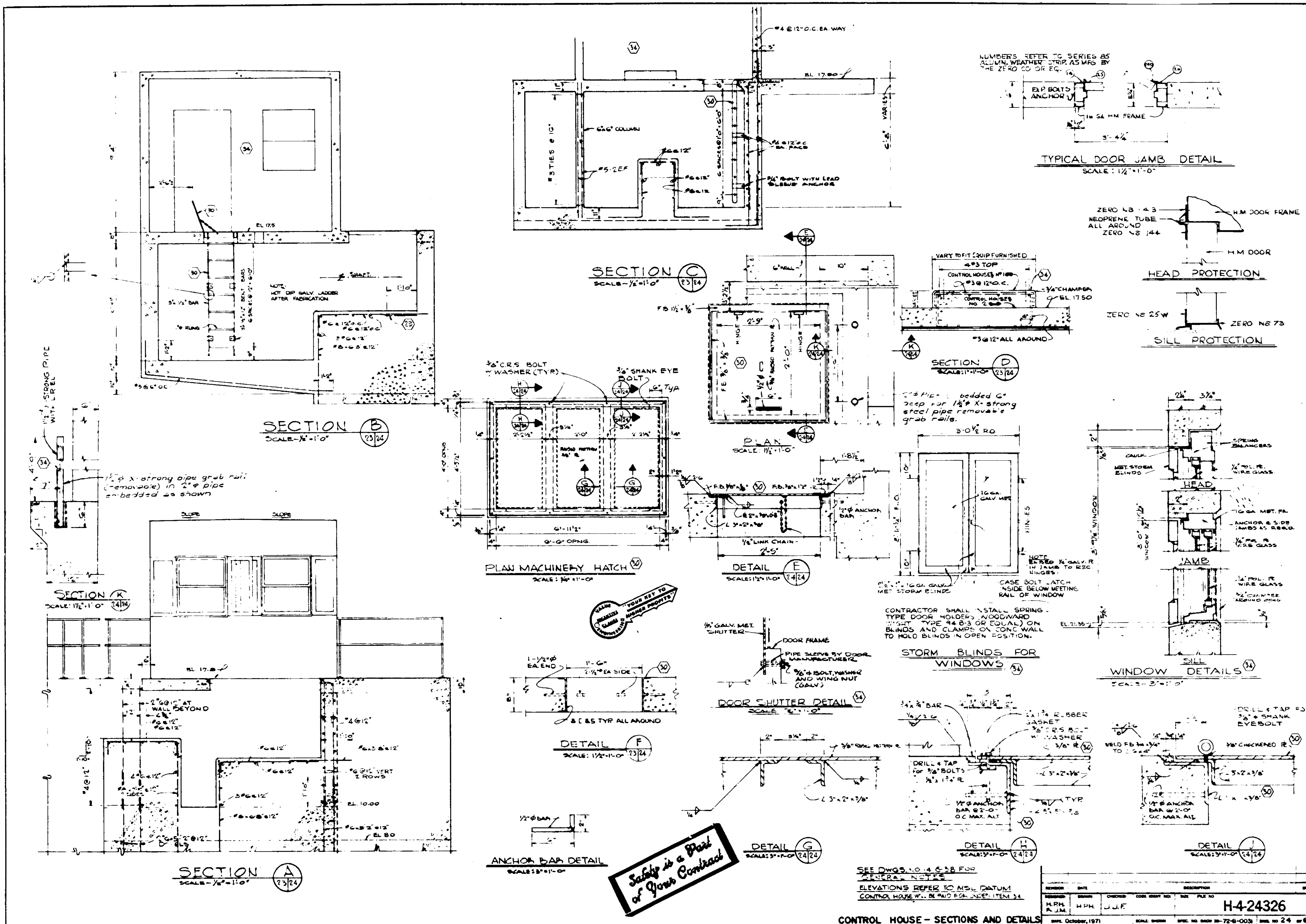
REVISION	DATE	DESCRIPTION	BY

DESIGNED	DRAWN	CHECKED	FILE NO.
J.D.F. H.P.H.	H.P.H.	J.J.F.	H-4-24326

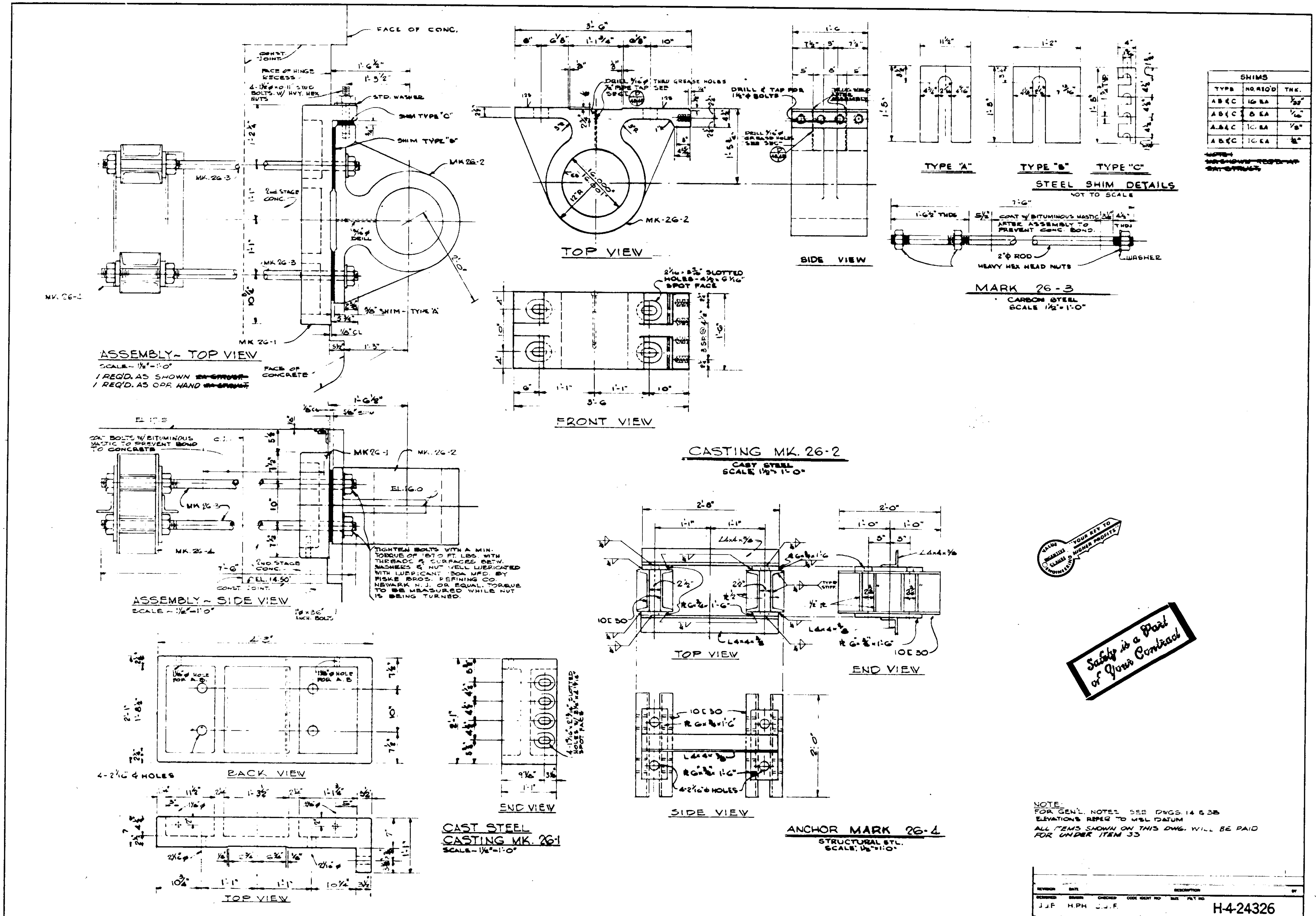
DATE October, 1971 SCALE: SHOWN SPEC. NO. DACW 29-72-B-0031 DWG. NO. 23 OF 65

CONTROL HOUSE-PLAN AND ELEVATION

BAYOU BIENVENUE CONTROL STRUCTURE PLATE II-15



BAYOU BIENVENUE CONTROL STRUCTURE PLATE II-16



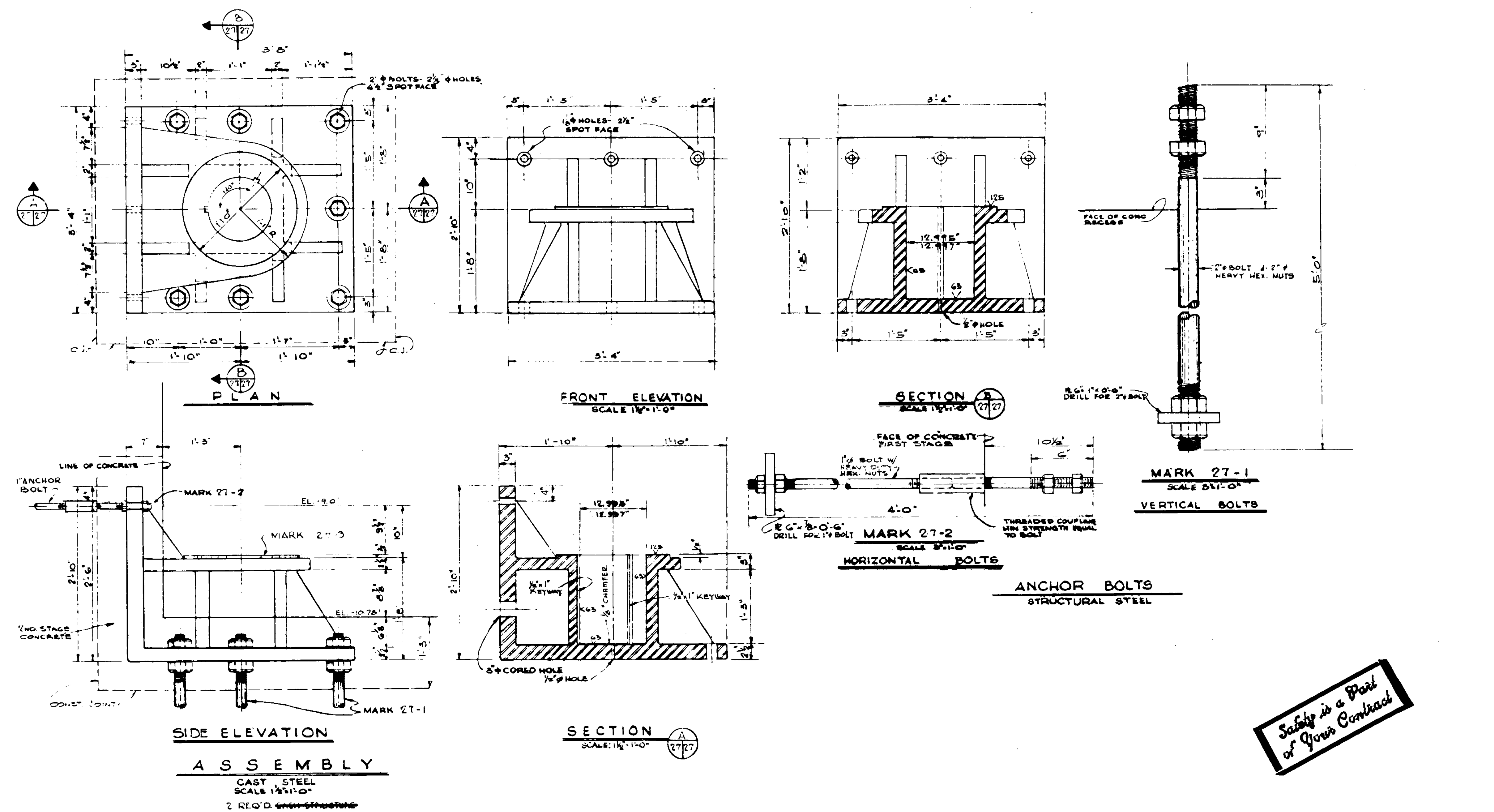
SHIMS		
TYPE	NO. REQ'D	THK.
A B & C	16 EA	1/32"
A B & C	8 EA	1/16"
A B & C	16 EA	1/8"
A B & C	16 EA	1/4"

NOTE:
FOR GEN'L. NOTES SEE DWGS. 14 & 38
ELEVATIONS REFER TO MSL DATUM
ALL ITEMS SHOWN ON THIS DWG. WILL BE PAID FOR UNDER ITEM 33

J.J.F. H.PH. J.J.F.
H-4-24326
DATE October, 1971
SPEC. NO. DACW 29-72-B-0031 DWG. NO 26 of 65

HINGE ANCHOR - ASSEMBLY & DETAILS

BAYOU BIENVENUE CONTROL STRUCTURE PLATE II-17

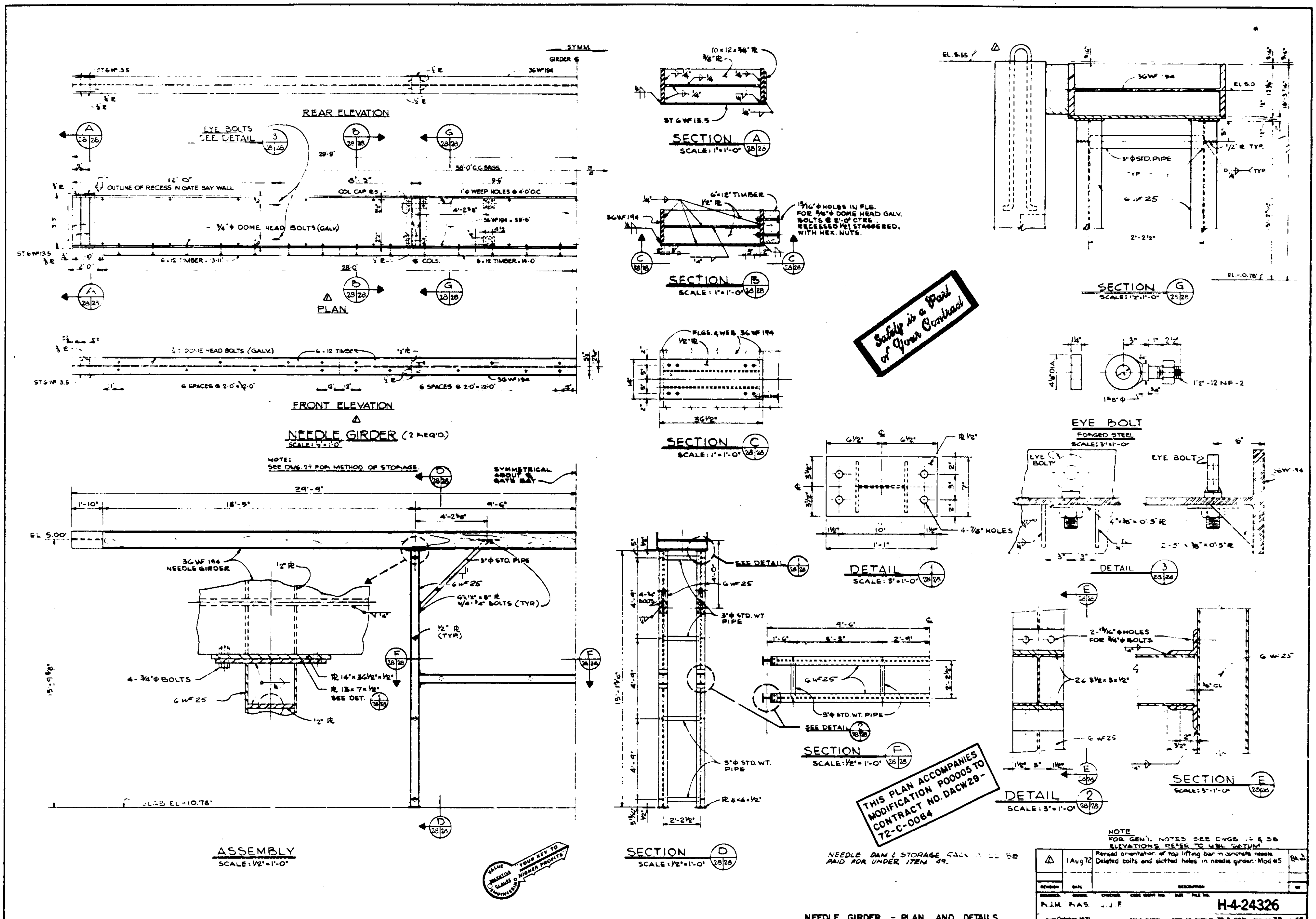


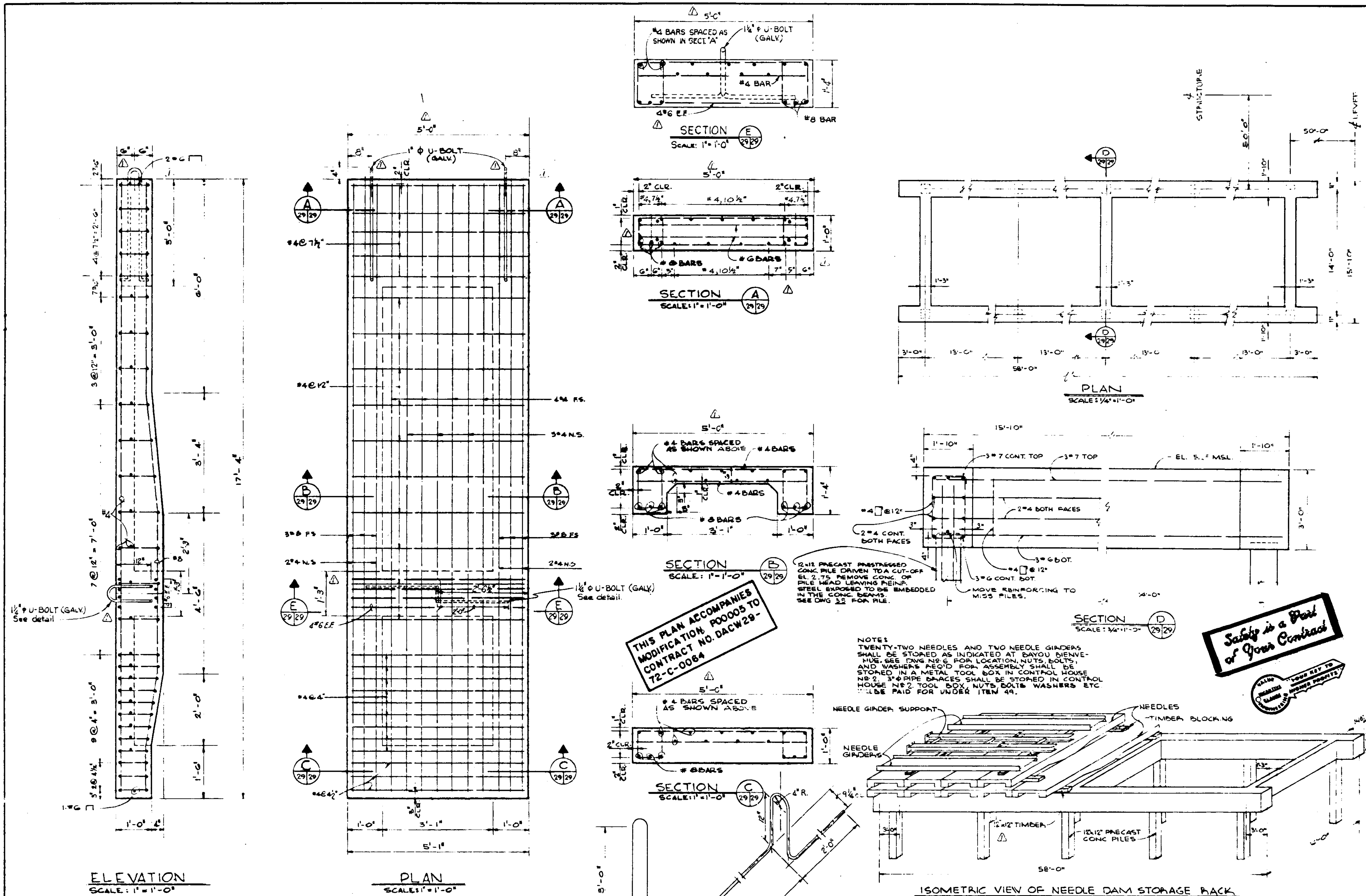
NOTE
FOR GEN'L NOTES SEE DWGS 14 & 38
ALL ITEMS SHOWN ON THIS DWG. WILL BE PAID FOR UNDER ITEM 33.

PINTLE SUPPORT ASSEMBLY AND DETAILS

DESIGNED	DRAWN	CHECKED	FILE NO.
J.J.F.	H.P.H.	J.J.F.	H-4-24326
DATE October, 1971	SCALE: SHOWN	SPEC NO. DACW 29-72-B-0031	DWG. NO. 27 OF 65

BAYOU BIENVENUE CONTROL STRUCTURE PLATE II-18


REAR ELEVATION
EYE BOLTS SEE DETAIL 3
PLAN
OUTLINE OF RECESS IN GATE BAY WALL
3/4"φ DOME HEAD BOLTS (GALV)
1"φ WEEP HOLES @ 4'-0" O.C.
FRONT ELEVATION
6 SPACES @ 2'-0" = 12'-0"
NEEDLE GIRDER (2 REQ'D)
NOTE: SEE DWG. 29 FOR METHOD OF STORAGE.
SYMMETRICAL ABOUT ℄ GATE BAY
36WF194 NEEDLE GIRDER
4-3/4"φ BOLTS
3"φ STD. PIPE
SLAB EL -10.78'
ASSEMBLY
SCALE: 1/2" = 1'-0"
SECTION A
SCALE: 1" = 1'-0"
SECTION B
SCALE: 1" = 1'-0"
13/16"φ HOLES IN FLG. FOR 3/4"φ DOME HEAD GALV. BOLTS @ 2'-0" CTRS. RECESSED 1/2", STAGGERED, WITH HEX. NUTS.
SECTION C
SCALE: 1" = 1'-0"
SECTION D
SCALE: 1/2" = 1'-0"
SECTION G
SCALE: 1/2" = 1'-0"
EYE BOLT
FORGED STEEL
SCALE: 3" = 1'-0"
DETAIL 1
SCALE: 3" = 1'-0"
4-7/8" HOLES
DETAIL 3
SECTION F
SCALE: 1/2" = 1'-0"
DETAIL 2
SCALE: 3" = 1'-0"
2-13/16"φ HOLES FOR 3/4"φ BOLTS
SECTION E
SCALE: 3" = 1'-0"
Safety is a Part of Your Contract
THIS PLAN ACCOMPANIES MODIFICATION P00005 TO CONTRACT NO. DACW29-72-C-0064
NEEDLE DAM & STORAGE RACK WILL BE PAID FOR UNDER ITEM 49.
NOTE
FOR GEN'L NOTES SEE DWGS 1 & 38
ELEVATIONS REFER TO MSL DATUM
1 Aug 72 Revised orientation of top lifting bar in concrete needle. Deleted bolts and slotted holes in needle girder. Mod #5
R.J.M. H.A.S. J.J.F.
H-4-24326
October 1971
NEEDLE GIRDER - PLAN AND DETAILS



NOTES:
TWENTY-TWO NEEDLES AND TWO NEEDLE GIRDERS SHALL BE STORED AS INDICATED AT BAYOU BIENVENUE. SEE DWG Nº 6 FOR LOCATION. NUTS, BOLTS, AND WASHERS REQ'D FOR ASSEMBLY SHALL BE STORED IN A METAL TOOL BOX IN CONTROL HOUSE Nº 2. 3" Φ PIPE BRACES SHALL BE STORED IN CONTROL HOUSE Nº 2 TOOL BOX, NUTS, BOLTS, WASHERS ETC. WILL BE PAID FOR UNDER ITEM 49.

ISOMETRIC VIEW OF NEEDLE DAM STORAGE RACK
(BAYOU BIENVENUE STRUCTURE ONLY)
(SEE DWG Nº 6 FOR LOCATION)

NOTE:
FOR GEN'L. NOTES SEE DWGS. 14 & 38
ELEVATIONS REFER TO MSL DATUM
NEEDLE DAM & STORAGE RACK WILL BE PAID FOR UNDER ITEM 49.

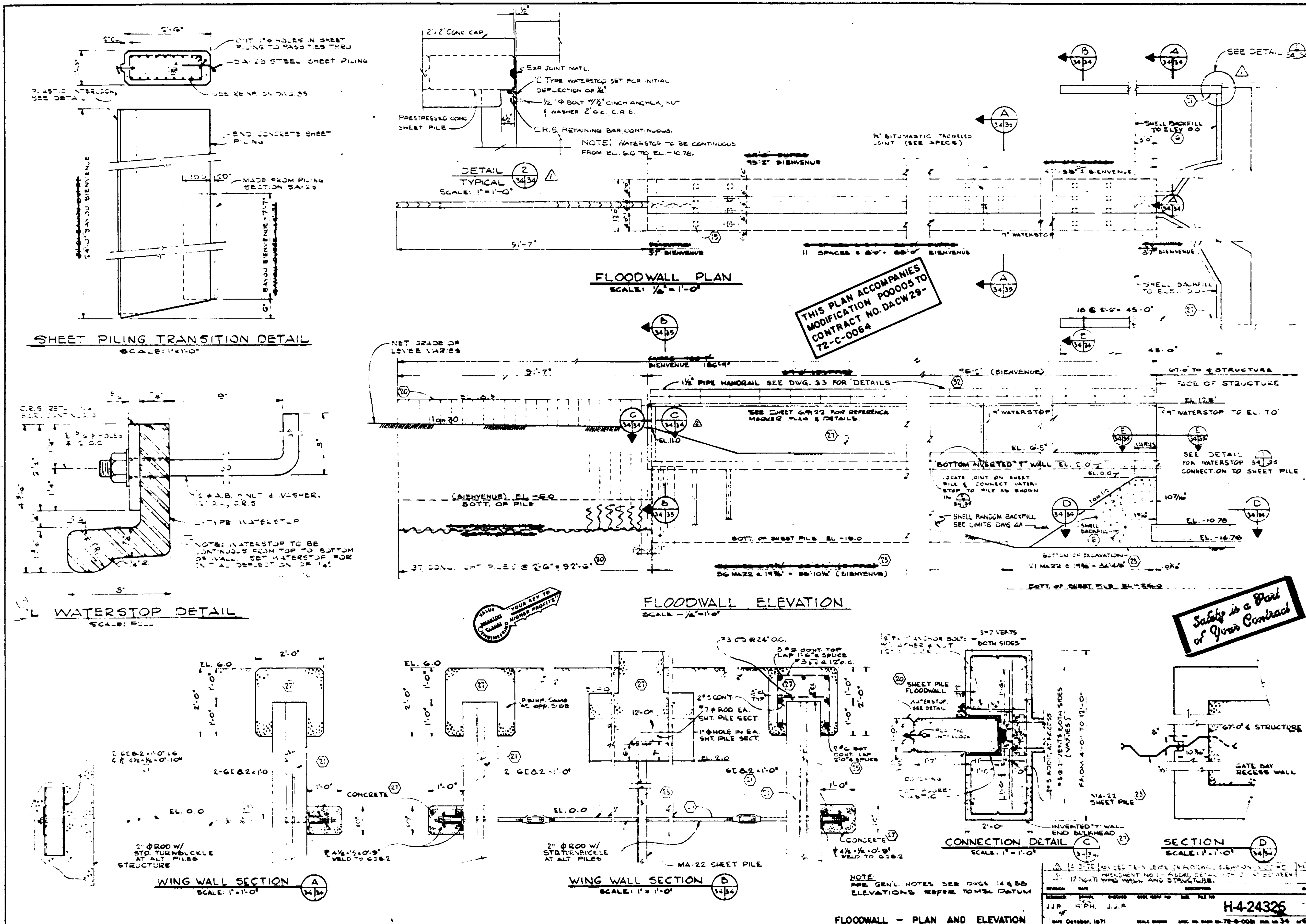
NEEDLE DETAILS

Revision	Date	Description
1	1 Aug 72	[illegible]

Designed	Drawn	Checked	File No.
R.J.M.	R.A.S.	J.J.F.	H-4-24326

Date: OCTOBER 1971 — Spec. No. DACW 29-72-B-0031 — Sheet No. 29 of 65

BAYOU BIENVENUE CONTROL STRUCTURE PLATE II-20



BAYOU BIENVENUE CONTROL STRUCTURE PLATE II -21

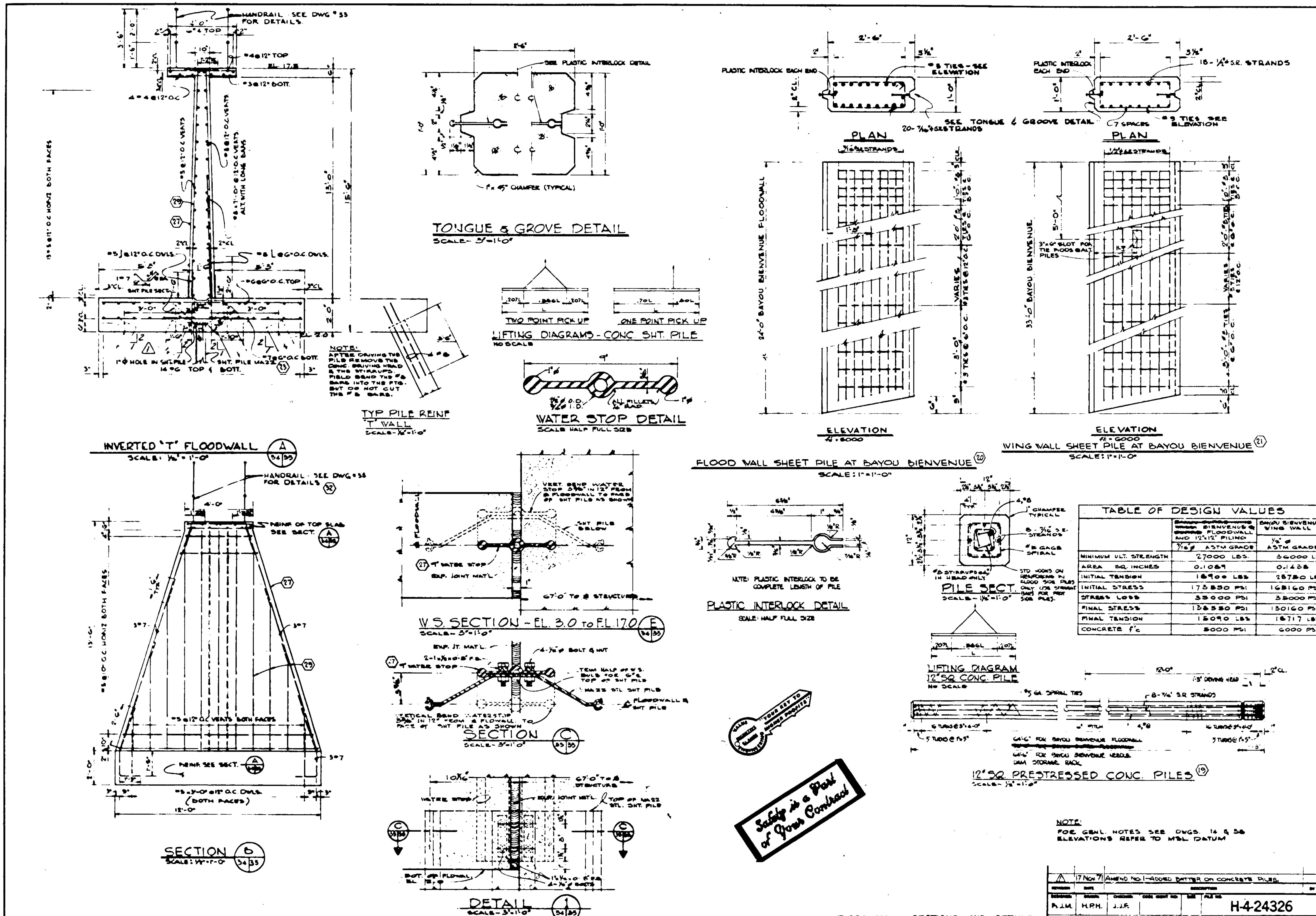


TABLE OF DESIGN VALUES		
	BIENVENUE FLOODWALL AND 12"x12" PILING — 7/16" ϕ ASTM GRADE	BAYOU BIENVENUE WING WALL — 1/2" ϕ ASTM GRADE
MINIMUM ULT. STRENGTH	27000 LBS.	36000 LBS
AREA SQ. INCHES	0.1089	0.1438
INITIAL TENSION	18900 LBS	28750 LBS
INITIAL STRESS	173550 PSI	165160 PSI
STRESS LOSS	35000 PSI	35000 PSI
FINAL STRESS	138550 PSI	130160 PSI
FINAL TENSION	15090 LBS	18717 LBS
CONCRETE f'c	5000 PSI	6000 PSI

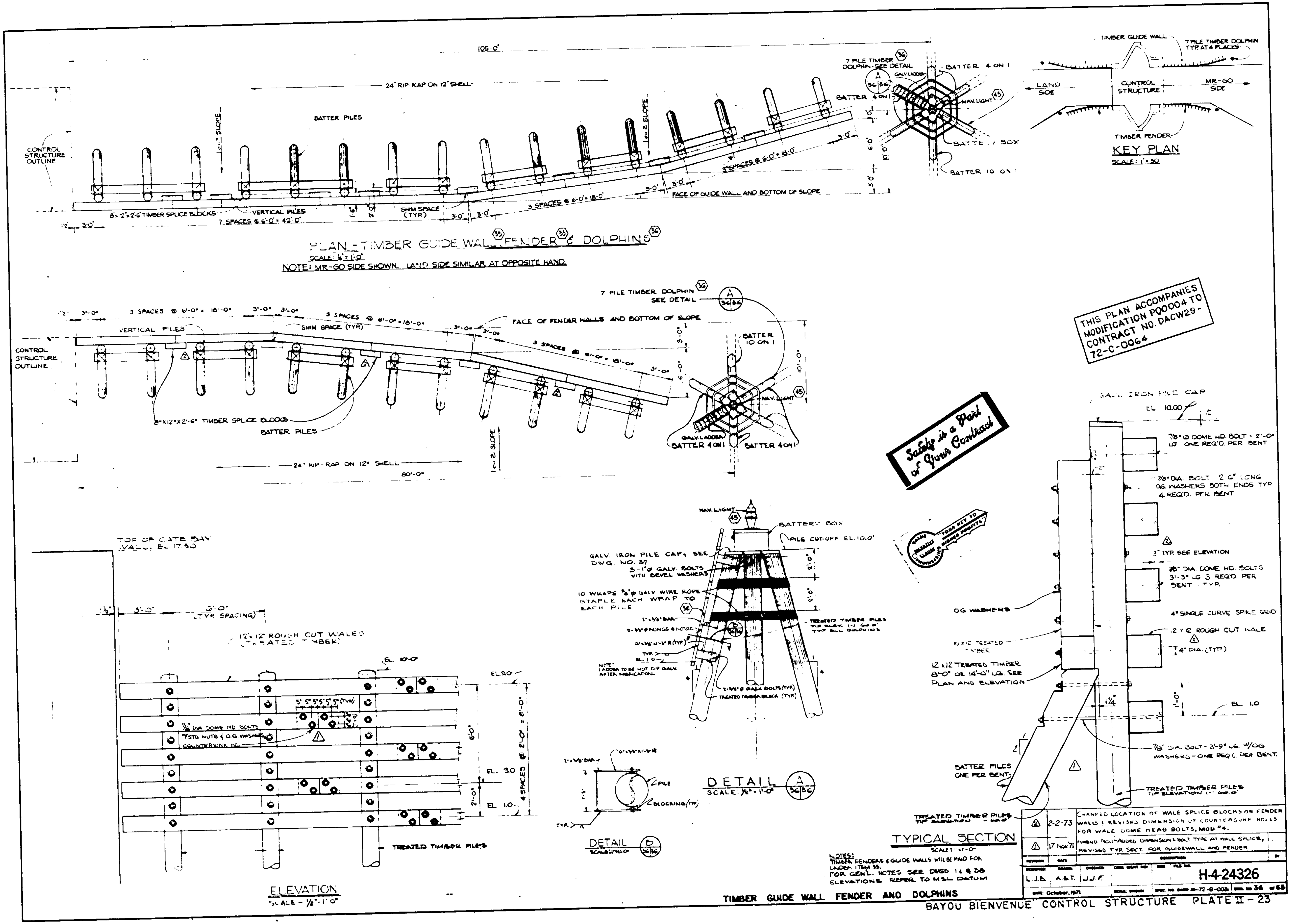
NOTE:
FOR GENL. NOTES SEE DWGS. 14 & 36
ELEVATIONS REFER TO MSL DATUM

Revision	Date	Description
△	17 Nov 71	AMEND No. 1 - ADDED BATTER ON CONCRETE PILES.

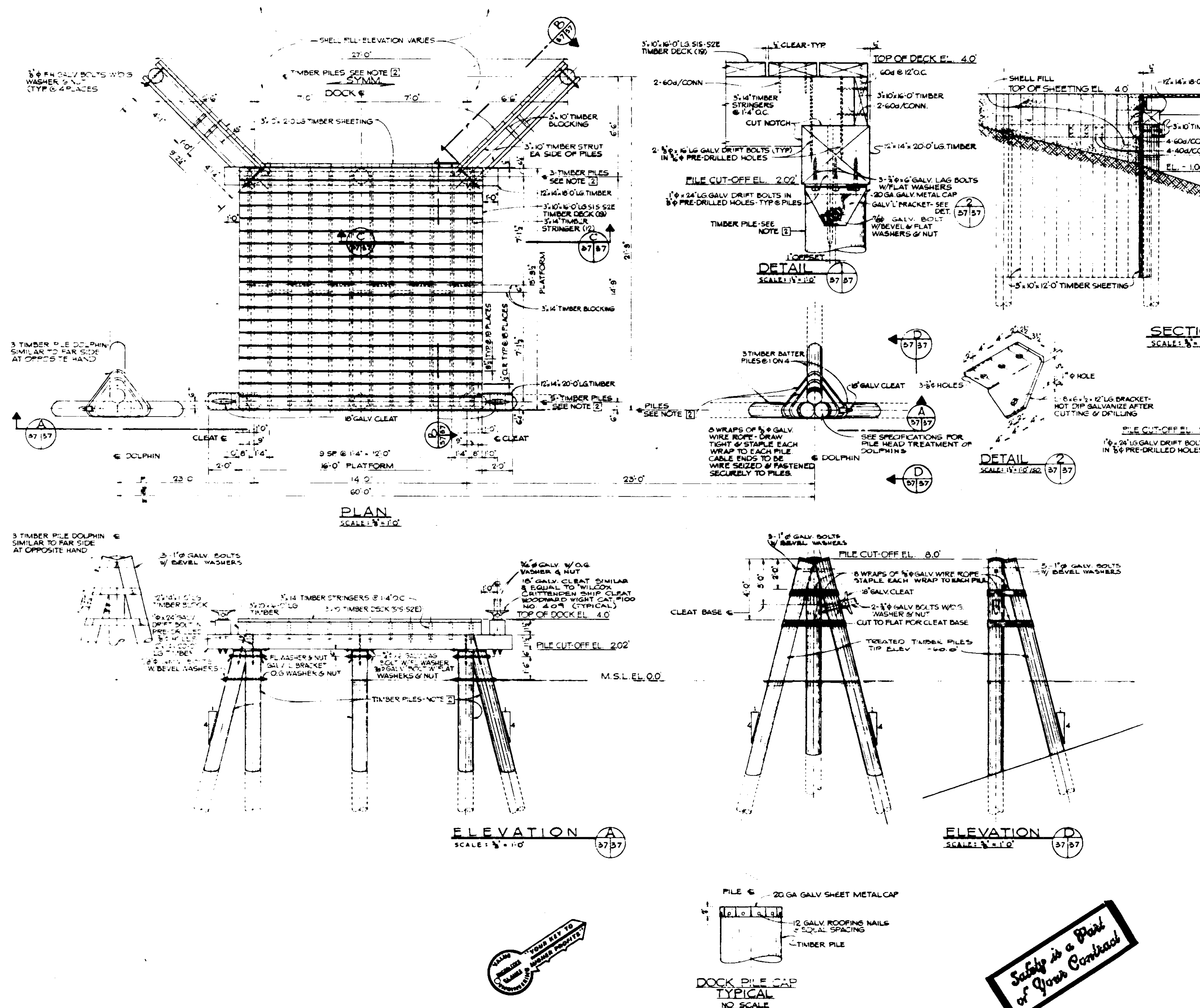
FLOODWALL - SECTIONS AND DETAILS

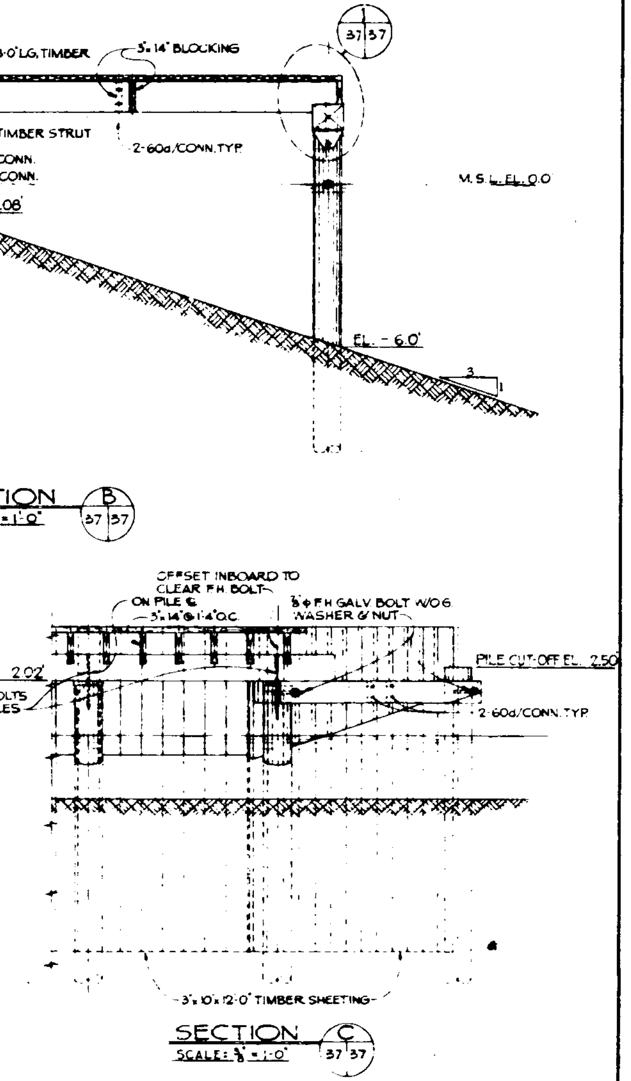
R.J.M. | H.P.H. | J.J.F. | H-4-24326

October, 1971 | D-72-B-0021 | 35 of 65



105'-0"
24" RIP-RAP ON 12" SHELL
BATTER PILES
1 on 2 SLOPE
CONTROL STRUCTURE OUTLINE
8x12"x2'-6" TIMBER SPLICE BLOCKS
VERTICAL PILES
SHIM SPACE (TYP)
7 SPACES @ 6'-0" = 42'-0"
3 SPACES @ 6'-0" = 18'-0"
FACE OF GUIDE WALL AND BOTTOM OF SLOPE
7 PILE TIMBER DOLPHIN - SEE DETAIL
GALV. LADDER
BATTER 4 ON 1
NAV. LIGHT
BATTERY BOX
BATTER 10 ON 1
PLAN - TIMBER GUIDE WALL, FENDER & DOLPHINS
SCALE: ¼" = 1'-0"
NOTE: MR-GO SIDE SHOWN. LAND SIDE SIMILAR AT OPPOSITE HAND.
TIMBER GUIDE WALL
7 PILE TIMBER DOLPHIN TYP AT 4 PLACES
LAND SIDE
CONTROL STRUCTURE
MR-GO SIDE
TIMBER FENDER
KEY PLAN
SCALE: 1" = 50'
7 PILE TIMBER DOLPHIN SEE DETAIL
3 SPACES @ 6'-0" = 18'-0"
FACE OF FENDER WALLS AND BOTTOM OF SLOPE
VERTICAL PILES
SHIM SPACE (TYP)
8"x12"x2'-6" TIMBER SPLICE BLOCKS
BATTER PILES
24" RIP-RAP ON 12" SHELL
80'-0"
1 on 3 SLOPE
BATTER 10 ON 1
GALV. LADDER
BATTER 4 ON 1
THIS PLAN ACCOMPANIES MODIFICATION P00004 TO CONTRACT NO. DACW29-72-C-0064
Safety is a Part of Your Contract
YOUR KEY TO HIGHER PROFITS
TOP OF GATE BAY WALL EL. 17.50
3'-0" (TYP SPACING)
12"x12" ROUGH CUT WALES (TREATED TIMBER)
EL. 10'-0"
EL. 9.0'
5" 5" 5" 5" 5" 5" (TYP)
⅞" DIA DOME HD BOLTS ⅞" STD. NUTS & O.G. WASHERS COUNTERSINK HD.
4 SPACES @ 2'-0" = 8'-0"
EL. 3.0
EL. 1.0
TREATED TIMBER PILES
ELEVATION
SCALE - ½" = 1'-0"
NAV. LIGHT
BATTERY BOX
PILE CUT-OFF EL. 10.0'
GALV. IRON PILE CAP, SEE DWG. NO. 37
3-1" Ø GALV. BOLTS WITH BEVEL WASHERS
10 WRAPS ⅝" Ø GALV. WIRE ROPE STAPLE EACH WRAP TO EACH PILE
TREATED TIMBER PILES TIP ELEV. (-) 60.0' TYP ALL DOLPHINS
NOTE: LADDER TO BE HOT DIP GALV. AFTER FABRICATION.
TREATED TIMBER BLOCK (TYP)
DETAIL A
SCALE: ⅜" = 1'-0"
PILE
BLOCKING (TYP)
DETAIL B
GALV. IRON PILE CAP
EL. 10.00
⅞" Ø DOME HD. BOLT - 2'-0" LG ONE REQ'D. PER BENT
⅞" DIA. BOLT 2'-6" LONG OG WASHERS BOTH ENDS TYP 4 REQ'D. PER BENT
3" TYP SEE ELEVATION
⅞" DIA. DOME HD BOLTS 3'-3" LG 3 REQ'D. PER BENT TYP.
OG WASHERS
4" SINGLE CURVE SPIKE GRID
12 x 12 ROUGH CUT WALE
4" DIA. (TYP)
10x12 TREATED TIMBER
12 x 12 TREATED TIMBER 8'-0" OR 14'-0" LG. SEE PLAN AND ELEVATION
EL. 1.0
⅞" DIA. BOLT - 3'-9" LG. W/OG WASHERS - ONE REQ'D PER BENT.
BATTER PILES ONE PER BENT
TREATED TIMBER PILES TIP ELEVATION (-) 60.0'
TYPICAL SECTION
NOTES: TIMBER FENDERS & GUIDE WALLS WILL BE PAID FOR UNDER ITEM 35. FOR GEN'L. NOTES SEE DWGS 14 & 38 ELEVATIONS REFER TO MSL DATUM
2-2-73 CHANGED LOCATION OF WALE SPLICE BLOCKS ON FENDER WALLS & REVISED DIMENSION OF COUNTERSUNK HOLES FOR WALE DOME HEAD BOLTS, MOD #4.
17 Nov 71 AMEND No. 1 - ADDED DIMENSION & BOLT TYPE AT WALE SPLICE, REVISED TYP. SECT. FOR GUIDEWALL AND FENDER
L.J.B. A.B.T. J.J.F.
H-4-24326
DATE: October, 1971
TIMBER GUIDE WALL FENDER AND DOLPHINS
BAYOU BIENVENUE CONTROL STRUCTURE PLATE II - 23





NOTES:

1 - ALL ELEVATIONS ... MEAN SEA LEVEL

2 - ALL PILES SHALL BE - TYPE CLASS "B" TREATED TIMBER PILES TIP ELEVATION = - 60.0'±.

3 - TIMBER COMPONENTS, OTHER THAN PILES SHALL BE S4S FINISH, EXCEPT DECKING SHALL BE S1S-S2E FINISH

4 - ALL FASTENINGS, INCLUDING COMMON NAILS, SHALL BE HOT DIP GALVANIZED.

5 - FOR GEN'L. NOTES SEE DWGS 14 & 38

6 EQUIPMENT DOCK (INCLUDING DOLPHINS AT DOCK) WILL BE PAID FOR UNDER ITEM 46.

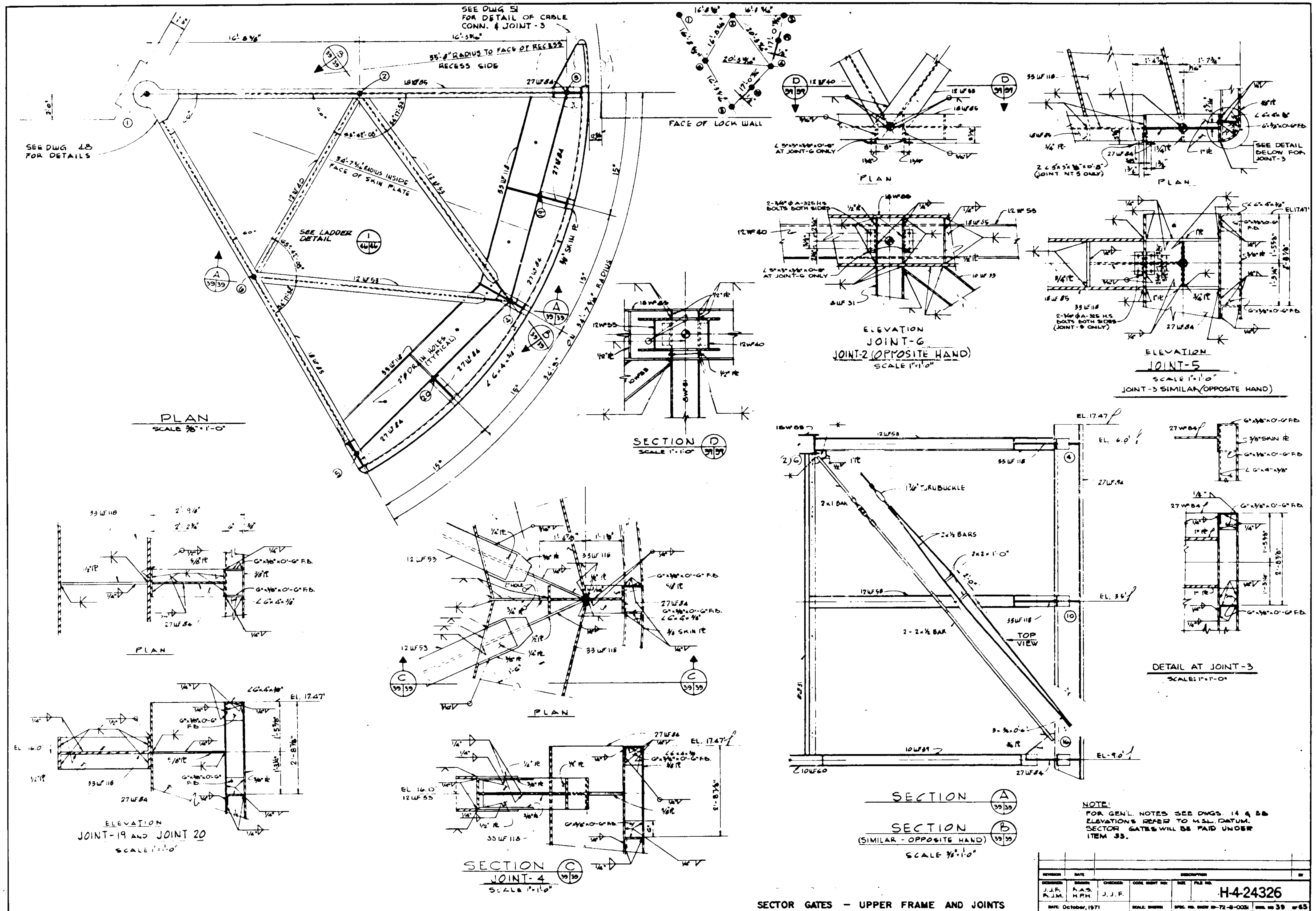
REVISION	DATE	DESCRIPTION	BY

DESIGNED	DRAWN	CHECKED	CODE IDENT NO.	SIZE	FILE NO.
L.J.B.	H.P.H.	J.J.F.			H-4-24326

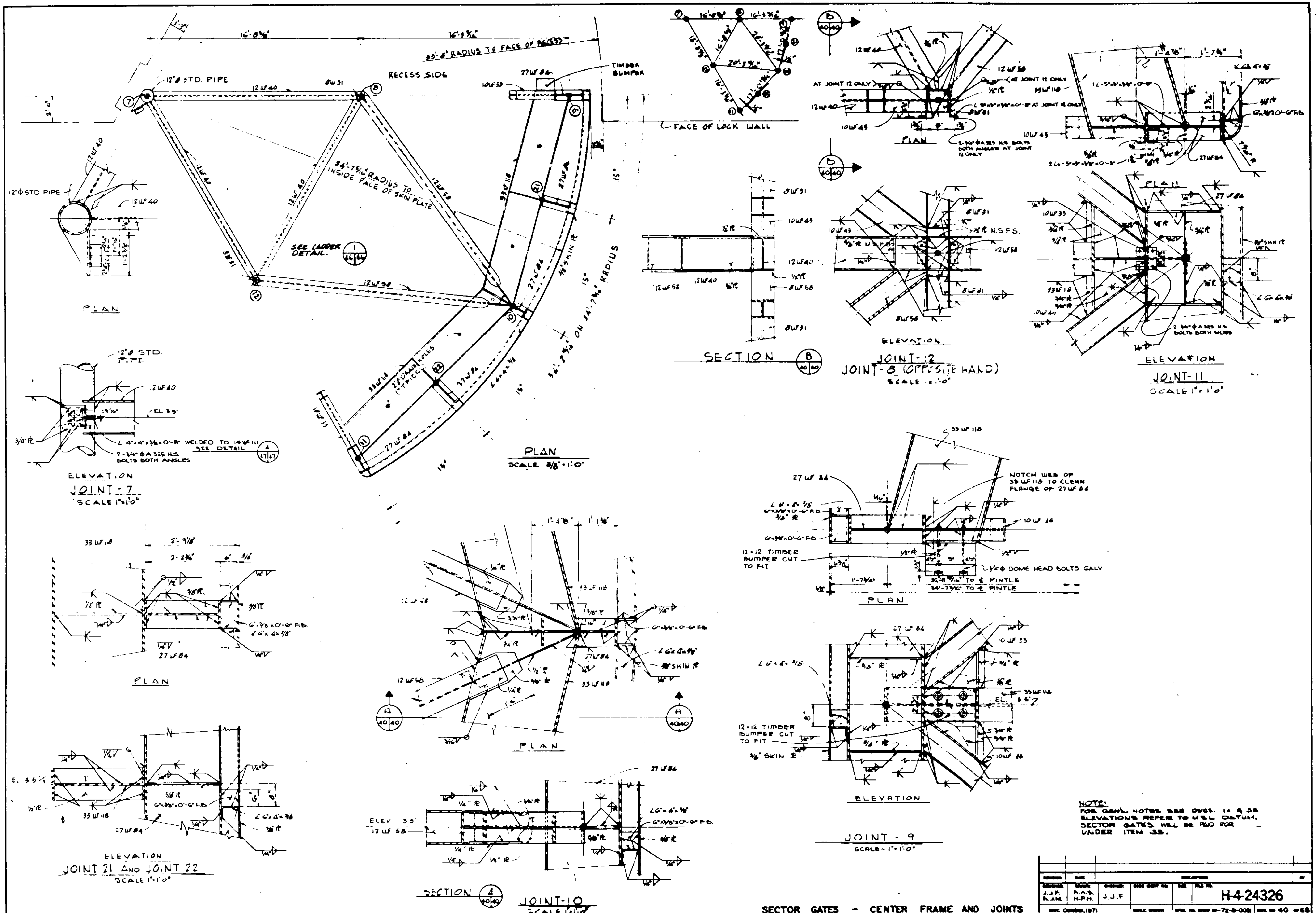
DATE: October, 1971 — SCALE: SHOWN — SPEC. NO. DACW 29-72-B-0031 — DWG. NO. 37 OF 65

LOADING DOCK

BAYOU BIENVENUE CONTROL STRUCTURE PLATE II - 24



BAYOU BIENVENUE CONTROL STRUCTURE PLATE II-25

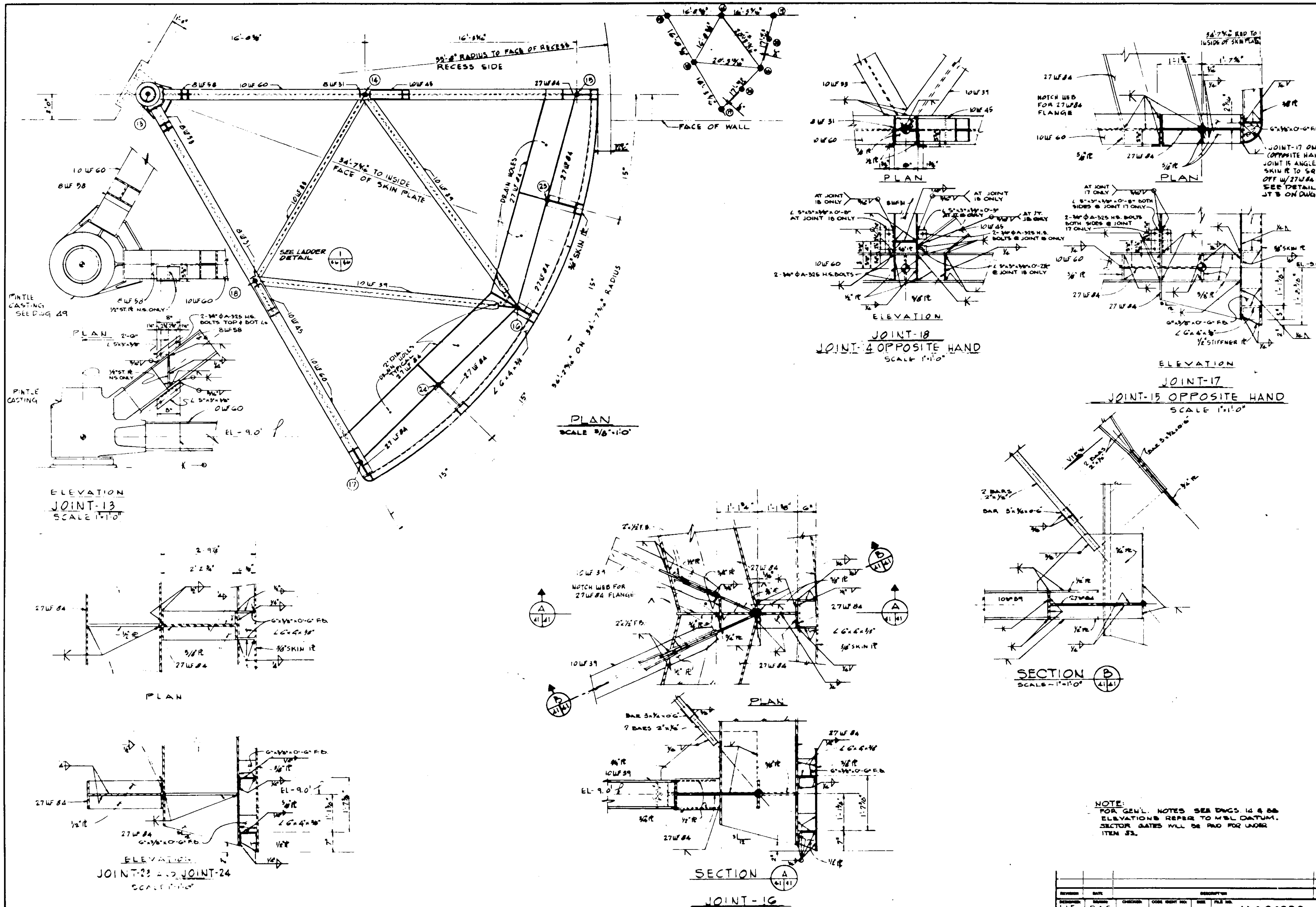


NOTE:
FOR GEN'L NOTES SEE DWGS. 14 & 36
ELEVATIONS REFER TO M.S.L. DATUM.
SECTOR GATES WILL BE PAID FOR UNDER ITEM 3B.

DESIGNED	DRAWN	CHECKED				
J.J.R. R.A.M.	R.A.S. H.P.H.	J.J.F.				H-4-24326

DATE: October, 1971 — SHEET 40 OF 65

SECTOR GATES - CENTER FRAME AND JOINTS

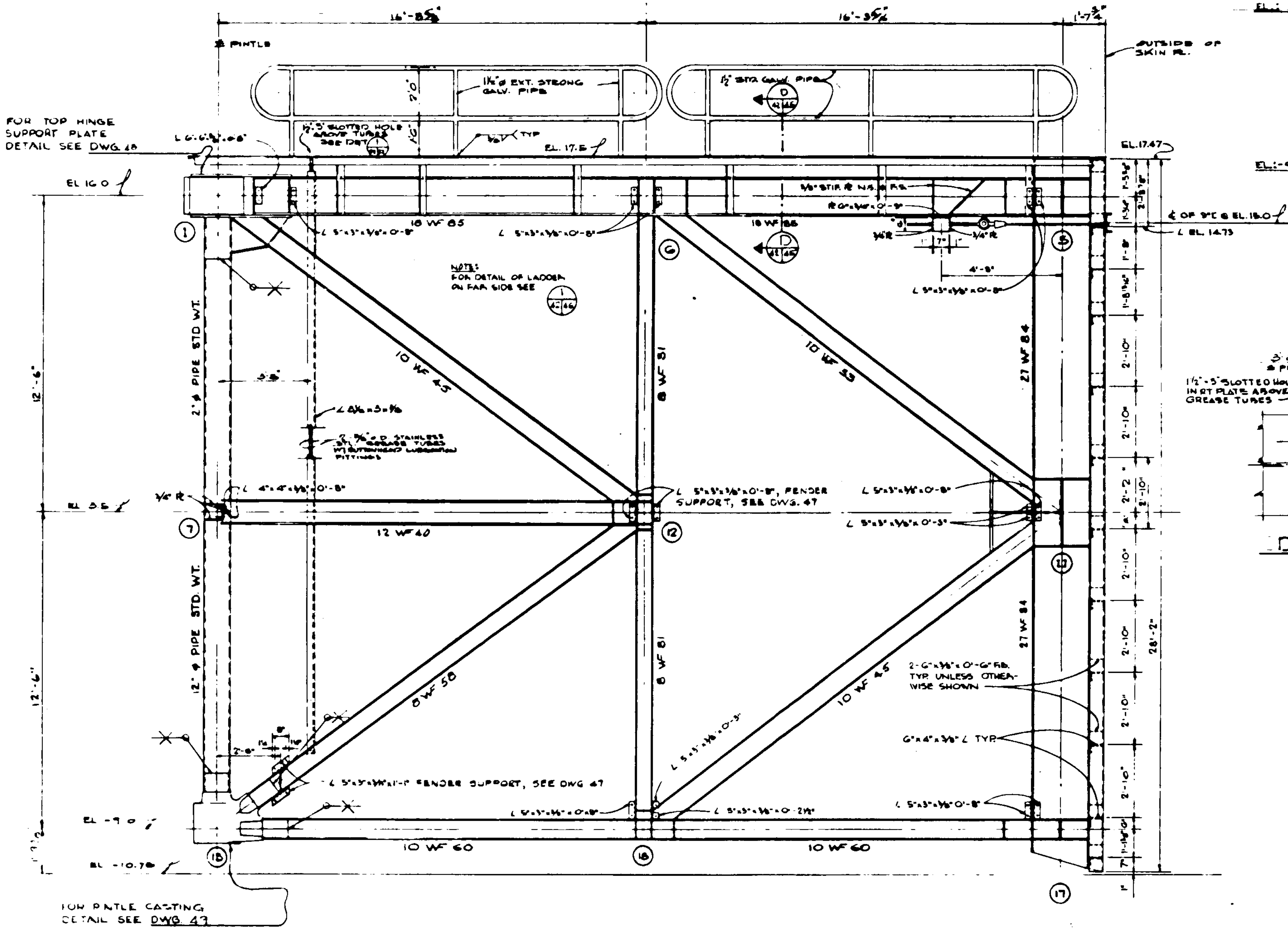


NOTE:
FOR GEN'L. NOTES SEE DWGS 14 & 86
ELEVATIONS REFER TO MSL DATUM.
SECTOR GATES WILL BE PAID FOR UNDER ITEM 53.

DESIGNED	DRAWN	CHECKED		FILE NO.
J.J.F. R.J.M.	R.A.S. H.P.H.	J.J.F.		H-4-24326
DATE: October, 1971			SPEC. NO. DACW 29-72-B-0031	DWG. NO. 41 of 86

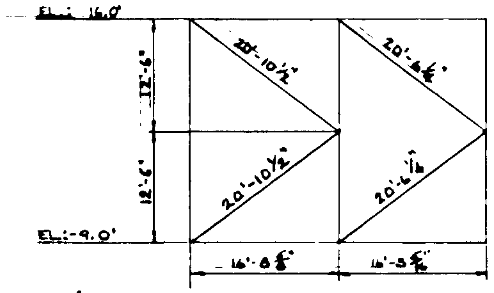
SECTOR GATES - LOWER FRAME AND JOINTS

BAYOU BIENVENUE CONTROL STRUCTURE PLATE II-27



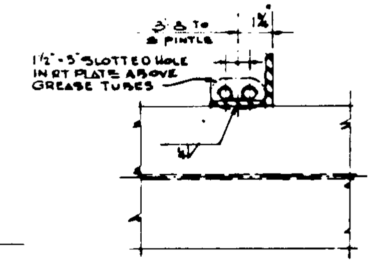
CHANNEL TRUSS ELEVATION

SCALE 1/2" = 1'-0"



TRUSS DIMENSIONS

SCALE 1/8" = 1'-0"



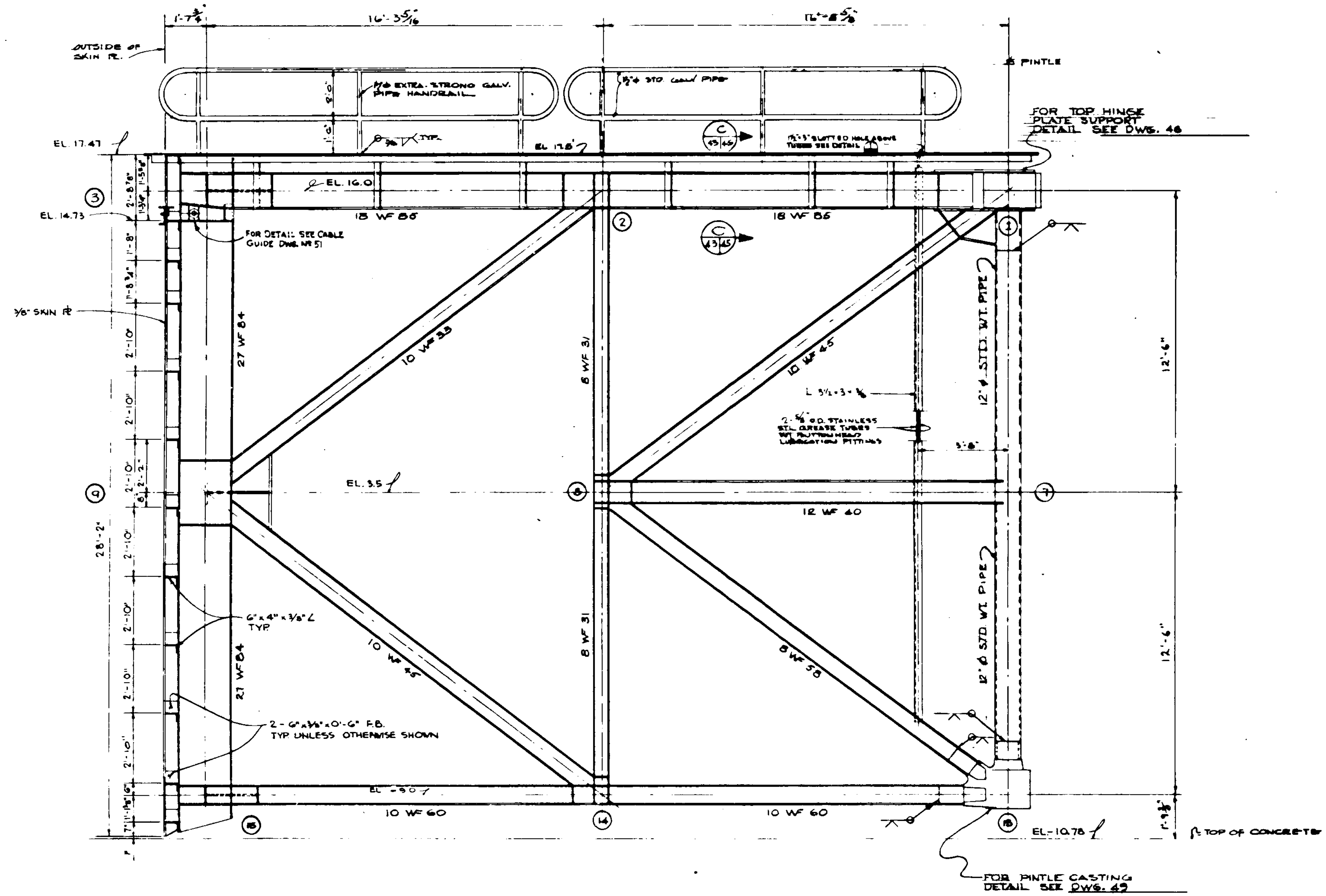
DETAIL 1 (42/42)

NOTE:
FOR GEN'L. NOTES SEE DWGS. 14 & 38
ELEVATIONS REFER TO MSL DATUM
SECTOR GATES WILL BE PAID FOR UNDER ITEM 33.

DESIGNED: J J F, R J M	DRAWN: R A S, H P H	CHECKED: J J F			H-4-24326
DATE: October 1971				SPEC. NO. DACW 29-72-B-0031	DWG. NO. 42 of 68

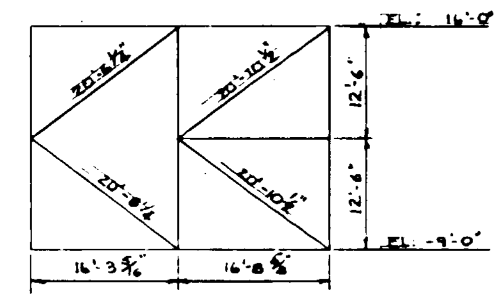
SECTOR GATES - CHANNEL TRUSS

BAYOU BIENVENUE CONTROL STRUCTURE PLATE II-28



RECESS TRUSS ELEVATION

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



TRUSS DIMENSIONS

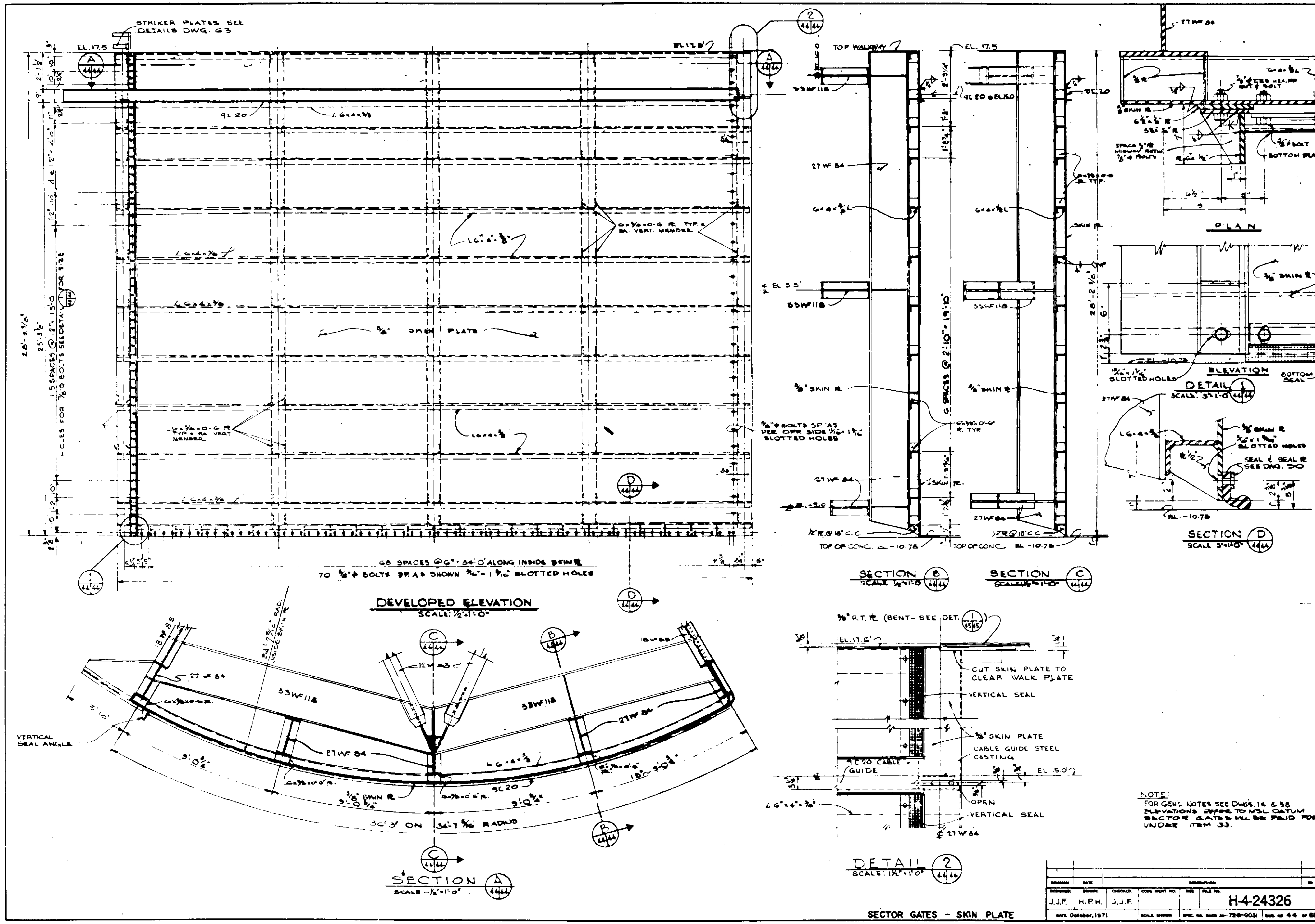
SCALE: 1/8"=1'-0"

NOTE:
FOR GEN'L NOTES SEE DWGS 14 & 38
ELEVATIONS REFER TO MSL DATUM
SECTOR GATES WILL BE PAID FOR UNDER ITEM 33

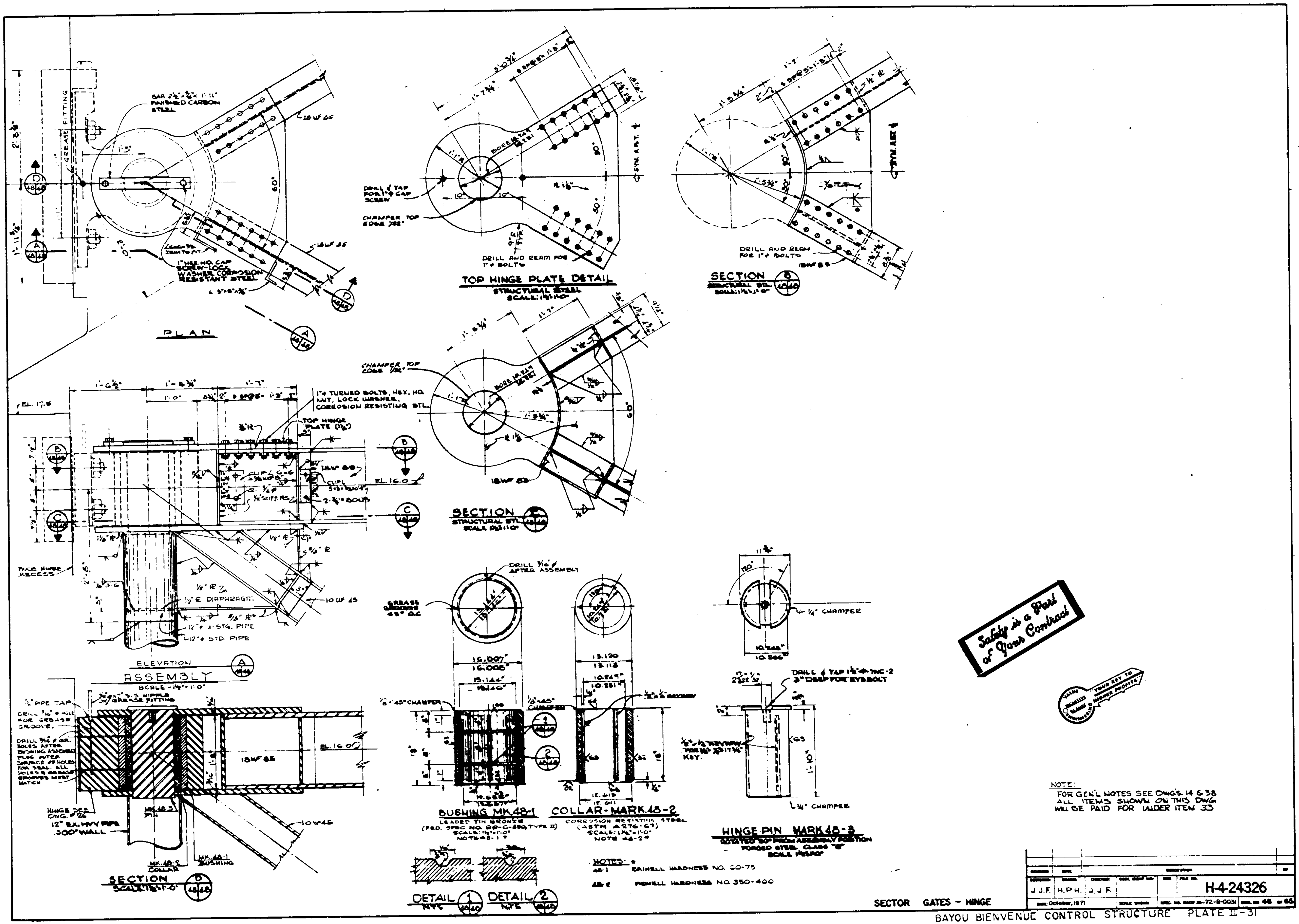
J.J.F. R.J.M.	R.A.S. H.P.M.	J.J.F.		H-4-24326
DATE October, 1971				43 of 65

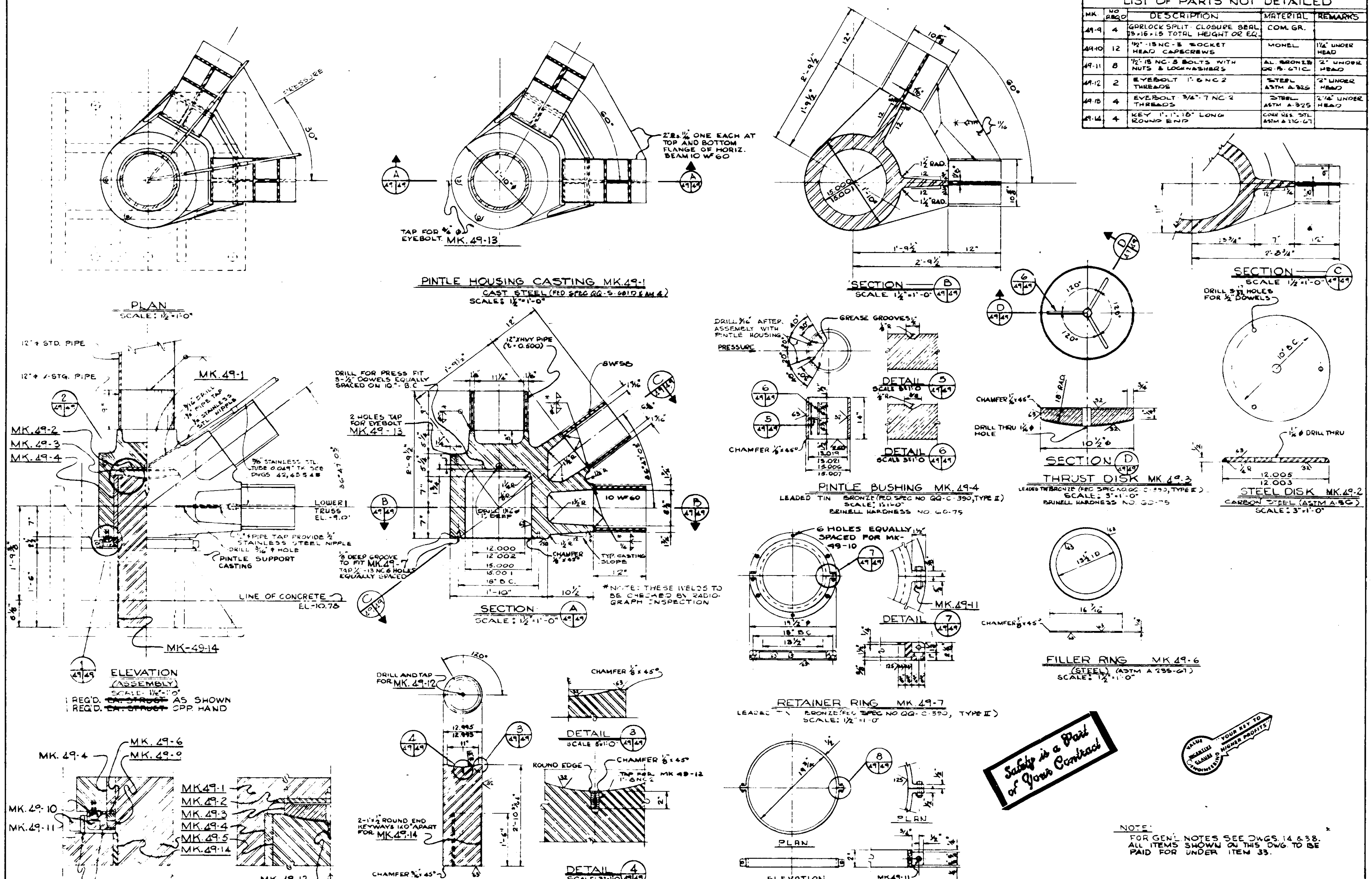
SECTOR GATES – RECESS TRUSS

BAYOU BIENVENUE CONTROL STRUCTURE PLATE II-29



BAYOU BIENVENUE CONTROL STRUCTURE PLATE II - 30


PLAN
BAR 2½" - ⅝" x 1' 11" FINISHED CARBON STEEL
GREASE FITTING
1" HEX. HD. CAP SCREW - LOCK WASHER CORROSION RESISTANT STEEL
TOP HINGE PLATE DETAIL
STRUCTURAL STEEL
DRILL & TAP FOR 1" φ CAP SCREW
CHAMFER TOP EDGE 1/32"
DRILL AND REAM FOR 1" φ BOLTS
SECTION B
SECTION C
STRUCTURAL STL.
1" φ TURNED BOLTS, HEX. HD. NUT, LOCK WASHER, CORROSION RESISTING STL.
TOP HINGE PLATE (1½")
EL. 17.5
EL. 16.0
FACE HINGE RECESS
½" ⊄ DIAPHRAGM
12" φ X-STG. PIPE
12" φ STD. PIPE
ELEVATION
ASSEMBLY
SCALE - 1½" = 1'-0"
½" PIPE TAP
DRILL 3/16" φ HOLE FOR GREASE GROOVE
HINGE SEE DWG. # 26
12" EX. HVY PIPE .500" WALL
MK 48-2 COLLAR
MK 48-1 BUSHING
SECTION D
GREASE GROOVE 45° O.C.
DRILL 3/16" φ AFTER ASSEMBLY
BUSHING MK 48-1
LEADED TIN BRONZE
NOTE 48-1
COLLAR - MARK 48-2
CORROSION RESISTING STEEL (ASTM A276-67)
NOTE 48-2
¼" CHAMFER
DRILL & TAP 1½"-4-NC-2 3" DEEP FOR EYEBOLT
KEY
HINGE PIN MARK 48-3
ROTATED 90° FROM ASSEMBLY POSITION
FORGED STEEL, CLASS "E"
DETAIL 1
DETAIL 2
NOTES:
48-1 BRINELL HARDNESS NO. 60-75
48-2 BRINELL HARDNESS NO. 350-400
NOTE:
FOR GEN'L NOTES SEE DWG'S. 14 & 38
ALL ITEMS SHOWN ON THIS DWG WILL BE PAID FOR UNDER ITEM 33
Safety is a Part of Your Contract
SECTOR GATES - HINGE
J.J.F. H.P.H. J.J.F.
H-4-24326
October, 1971
72-B-0031
48 of 65



LIST OF PARTS NOT DETAILED

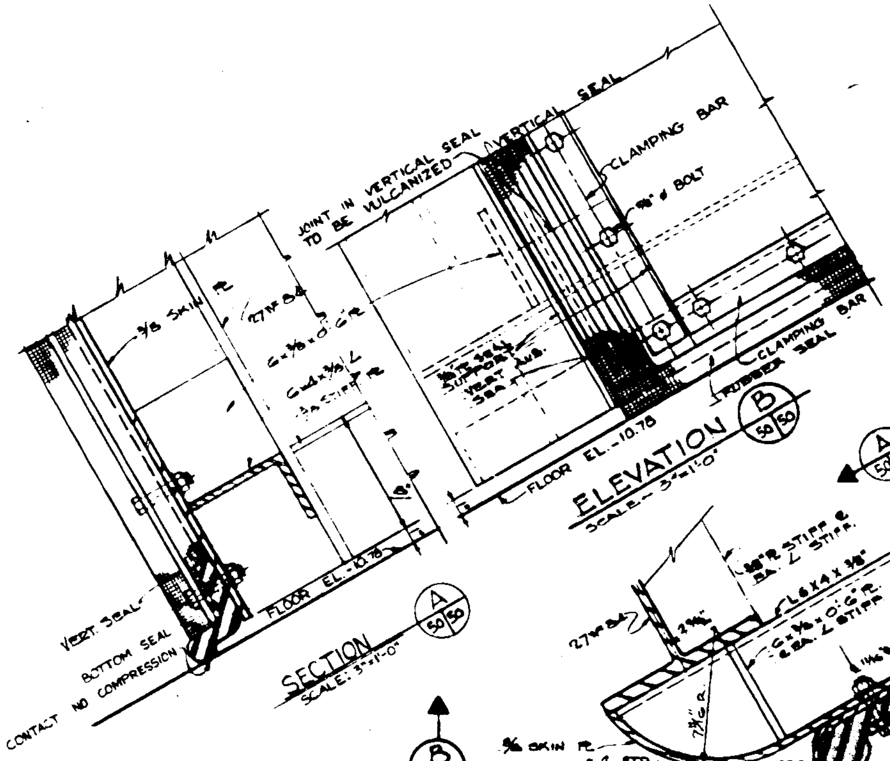
MK.	NO REQ'D	DESCRIPTION	MATERIAL	REMARKS
49-9	4	GARLOCK SPLIT-CLOSURE SEAL 13×16×1.5 TOTAL HEIGHT OR EQ.	COM. GR.	
49-10	12	1/2"-13NC-3 SOCKET HEAD CAPSCREWS	MONEL	1 1/4" UNDER HEAD
49-11	8	1/2"-13 NC-3 BOLTS WITH NUTS & LOCKWASHERS	AL. BRONZE QQ-B-671C	2" UNDER HEAD
49-12	2	EYEBOLT 1"-8NC2 THREADS	STEEL ASTM A-325	2" UNDER HEAD
49-13	4	EYEBOLT 3/4"-7 NC-2 THREADS	STEEL ASTM A-325	2 1/4" UNDER HEAD
49-14	4	KEY 1"×1"×18" LONG ROUND END	CORR RES. STL ASTM A 276-67	

NOTE:
FOR GEN'L NOTES SEE DWGS. 14 & 38.
ALL ITEMS SHOWN ON THIS DWG. TO BE PAID FOR UNDER ITEM 33.

SECTOR GATES - PINTLE

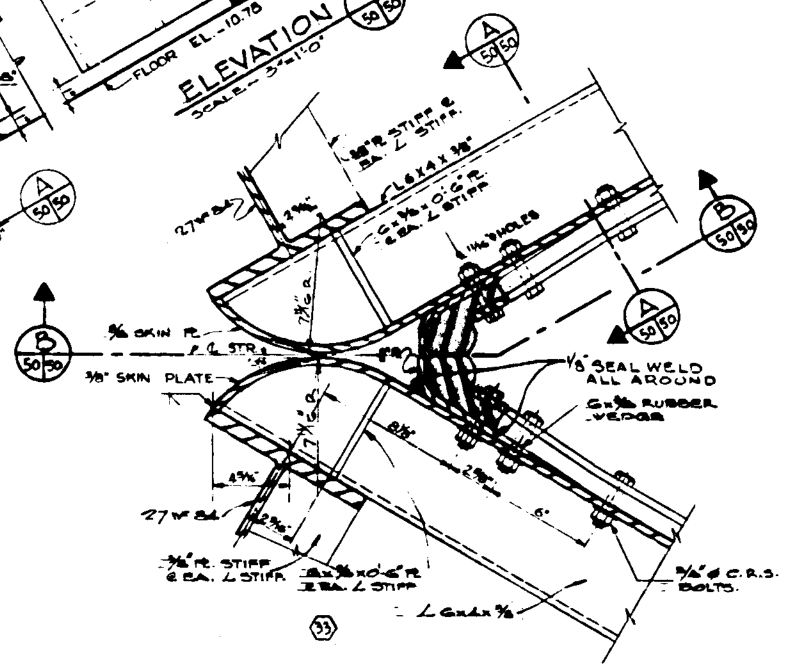
DESIGNED: JJF	DRAWN: HPH	CHECKED: JJF	FILE NO.	H-4-24326
DATE: October, 1971	SCALE: SHOWN	SPEC. NO. DACW 29-72-B-0031	SHEET 49 of 65	

BAYOU BIENVENUE CONTROL STRUCTURE PLATE II-32

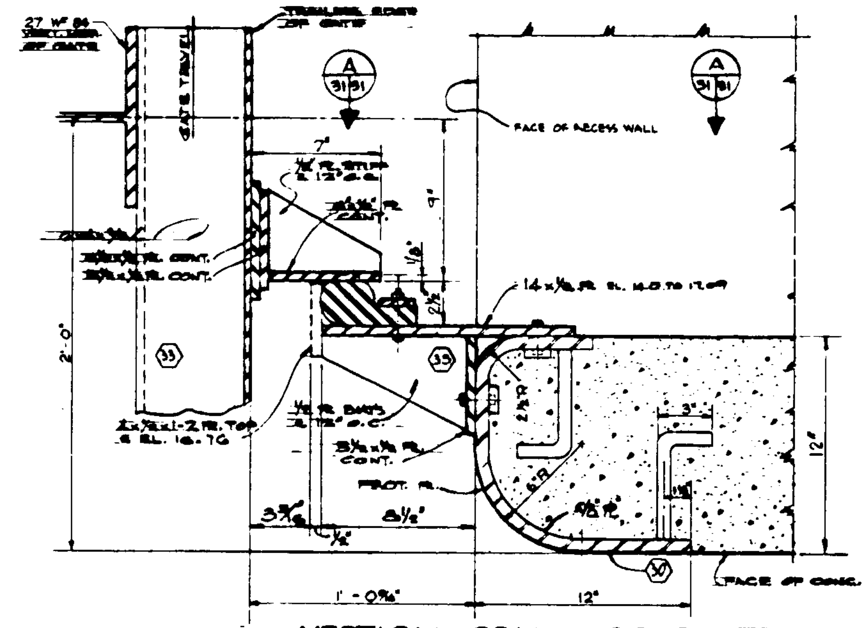


SECTION (A 50/50)
SCALE: 3"=1'-0"

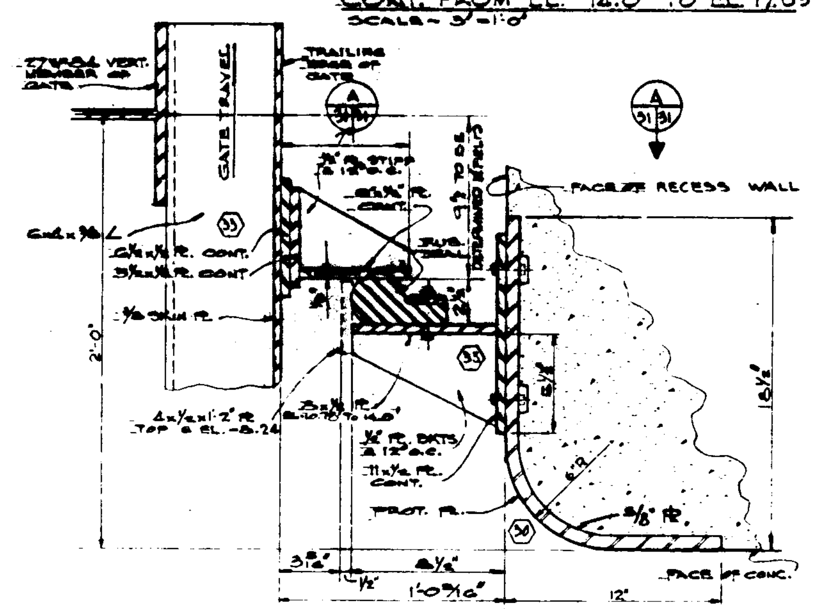
ELEVATION (B 50/50)
SCALE - 3"=1'-0"



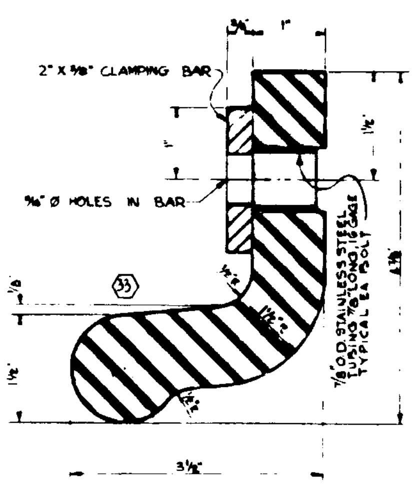
SEAL AT GATE CLOSURE
SCALE: 3"=1'-0"



VERTICAL SEAL @ CONC. STR.
CONT. FROM EL. 14.0 TO EL. 17.09
SCALE - 3"=1'-0"

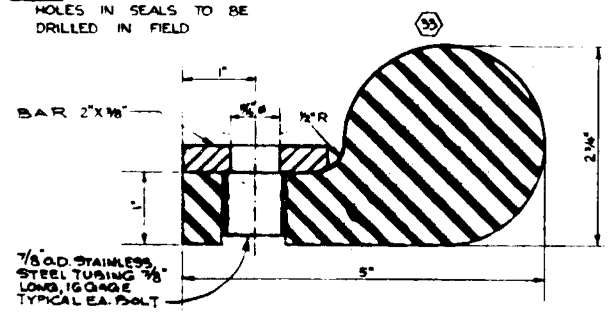


VERTICAL SEAL @ CONC. STR.
CONT. FROM EL. -10.78 TO EL. 14.00
SCALE - 3"=1'-0"

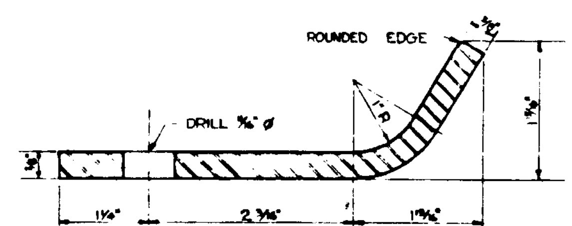


BOTTOM RUBBER SEAL
FULL SCALE

NOTE:
HOLES IN SEALS TO BE DRILLED IN FIELD



VERTICAL RUBBER SEAL
FULL SCALE



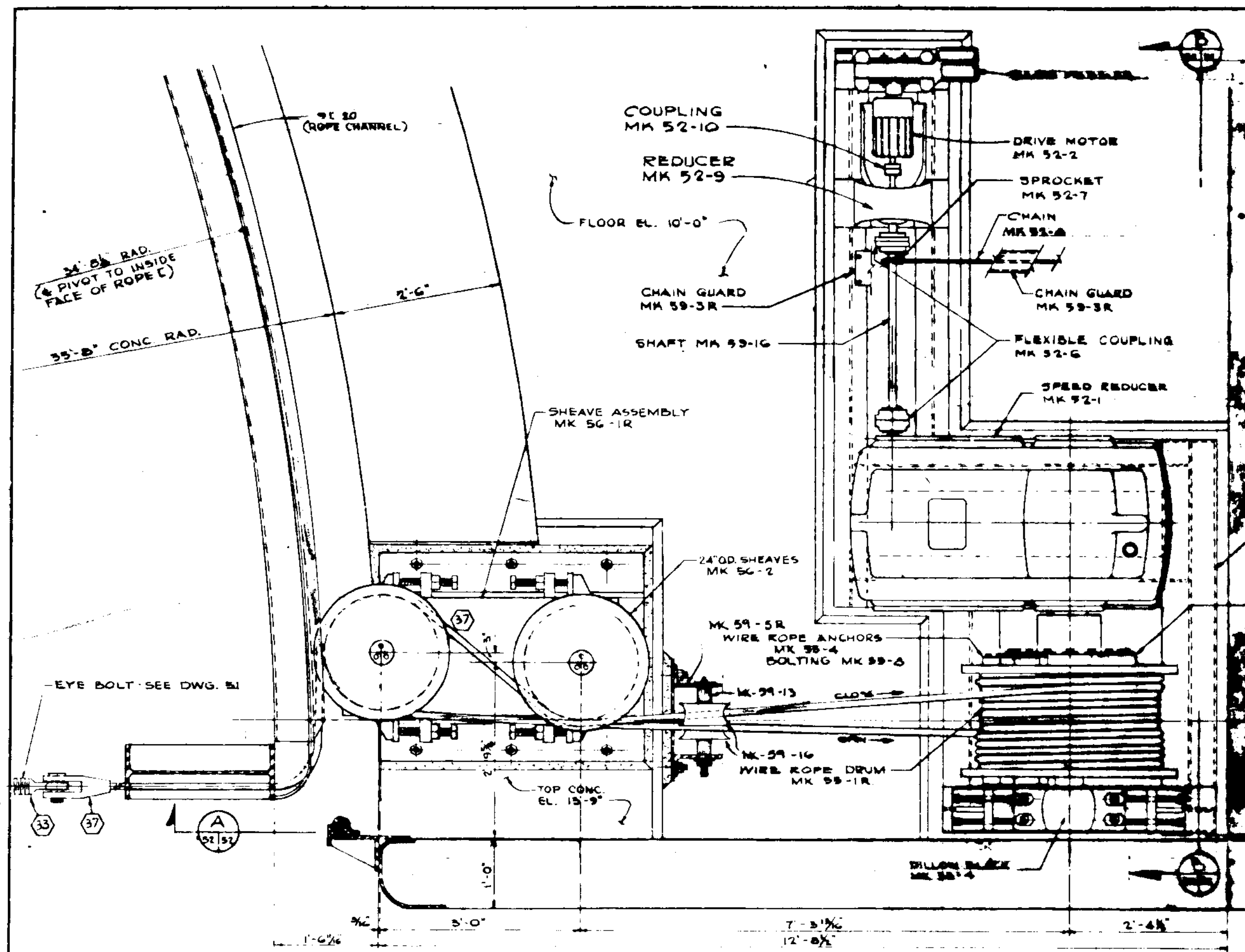
F.S. VERTICAL SEAL SUPPORT
AT LEADING EDGE OF GATE

NOTE:
FOR GEN'L. NOTES SEE DWG'S. 14 & 38

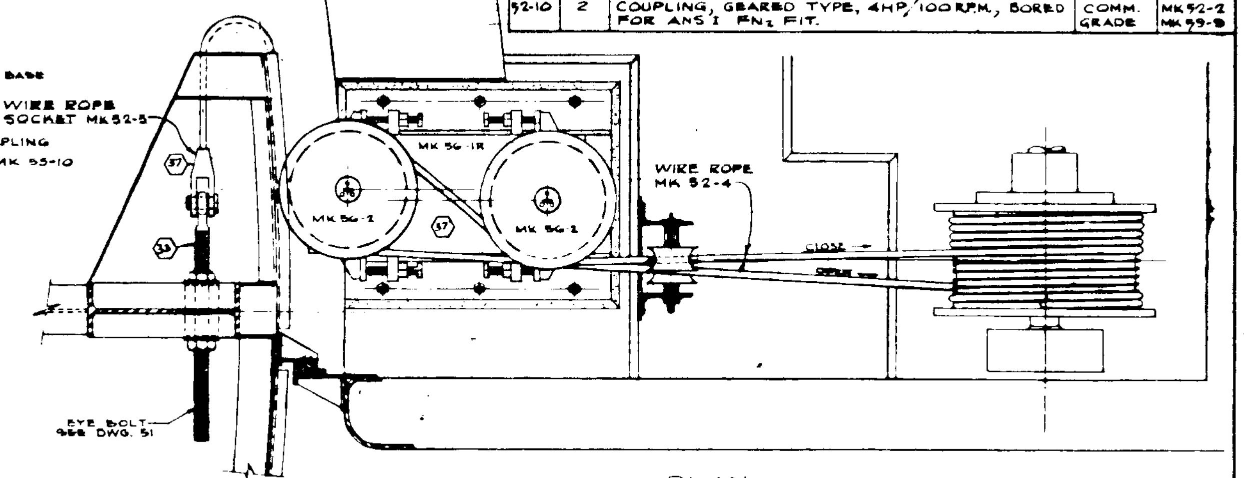
SECTOR GATES - RUBBER SEALS

J.J.F.	H.P.H.	J.J.F.	H-4-24326
October, 1971			50

BAYOU BIENVENUE CONTROL STRUCTURE PLATE II-33



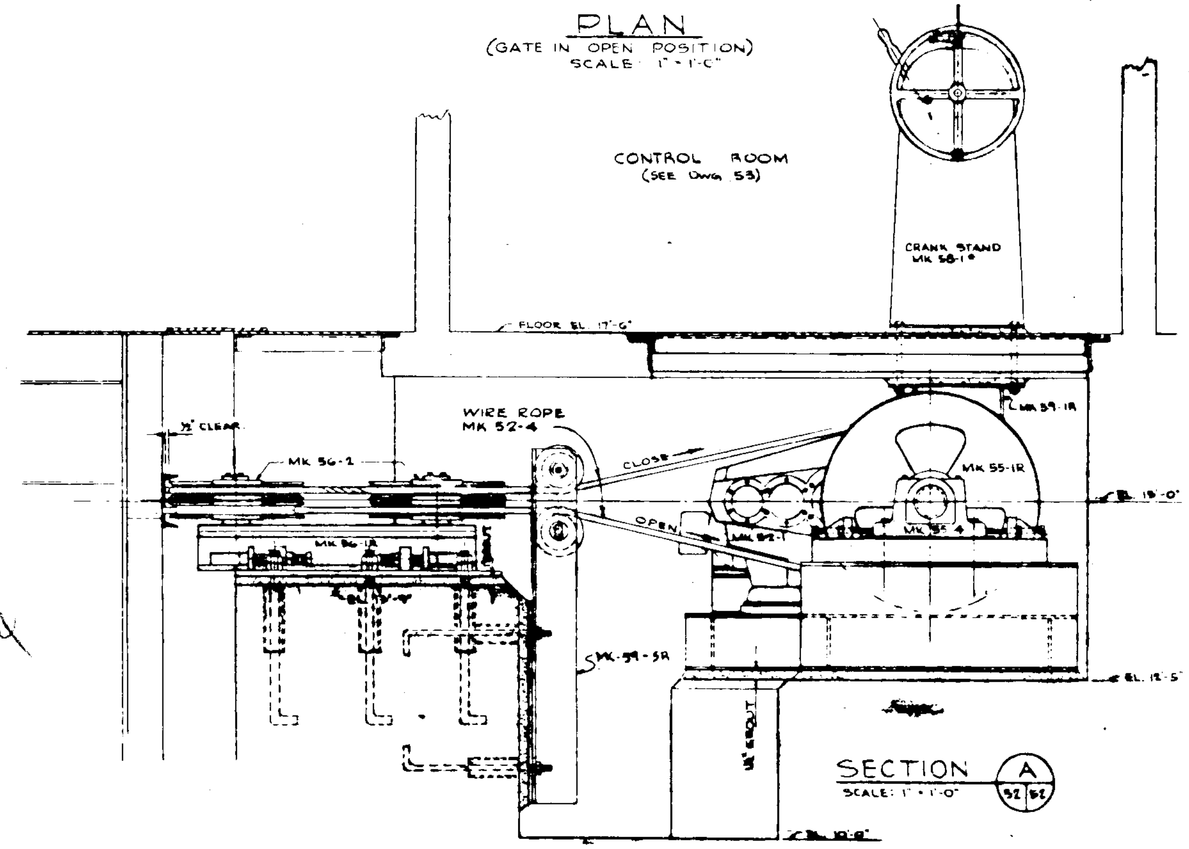
PLAN
(GATE IN OPEN POSITION)
SCALE 1" = 1'-0"



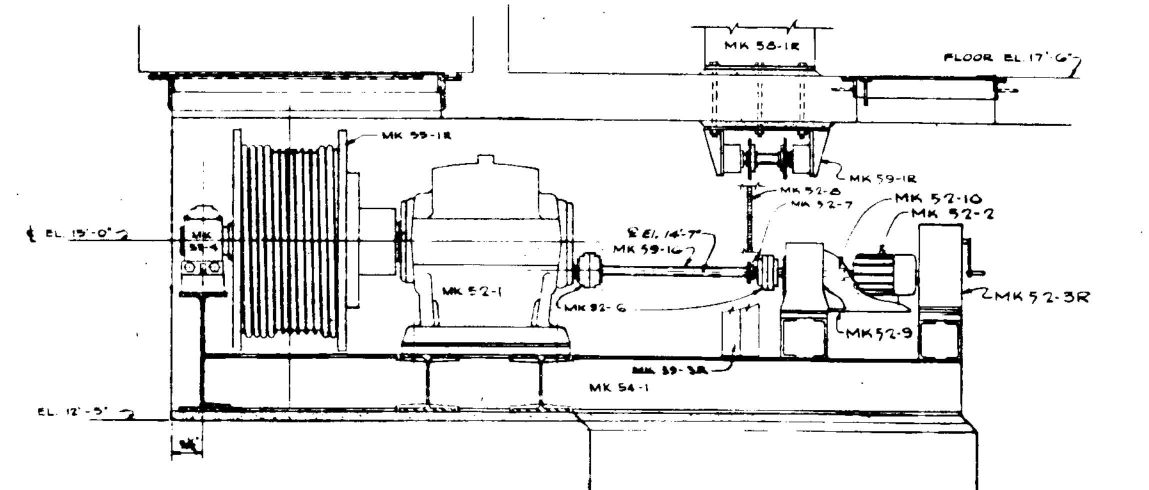
PLAN
(GATE IN CLOSED POSITION)
SCALE 1" = 1'-0"

LIST OF PARTS NOT DETAILED

MK. NO.	REQ'D.	DESCRIPTION	MATERIAL	USED WITH
52-1	2	SPEED REDUCER, PARALLEL SHAFT, QUADRUPLE OR QUINTUPLE REDUCTION, HELICAL OR HERRINGBONE GEAR TYPE, TOTAL RATIO OF 1200 TO 1, MIN. RATING OF 2 1/2 H.P. AT 420 RPM. INPUT SPEED.	COMM GRADE	MK 52-6 MK 55-2
52-2	2	MOTOR, 480V., 60Hz, 3 PHASE T.E.F.C., 2 H.P. @1800 R.P.M. W/REAR SHAFT EXTENSION, 5 1/2" MIN. REAR SHAFT LENGTH.	COMM GRADE	MK 52-3 MK 52-9
52-3	2	BRAKE, OFF SET TYPE, 480 V., 60Hz, 1 PHASE, 65 FT/LB MIN. CONT. RETARDING TORQUE, HAND RELEASE REQ'D. W/ELECTRICAL INTERLOCK, NEMA 4 WATERTIGHT ENCLOSURE.	COMM GRADE	MK 52-2
52-4	4 (65' EA)	WIRE ROPE, 1 1/4" DIA., 6X37 WIRE ROPE W/FIBER CORE, TYPE I, CLASS 3, W/FACTORY ZINCED SOCKET (MK 52-5)	FED. SPEC. RR-W-410A	MK 52-9 MK 55-1
52-5	4	SOCKET, FORGED STEEL OPEN SPELTER, SINILIAR OR EQUAL TO CROSBY-LAUGHLIN #G-416.	FED. SPEC. RR-S-550	MK 52-4
52-6	4	COUPLING, GEARED TYPE, 12 HP/100 R.P.M.; 4 BORED FOR REDUCER OUTPUT SHAFT & FLOATING SHAFT; 4 BORED FOR SPEED REDUCER L.S SHAFT & FLOATING SHAFT, ANSI FN_2 FIT, ALL SHAFTS	COMM GRADE	MK 52-1 MK 52-2 MK 59-16
52-7	2	SPROCKET, CAST IRON, TYPE "B", RC40, 20 TEETH, 3.196" P.D., BORED & KEYSLOT FOR ANSI FN_2 FIT ON MK 59-16 SHAFT	COMM. GRADE	MK 52-2
52-8	2	ROLLER CHAIN, ANSI STANDARD B29.1, CHAIN #40, EACH LENGTH APPROX. 6'-6"	COMM. GRADE	MK 52-7 MK 59-12
52-9	2	REDUCER, CONCENTRIC SHAFT DESIGN, RATED AT 2 H.P. AT 1750 R.P.M. INPUT SPEED, TOTAL RATIO OF 4 TO 1	COMM. GRADE	MK 52-6 MK 52-10
52-10	2	COUPLING, GEARED TYPE, 4HP/100 R.P.M., BORED FOR ANSI FN_2 FIT.	COMM. GRADE	MK 52-2 MK 59-9



SECTION A (52/52)
SCALE: 1" = 1'-0"



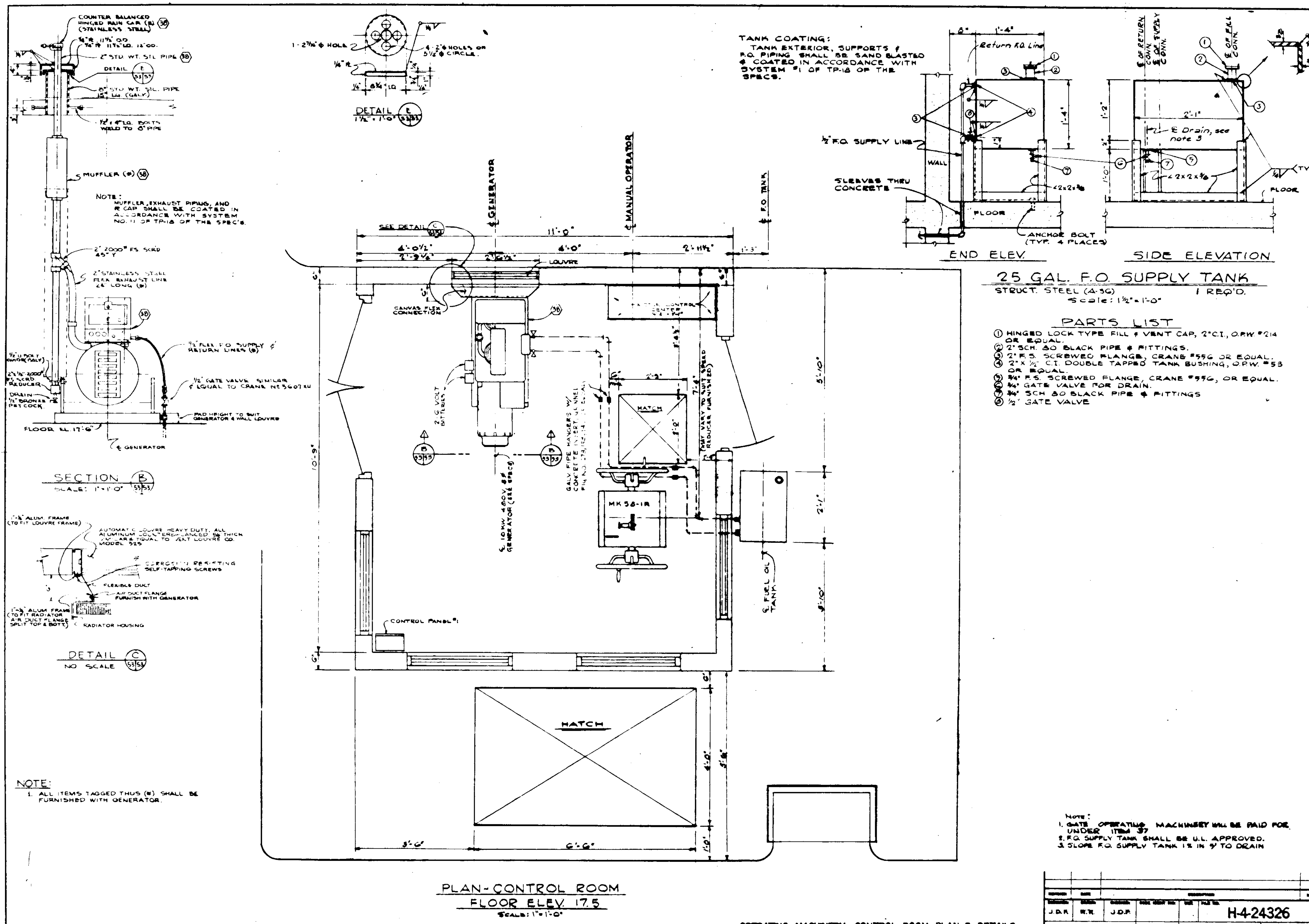
SECTION B (52/52)
SCALE 1" = 1'-0"

* USE [illegible] WITH QUADRUPLE SPEED REDUCER
USE [illegible] WITH QUINTUPLE SPEED REDUCER
(SEE DRAWING 56 & PARA. 7, SECT. 14 OF THE SPECS. — QUADRUPLE SPEED REDUCER SHOWN ON THESE DWGS.)
GATE OPERATING MACHINERY WILL BE PAID FOR UNDER ITEM 37

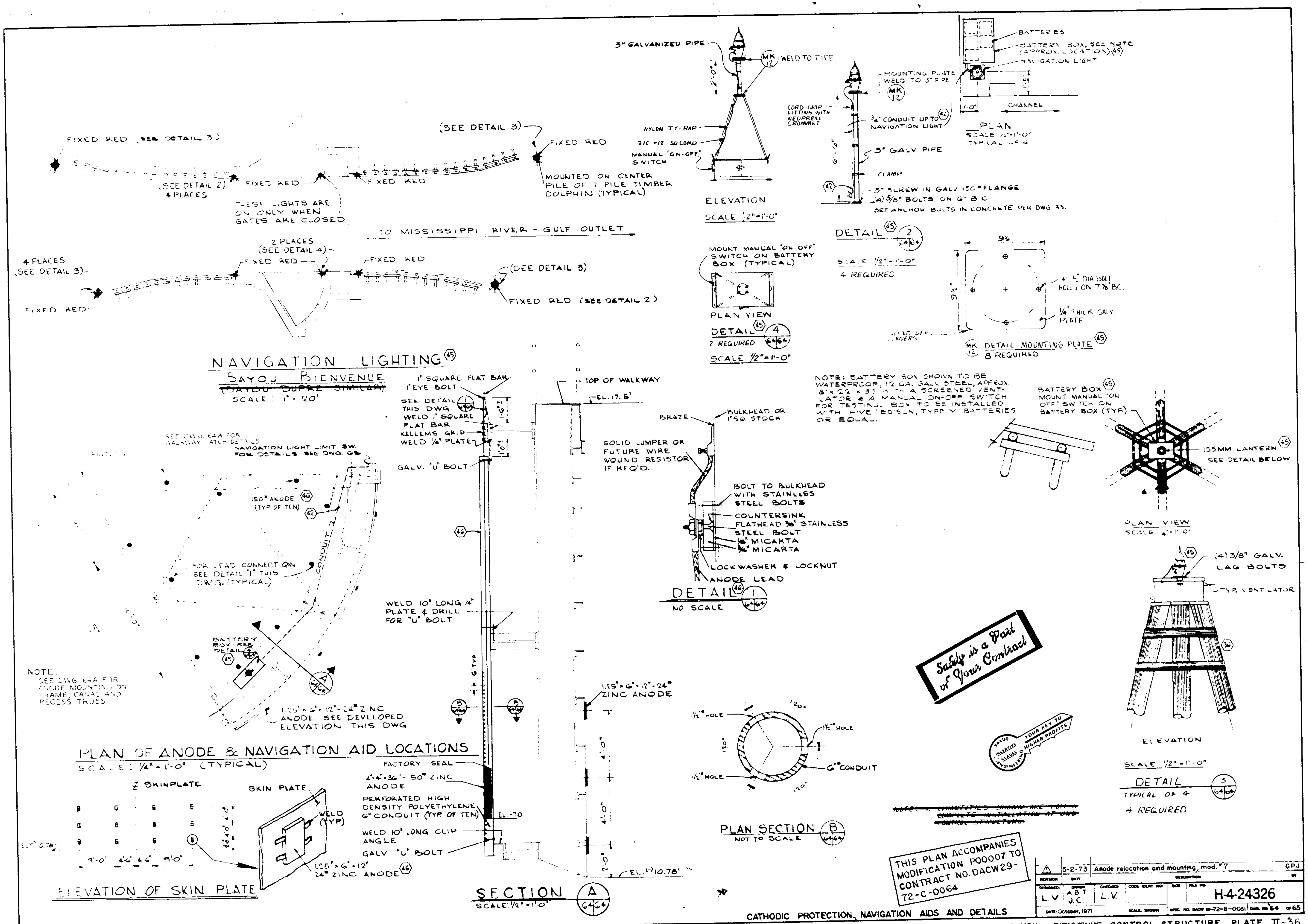
J.D.F.	H.E.J.	J.D.F.				H-4-24326
October, 1971					-72-B-0031	52 of 68

OPERATING MACHINERY - GENERAL ARRANGEMENT

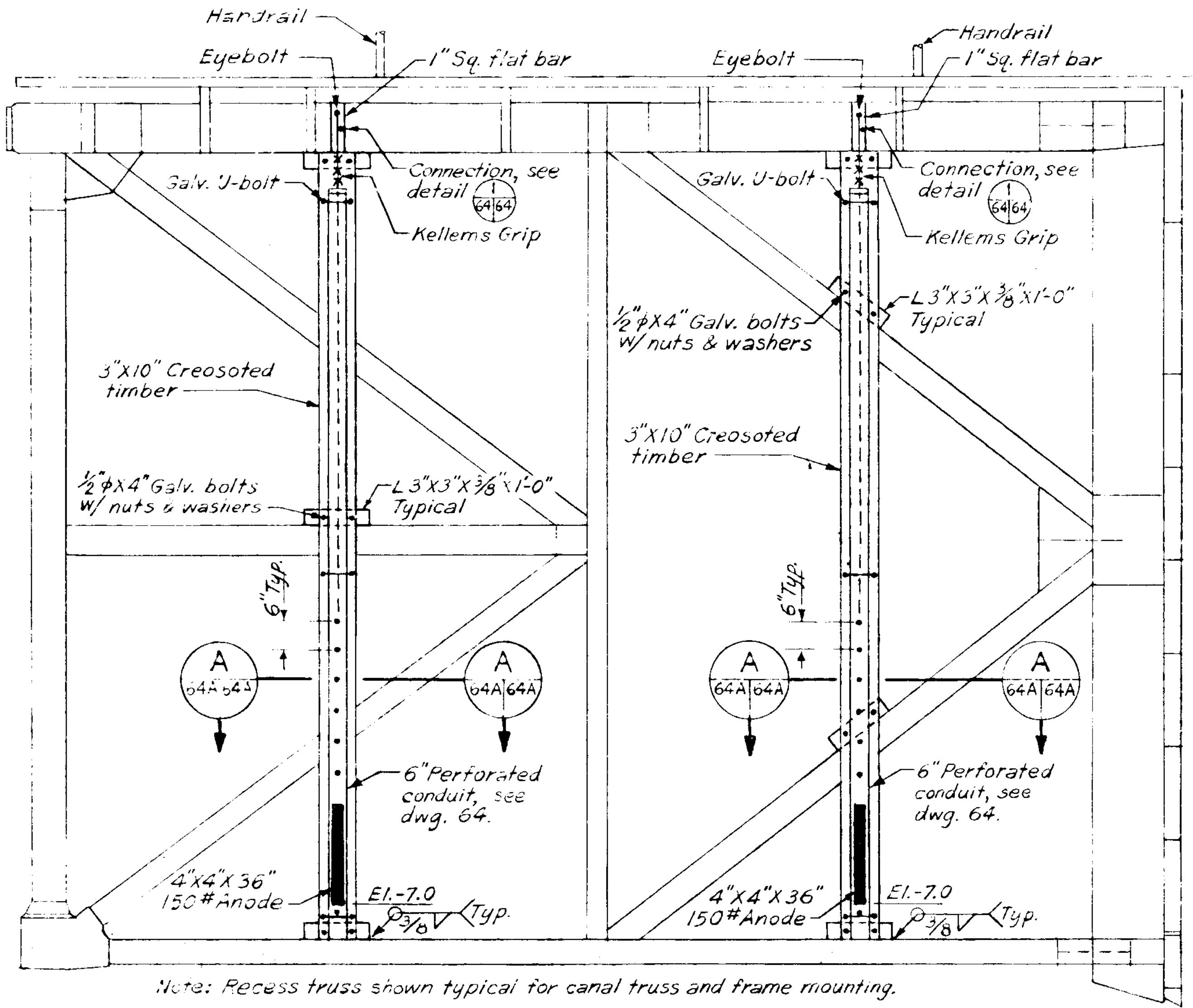
BAYOU BIENVENUE CONTROL STRUCTURE PLATE II-34



BAYOU BIENVENUE CONTROL STRUCTURE PLATE II-35



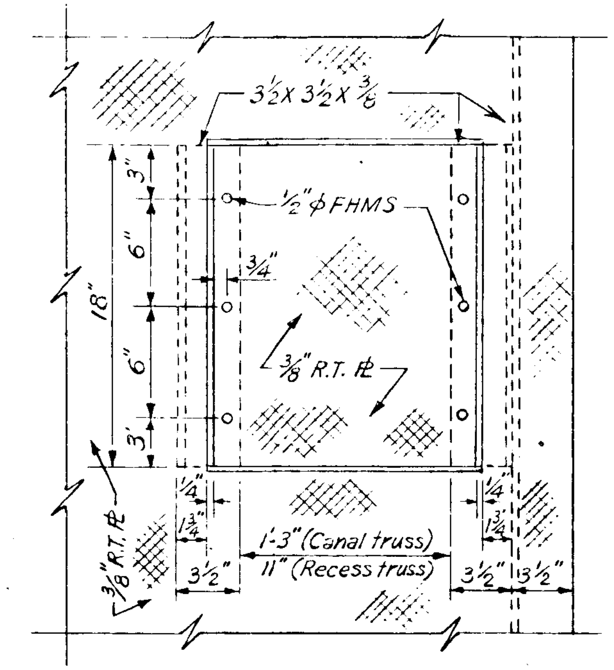
BAYOU BIENVENUE CONTROL STRUCTURE PLATE II-36



Note: Recess truss shown typical for canal truss and frame mounting.

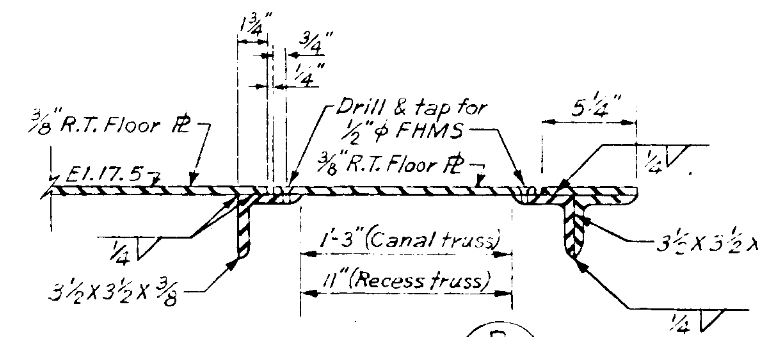
ANODE MOUNTING - RECESS TRUSS

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



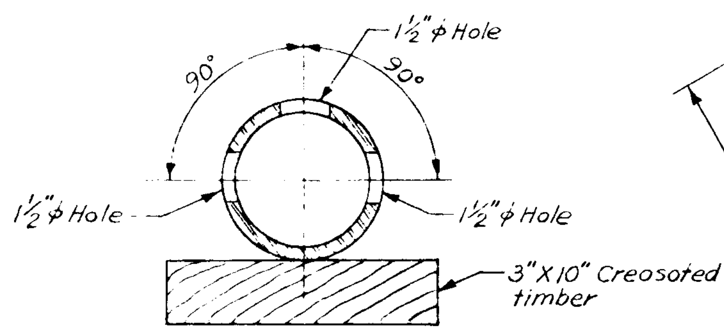
PLAN OF ACCESS HOLE

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



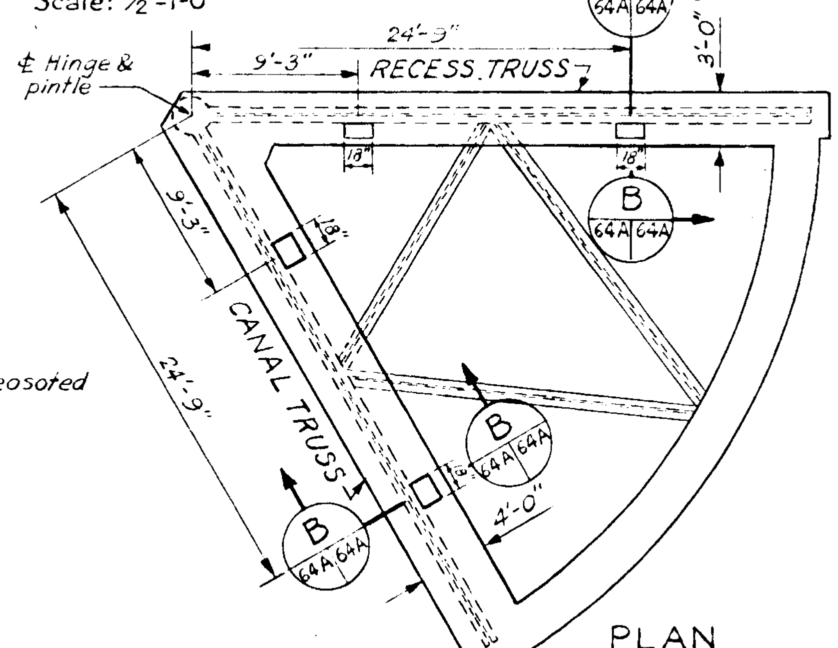
SECTION B 64A 64A

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



PLAN SECTION A 64A 64A

Not to scale



PLAN

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

THIS PLAN ACCOMPANIES MODIFICATION P00007 TO CONTRACT NO. DACW29-72-C-0064

CATHODIC PROTECTION, MOUNTING DETAILS

REVISION	DATE	DESCRIPTION	BY
1	5-2-73	New dwg. mod. # 7	RGS

DESIGNED	DRAWN	CHECKED	CODE IDENT. NO.	SIZE	FILE NO.
					H-4-24326
DATE			SCALE: SHOWN	SPEC. NO. DACW 29-72-B-0031	DWG. NO. 64A OF 65

BAYOU BIENVENUE CONTROL STRUCTURE PLATE II-37

SECTION III - SUMMARY OF DESIGN

3-01 Hydrology and Hydraulic Design. a. Hydrology. Detailed descriptions and analyses of the tidal hydraulic methods and procedures used in the tidal hyraulic design are included in "Design Memorandum No. 1, Hydrology and Hydraulics Analysis, Part I--Chalmette." Included in the descriptions and analyses are the essential data, climatology, assumptions, and criteria used, and the results of studies which provide the bases for determining surges, routing, wind tides, runup, overtopping, and frequencies. The design hurricane critical to the Chalmette Area Plan as defined in the above mentioned design memorandum is a standard project hurricane (SPH) having a frequency of about one in 200 years, a central pressure index of 27.6, a maximum 5-minute average wind velocity of 100 m.p.h., 30 feet above ground level at a radius of 30 nautical miles from the center, a forward speed of 11 knots, on a track critical to the area in question. The design hurricane will produce maximum wind tide levels as follows: IHNC to Paris Road, 13.0 feet; Paris Road to Bayou Lawler, 13.0-12.5 feet; and Bayou Lawler to Verret, 13.0-12.5 feet; and Verret to Caernarvon, 12.5-11.8 feet. From IHNC to Paris Road waves are not a factor and one foot of freeboard was added to the wind tide level producing a net grade of 14.0 feet. Between Paris Road and right above Caernarvon, where wave action will occur, an allowance varying from 4.3 to 4.8 feet was made for computed wave runup, yielding a net grade of 16.5 to 17.5 feet. The controlling elevation of the structures at Bayou Bienvenue and at Bayou Dupre has been set at 17.5 feet. The hydraulic design criteria for the control structures is a follows:

Maximum Differential Head (Direct)	11.0 feet
Water Surface, MR-GO Side	13.0 feet
Water Surface, Landside	2.0 feet
Maximum Differential Head (Reverse)	5.0 feet
Water Surface, Landside	5.0 feet
Water Surface, MR-GO side	0.0 feet

In addition to protecting the area from hurricane tidal overflows, the control structures at Bayou Bienvenue and Bayou Dupre will also provide drainage for the area to be inclosed by the Chalmette Area Plan levee. The area to be inclosed is described in Design Memorandum No. 3, General Design, Chalmette Area Plan and Design Memorandum No. 3, Supplement No. 1, Chalmette Extension. Approximately 51,000 acres will be inclosed under the modified Chalmette Plan. The area bounded by the Mississippi River levee, Inner Harbor Navigation Canal, existing Chalmette back levee and Lake Borgne Canal contains approximately 11,500 acres and is drained by four pumping stations which discharge across the Chalmette back levee into the marshland subject to tidal inundation. In addition to the above four pumping stations, Sewerage and Water Board of New Orleans pumping station no. 5 discharges into Bayou Bienvenue. The area along the Inner Harbor Navigation Canal and the MR-GO, containing approximately 7,400 acres, received spoil from the excavation of the MR-GO and has an elevation ranging from 4 to 8 feet. The protected area south of Louisiana Highway 46, comprised of approximately 3,400 acres, will be drained by gravity towards the south through the drainage structure to be installed in the levee at Creedmore Canal. The protected area north of

Louisiana Highway 46, which includes 5,200 acres, is drained by gravity to the north through two floodgates in the back levee. The remaining 22,600 acres is all marshland subject to tidal inundation and, upon completion of the project, this area will serve as a ponding area. *See plates I-1 and II-1.*

b. Hydraulics of structures. (1) The ponding area north of Louisiana Highway 46 contains a number of small canals and bayous which normally direct flow towards Bayous Bienvenue and Dupre. Directly landside of the spoil area is a canal which parallels the spoil area and acts as a drainage collector for the entire ponding area. See plate *I-1. Tides in excess of elevation 0.5 to 1.0 will overflow these * canals and commence flooding the ponding area. Rainfall on the area and discharges from the pumping stations also tend to overflow these canals and cover the ponding area. When tides in the MR-GO become lower than the water level within the ponding area, the flow of water will be within canals and overland for water stages greater than elevation 1.0 and through the canals for water stages less than elevation 1.0 towards Bayous Dupre and Bienvenue.

(2) Studies indicate a range between -1.0 and 2.6 feet appears to cover tides that would normally be experienced through the year. With adverse southeasterly winds, high tides can be expected to reach an elevation of 4.0 several times a year.

(3) The area presently is drained by four exits, however, subsequent to completion of the control structures and levee there will be only two exits--Bayous Bienvenue and Dupre--through the control structures. Since the waterway will be restricted, there will be some increase in velocities at these points.

* Revised September 1974

(4) With the inter-connection of the many old bayous and canals within the ponding area and the back canal serving as an equalizer between the two drainage outlets, there will be an equal distribution of flow to and from the two control structures. Very little increase in water level elevation is expected due to construction of the two control structures.

(5) Head loss through the structure will range from zero to 1 foot and will produce velocities ranging from zero to slightly over 7 feet per second. Based on 2,063 hourly readings of tides in the MR-GO the following table of velocity/frequency was simulated in routing tidal waters through the control structure.

Velocity (FPS)	Percent of Time Velocity Exceeded
0	100.00
1	86.86
2	73.29
3	57.00
4	41.73
5	26.41
6	11.68
7	1.01
8	0.00

* See plate II-2 for curve of above tabulation. It is felt that under * normal tidal cycles velocities as represented by the above tabulation can be tolerated.

(c) Storm drainage. (1) Due to the size of the ponding area, high intensity rains of relative short duration will not present any drainage problem through the structures. Assuming an 8-inch rainfall over the project area, the ponding area level would rise approximately one foot if no outflow was allowed. With gates open during such a rainfall the rise would not exceed 0.5 feet.

* Revised September 1974

(2) The control structure gates will be closed when water levels in the ponding area reach an elevation 2.0 in advance of hurricane warnings. The rainfall accompanying a hurricane is usually heavy. However, its distribution during the passage of the hurricane is not uniform.

(3) Although 14 inches of rain in 24 hours has occurred in the past (April 1927), it is improbable that more than 12 inches in 72 hours would occur during the passage of the design hurricane over the area. This assumption is based on 25-year frequency data (a 12.5-inch rainfall in 3 days) as outlined in Weather Bureau Technical Paper No. 49 titled "Two to Ten Day Precipitation for Return Period of 2-100 years in the Contiguous United States." Assuming that the control structure gates are closed when ponding area elevation reaches 2.0 and there is a 12.5-inch rainfall over the contributory area of 46,700 acres along with the Sewerage and Water Board Pumping Station No. 5 contributing an average of 1,000 cfs over a period of 72 hours, there will be an accumulation of 2,376,200,000 cubic feet of water in the ponding area. This would result in an increase of water level of 2.4 feet to a ponding area elevation of 4.4.

(4) After passage of a hurricane, the storm surge will fall rapidly. For the design hurricane it has been estimated that a tide level of elevation 2.0 in the MR-GO would occur approximately 22 to 24 hours after the peak storm surge. A recording water level gauge located in the MR-GO at Paris Road bridge (New Orleans) indicated a time interval of approximately 48 hours after passage of the peak surge to normal tide level for Hurricane Betsy in September 1965.

(5) The control structure gates are to be opened as the MR-GO tide elevation falls below the interior ponding level. The ponding area

will begin discharging through the structures. Based on the hydrograph recorded for Hurricane Betsy, approximately 32 hours after the gates are opened at elevation 4.4 the tide level in the MR-GO would be at elevation 2.0. The ponding area will reach MR-GO tide level approximately 3 to 5 days after opening of the gates at elevation 4.4. This will depend on tidal fluctuations in the MR-GO after the receding of the storm surge. If the gates are opened as stated above, velocities of approximately 10 feet per second will be experienced 8 to 12 hours after opening of the gates based on the computed hydrograph for the design storm. The duration of maximum velocities is dependent on how fast the storm surge tide will recede. Based on the hydrograph of Hurricane Betsy, velocities will be less than 7 feet per second approximately 36 hours after opening of the gates.

(6) Based on studies involved in the preceding paragraphs, it was found that the magnitude of tidal cycle in the MR-GO can vary the lowering of the ponding area water levels from 3 to 5 days. The additional area which is included under the modified levee plan increased the area to be drained and also increased the ponding area. This increase of area does not affect the magnitude of velocities since that is a function of the speed of receding storm surge tide. Increasing the width of the structures because of the increased area is not indicated since, to significantly reduce the velocities, opening widths four to five times that proposed would be required. Based on the estimated maximum velocities, additional erosion protection in the vicinity of the structures is not indicated.

d. Waves and surges. The elevation of the top of the gate structure was established equal to that of the top of levee at each side of the structure. This elevation was based on data contained in Design Memorandum No. 1, Hydrology and Hydraulic Analysis, Part 1--Chalmette, of the Lake

Pontchartrain, Louisiana and Vicinity project. The net grade elevation was based on computed hurricane tidal elevations plus runup on the levee.

e. Tidal flows. The MR-GO is directly influenced by tidal action in the Gulf. In general, 90 percent of the time normal high tides are less than elevation 2.0. However, several times during the year the tides will exceed elevation 2.0 and may, in conjunction with adverse winds, reach elevation 4.0.

3-02 Soils and Foundation. a. Investigations. Design Memorandum No. 3, General Design, Chalmette Area Plan, contains a discussion of the geology of the general area and the subsurface exploration and laboratory test data for the general area. In addition, four 1 7/8-inch I.D. general type borings were made by the Corps of Engineers at each structure *location and the logs are shown on plate III-4. At Bayou Bienvenue one 5-inch* I.D. undisturbed boring designated as B IU was made by the Corps of Engineers *and the results of the (Q), (R), and (S) tests are shown on plate III-1.* Location and the log of the boring are shown on plates II-2 and II-4.

b. Soils. A description of the subsurface soil conditions is included in paragraph 2-07.

c. Stability against uplift. During an unwatered condition, it is assumed that the water on the MR-GO side is at elevation 5.0 and the water on the landside is at elevation 2.0. Under these conditions and with the structure completely dewatered, there is a factor of safety of 1.16 against uplift disregarding the holddown straps on the piles. Assuming the cutoff wall impervious and the same water heights as above, a factor of safety of 1.07 exists against uplift disregarding the holddown straps on the piles. Therefore, no pressure relief is required.

During the normal operating condition, that is, the gates open, no pressure relief is required.

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The structure has been designed considering full uplift pressures beneath the entire base slab.

d. Stability of slopes. Construction slopes and permanent slopes at the structure location were analyzed by the "method of planes" for stability with a minimum factor of safety of 1.3. Shear strengths were based on "Q" test results obtained from samples of boring B-1U. Values of increased shear strengths used were based on procedures developed in analyzing levee stabilities for the preparation of Design Memorandum No. 3, General Design, Chalmette Area Plan, dated November 1966.

The following sections were analyzed for stability:

(1) Stream closure of Bayou Bienvenue, with the stability studies *shown on plate III-12 and location shown on plate I-3. Studies indicated* that a shell core would be required for stability.

(2) Section taken from the end of the levee to the approach channel. Water surface in the approach channel was assumed at elevation 0.0. The full levee height and increased shear strengths were used. The stability *studies are shown on plate III-14 and the location of the sections on plate I-3. *

e. Stability of floodwalls and wingwalls. Design soil shear strengths and densities used in the stability study of the inverted "tee" wall were obtained from test results of samples from boring B-IU. The stability of the inverted "tee" wall was analyzed for the following loading conditions:

(1) The dead load of the wall and walkway and the weight of the earth on the base slab acting downward vertically and the soil lateral pressure acting horizontally. On the floodside, the still water elevation set at 13.0 with a 7-foot broken wave and ground water on the protected side at elevation 2.0. The water was a[illegible] placed on the base slab as a

* Revised September 1974

vertical downward load. Uplift pressures were placed against the base slab assuming the cutoff wall as pervious and impervious, and uplift pressure also placed on the underside of the walkway on the floodside of the wall.

(2) Same as (1) above, but the still water elevation was set at 8.3 with a 2-foot broken wave on the floodside.

A factor of safety of 1.75 was used for determining compressive pile penetration and 2.0 for tension piles with a conjugate stress coefficient K_o of 1.0 and 0.7 respectively.

Two methods of analysis were used in the stability study of the inverted "tee" wall. The first method used was that presented by A. Hrennikoff in paper no. 2401, ASCE transactions titled, "Analysis of Pile Foundation with Batter Piles" and a paper by M. T. Davisson and H. L. Gill in Journal No. 3509, May 1963 of Soil and Foundations Division of ASCE "Laterally Loaded Piles in a Layered Soil System." Analysis based on the above references was performed for each of the loading conditions. A group of curves was developed showing actual and allowable stresses and deflections of the battered piles for various assumed modulus of subgrade reaction (K) values. Approximate values of K were obtained from unconfined compression test results based on methods presented in a paper by Terzaghi "Evaluation of Coefficients of Subgrade Reaction," GEOTECHNIQUE, London, England, volume V, 1966 and a paper by Bengt B. Broms, "Lateral Resistance of Piles in Cohesive Soils" no. 3825, Journal of the Soils Mechanics and Foundation Division, ASCE, March 1964. Low average unconfined compression qu values, based on test results from boring B-IU, of 300 psf for the Bayou Bienvenue location resulted in K values of

62 psi. The position of this value on the above mentioned group of curves indicated that the battered pile foundation of the inverted "tee" wall was satisfactory.

The second method of analysis was based on the "Method of Elastic Centers" as presented in the book titled, "Substructure Analysis and Design," by Paul Anderson. This study is presented on *plate IV-37. *

Stability studies for the"I" type floodwall were made using the "method of planes" utilizing soil data obtained from laboratory test results of soil samples from boring B-IU. The floodwall was analyzed for a hurricane condition with a still water elevation of 13.0 and a 5-foot broken wave on the floodside and ground water at elevation 2.0 on the protected side. The wall was investigated for both (Q) and (S) design shear strengths for a factor of safety of 1.5 with static water level at the top of the wave and a factor of safety of 1.25 with the dynamic force of the wave added. The effect of drag force on the wall was investigated and found to be not critical. *See plate IV-38 for the stability studies and governing conditions. *

The wingwalls were analyzed for stability using (Q) shear strengths and other soil data obtained from soil samples of boring B-IU. The water was assumed to be at elevation 0.0 on the channel side and behind the wall. The walls were also checked for stability using the (S) shear strengths. A factor of safety of 1.5 was used in both analyses. *See plate IV-37 for loads and resulting diagrams.*

The stabilities of the "I" and inverted "tee" type floodwalls were checked for maximum reverse differential head using (Q) and (S) design shear strengths and a factor of safety of 1.5 and found to be satisfactory.

* Revised September 1974

f. Ultimate settlement. (1) Structure. The weight of the earth that was excavated is approximately equal to the weight of the structure. Therefore, there was little net change in the soil pressures below the structure. However, bearing piles are required for stability under the various loading conditions and to transfer loads induced to deeper and stronger soil strata. Little or no settlement of the structure is anticipated.

(2) Inverted "tee" wall. It is anticipated that there will be little or no settlement in the wall adjacent to the gate structure and a settlement of approximately 2 inches at the connection to the "I" type wall.

(3) "I" wall. The concrete sheet pile I-wall will be constructed after the final levee lift is placed and the levee settlement has stabilized. A concrete cap will be constructed and hand railing installed to form a walkway to extend from the T-wall to the levee.

(4) Stream closure. Studies have indicated that closure settlements would be approximately 3 feet at Bayou Bienvenue.

3-03 Structural Design. a. General. All structural design has been made in accordance with standard engineering practice and with criteria as set forth in engineering manuals for Civil Work Construction, published by the Office of the Chief of Engineers.

b. Unit weights. The following values of unit weights, earth pressure, and soil properties were used in the design:

Unit Weight	Weight-Lbs. Per Cubic Foot
Water	62.5
Concrete	150.0
Earth	See plates
Shell backfill	98.0

Lateral Pressure

Shell Backfill (ϕ = 40°)	Equivalent Fluid Pressure
Active (above water)	21.3 lbs.
Active (submerged)	8.0 lbs.
At Rest (above water)	54.0 lbs.
At Rest (submerged)	20.0 lbs.

c. Allowable working stresses. The allowable working stresses for structural steel and concrete are in accordance with those recommended in "Working Stresses for Structural Design,: EM 1110-1-2101 of 1 November 1963. For convenient reference, allowable stresses are tabulated as follows:

(1) Allowable working stresses structural steel, ASTM A-36.

APPLICATION	GROUP 1 LOADING PSI	GROUP 2 LOADING PSI
(a) Tension		
Structural steel net section except at pin holes	18,000	24,000
Net section at pin holes in eye-bars, pin connected plates, or built-up members	13,500	18,000
(b) Shear		
On the gross section of beam and plate girder webs	12,000	16,000
(c) Compression		
On gross section of axially loaded compression member for $(K\ell/r)$ less than C_c	$0.83\ K_1F_y$	$1.11\ K_1F_y$

$$K_1 = \frac{\left[1 - \frac{(K\ell/r)^2}{2C_c^2}\right]}{F.S.} \qquad \text{where; } C_c = \sqrt{\frac{2\pi^2 E}{F_y}} = 126.1$$

K = Effective Length Factor

$$F.S. = \frac{5}{3} + \frac{3}{8}\frac{(K\ell/r)}{C_c} - \frac{(K\ell/r)^3}{8C_c^3}$$

For axially loaded column with ℓ/r greater than C_c	$\dfrac{124{,}000{,}000}{\left(\frac{K\ell}{r}\right)^2}$	$\dfrac{165{,}000{,}000}{\left(\frac{K\ell}{r}\right)^2}$

APPLICATION	GROUP 1 LOADING PSI	GROUP 2 LOADING PSI
On secondary member, modify the above values by multiplying by the following factor:	$\dfrac{1}{1.6-\ell/200r}$	$\dfrac{1}{1.7-\ell/200r}$ *
On gross area of plate girder stiffeners	18,000	24,000
On web rolled shapes at toe of fillet	22,500	30,000

* This modification factor is applied to secondary members for $\ell/r \geq 150$. For ℓ/r between C_c and 150, a factor of 1.0 is applied.

(d) Bending

Tension and compression on extreme fibers of rolled sections, plate girders and built-up members having axis of symmetry and meeting required dimension proportions	20,000	26,500
Tension and compression on extreme fibers of unsymmetrical members (with compression flange supported)	18,000	24,000
Tension and compression on extreme fibers of box type members not meeting required dimension proportions	18,000	24,000
Tension on extreme fibers of other rolled shapes, built-up members and plate girders	18,000	24,000
Compression on extreme fibers of rolled shapes, plate girders and built-up members having axis of symmetry in the plane of the web (Formula 4)	$0.50\ K_2F_y$	$0.67\ K_2F_y$

$$K_2 = 1 - \frac{(\ell/r)^2}{2C_c^2C_b}$$

$$C_b = 1.75 - 1.05\left(\frac{M_1}{M_2}\right) + 0.3\left(\frac{M_1}{M_2}\right)^2 \text{, but not more than 2.3}$$

APPLICATION	GROUP 1 LOADING PSI	GROUP 2 LOADING PSI
M_1 is the smaller and M_2 is the larger bending moment at the ends of the unbraced length.		
(Formula 5)	$\frac{10,000,000}{\frac{\ell d}{A_f}}$	$\frac{12,000,000}{\frac{\ell d}{A_f}}$
Use larger value computed by Formula 4 or 5 but not more than basic stress. Where ℓ/r is less than 40, Formula 4 may be neglected. For allowable stresses based on the use of Formula 4, see Appendix 1 of EM 1110-1-2101		
Compression on extreme fibers of channels. Value computed by Formula 5, but not more than	18,000	24,000
Tension and compression on extreme fibers of rectangular bearing plates (Max. for Group 2 Loading, 0.85 F_y)	22,500	30,500
Tension and compression on extreme fibers of large pins (Max. for Group 2 Loading, 0.90 F_y)	27,000	32,500
(e) Bearing		
Milled surfaces and pins in reamed, drilled or bored holes (Max. for Group 2 Loading, 0.90 F_y)	27,000	32,500
Finished stiffeners (Max. for Group 2 Loading 0.80 F_y)	24,000	29,000
Expansion rollers and rockers (lbs/1 in. inch)	0.83 K_3d	1.11 K_3d

$$K_3 = \left(\frac{F_y - 13,000}{20,000}\right) 660$$

d = Diameter of Roller or Rocker in Inches.

APPLICATION	GROUP 1 LOADING PSI	GROUP 2 LOADING PSI
(f) Bolts (Tension)		
A307 bolts	11,500	15,500
A325 bolts	33,500	44,500
A354 bolts (Grade BC)	41,500	55,500
(g) Bolts (Shear) (Bearing Type Connections)		
A307 bolts	8,500	11,000
A325 bolts when threading is not excluded from shear planes	12,500	16,500
A325 bolts when threading is excluded from shear planes	18,500	24,500
A354 bolts (Grade BC) when threading is not excluded from shear planes	16,500	22,000
A354 bolts (Grade BC) when threading is excluded from shear planes	20,000	26,500
(h) Bolts (Shear) (Friction Type Connections)		
A325 Bolts	12,500	16,500
A354 Bolts (Grade BC)	16,500	22,000
(i) Bolts (Bearing) (Bearing Type Connections)		
Bearing on projected area (max. for Group 2 Loading 1.35 F_y)	1.13 F_y	1.35 F_y
(j) Welds		
Fillet, plug, slot and partial penetration groove welds using A233 Class E-60 electrodes or submerged arc Grade SAW-1	11,500	15,000
Fillet, plug, slot, and partial penetration groove welds using A233 Class E-70 electrodes or submerged arc Grade SAW-2	13,000	17,500

Complete penetration groove welds shall have the same allowable for tension, compression, bending, shear and bearing stresses as those allowed for the connected material.

(k) Combined Stresses.

Axial compression and bending. Members subject to both axial compression and bending stresses shall be proportioned to satisfy the following requirements:

WHEN $f_a/F_a \leqq 0.15$,

$$\frac{f_a}{F_a} + \frac{f_b}{F_b} \leqq 1$$

WHEN $f_a/F_a > 0.15$,

$$\frac{f_a}{F_a} + \frac{C_m f_b}{\left(1 - \frac{f_a}{K_4 F_e}\right) F_b} \leqq 1$$

F_e = Euler stresses divided by factor of safety

$$F_e = \frac{149{,}000{,}000}{\left(\frac{Kl_b}{r_b}\right)^2}$$

and, in addition, at points braced in the plane of bending,

$$\frac{f_a}{K_5 F_y} + \frac{f_b}{F_b} \leqq 1$$

Where K_4 = 0.83 for Group 1 Loading and 1.11 for Group 2 Loading.

Where K_5 = 0.50 for Group 1 Loading and 0.67 for Group 2 Loading.

C_m = a coefficient - See Section 1.6 AISC Specifications in Manual of Steel Construction, Sixth Edition

Shear and Tension. Rivets and bolts subject to combined shear and tension shall be proportioned so that the tension stress from the force applied to the connected part does not exceed the following:

For A307 Bolts........................$F_t = 15{,}000 - 1.6\ f_v \leqq 10{,}500$
For A325 Bolts in Bearing Type Joints.$F_t = 37{,}500 - 1.6\ f_v \leqq 30{,}000$
For A354 Bolts (Grade BC) in Bearing
Type Joints.........................$F_t = 45{,}000 - 1.6\ f_v \leqq 37{,}500$

Where f_v, the shear produced by the same force, shall not exceed the value for shear given in Section (g) and (h) of this paragraph.

APPLICATION	GROUP 1 LOADING PSI	GROUP 2 LOADING PSI

For bolts used in friction type joints, the allowable shear stresses shall be reduced to meet the following:

For A325 Bolts.................... $F_v \leqq 11,000\ (1-\ f_t A_b/T_b)$
For A354 Bolts.................... $F_v \leqq 15,000\ (1-\ f_t A_b/T_b)$
T_b = the proof load of the bolt.

(2) Allowable working stresses concrete (3,000 p.s.i., 28 days). Concrete which will be subjected to submergence, wave action and spray will be designed with working stresses in accordance with ACI Building Code with the following modifications:

Flexure (f_c):

Extreme fiber stress in compression	$0.35\ f'_c$
Extreme fiber stress in tension (Plain concrete for footings and walls but not for other portions of gravity section	$1.2\sqrt{f'_c}$
Extreme fiber stress in tension (for other portions of gravity sections)	$0.6\sqrt{f'_c}$

Types of structures to which those modifications apply are:

Floodwalls
Lock Walls, Guide and Guard Walls
Retaining Walls subject to contact with water

Allowable stresses in reinforcement will be in accordance with the ACI Building Code except for tension in deformed bars with a yield strength of 60,000 p.s.i. or more, the stress shall not exceed 20,000 p.s.i. based upon Group 1 Loading.

For Group 2 Loading the above stresses may be increased by 33-1/3 percent.

(3) Application of working stresses.

(a) Group 1 Loading: Allowable working stresses as listed for structural steel and for reinforced concrete will be applied to the following loads:

Dead Load
Live Load
Buoyancy
Earth Pressure
Water Pressure

(b) Group 2 Loading: Allowable working stresses as listed for structural steel and for reinforced concrete will be applied to the following loads when combined with Group 1 Loads:

Wind Loads
Wave Loads
Boat Loads
Erection Loads

d. Design loading conditions.

(1) Base slab.

Case 1. Gate open, backfill not in place, no buoyancy.

Case 1A. Gate open, backfill in place, no buoyancy.

Case 2. Structure complete, backfill in place, water at elevation 0.0, buoyancy active.

Case 3. Needle dams in place, structure dewatered, gates removed, water at elevation 5.0, buoyancy active.

Case 4. Hurricane condition, gate closed, water in MR-GO at elevation 13.0, water on landside at elevation 2.0, buoyancy active, sheet pile wall impervious.

Case 4A. Same as Case 4, except sheet pile wall is pervious.

Case 5. Gate closed, water in MR-GO at elevation 0.0, water on landside at elevation 5.0, buoyancy active.

Case 5A. Same as Case 5 above with cutoff wall assumed pervious.

All of the above conditions are considered as Group 1 loadings.

Case 6. Same as Case 4 above, with wave loading (Group 2 loading).

Case 6A. Same as Case 6 above, with cut-off wall assumed pervious (Group 2 loading).

(2) Sector gates.

Case 1. Dead load only, which includes truss members, skin plate, skin plate supports, fender system and fender system supports.

Case 2. Dead load, water in MR-GO at elevation 13.0, water on landside at elevation 2.0.

Case 3. Dead load, water in MR-GO at elevation 0.0, water on landside at elevation 5.0.

Case 1, 2, and 3 are considered as Group 1 loadings.

Case 4. Same as Case 3, with a boat load of 120 kips acting at right angle to canal truss at elevation 6.0.

Case 5. Dead load, water at elevation 13.0 in MR-GO and a wave loading on MR-GO side and water on landside at elevation 2.0.

Case 6. Same as Case 2, with a boat load of 120 kips acting at right angles to skin plate at elevation 14.0.

Cases 4, 5, and 6 are considered as Group 2 loadings.

Inasmuch as in the threat of a hurricane the gates will be closed when the water elevation in Lake Borgne reaches 2.0 feet, the following other cases were investigated:

Boat loads applied on MR-GO side with various elevations ranging from 2.0 feet to 13.0 feet on the MR-GO side and water at elevation 2.0 on the landside.

Boat loads applied on protected side with various water elevations ranging from 2.0 feet to 7.0 feet on the MR-GO side and water elevations ranging from 2.0 feet to 5.0 feet on the protected side.

e. Structural features.

(1) Base slab. The base slab, treated as a monolithic unit, has been designed to withstand the bending moment of forces producing bending in both the transverse and longitudinal directions for the various loading conditions as described in paragraph 3-03d(1).

Case 6 was found to be critical for design in the longitudinal direction and Case 1A was critical in the transverse direction. See *plates IV-3 and IV-8.*

The base slab under Case 3 (dewatered condition with buoyancy active) has a factor of safety of 1.16 against uplift if the tension capabilities of the piles are disregarded and 2.1 considering all piles active in tension.

(2) Gate bay walls. Gate recess walls were designed as rectangular panels supported along the sides, top and bottom. Moment coefficients were taken from the bulletin "Concrete Information No. ST-63, Rectangular Concrete Tanks," as published by the Portland Cement Association, Chicago, Illinois. In this bulletin the moment coefficients are expressed as a function of triangular hydrostatic load for edge restraint assumed as follows:

* Revised September 1974

(a) Sides fixed, top and bottom hinged.

(b) Sides fixed, bottom hinged, top free.

(c) Sides and bottom fixed, top free.

Design moments were computed for a triangular load equivalent in magnitude to shell and water loading using at rest shell pressures and for edge restraint in accordance with assumptions (a), (b), or (c) above, whichever produced the larger moment.

The walkway on top of the recess wall was designed as a horizontal rectangular beam to take the shear at the top edge of the recess wall for condition (a) above. In addition, the walkway was designed to support a live load of 200 pounds per square foot. The large walls flanking the gate recess were designed to resist the pressures of earth and water combined with reactions from the recess walls, sector gates, and needle girder.

(3) Needle dam. Loading, moments, and shear diagrams for the *needles and needle girder are shown on plates IV-12 and IV-13.*

(4) Sector gates. The skin plate was designed as a member spanning in the vertical direction across horizontal ribs. The ribs were designed as beams continuous over five supports with a portion of the skin plate acting as one flange. Loads on the skin plate and horizontal skin plate ribs were assumed to act directly on the vertical beams. Outside vertical beams form part of the two vertical trusses. The weights of the outer portions of the skin plate, horizontal ribs, and vertical skin plate supports are carried to the vertical trusses through the skin plate. Center portions of the above are carried to vertical trusses through the diagonals. Various members of the horizontal and vertical frames were designed for maximum stresses resulting from a combination of dead load, water load, and boat load. The effect of

* Revised September 1974

bending, resulting from friction in hinge and pintle, normal to the top and bottom horizontal frames was also investigated.

In analyzing the steel frame of the sector gate for the various loading conditions, a computer program titled, "Structural Engineering System Solver (STRESS)" for the IBM 1130, was utilized. This program analyzes the entire sector gate as a space frame with rigid or pinned joints as the case may be. The resulting moments and shears include all primary and secondary stresses induced by the various loading conditions. Sufficient manual computations were made to verify the computer output.

(5) Floodwalls. The floodwalls are designed against lateral loading resulting from hurricane tides, waves, and soil pressures. *See plates IV-37 and IV-38.*

(6) Concrete sheet pile wingwall. The concrete sheet pile wing-*wall was designed as a tieback wall. See plate IV-37.*

3-04 Operating Machinery Design. a. Design criteria and assumptions. The design of the sector gate operating machinery was based on the dead load of the gate leaf and the hydraulic conditions under which the gate leaves must be operated. The two design cases were:

Case A	Landside elevation	+5.0
	MR-GO side elevation	0.0
	Differential head	+5.0 ft.
Case B	Landside elevation	0.0
	MR-GO side elevation	+5.0
	Differential head	+5.0 ft.

The parts of the operating machinery which are stressed in proportion to the torque are so proportioned that the stresses, when stalling occurs, will not exceed 75 percent of the yield point of the materials used.

*Revised September 1974

The following coefficients of friction were assumed:

Bearing surfaces	0.25
Rubber seals (wet)	0.25

b. Operating machinery capacity. The force acting on the cable to move the gate was determined by the following loads acting on the gate:

Dead load of the gate (109^k)
Water load acting on the gate skin
Water load acting on the vertical seal fin
Seal friction

The gate loads used in the machinery design were obtained from the gate design computations.

The cable tension computed for Case A (4,300 lbs, including 10 percent added for shock) was used as the basis for the machinery design.

3-05 Cathodic Protection. a. Structure to be protected. For purposes of computing the total surface area of steel to be protected, the cathodically protected area is considered to include all structural members comprising the lower half of the gate structure up to elevation 1.5, including the inner and outer faces of the skin plate. See plates II-36 and II-37 for details.

The vinyl coating is assumed to be 99 percent efficient initially to allow for voids, and 61 percent efficient at the end of 10 years to allow for deterioration. This results in an average efficiency of 80 percent, or a factor of 0.20 to be applied in computing the effective area of exposed steel surface.

b. Life expectancy of cathodic protection system. In order to minimize maintenance requirements the total anode weight is computed on the basis of a 10 to 20-year life expectancy of the cathodic protection system. The actual life of the anodes will be dependent upon the actual versus the assumed efficiency of the paint system, variations in water conductivity, motion and temperature of the water, and other factors.

c. Water resistivity. Salinity observations for Bayous Bienvenue and Dupre were taken in the channel at various depths from 5 to 35 feet over a period from October 1963 through November 1966. The readings at the 5-foot depth are most nearly applicable to the average depth at the control structures. At Bayou Dupre the average of all readings at the 5-foot depth is 5,442 ppm, and at Bayou Bienvenue the average is 5,186 ppm. Since these two averages are substantially the same, the cathodic protection systems were made identical, based on an overall average salinity of 5,314 ppm.

Salinity observations at Paris Road bridge were taken only at mid-depth for the period from 1948 through 1961. From 1962 through 1966 readings were taken at the surface, mid-depth, and bottom of the MR-GO. Considering only surface readings for the period 1964 through 1966, the average salinity is 5,264 ppm, which is essentially the same as the average 5-foot depth readings at Bayous Bienvenue and Dupre.

Using 5,314 ppm dissolved chlorides as representative of average conditions, the resistivity is computed to 118 ohm-cm.

d. Required current density. U. S. Army Corps of Engineers Manual TM-5-118-4, page 203, lists current densities for bare steel in sea water ranging from 3.0 to 10.0 milliamps per square foot. Sea water has a resistivity range from 15 to 40 ohm-cm., as compared to the considerably higher 118 ohm-cm for the MR-GO at the proposed control structure locations. Thus an assumed current density of 6.0 ma. per square foot is considered an adequate criterion for protection of the structures, and this is in keeping with experiences on other structures in similar waters.

* BAYOU BIENVENUE CONTROL STRUCTURE

INDEX

SELECTED PLATES FROM DESIGN MEMORANDUM NO. 5

Plate No.	Title	File No.
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I-3	Site Plan	H-2-24147
I-4	Site Plan - cont.	H-2-24147
II-1	Hydraulic Data - 1	H-2-24147
II-2	Hydraulic Data - 2	H-2-24147
III-1	Undisturbed Boring B-IU Test Data	H-2-24147
III-4	General Borings	H-2-24147
III-12	Stability Analysis - 1	H-2-24147
III-14	Stability Analysis - 3	H-2-24147
IV-37	Floodwall Stability - 1	H-2-24147
IV-38	Floodwall Stability - 2	H-2-24147
IV-3	Base Slab - 1	H-2-24147
IV-8	Base Slab - 6	H-2-24147
IV-12	Needle Dam	H-2-24147
IV-13	Needle Girder	H-2-24147 *

*Revised September 1974

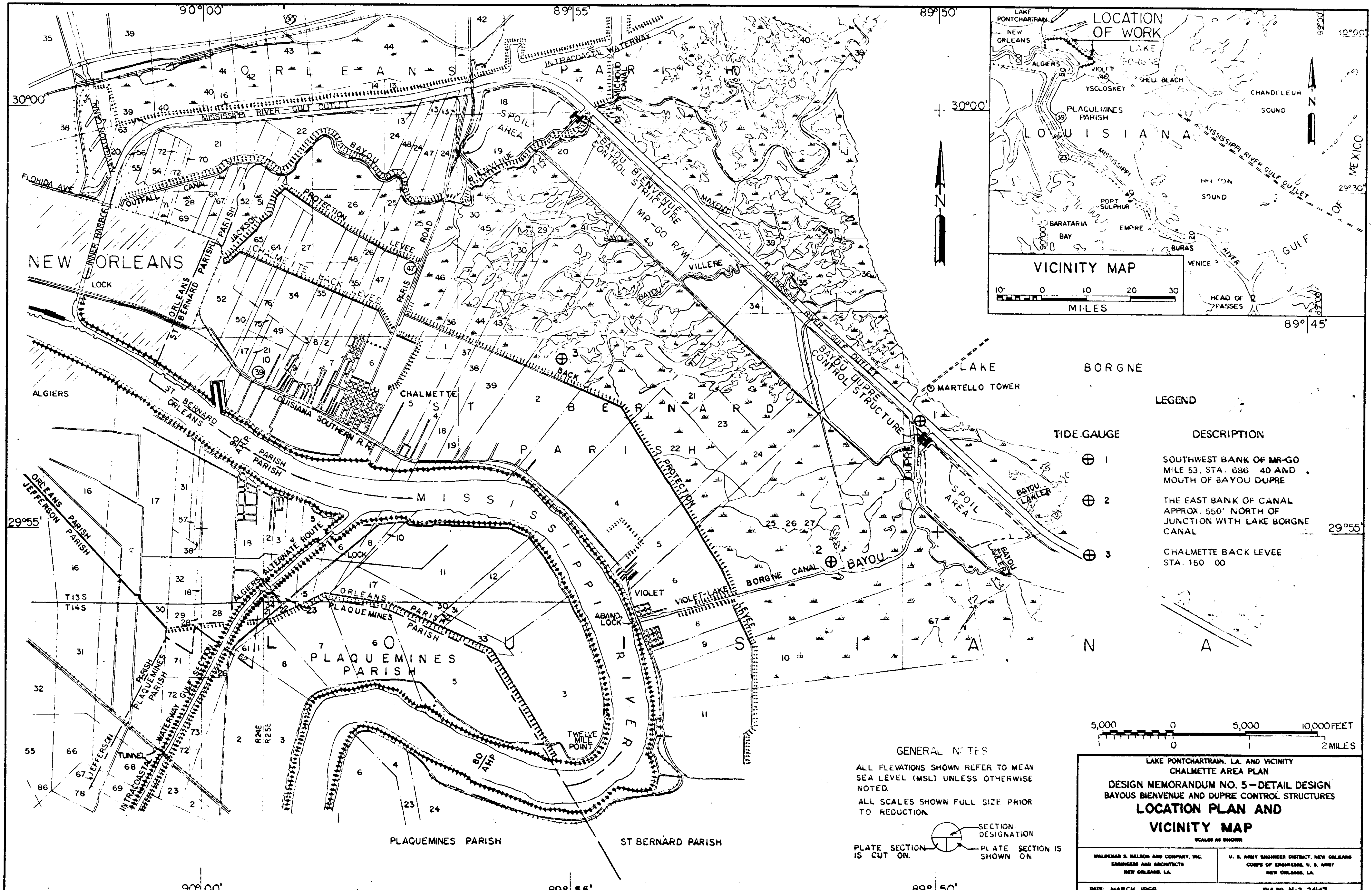
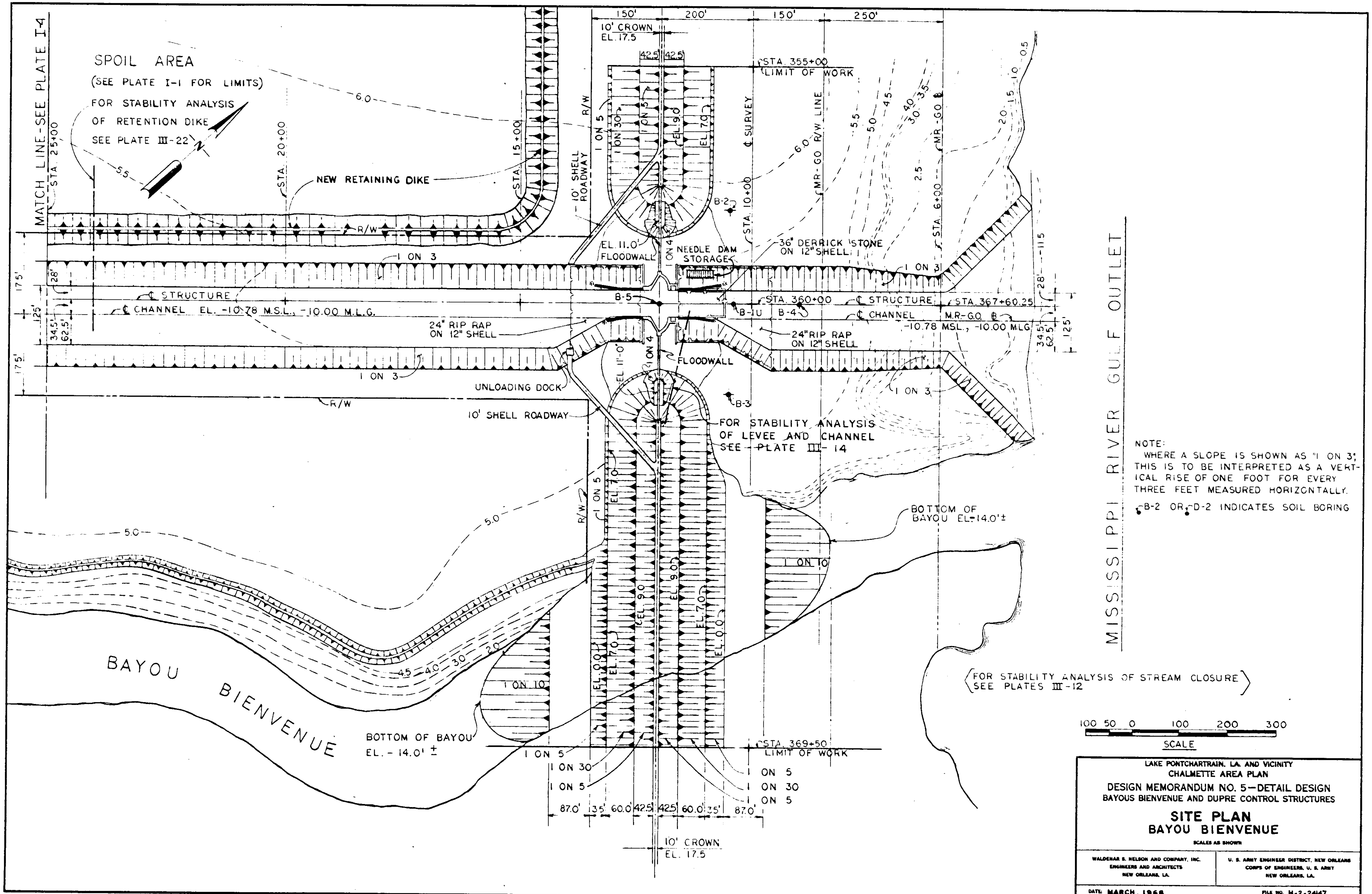

LOCATION OF WORK
VICINITY MAP
10 0 10 20 30
MILES
LAKE PONTCHARTRAIN
NEW ORLEANS
ALGIERS
LAKE BORGNE
YSCLOSKEY
SHELL BEACH
CHANDELEUR SOUND
PLAQUEMINES PARISH
LOUISIANA
MISSISSIPPI RIVER GULF OUTLET
BRETON SOUND
GULF OF MEXICO
PORT SULPHUR
BARATARIA BAY
EMPIRE
BURAS
VENICE
HEAD OF PASSES
NEW ORLEANS
ORLEANS PARISH
ST BERNARD PARISH
PLAQUEMINES PARISH
LOUISIANA
MISSISSIPPI RIVER
MISSISSIPPI RIVER - GULF OUTLET
INTRACOASTAL WATERWAY
BAYOU BIENVENUE CONTROL STRUCTURE
BAYOU DUPRE CONTROL STRUCTURE
SPOIL AREA
CHALMETTE
CHALMETTE BACK LEVEE
PROTECTION LEVEE
BAYOU VILLERE
BAYOU LAWLER
BAYOU DUPRE
BORGNE CANAL
VIOLET
VIOLET-LAKE BORGNE CANAL
ABAND. LOCK
MARTELLO TOWER
LAKE BORGNE
ALGIERS
ALGIERS ALTERNATE ROUTE
LOUISIANA SOUTHERN R.R.
PARIS ROAD
JACKSON
INNER HARBOR NAVIGATION CANAL
FLORIDA AVE
OUTFALL CANAL
MR-GO R/W
MAXENT
TWELVE MILE POINT
TUNNEL
JEFFERSON PARISH
INTRACOASTAL WATERWAY
LEGEND
TIDE GAUGE
DESCRIPTION
1 SOUTHWEST BANK OF MR-GO MILE 53, STA. 686 40 AND MOUTH OF BAYOU DUPRE
2 THE EAST BANK OF CANAL APPROX. 550' NORTH OF JUNCTION WITH LAKE BORGNE CANAL
3 CHALMETTE BACK LEVEE STA. 150 00
GENERAL NOTES
ALL FLEVATIONS SHOWN REFER TO MEAN SEA LEVEL (MSL) UNLESS OTHERWISE NOTED.
ALL SCALES SHOWN FULL SIZE PRIOR TO REDUCTION.
SECTION DESIGNATION
PLATE SECTION IS CUT ON.
PLATE SECTION IS SHOWN ON.
5,000 0 5,000 10,000 FEET
1 0 1 2 MILES
LAKE PONTCHARTRAIN, LA. AND VICINITY
CHALMETTE AREA PLAN
DESIGN MEMORANDUM NO. 5—DETAIL DESIGN
BAYOUS BIENVENUE AND DUPRE CONTROL STRUCTURES
LOCATION PLAN AND VICINITY MAP
SCALES AS SHOWN
WALDEMAR S. NELSON AND COMPANY, INC. ENGINEERS AND ARCHITECTS NEW ORLEANS, LA.
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS CORPS OF ENGINEERS, U. S. ARMY NEW ORLEANS, LA.
DATE MARCH, 1968
FILE NO. H-2-24147

PLATE I-1



SPOIL AREA
(SEE PLATE I-1 FOR LIMITS)
FOR STABILITY ANALYSIS OF RETENTION DIKE SEE PLATE III-22
N
MATCH LINE-SEE PLATE I-4
STA. 25+00
STA. 20+00
STA. 15+00
NEW RETAINING DIKE
R/W
1 ON 3
€ STRUCTURE
€ CHANNEL EL. -10.78 M.S.L., -10.00 M.L.G.
24" RIP RAP ON 12" SHELL
UNLOADING DOCK
10' SHELL ROADWAY
10' CROWN EL. 17.5
EL. 11.0' FLOODWALL
NEEDLE DAM STORAGE
B-5
B-2
B-3
B-4
36" DERRICK STONE ON 12" SHELL
€ SURVEY
STA. 10+00
MR-GO R/W LINE
STA. 6+00
MR-GO €
STA. 355+00 LIMIT OF WORK
STA. 360+00
STA. 367+60.25
M.R-G.O. € -10.78 MSL., -10.00 MLG
FLOODWALL
FOR STABILITY ANALYSIS OF LEVEE AND CHANNEL SEE PLATE III-14
BOTTOM OF BAYOU EL.-14.0'±
1 ON 10
BAYOU BIENVENUE
BOTTOM OF BAYOU EL. - 14.0' ±
STA. 369+50 LIMIT OF WORK
1 ON 5
1 ON 30
87.0' 13.5' 60.0' 42.5' 42.5' 60.0' 13.5' 87.0'
150' 200' 150' 250'
MISSISSIPPI RIVER GULF OUTLET
NOTE: WHERE A SLOPE IS SHOWN AS "1 ON 3", THIS IS TO BE INTERPRETED AS A VERTICAL RISE OF ONE FOOT FOR EVERY THREE FEET MEASURED HORIZONTALLY.
B-2 OR D-2 INDICATES SOIL BORING
FOR STABILITY ANALYSIS OF STREAM CLOSURE SEE PLATES III-12
100 50 0 100 200 300
SCALE
LAKE PONTCHARTRAIN, LA. AND VICINITY
CHALMETTE AREA PLAN
DESIGN MEMORANDUM NO. 5—DETAIL DESIGN
BAYOUS BIENVENUE AND DUPRE CONTROL STRUCTURES
SITE PLAN
BAYOU BIENVENUE
SCALES AS SHOWN
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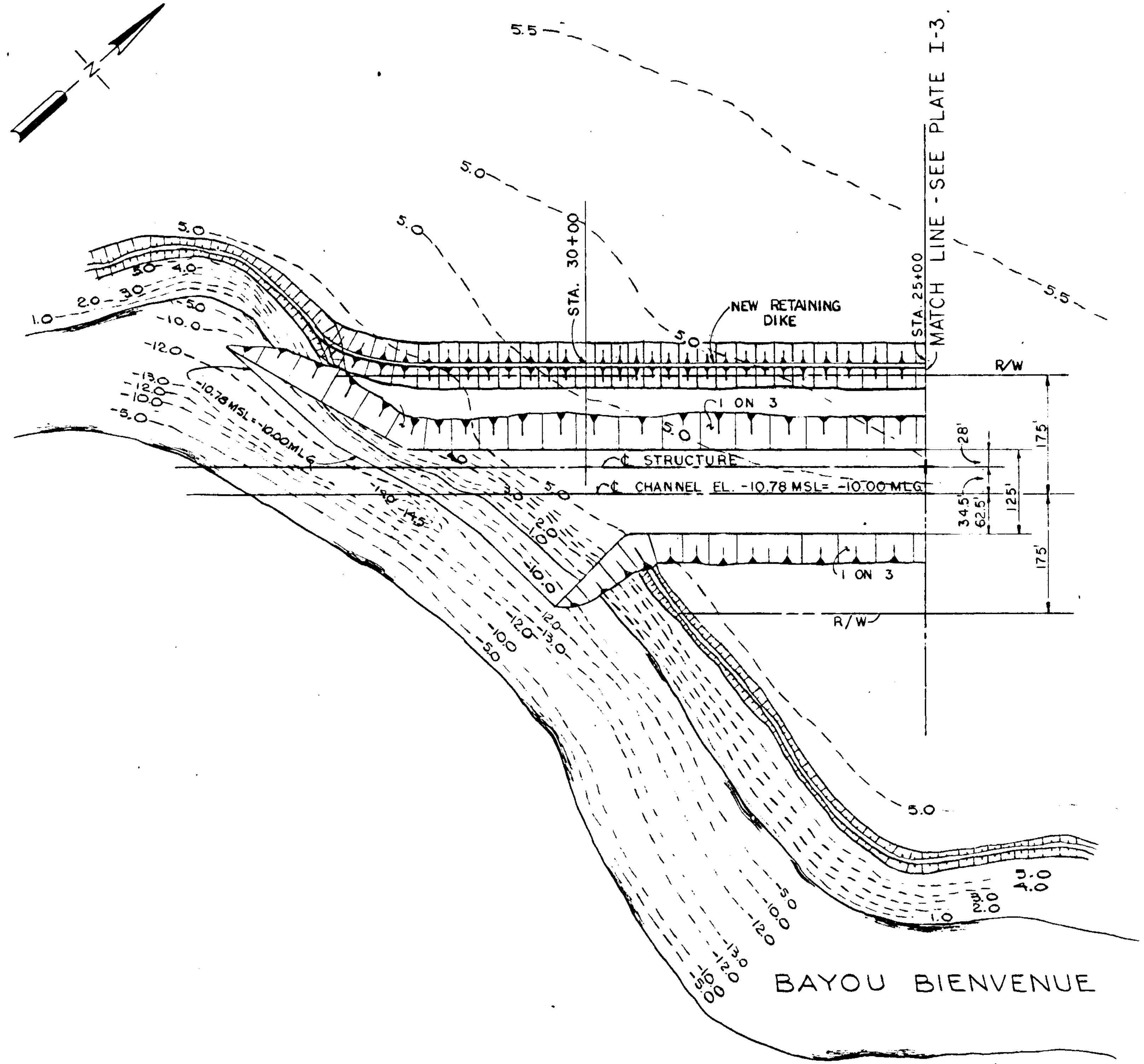
DATE MARCH, 1966
FILE NO. H-2-24147



NOTE
WHERE A SLOPE IS SHOWN AS "1 ON 3" THIS IS TO BE INTERPRETED AS A VERTICAL RISE OF ONE FOOT FOR EVERY THREE FEET MEASURED HORIZONTALLY.

100 50 0 100 200 300 FT.
SCALE

LAKE PONTCHARTRAIN, LA. AND VICINITY
CHALMETTE AREA PLAN
DESIGN MEMORANDUM NO. 5—DETAIL DESIGN
BAYOUS BIENVENUE AND DUPRE CONTROL STRUCTURES

SITE PLAN
BAYOU BIENVENUE — CONT'D

SCALES AS SHOWN

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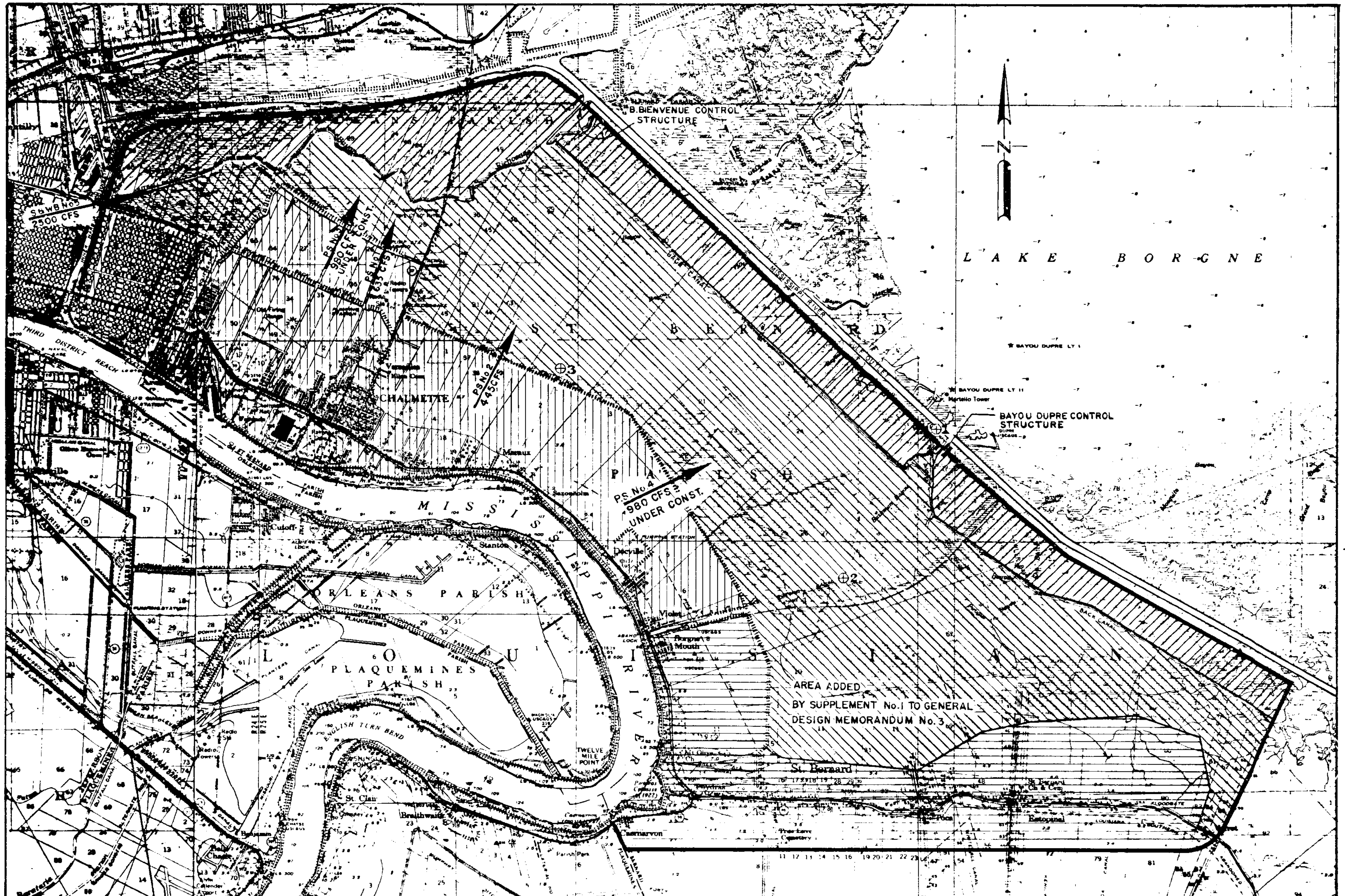
DATE: MARCH, 1966	FILE NO. H-2-24147



LEGEND

////	SPOIL AREA GRAVITY RUNOFF
\\\\	PONDING AREA
| | |	AREA UNDER PUMPS
═══	GRAVITY DRAINAGE
H	CONTROL STRUCTURE

TOTAL AREA = 50,100± ACRES

PONDING AREA = 22,600± ACRES

⊕ TIDE GAUGE

TIDE GAUGE	DESCRIPTION
⊕1	SOUTHWEST BANK OF MR-GO MILE 53, STA. 686+40 AND MOUTH OF BAYOU DUPRE
⊕2	THE EAST BANK OF CANAL APPROX. 550' NORTH OF JUNCTION WITH LAKE BORGNE CANAL
⊕3	CHALMETTE BACK LEVEE STA. 150+00

5,000 0 5,000 10,000 15,000 FEET

1 0 1 2 3 MILES

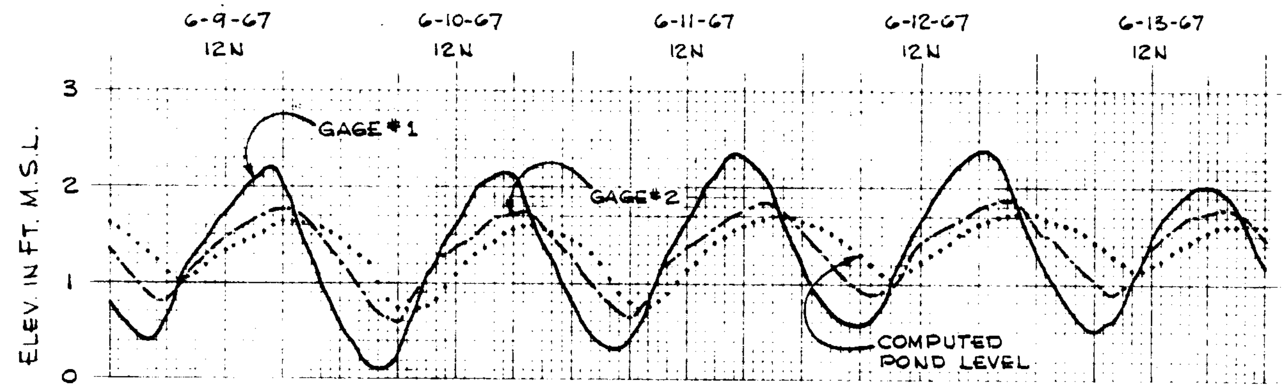
LAKE PONTCHARTRAIN, LA. AND VICINITY
CHALMETTE AREA PLAN

DESIGN MEMORANDUM NO. 5—DETAIL DESIGN
BAYOUS BIENVENUE AND DUPRE CONTROL STRUCTURES

HYDRAULIC DATA - I

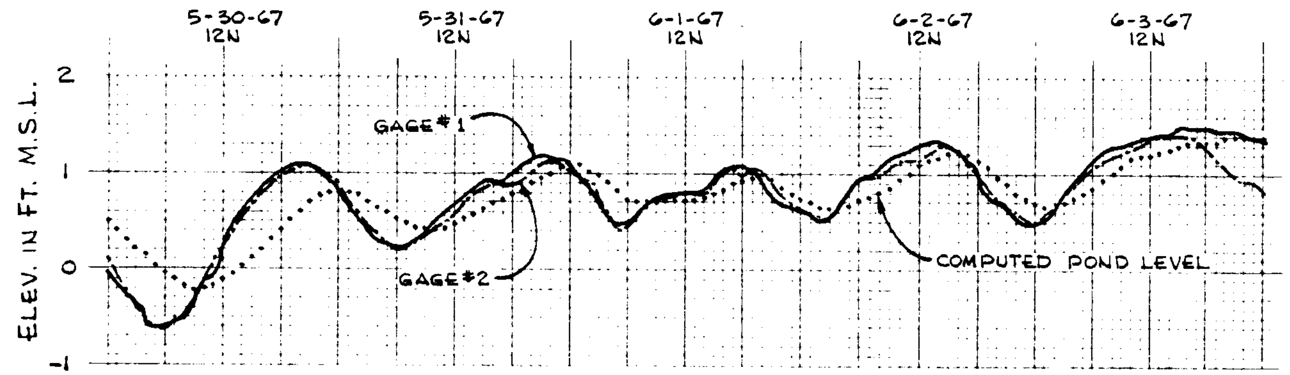
SCALES AS SHOWN

WALDEMAR S. NELSON AND COMPANY, INC. ENGINEERS AND ARCHITECTS NEW ORLEANS, LA.	U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS CORPS OF ENGINEERS, U. S. ARMY NEW ORLEANS, LA.
DATE MARCH, 1968	FILE NO. H 2-24147

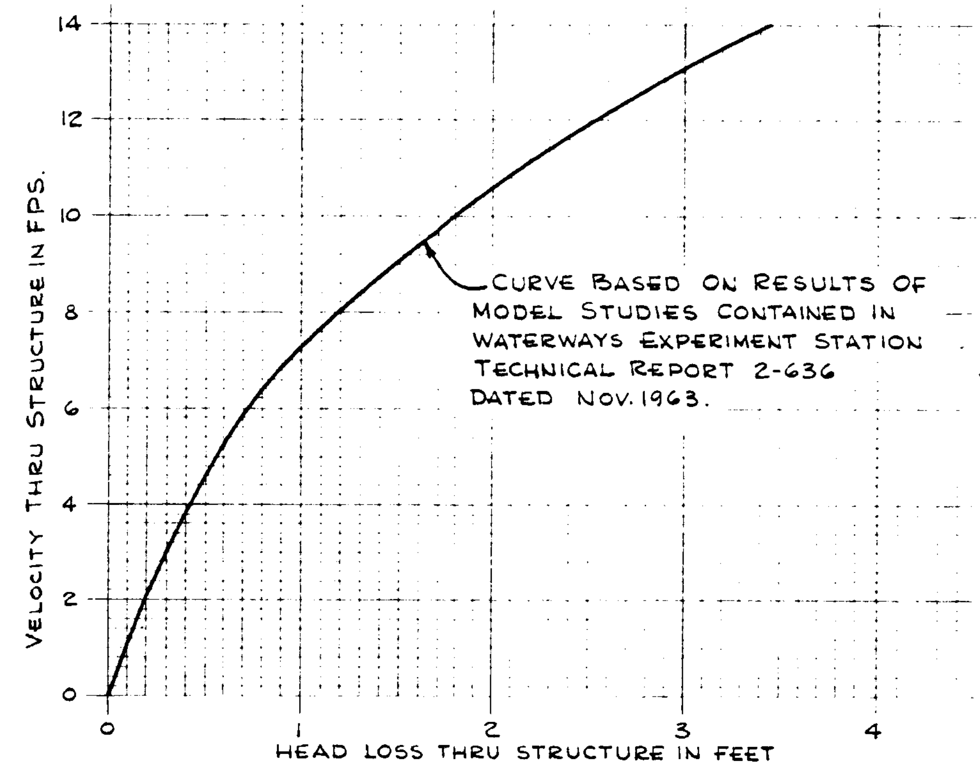


HYDROGRAPH - HIGH TIDE CYCLE

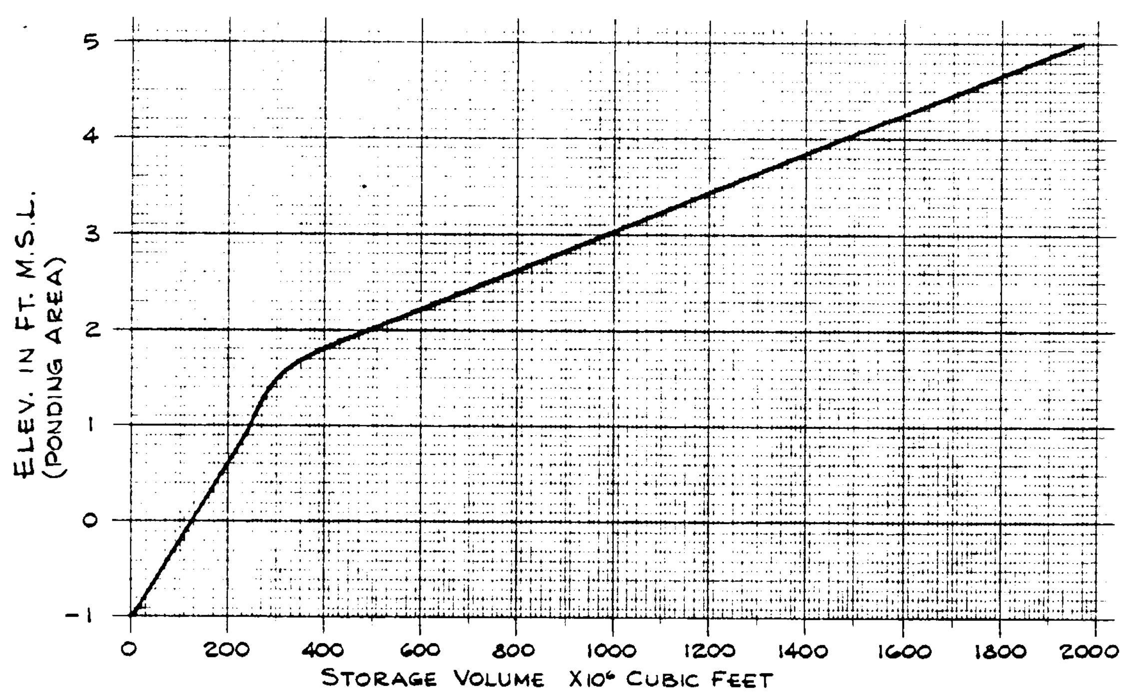
NOTE: GAGE 1 AT INTERSECTION OF BAYOU DUPRE & M.R.-G.O.
GAGE 2 16,000 FEET INLAND (SEE PLATE II-1)



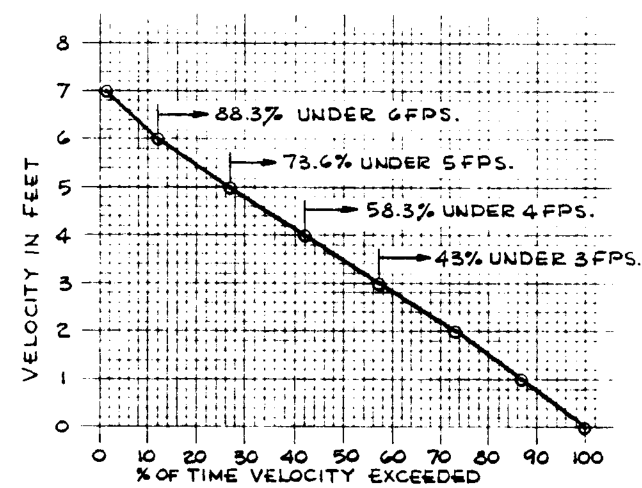
HYDROGRAPH - LOW TIDE CYCLE
(SEE NOTE ABOVE FOR GAGE LOCATION)



VELOCITY VS. HEAD LOSS THRU STRUCTURE



STORAGE VOLUME VS. PONDING AREA LEVEL
(11,300 ACRES = 1/2 OF TOTAL PONDING AREA)



NOTE: CURVE BASED ON 2,063 HOURLY READINGS
MAX. HIGH TIDE 2.64 MIN. LOW TIDE -0.95

VELOCITY THRU STRUCTURE VS. PERCENT OF TIME

LAKE PONTCHARTRAIN, LA. AND VICINITY
CHALMETTE AREA PLAN
DESIGN MEMORANDUM NO. 5—DETAIL DESIGN
BAYOUS BIENVENUE AND DUPRE CONTROL STRUCTURES

HYDRAULIC DATA-2

SCALES AS SHOWN

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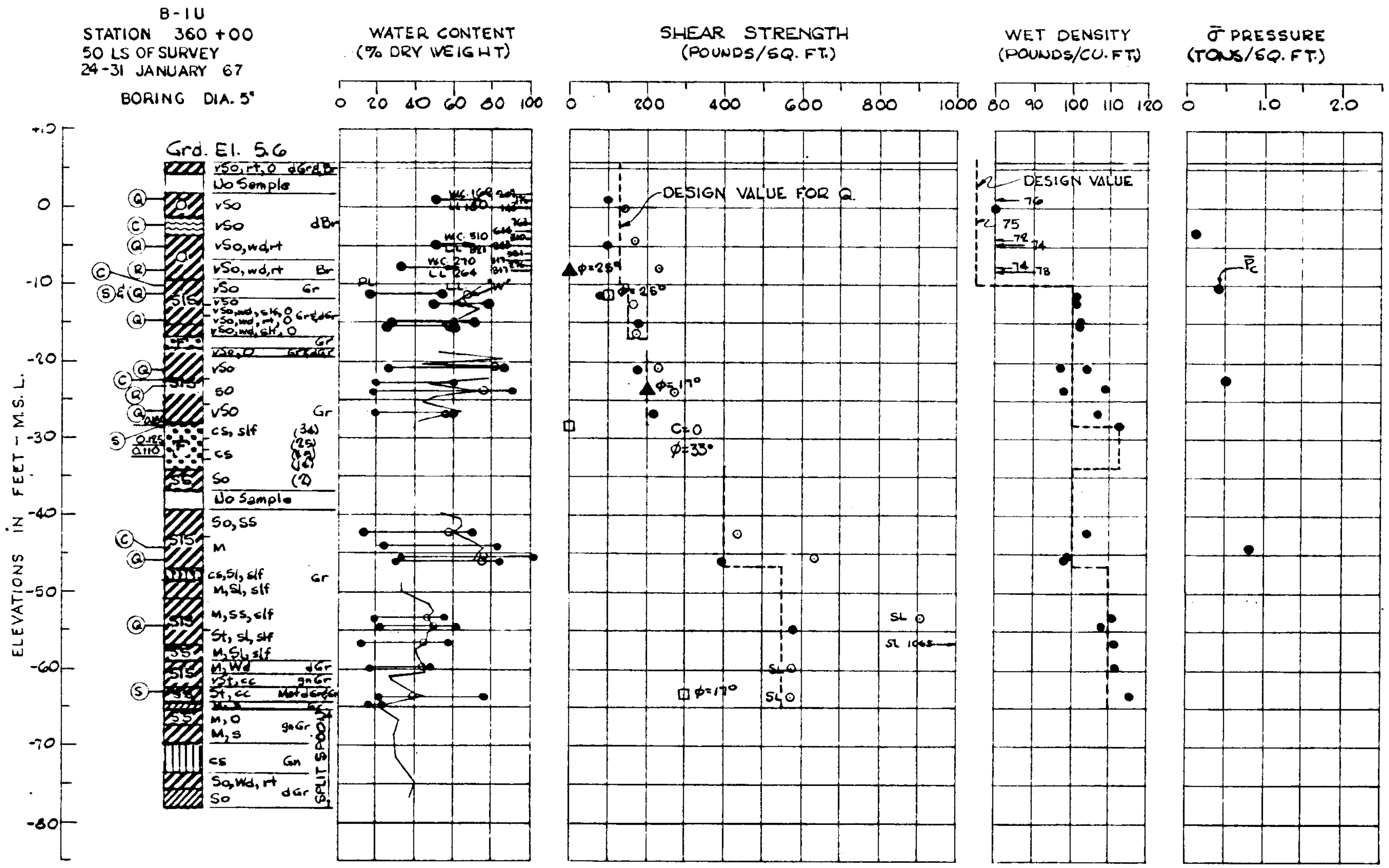
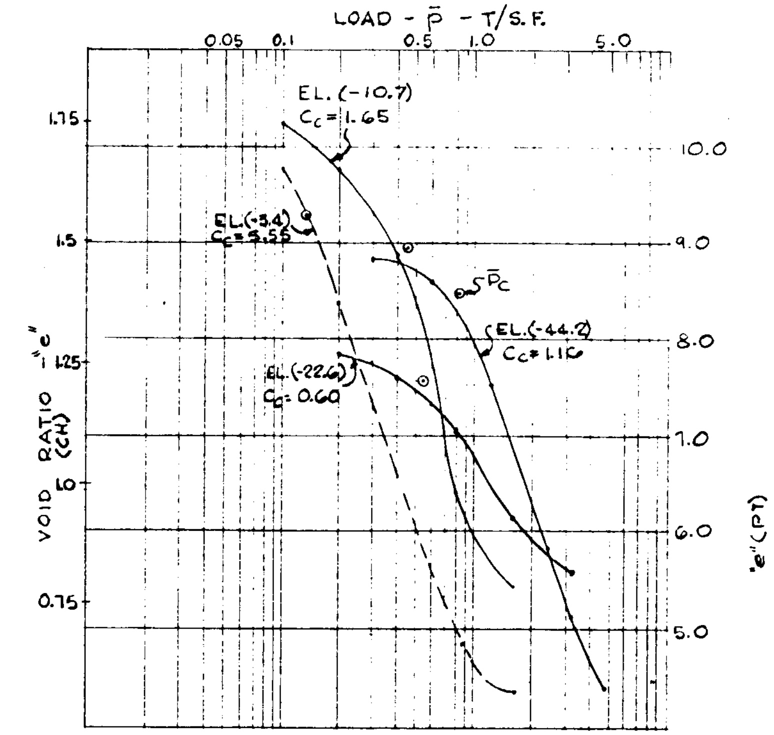
DATE: MARCH, 1968	FILE NO. H-2-24147



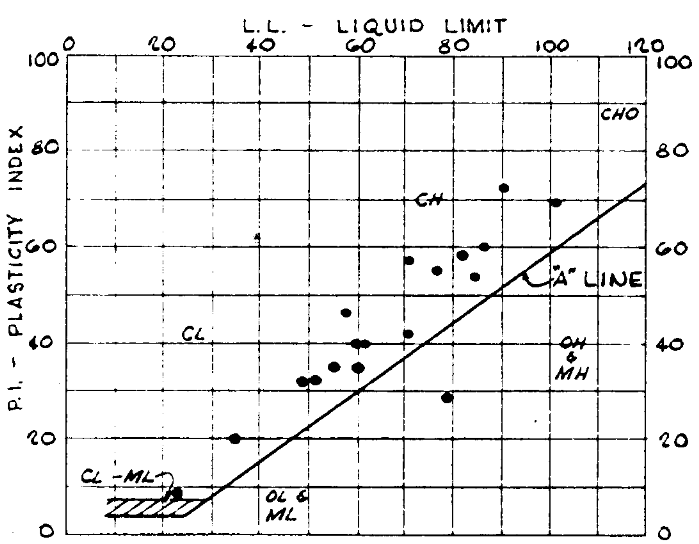


CONSOLIDATION DATA

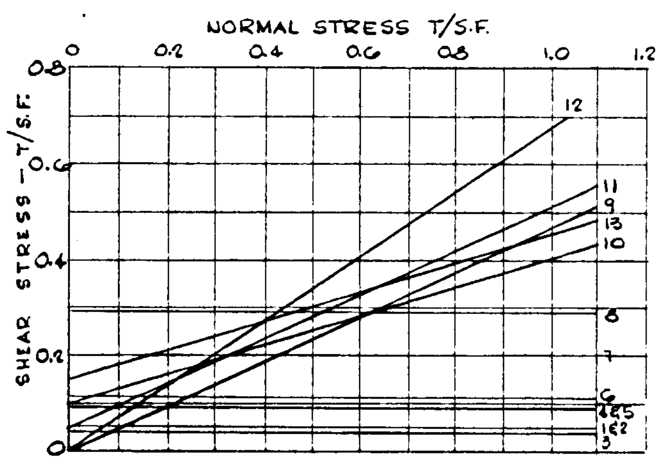
GENERAL NOTES

SEE PLATE "A" FOR SOIL BORING LEGEND

- ⊙ UC — UNCONFINED COMPRESSION SHEAR
- • Ⓠ — UNCONSOLIDATED UNDRAINED TRIAXIAL SHEAR
- ▲ Ⓡ — CONSOLIDATED UNDRAINED TRIAXIAL SHEAR
- ⊡ Ⓢ — CONSOLIDATED DRAINED DIRECT SHEAR
- Ⓒ — CONSOLIDATION TEST
- W — NATURAL WATER CONTENT
- LL — LIQUID LIMIT
- PL — PLASTIC LIMIT
- c — UNIT COHESION
- ϕ — ANGLE OF FRICTION
- γ — UNIT WEIGHT OF SOIL-WATER SYSTEM
- $\bar{\sigma}$ — NORMAL STRESS
- O.B. — OVERBURDEN
- $\bar{P}_c$ — PRECONSOLIDATION PRESSURE
- e — VOID RATIO
- C_c — COMPRESSION INDEX



PLASTICITY CHART



SHEAR STRENGTH DATA

ENVELOPE NO.	ENVELOPE EL.	TYPE	STRENGTH $\phi°$	STRENGTH c (tsf)	CLASS
1	+0.7	Q	0	0.05	CH
2	-5.2	Q		0.05	CH
3	-11.5	Q		0.04	CH
4	-15.1	Q		0.09	CH
5	-21.2	Q		0.09	CH
6	-26.7	Q		0.11	CH
7	-46.0	Q		0.20	CH
8	-54.2	Q	0	0.29	CH
9	-8.4	R	26	0	PT
10	-28.6	R	17	0.10	CL
11	-11.5	S	25	0.05	CH
12	-28.4	S	34	0	SM
13	-68.1	S	17	0.15	CH

LAKE PONTCHARTRAIN, LA. AND VICINITY
CHALMETTE AREA PLAN

DESIGN MEMORANDUM NO. 5—DETAIL DESIGN
BAYOUS BIENVENUE AND DUPRE CONTROL STRUCTURES

UNDISTURBED BORING B-1U

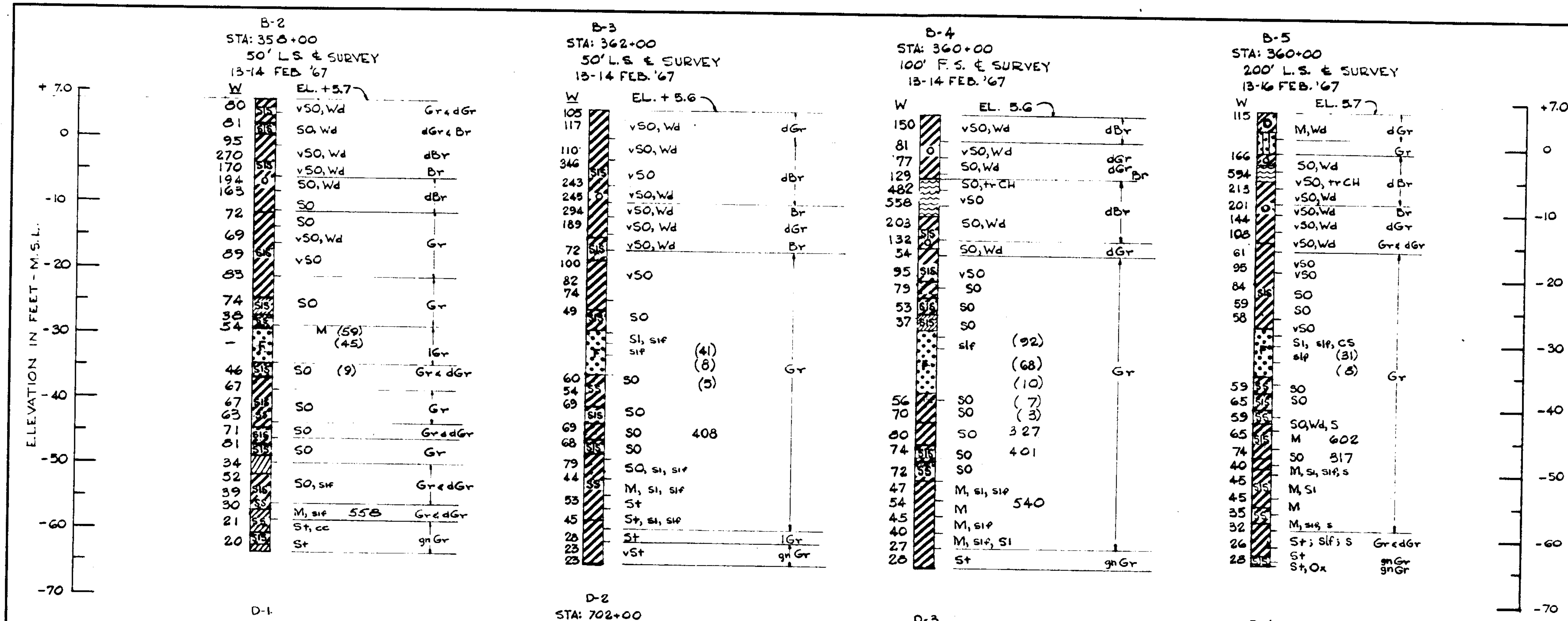
TEST DATA

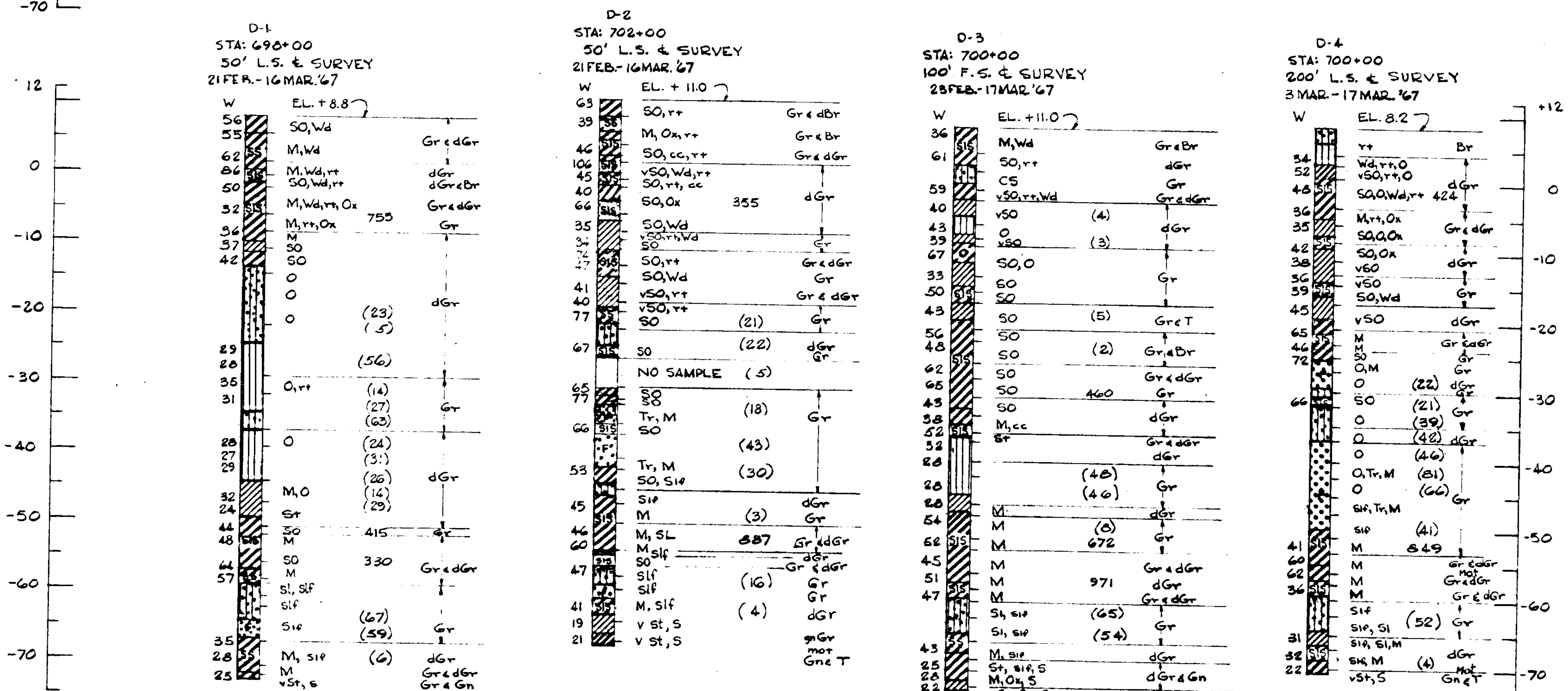
SCALES AS SHOWN

WALDEMAR S. NELSON AND COMPANY, INC.
ENGINEERS AND ARCHITECTS
NEW ORLEANS, LA.

U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS, U. S. ARMY
NEW ORLEANS, LA.

DATE: MARCH, 1968 FILE NO. H-2-24147





GENERAL NOTES:

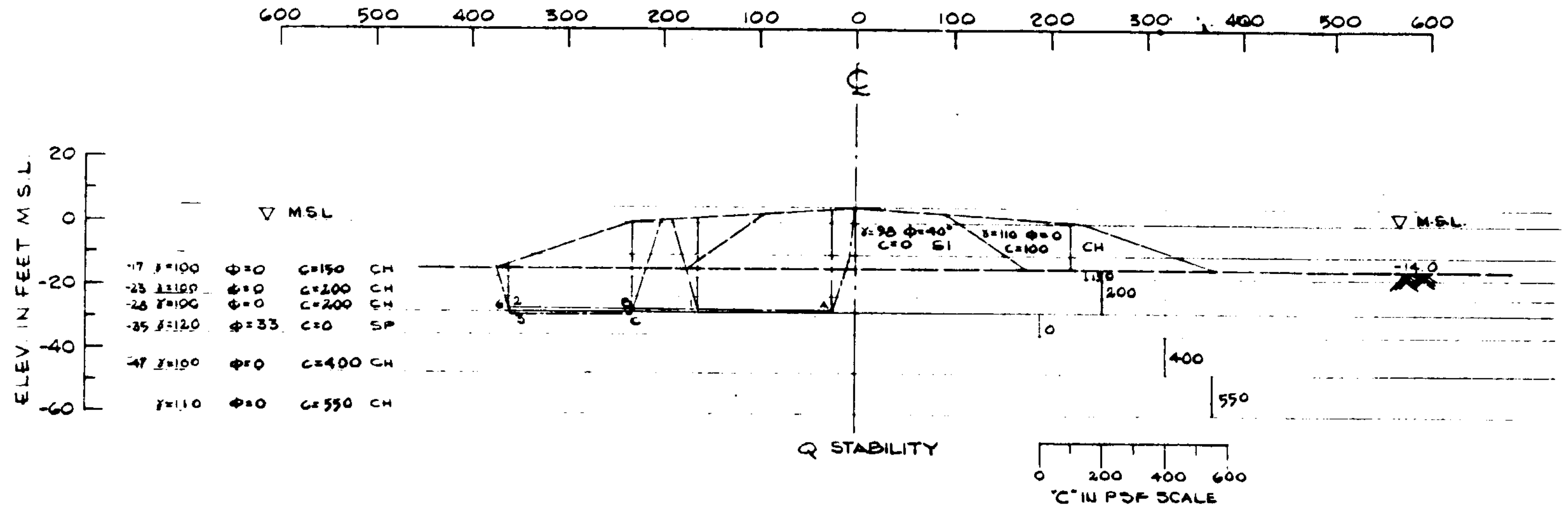
1) SEE PLATE 'A' FOR SOIL BORING LEGEND.
2) L.S. LANDSIDE
F. S. FLOODSIDE
3) COHESIVE SOIL SAMPLES WERE TAKEN WITH A 1 7/8" I.D. CORE BARREL SAMPLER. NON-COHESIVE SOIL SAMPLES WERE TAKEN WITH A 1 3/8" I.D., 2" O.D. SPLIT SPOON SAMPLER USING A 140 lbs. HAMMER WITH A 30" DROP.

LAKE PONTCHARTRAIN, LA. AND VICINITY
CHALMETTE AREA PLAN
DESIGN MEMORANDUM NO. 5—DETAIL DESIGN
BAYOUS BIENVENUE AND DUPRE CONTROL STRUCTURES

GENERAL BORINGS

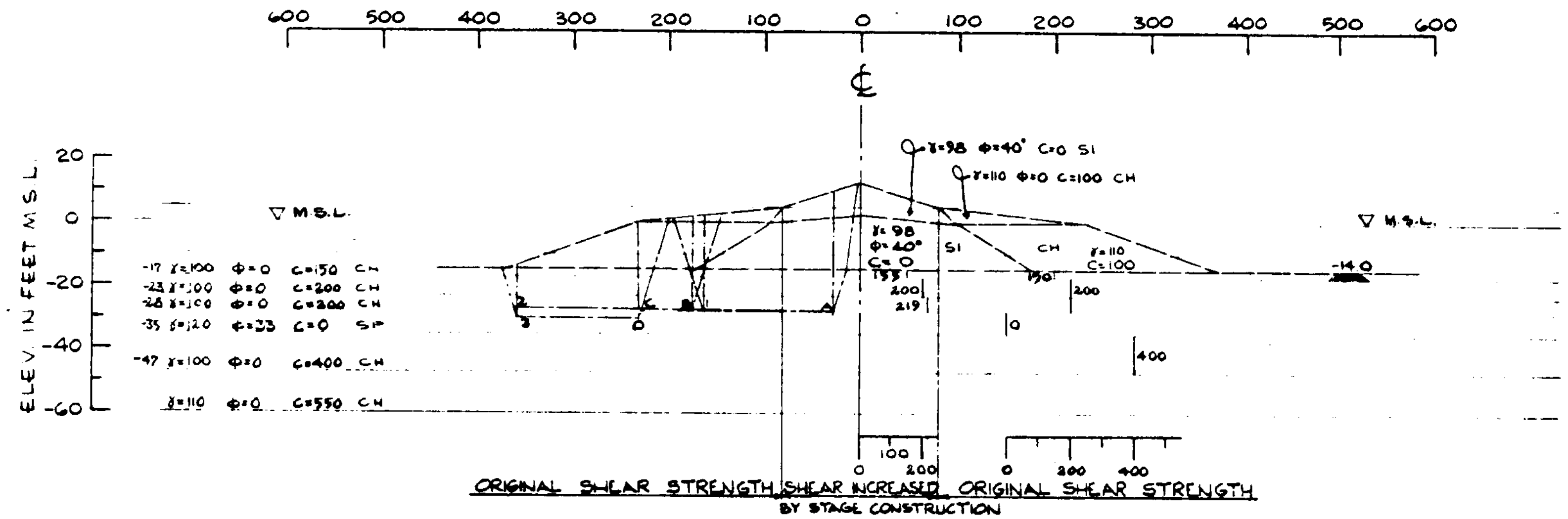
SCALES AS SHOWN

WALDEMAR S. NELSON AND COMPANY, INC. ENGINEERS AND ARCHITECTS NEW ORLEANS, LA.	U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS CORPS OF ENGINEERS, U. S. ARMY NEW ORLEANS, LA.
DATE: MARCH, 1968	FILE NO. H-2-24147



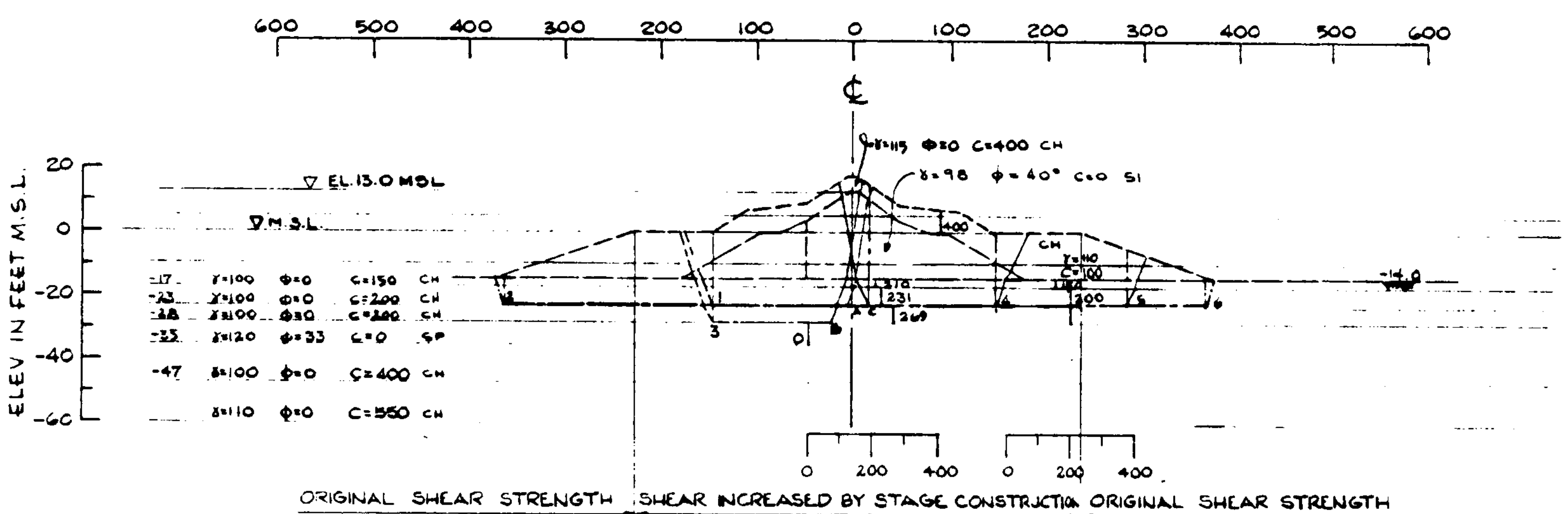
1ST. LIFT

VERT. SCALE 1"=30' HORZ. SCALE 1"=100'



2ND. LIFT

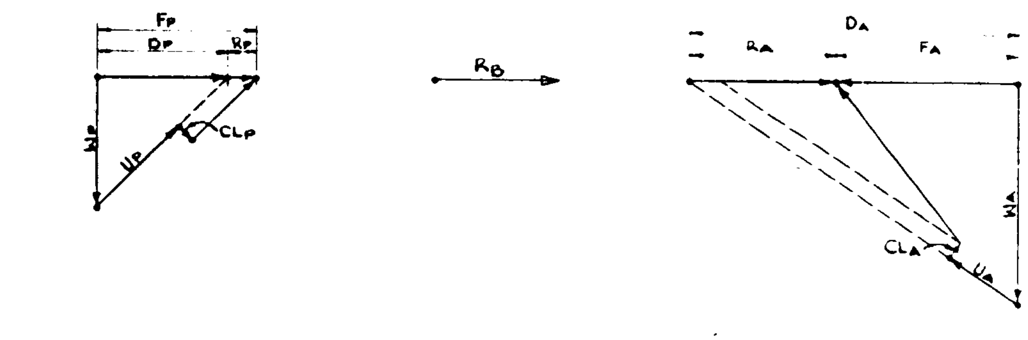
SCALE AS SHOWN ABOVE



3RD. LIFT

SCALE AS SHOWN ABOVE

BAYOU BIENVENUE											
SECTION	FAILURE SURFACE			DRIVING FORCES			RESISTING FORCES				FACTOR OF SAFETY
	NO.		EL.	$+D_A$	$-D_P$	ΣD	$+R_A$	$+R_B$	$+R_P$	ΣR	$\Sigma R/\Sigma D$
FIRST LIFT	A	1	-27.5	48,225	42,918	5,307	12,616	28,004	8,017	48,637	2.16
	A	2	-27.5	48,225	27,364	20,861	12,616	67,121	5,100	84,837	4.07
	B	2	-27.5	41,382	27,364	14,018	7,988	25,912	5,100	39,000	2.78
	C	3	-28.5	44,373	29,700	14,673	8,617	77,063	6,021	91,701	6.25
SECOND LIFT	A	1	-27.5	75,068	46,103	28,965	26,267	28,137	8,583	62,987	2.17
	A	2	-27.5	75,068	27,364	47,704	26,267	67,412	5,100	98,779	2.07
	B	2	-27.5	48,025	27,364	20,661	10,245	37,378	5,100	52,723	2.55
	C	2	-27.5	42,430	27,364	15,066	8,391	26,189	5,100	39,680	2.63
	D	3	-28.5	45,382	29,700	15,682	9,019	77,384	6,020	92,423	5.89
THIRD LIFT	A	1	-22.5	80,350	28,118	52,232	41,760	35,301	6,146	83,207	1.59
	A	2	-22.5	80,350	7,008	63,342	41,760	75,304	2,950	120,014	1.89
	B	3	-27.5	100,512	40,585	59,927	44,412	38,419	8,798	91,629	1.53
	*C	4	-22.99	80,041	26,808	53,233	29,111	32,480	10,692	72,283	1.36
	*C	5	-22.99	80,041	23,171	56,870	29,111	59,363	4,880	93,354	1.64
	*C	6	-22.99	80,041	18,108	61,933	29,111	75,763	3,187	109,061	1.74



PASSIVE WEDGE CENTRAL WEDGE ACTIVE WEDGE

SURFACE B3 THIRD STAGE F.S. WITH RESPECT TO SHEAR STRENGTH

$$= \frac{RA+RB+RP}{DA-DP} = \frac{91,629}{59,927} = 1.53$$

VECTOR DIAGRAM

(METHOD OF PLANES)

SCALE: 1" = 30,000#

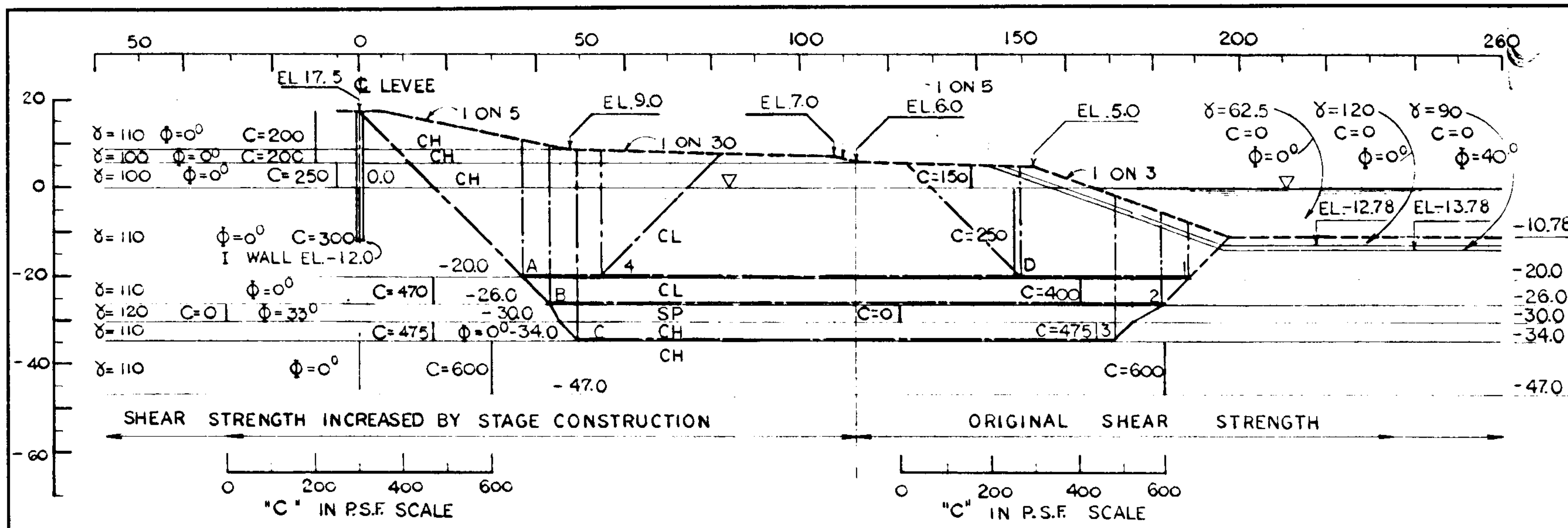
NOTES:
SEE PLATE I-3 FOR LOCATION OF STREAM CLOSURE SECTION.
SEE PLATE I-9 FOR DETAIL DIMENSIONS OF SECTIONS.
MANY OTHER FAILURE PLANES HAVE BEEN STUDIED BUT ARE NOT SHOWN ON THIS DWG. ONLY THE WORST CONDITIONS HAVE BEEN SHOWN.
*WATER MR-GO SIDE AT EL. 13.0

LAKE PONTCHARTRAIN, LA. AND VICINITY
CHALMETTE AREA PLAN
DESIGN MEMORANDUM NO. 5—DETAIL DESIGN
BAYOUS BIENVENUE AND DUPRE CONTROL STRUCTURES

STABILITY ANALYSIS-I

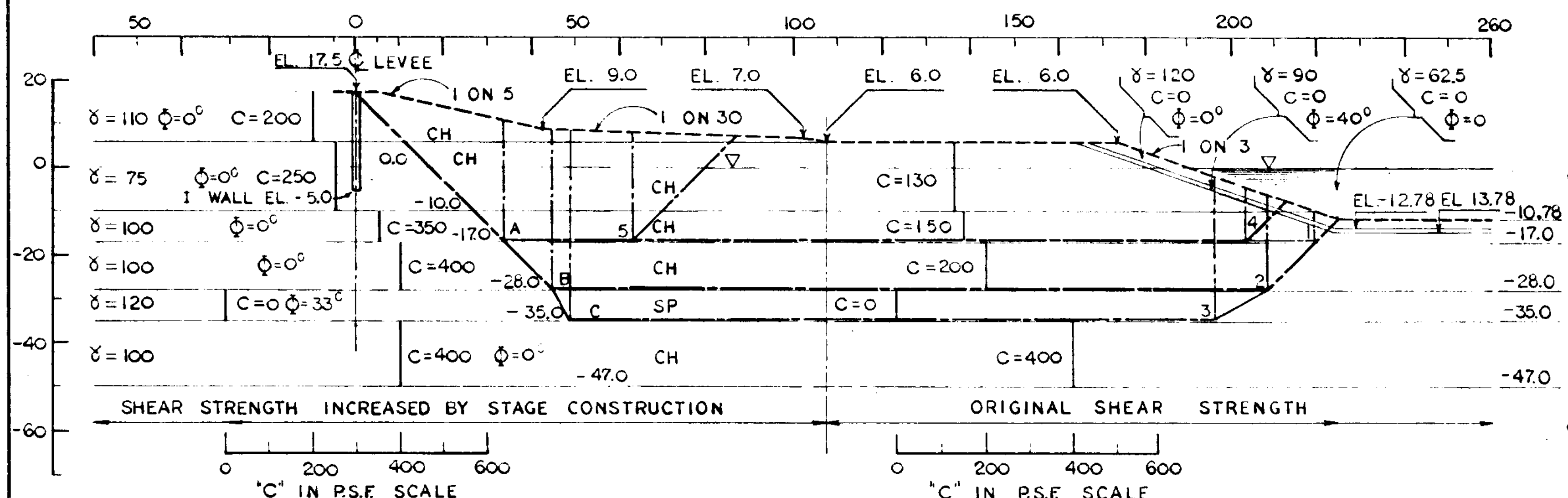
SCALES AS SHOWN

WALDEMAR S. NELSON AND COMPANY, INC. ENGINEERS AND ARCHITECTS NEW ORLEANS, LA.	U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS CORPS OF ENGINEERS, U. S. ARMY NEW ORLEANS, LA.
DATE MARCH, 1966	FILE NO. H-2-24147



— BAYOU DUPRE — SECTION THRU LEVEE AND CHANNEL —

"Q" STABILITY

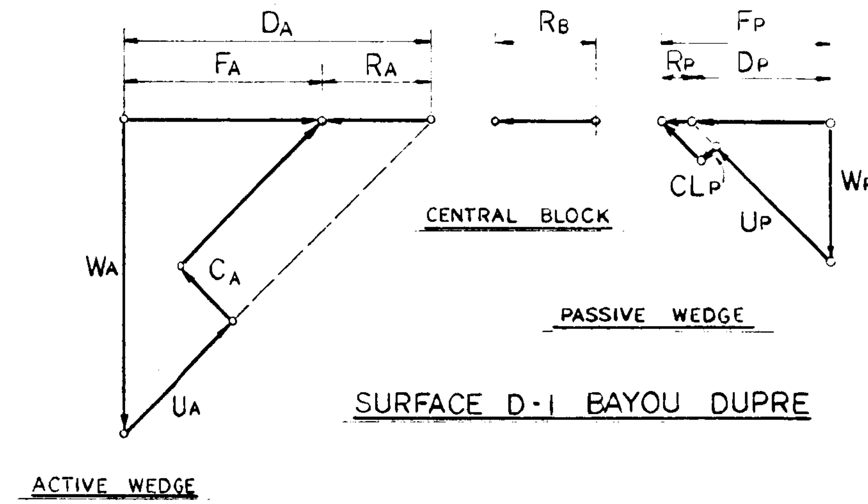


— BAYOU BIENVENUE — SECTION THRU LEVEE AND CHANNEL —

"Q" STABILITY

SECTION	FAILURE SURFACE		DRIVING FORCES			RESISTING FORCES				FACTOR OF SAFETY	F.O.S. NEGLECT'G STRENGTH INCREASE
	NUMBER	EL.	$+D_A$	$-D_P$	ΣD	R_A	R_B	R_P	ΣR	$\Sigma R / \Sigma D$	
BAYOU DUPRE	D 1	-19.5	32579	14230	18349	11453	10455	3139	25047	1.37	1.37
	A 1	-19.5	61871	14230	47641	19300	41801	3139	64240	1.35	1.21
	B 2	-25.5	83111	27131	55980	24770	60860	7789	93419	1.67	1.51
	C 3	-33.5	116826	52001	64825	35100	58406	22539	116045	1.79	1.79
	A 4	-19.5	63221	43864	19357	19300	4350	15900	39550	2.04	1.82
BAYOU BIEN-VENUE	B 2	-22.5	77963	28058	49905	25766	46375	4182	76323	1.53	1.15
	A 1	-16.5	45998	7308	38690	17016	43689	1300	62005	1.57	1.11
	C 3	-35.5	107754	52524	55230	35227	59655	23079	117961	2.14	2.05
	A 4	-16.5	45998	10448	35550	17016	41438	5527	63981	1.80	1.11
	A 5	-16.5	63221	43864	19357	19300	4350	15900	39550	2.04	1.06

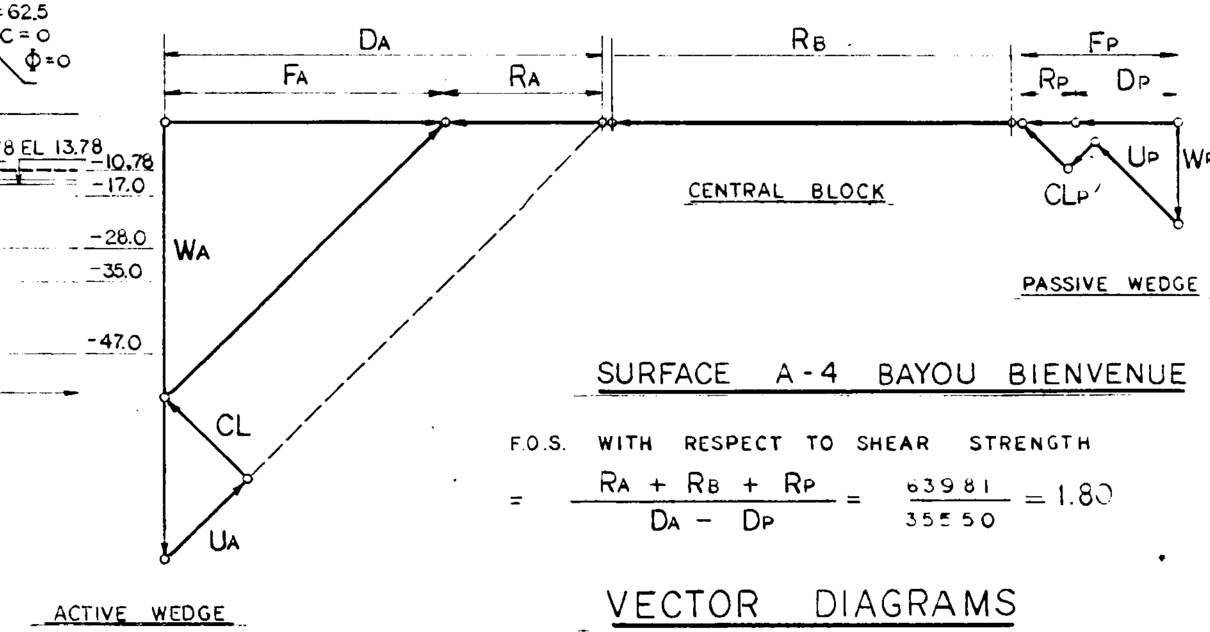
STABILITY CALCULATIONS



SURFACE D-1 BAYOU DUPRE

F.O.S. WITH RESPECT TO SHEAR STRENGTH

$$= \frac{R_A + R_B + R_P}{D_A - D_P} = \frac{25047}{18349} = 1.37$$



SURFACE A-4 BAYOU BIENVENUE

F.O.S. WITH RESPECT TO SHEAR STRENGTH

$$= \frac{R_A + R_B + R_P}{D_A - D_P} = \frac{63981}{35550} = 1.80$$

VECTOR DIAGRAMS

(METHOD OF PLANES)

SCALE : 1" = 10,000#

NOTE :
SEE PLATES I-3 AND I-5 FOR LOCATION OF SECTIONS THRU LEVEE AND CHANNEL.

LAKE PONTCHARTRAIN, LA. AND VICINITY
CHALMETTE AREA PLAN
DESIGN MEMORANDUM NO. 5—DETAIL DESIGN
BAYOUS BIENVENUE AND DUPRE CONTROL STRUCTURES

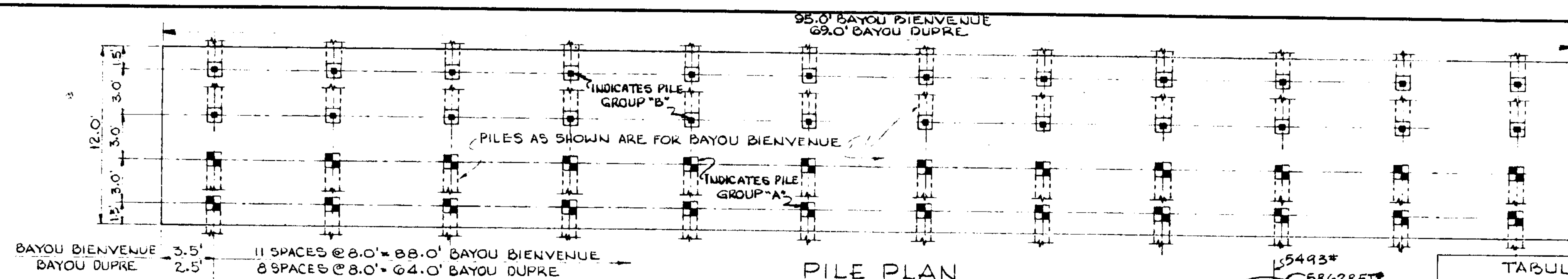
STABILITY ANALISIS - 3

SCALES AS SHOWN

WALDEMAR S. NELSON AND COMPANY, INC. ENGINEERS AND ARCHITECTS NEW ORLEANS, LA.

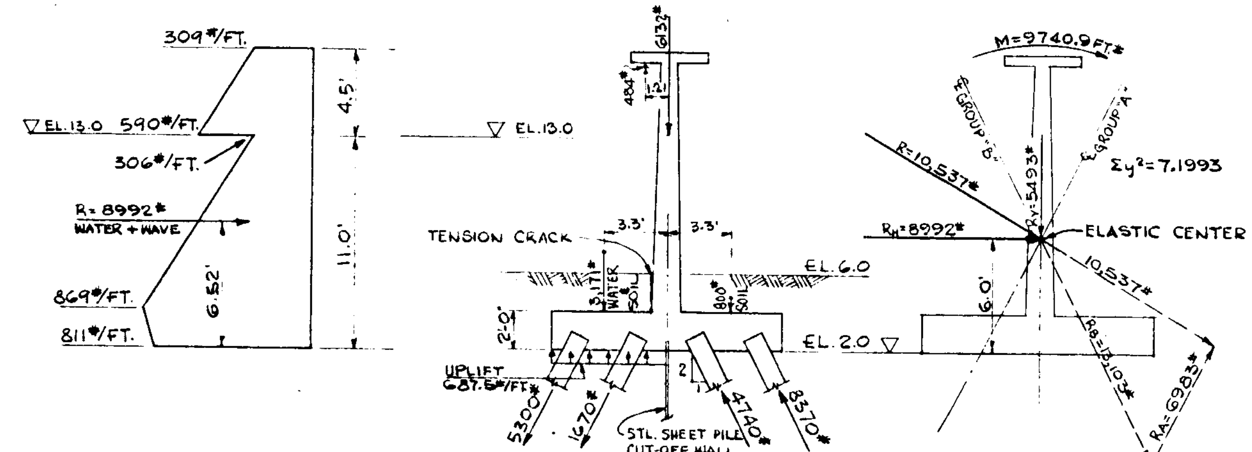
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS CORPS OF ENGINEERS, U. S. ARMY NEW ORLEANS, LA.

DATE: MARCH, 1968 — FILE NO. H-2-24147



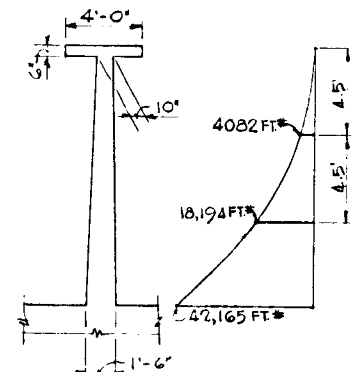
PILE PLAN

1" = 5'-0"



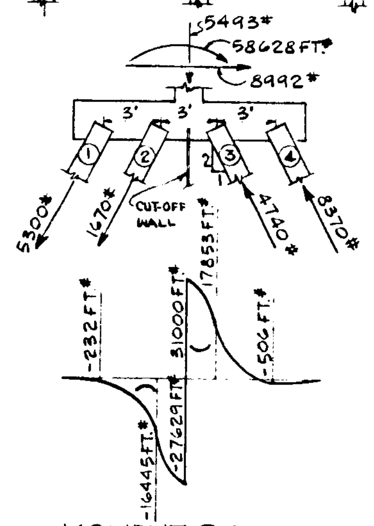
LOADS AND PILE REACTIONS ON INVERTED "T" FLOOD WALL

SCALE: 1" = 5'-0"
1" = 5000 FT.#



MOMENT DIAGRAM FOR STEM

SCALE: 1" = 3'-0"
1" = 40,000 FT.#



MOMENT DIAGRAM FOR BASE

SCALE: 1" = 3'-0"
SCALE: 1" = 10,000 FT.#

TABULATION OF PILE LOADS IN KIPS

PILE NO	ELASTIC CENTER		K=50 HRENNIKOFF				K=125 HRENNIKOFF				K=200 HRENNIKOFF			
			BIENVENUE		DUPRE		BIENVENUE		DUPRE		BIENVENUE		DUPRE	
	P	Q	P	Q	P	Q	P	Q	P	Q	P	Q	P	Q
LOADING CONDITION NO. 1														
1	-42.4	0.0	-42.5	-0.016	-42.5	-0.016	-42.6	-0.032	-42.6	-0.024	-42.6	-0.040	-42.6	-0.032
2	-13.4	0.0	-13.3	-0.056	-13.4	-0.040	-13.2	-0.104	-13.3	-0.080	-13.1	-0.144	-13.2	-0.112
3	37.9	0.0	37.8	-0.960	37.9	-0.016	37.8	-0.040	37.8	-0.032	37.7	-0.056	37.7	-0.040
4	67.0	0.0	67.0	-0.016	67.0	0.008	67.0	0.032	67.0	0.024	67.1	0.048	67.1	0.040
LOADING CONDITION NO 1-A														
1	-36.2	0.0	-36.6	-0.096	-36.5	-0.072	-36.8	-0.176	-36.7	-0.144	-37.0	-0.240	-36.9	-0.192
2	-19.5	0.0	-18.7	-0.120	-19.0	-0.096	-18.4	-0.224	-18.6	-0.176	-18.0	-0.360	-18.3	-0.248
3	44.1	0.0	43.5	-0.088	43.6	-0.072	43.0	-0.160	43.2	-0.128	42.6	-0.216	42.8	-0.176
4	60.8	0.0	61.1	-0.064	61.0	-0.048	61.4	-0.112	61.3	-0.096	61.5	-0.152	61.4	-0.128
LOADING CONDITION NO. 2														
1	7.0	0.0	6.9	-0.072	7.0	-0.056	6.7	-0.136	6.8	-0.112	6.6	-0.192	6.7	-0.152
2	4.1	0.0	4.6	-0.072	4.5	-0.024	4.9	-0.136	4.7	-0.104	5.1	-0.184	5.0	-0.152
3	23.3	0.0	23.0	-0.040	23.0	-0.032	22.5	-0.064	22.7	-0.056	22.3	-0.088	22.5	-0.072
4	20.8	0.0	20.6	-0.040	20.6	-0.032	20.7	-0.072	20.6	-0.056	20.8	-0.096	20.7	-0.080
LOADING CONDITION NO. 2-A														
1	10.5	0.0	10.2	-0.120	10.3	-0.096	10.0	-0.224	10.1	-0.128	9.8	-0.304	9.9	-0.248
2	0.6	0.0	1.3	-0.104	1.2	-0.088	1.92	-0.200	1.7	-0.160	2.3	-0.280	2.1	-0.224
3	26.7	0.0	26.2	-0.072	26.2	-0.056	25.5	-0.136	25.8	-0.112	25.1	-0.176	25.4	-0.144
4	16.9	0.0	17.3	-0.088	17.1	-0.064	17.4	-0.152	17.4	-0.128	17.6	-0.208	17.5	-0.168

NOTES:

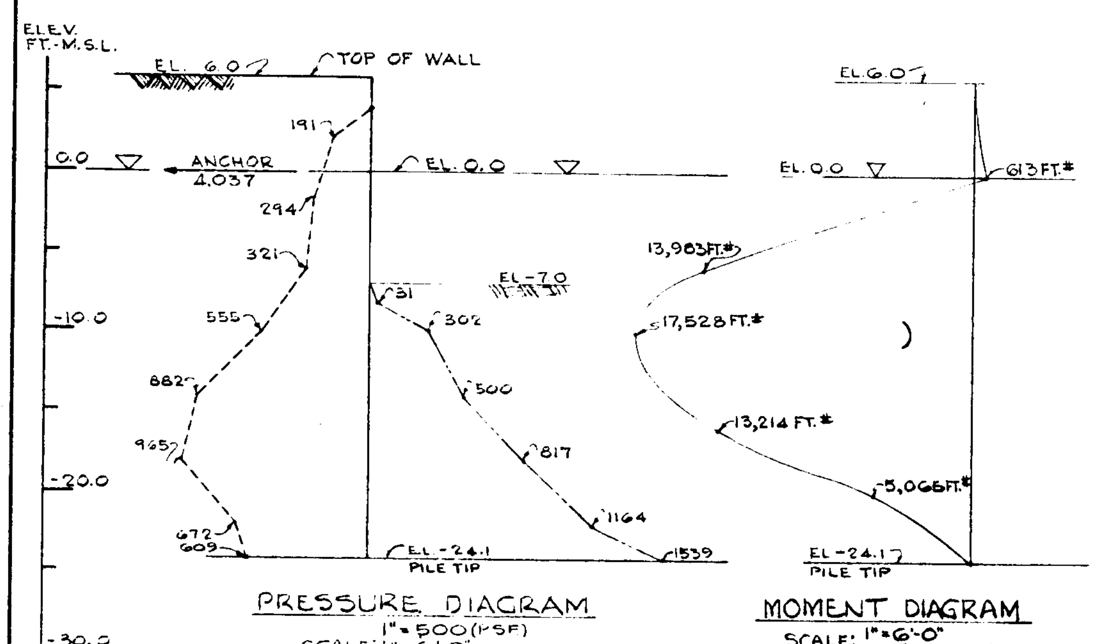
LOADING CONDITION NO. 1-
STILL WATER OF EL. 13.0, 7FT. BROKEN WAVE, SHEET PILE CUT-OFF WALL ASSUMED IMPERVIOUS, LANDSIDE WATER EL. 2.0.

LOADING CONDITION NO. 1-A-
SAME AS CONDITION NO. 1 EXCEPT SHEET PILE CUT-OFF WALL ASSUMED PERVIOUS.

LOADING CONDITION NO. 2-
STILL WATER OF EL. 8.3, 2FT BROKEN WAVE, SHEET PILE CUT-OFF WALL ASSUMED IMPERVIOUS, LANDSIDE WATER EL. 2.0.

LOADING CONDITION NO. 2-A-
SAME AS CONDITION NO. 2 EXCEPT SHEET PILE CUT-OFF WALL ASSUMED PERVIOUS.

⌒ INDICATES TENSION IN TOP OF BASE SLAB.
⌣ " " BOT. " " "
ABOVE LOADINGS ARE GROUP II LOADINGS.



PRESSURE DIAGRAM

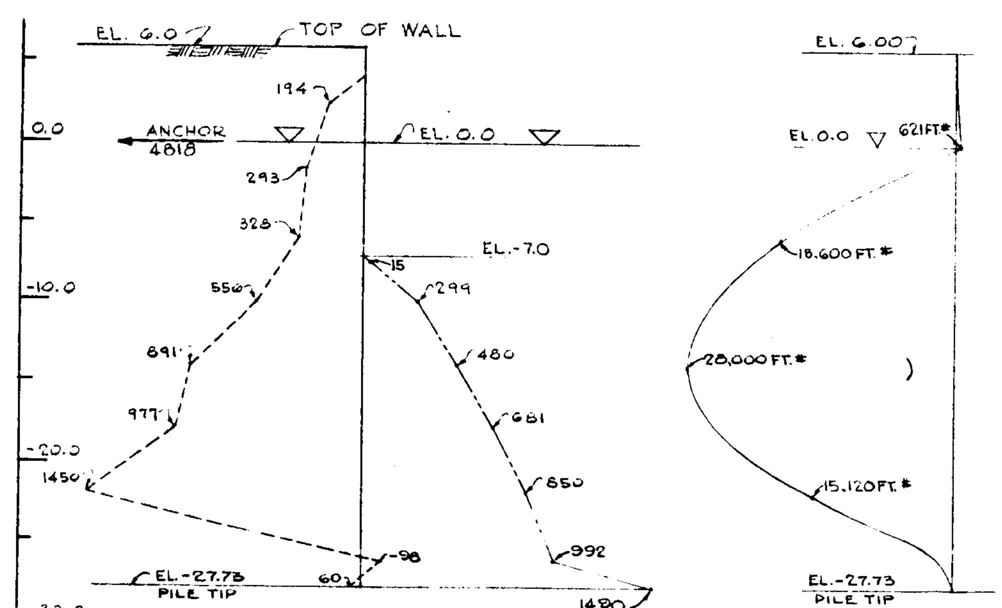
1" = 500 (PSF)
SCALE: 1" = 6'-0"
F.O.S = 1.5

MOMENT DIAGRAM

SCALE: 1" = 6'-0"
1" = 5000 FT.#

WING WALL STABILITY

BAYOU DUPRE



PRESSURE DIAGRAM

1" = 500 (P.S.F)
SCALE: 1" = 6'-0"
F.O.S. = 1.5

MOMENT DIAGRAM

SCALE: 1" = 6'-0"
1" = 10,000 FT.#

WING WALL STABILITY

BAYOU BIENVENUE

LAKE PONTCHARTRAIN, LA. AND VICINITY
CHALMETTE AREA PLAN
DESIGN MEMORANDUM NO. 5—DETAIL DESIGN
BAYOUS BIENVENUE AND DUPRE CONTROL STRUCTURES

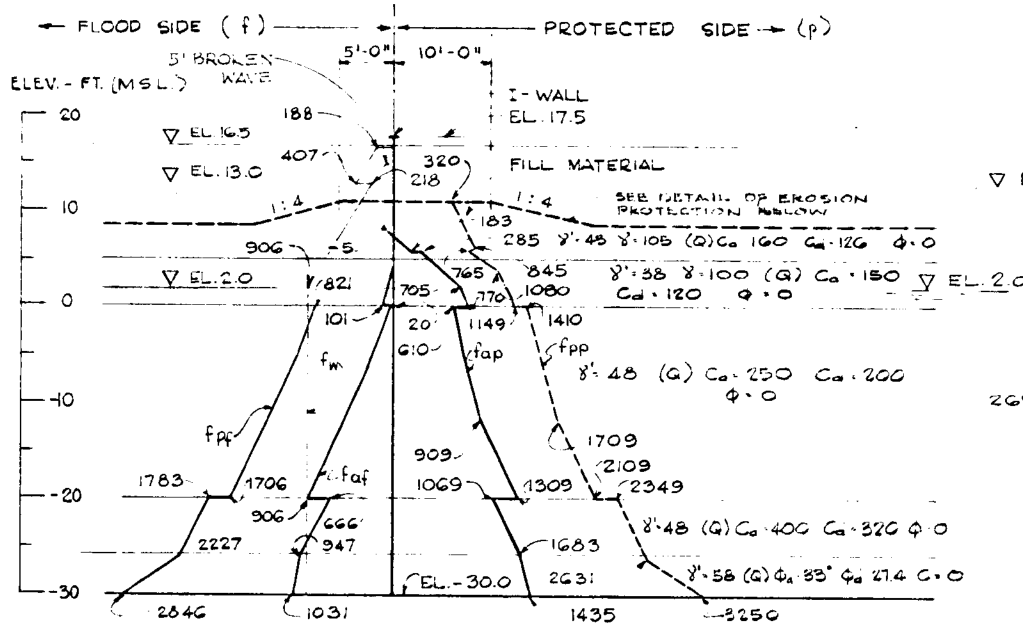
FLOOD WALL STABILITY - I

SCALES AS SHOWN

WALDEMAR S. NELSON AND COMPANY, INC.
ENGINEERS AND ARCHITECTS
NEW ORLEANS, LA.

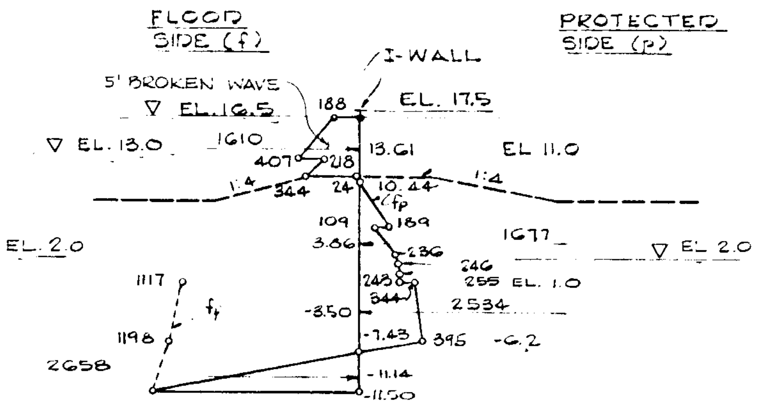
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS, U. S. ARMY
NEW ORLEANS, LA.

DATE: MARCH, 1968
FILE NO. H-2-24147



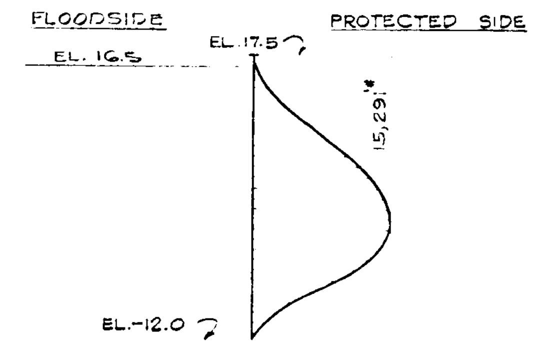
GROSS PRESSURE DIAGRAM

F.S. = 1.25
SCALE 1" = 1000 PSF
SCALE 1" = 10'-0"



NET PRESSURE DIAGRAM

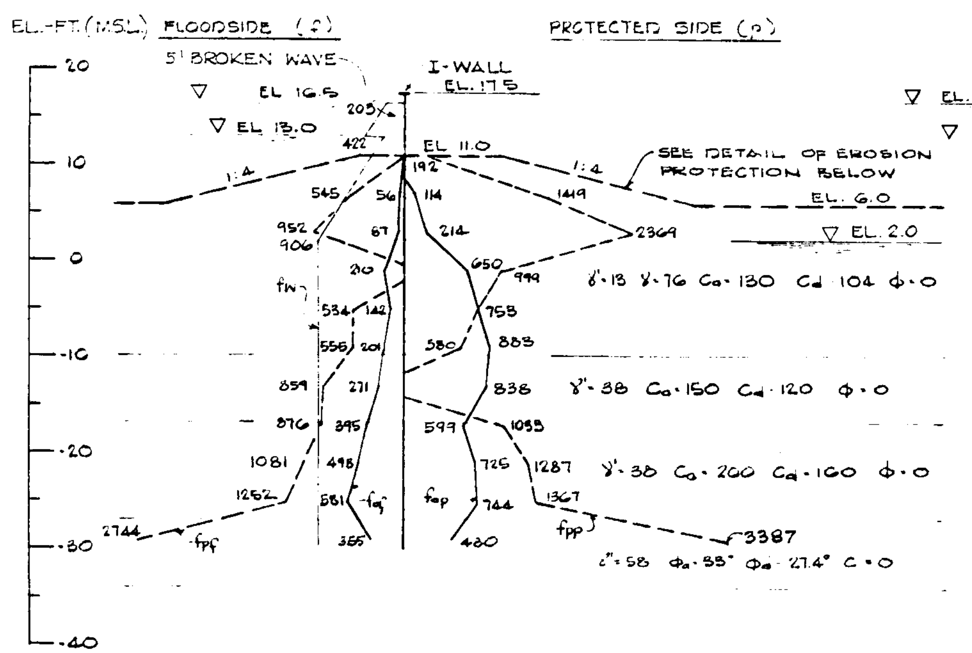
"Q" STABILITY
SCALE 1" = 600 P.S.F.
SCALE 1" = 10'-0"
F.S. = 1.25



MOMENT DIAGRAM

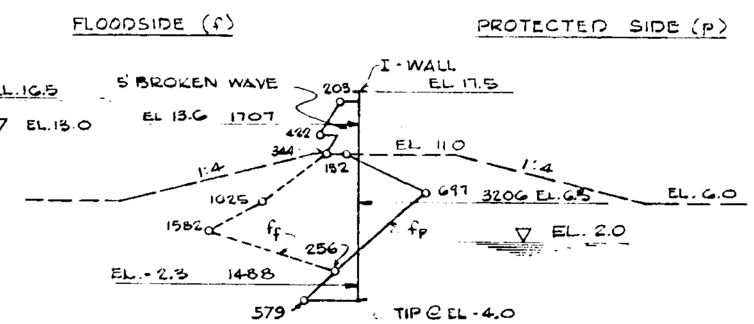
F.S. = 1.25
SCALE 1" = 10,000 FT. LB.
SCALE 1" = 10'-0"

BAYOU DUPRE



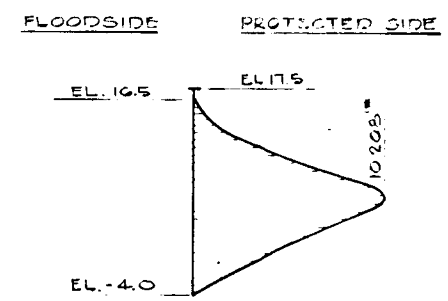
GROSS PRESSURE DIAGRAM

F.S. = 1.25
SCALE 1" = 1000 PSF
SCALE 1" = 10'-0"



NET PRESSURE DIAGRAM

"Q" STABILITY
SCALE 1" = 1000 PSF
SCALE 1" = 10'-0"
F.S. = 1.25

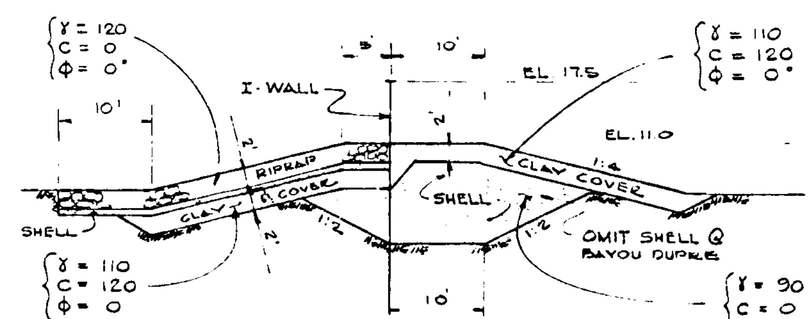


MOMENT DIAGRAM

F.S. = 1.25
SCALE 1" = 5000 FT. LB.
SCALE 1" = 10'-0"

NOTE

THE FOLLOWING CASES HAVE BEEN STUDIED BUT CONTROLLING CASES ONLY ARE SHOWN:
1. "Q" STABILITY: S.W.L. @ EL. 13.0 TOP OF WAVE @ EL. 16.5, DYNAMIC LOAD OMITTED, F.O.S. = 1.50
2. "Q" STABILITY: SAME AS (1) EXCEPT DYNAMIC LOAD APPLIED & F.O.S. = 1.25
3. "S" STABILITY: SAME AS (1)
4. "S" STABILITY: SAME AS (2)



DETAIL OF EROSION PROTECTION

SCALE 1" = 10'-0"

BAYOU BIENVENUE

LAKE PONTCHARTRAIN, LA. AND VICINITY
CHALMETTE AREA PLAN
DESIGN MEMORANDUM NO. 5—DETAIL DESIGN
BAYOUS BIENVENUE AND DUPRE CONTROL STRUCTURES

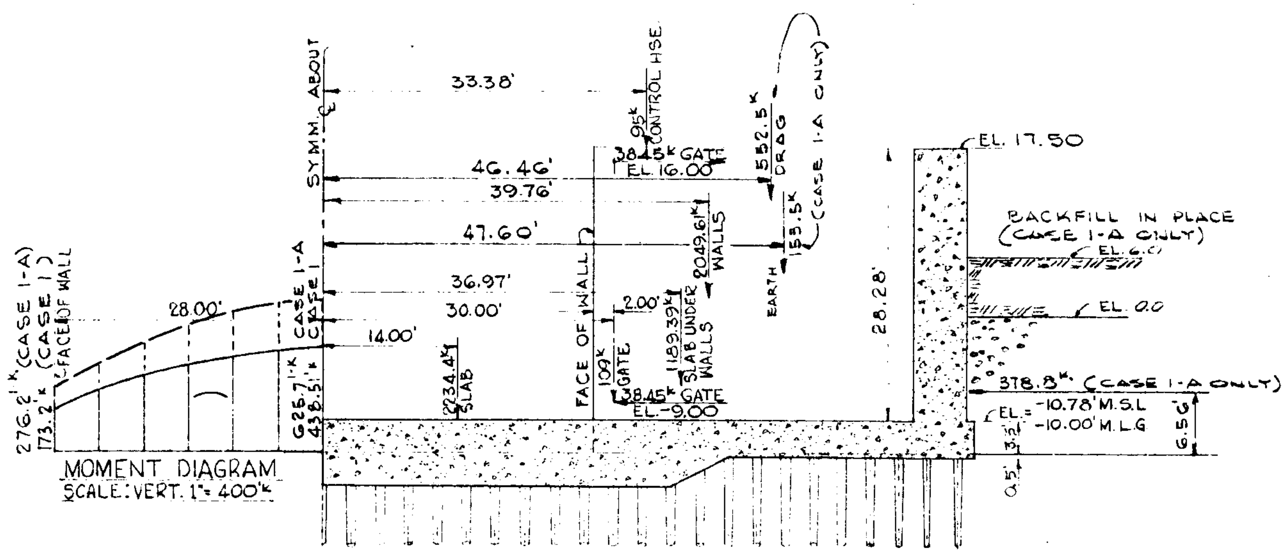
FLOOD WALL STABILITY - 2

SCALES AS SHOWN

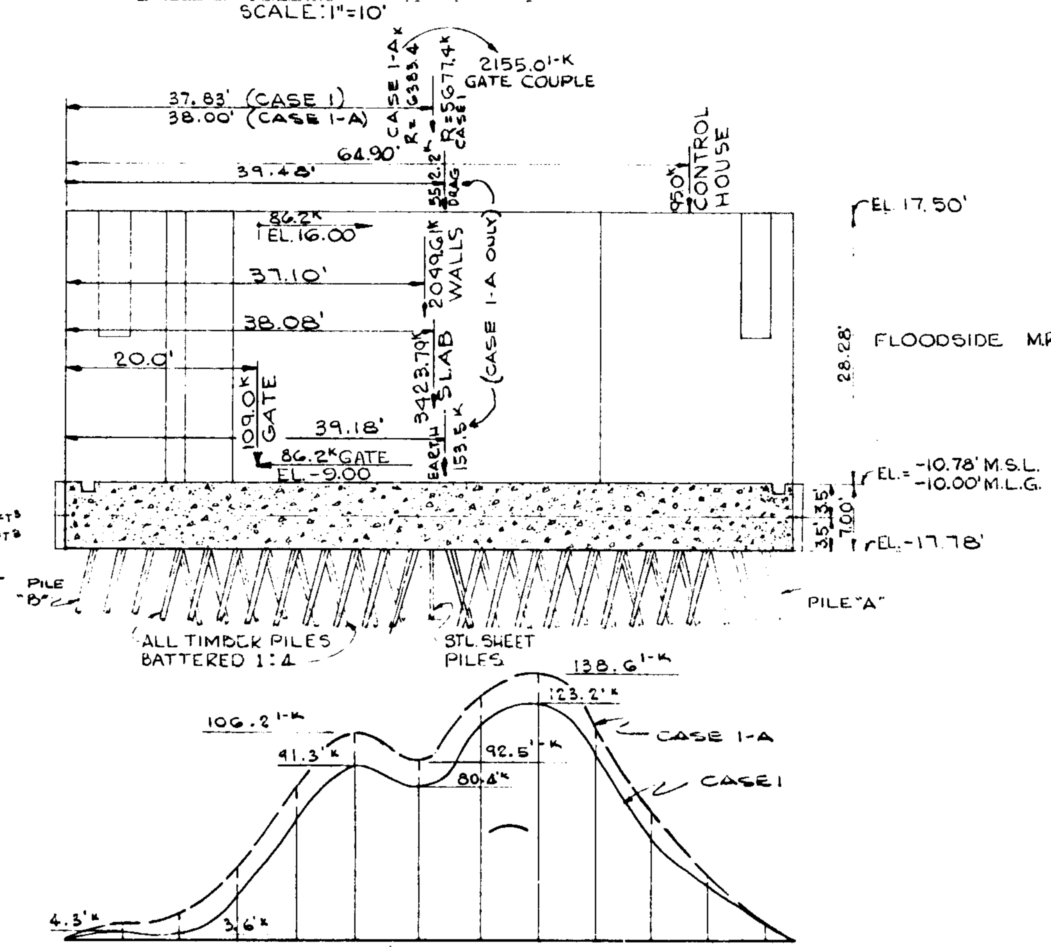
WALDEMAR S. NELSON AND COMPANY, INC. ENGINEERS AND ARCHITECTS NEW ORLEANS, LA

U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS CORPS OF ENGINEERS, U. S. ARMY NEW ORLEANS, LA

DATE MARCH, 1968 FILE NO. H-2-24147



TRANSVERSE SECTION
SCALE: 1"=10'



MOMENT DIAGRAM - SCALE: VERT. 1"=50^{1-K}

LONGITUDINAL SECTION - SCALE: 1"=10'

DRAG FORCE COMPUTATION:

EL. 6.0 TO EL. 0.0 CLAY C=120 P.S.F. $\phi = 0°$ $\gamma = 110^{\#}/FT^3$
EL. 0.0 TO EL. -17.78 SHELL C=0 P.S.F. $\phi = 40°$ $\gamma = 98^{\#}/FT^3$
DRAG FORCE FOR CLAY = (6)C X LENGTH OF WALL
DRAG FORCE FOR SHELL = LATERAL FORCE X TAN ϕ X L
LATERAL FORCE = OVERBURDEN WT. X $TAN^2(45-\phi/2)$
TOTAL DRAG FORCE = DRAG FORCE FROM CLAY + SHELL
LENGTH OF WALL FROM EL. 17.5 TO EL -14.78 = 89 FT
LENGTH OF WALL FROM EL. 17.5 TO EL -17.78 = 29 FT.

LOADING CONDITION: CASE 1

GATE OPEN, BACKFILL NOT IN PLACE NO BUOYANCY.

PILE REACTIONS ASSUMED UNIFORMLY DISTRIBUTED IN TRANVERSE DIRECTION

LOADING CONDITION: CASE 1-A

SAME AS CASE 1 EXCEPT BACKFILL IN PLACE

NOTES:

LOADS SHOWN ARE FOR HALF OF STRUCTURE.

MOMENTS SHOWN ARE FOR ONE FOOT STRIP.

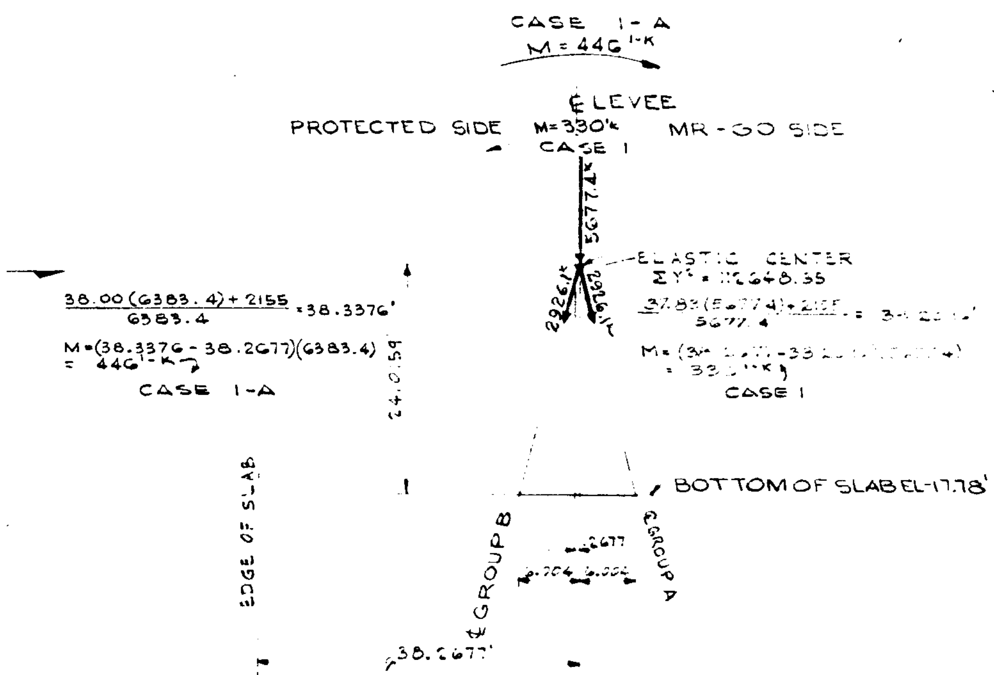
⁀ INDICATES TENSION IN TOP OF SLAB.

CASE 1

PILE REACTIONS		
	MAXIMUM	MINIMUM
PILES A	19.21^K	19.04^K
PILES B	17.81^K	17.63^K

CASE 1-A

PILE REACTIONS		
	MAXIMUM	MINIMUM
PILES A	21.61^K	21.38^K
PILES B	20.07^K	19.82^K



STABILITY DIAGRAM
SCALE: LINEAR: 1"=10'
LOADS: 1"=5000^K

LAKE PONTCHARTRAIN, LA. AND VICINITY
CHALMETTE AREA PLAN
DESIGN MEMORANDUM NO. 5—DETAIL DESIGN
BAYOUS BIENVENUE AND DUPRE CONTROL STRUCTURES

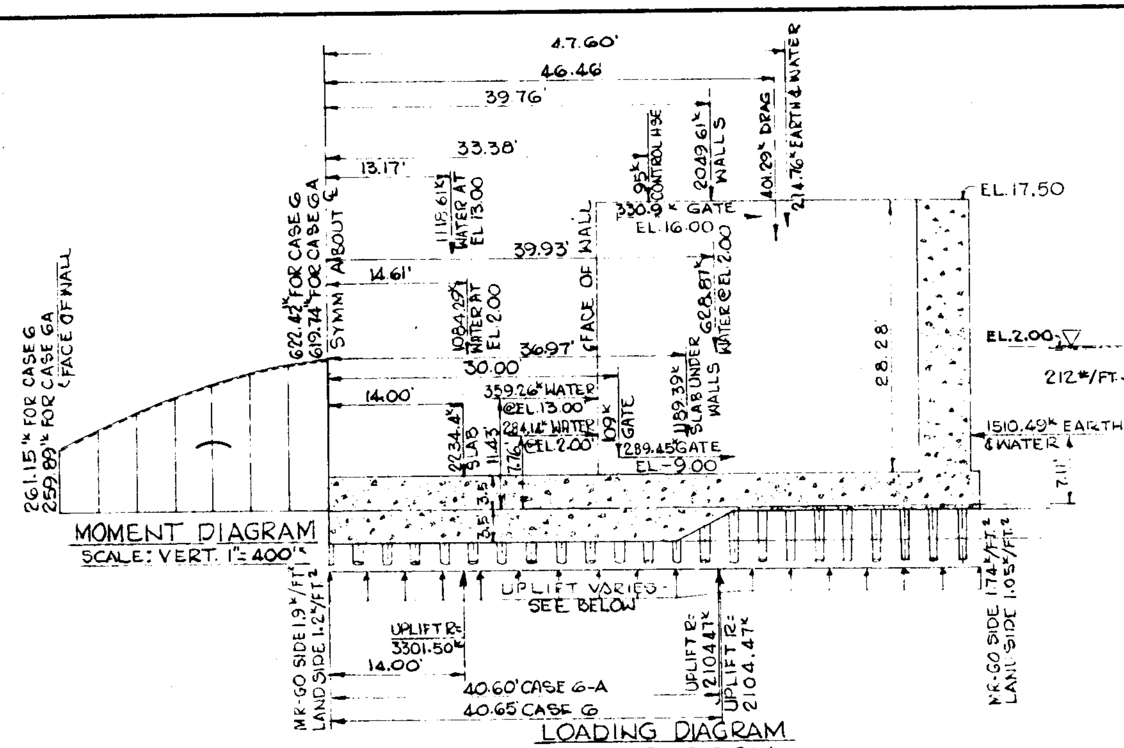
BASE SLAB—I

SCALES AS SHOWN

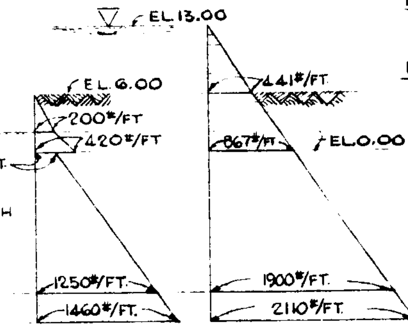
WALDEMAR S. NELSON AND COMPANY, INC.
ENGINEERS AND ARCHITECTS
NEW ORLEANS, LA.

U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS, U. S. ARMY
NEW ORLEANS, LA.

DATE: MARCH, 1968 FILE NO. H-2-24147



TRANSVERSE SECTION - SCALE: 1"=10'



LOADING CONDITION: CASE 6

STRUCTURE COMPLETE, BACKFILL IN PLACE, HURRICANE CONDITION, GATE CLOSED, WATER MR-GO SIDE AT EL+13.00M.S.L., WATER LANDSIDE AT EL+2.00M.S.L., BUOYANCY ACTIVE, SHEET PILE CUT-OFF WALL IMPERVIOUS, WAVE LOAD M.R-GO SIDE.

PILE REACTIONS ASSUMED UNIFORMLY DISTRIBUTED IN TRANSVERSE DIRECTION.

LOADING CONDITION: CASE 6-A

SAME AS CASE 6 EXCEPT SHEET PILE CUT-OFF WALL PERVIOUS.

NOTES:

LOADS SHOWN ARE FOR HALF OF STRUCTURE.
MOMENTS SHOWN ARE FOR A ONE FOOT STRIP.
⌒ INDICATES TENSION IN TOP OF SLAB.
‿ INDICATES TENSION IN BOTTOM OF SLAB.

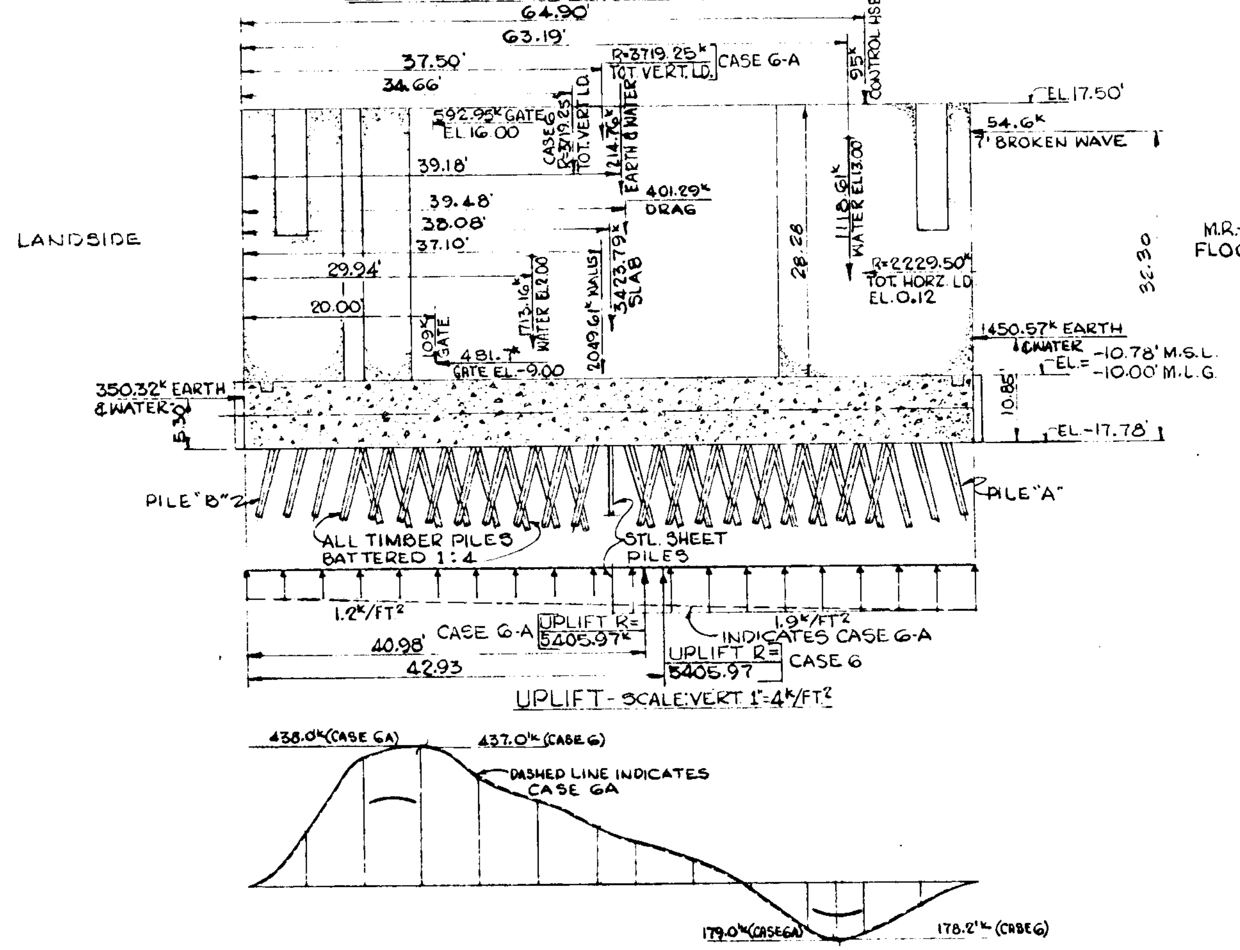
CASE 6

PILE REACTIONS	MAXIMUM	MINIMUM
PILE "A"	-17.42K*	-17.54K*
PILE "B"	39.51K	39.39K

CASE 6-A

PILE REACTIONS	MAXIMUM	MINIMUM
PILE "A"	-14.81K*	-20.47K*
PILE "B"	42.39K	36.73K

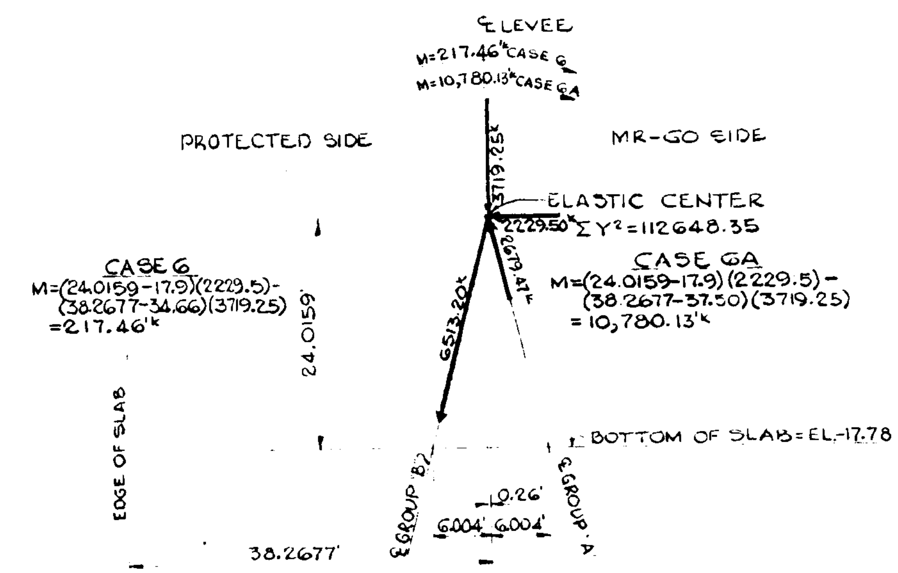
* DENOTES TENSION



MOMENT DIAGRAM - SCALE: VERT. 1"=300'K

LONGITUDINAL SECTION

SCALE: 1"=10'



STABILITY DIAGRAM

SCALE: LINEAR: 1"=10'
LOADS: 1"=3,000K

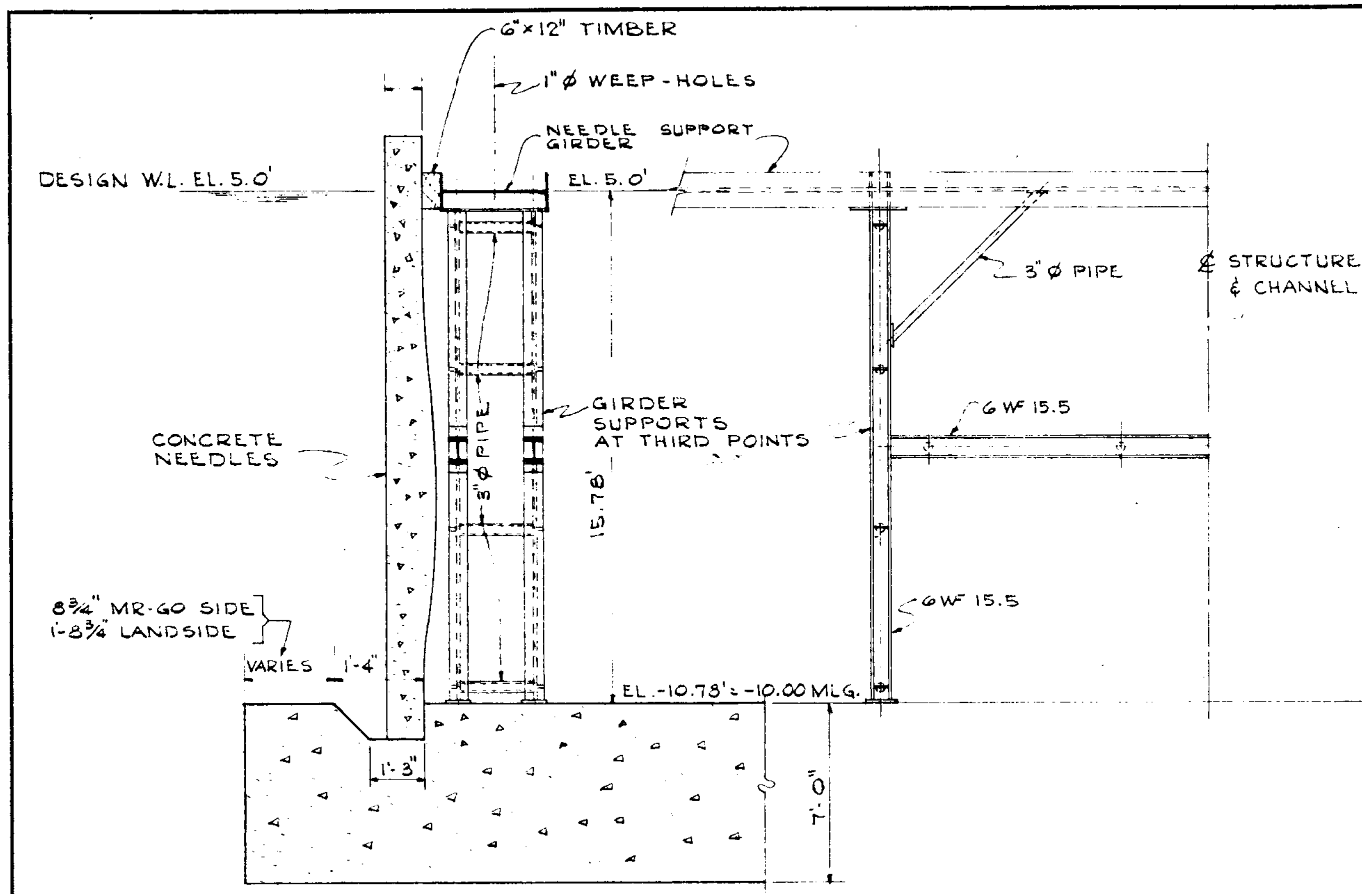
LAKE PONTCHARTRAIN, LA. AND VICINITY
CHALMETTE AREA PLAN

DESIGN MEMORANDUM NO. 5—DETAIL DESIGN
BAYOUS BIENVENUE AND DUPRE CONTROL STRUCTURES

BASE SLAB - 6

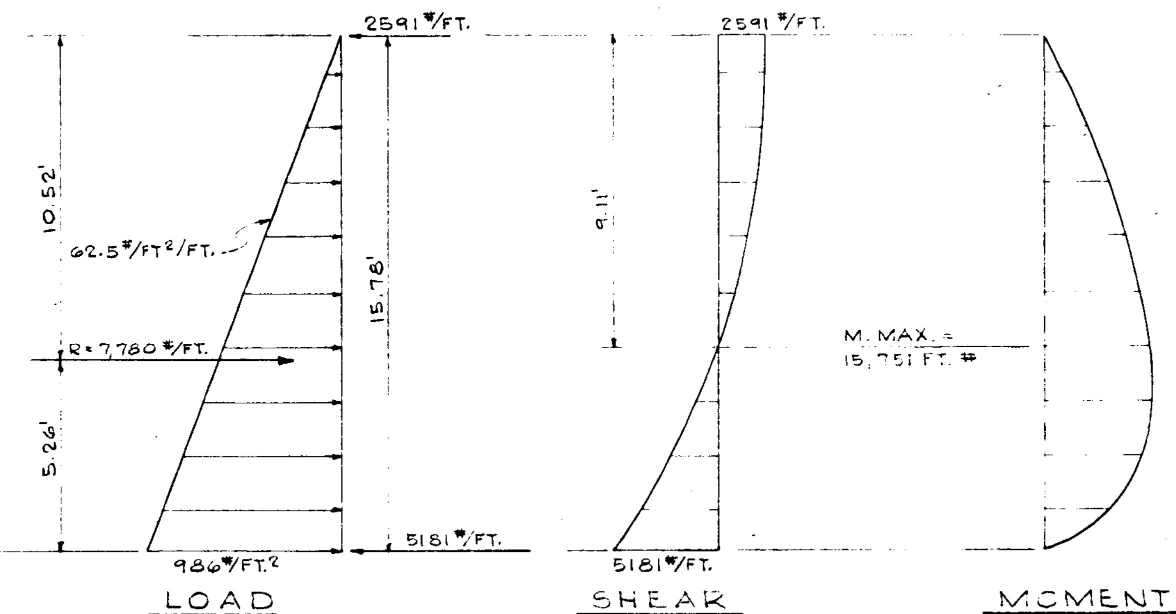
SCALES AS SHOWN

WALDEMAR S. NELSON AND COMPANY INC. ENGINEERS AND ARCHITECTS NEW ORLEANS, LA.	U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS CORPS OF ENGINEERS, U. S. ARMY NEW ORLEANS, LA.
DATE: MARCH, 1966	FILE NO. H-2-24147

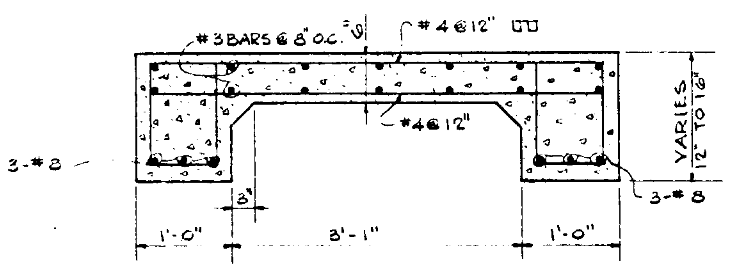


SECTION THRU NEEDLE DAM
N. T. S.

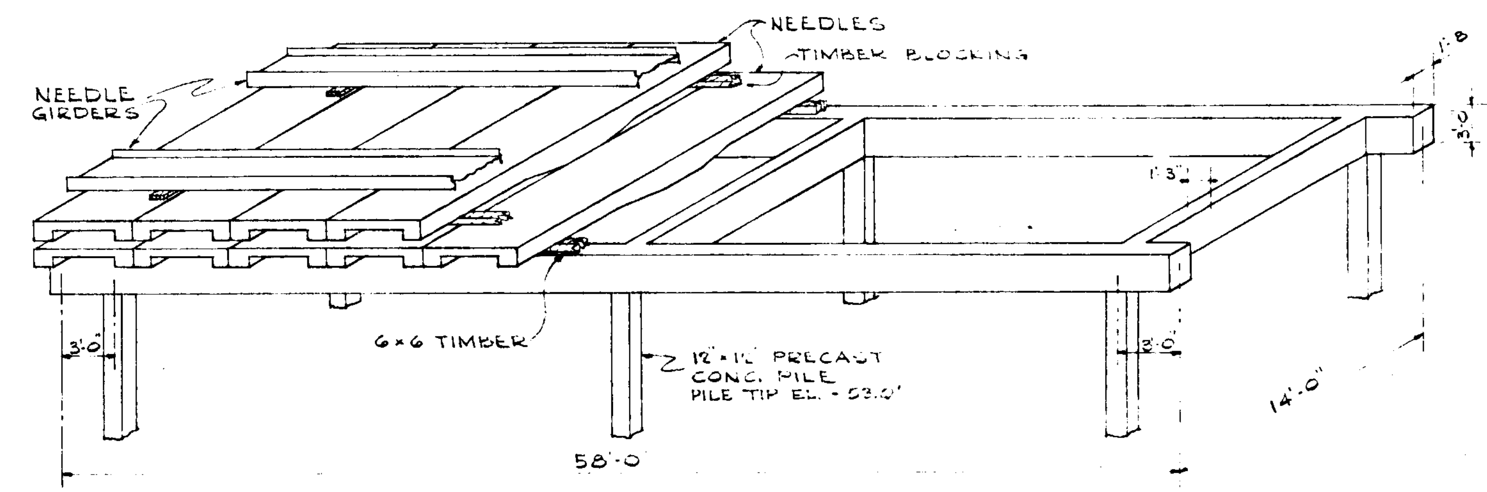
22 NEEDLES REQUIRED
TO BE STORED AT ONE STRUCTURE



NEEDLE BEAMS
N. T. S.



SECTION THRU NEEDLE
N. T. S.



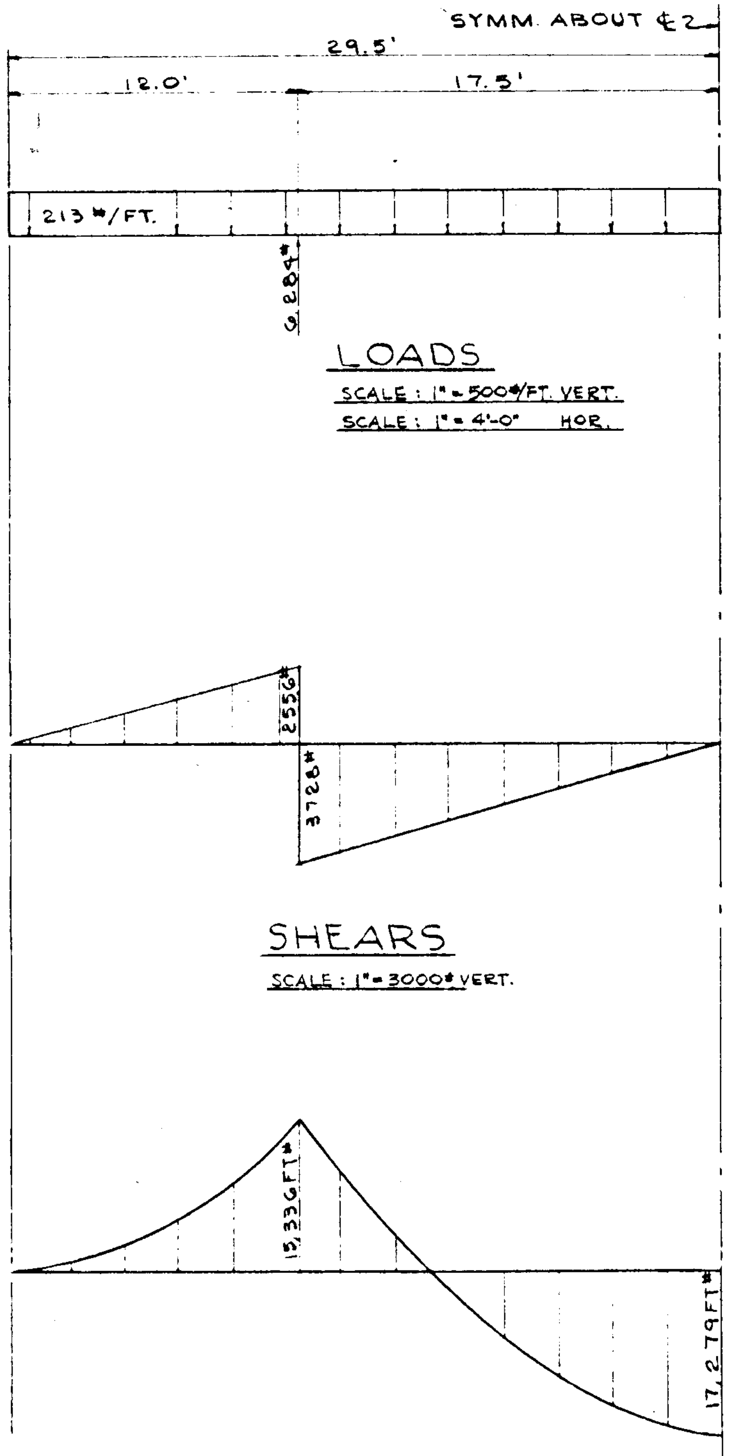
ISOMETRIC VIEW OF NEEDLE
DAM STORAGE RACK
(BAYOU BIENVENUE STRUCTURE ONLY)
(SEE PLATE I-7 FOR LOCATION)

LAKE PONTCHARTRAIN, LA. AND VICINITY
CHALMETTE AREA PLAN
DESIGN MEMORANDUM NO. 5—DETAIL DESIGN
BAYOUS BIENVENUE AND DUPRE CONTROL STRUCTURES

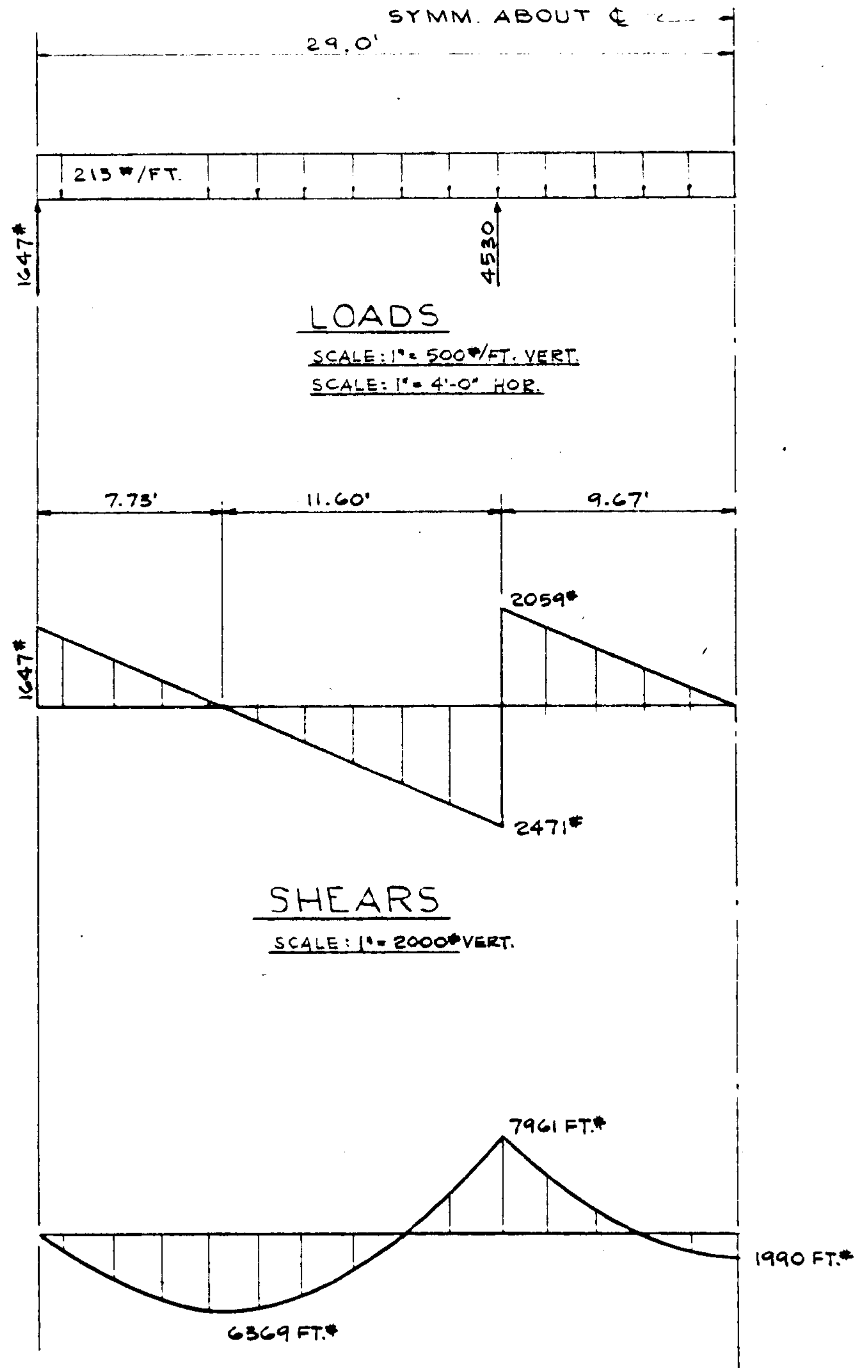
NEEDLE DAM

SCALES AS SHOWN

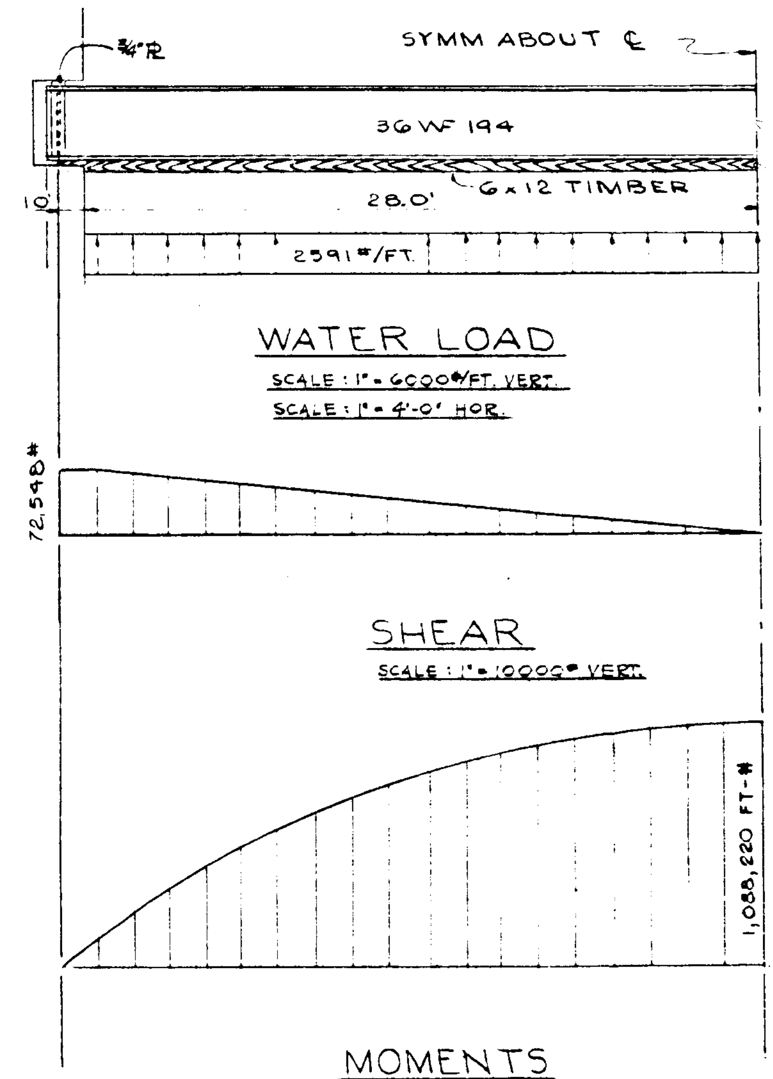
WALDEMAR S. NELSON AND COMPANY, INC. ENGINEERS AND ARCHITECTS NEW ORLEANS, LA.	U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS CORPS OF ENGINEERS, U. S. ARMY NEW ORLEANS, LA.
DATE MARCH, 1966	FILE NO. H-2-24147



MOMENTS
SCALE: 1" = 10000 FT.# VERT.
LIFTING STRESSES



MOMENTS
SCALE: 1" = 8,000 FT.# VERT.
DEAD LOAD OF GIRDER
2 GIRDERS ARE REQUIRED



MOMENTS
SCALE: 1" = 400000 FT.# VERT.
WATER LOADS

LAKE PONTCHARTRAIN, LA. AND VICINITY
CHALMETTE AREA PLAN
DESIGN MEMORANDUM NO. 5—DETAIL DESIGN
BAYOUS BIENVENUE AND DUPRE CONTROL STRUCTURES

NEEDLE GIRDER

SCALES AS SHOWN

WALDEMAR S. NELSON AND COMPANY, INC. ENGINEERS AND ARCHITECTS NEW ORLEANS, LA.	U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS CORPS OF ENGINEERS, U. S. ARMY NEW ORLEANS, LA.
DATE MARCH, 1966	FILE NO. H-2-24147

SECTION IV - CONSTRUCTION HISTORY

4-01 General. The Bayou Bienvenue control structure is being constructed under contract no. DACW29-72-C-0064, awarded on 20 January 1972 to T. L. James and Co., Inc. of Ruston, Louisiana. Work started on 10 February 1972 and at the time of the inspection was about 70 percent complete. A recent contract modification has set the present completion date at 8 March 1974 with actual completion expected 1 May 1974.

4-02 Construction Sequence. Since starting on this job, the contractor has observed the following construction sequence:

a. Built an access road to the jobsite.

b. Cleared the jobsite and established the field office.

c. Constructed the dike for storage of borrow material.

d. Performed initial excavation with a hydraulic dredge.

e. Installed dewatering equipment and piezometers and dewatered the excavation.

f. Placed shell for use as a dry working surface.

g. Performed timber and concrete pile tests.

h. Drove timber and steel sheet piling.

i. Placed stabilization slab and concrete base slab.

j. Placed concrete walls, constructed the wingwalls, inverted T-walls and fender system, and started placing shell random backfill.

k. Installed the gates, placed shell blanket and derrick stones on the approach channels.

After all work is complete at the structure site, and the north and south bypass channels have been dredged, the contractor will close off Bayou Bienvenue just south of its confluence with the MR-GO.

4-03 Sources of Materials. a. Random and selected impervious backfill. When the structure was planned, it was envisioned that random backfill and the selected impervious backfill would come from selected locations on the Mississippi River-Gulf Outlet. Shortly after this contract was awarded, it was discovered that in the ensuing years since the structure was planned, the borrow for random backfill was no longer available along the MR-GO, and only the 50 cubic yards of selected impervious backfill was obtained from the initial excavation. This impervious material is clay with a liquid limit of not less than 40. The contract was modified and the contractor was allowed to backfill with a combination of shell and earth. Some earth random backfill was obtained from the extension of Judge Perez Drive in Meraux, La. The contractor has also obtained material from the area where Lucerne Street intersects the Morrison Road Canal and from a spoil levee adjacent to Twenty Arpent Canal on the property of Ed de Bouchael in Meraux, La. The contractor has also requested permission to use material from the Bulk Loading Facility on the west side of the Inner Harbor Navigation Canal.

b. Concrete materials. The concrete was obtained by the contractor from Jimco, Inc. at a plant about 4 miles away from the jobsite. Concrete trucks made the trip from the plant to the jobsite in about 1/2 hour. The contractor experienced some difficulty in trying to get type II cement because of a national shortage. However, he was able to obtain it from the Baton Rouge plant of Ideal Cement Co. The fine and coarse aggregate came from the Franklinton Pit of Smith Sand and Gravel Co. at Mt. Herman, Louisiana.

4-04 Concrete Proportions and Control Procedures. The U.S. Army Corps of Engineers' Waterways Experiment Station at Vicksburg, Miss. was requested to design the concrete mix and they recommended using 399.5 lbs. of cement; 1,212.1 lbs.of fine aggregate; 1,993.3 lbs.of coarse aggregate; and 219.73 lbs. of water per cubic yard of mix. Design plans required that the strength of the design mix was 3,000 p.s.i. at 28 days. However, the contractor added one more sack of cement per cubic yard at his own expense to insure proper strength and workability. The strength of the concrete placed ranged from 3,400 p.s.i. to 6,200 p.s.i.

During the placement of the slab and the walls, the contractor hired Pittsburg Testing Laboratory of New Orleans, Louisiana to supervise concrete operations and testing so as to ensure quality concrete. In the beginning, Pittsburg had a man at the jobsite to conduct slump and air content tests. This man was later changed to Jimco's plant and the rejection of concrete at the jobsite was greatly reduced. This man also obtained concrete cylinder samples which were later broken by the Pittsburg Laboratory. The test (slump and air content) conducted by the technician from Pittsburg were supervised by Government personnel. Government personnel also obtained concrete cylinder samples that were broken at 7 and 28 days in the testing machine at District Headquarters.

Concrete placement on the stabilization slab began on 15 November 1972 and was completed on 21 November 1972. Concrete placement on the floor slab began on 1 December 1972 and was completed on 6 February 1973. Placement on the walls started on 16 February 1973 and was completed on 30 May 1973.

4-05 Dewatering System. In accordance with the contract, the contractor was required to operate the dewatering system so as to maintain the piezometric heads a minimum of 2 feet below the bottom of the excavation at all times. Before the contractor started backfilling, the piezometric heads were maintained at elevations ranging from 5 to 7 feet below the bottom of the excavation.

SECTION V - INSPECTION

5-01 Inspection Team. The inspection of the structure was conducted on 31 October 1973 by the following personnel:

LMVD

Mr. C. Trahan	Geology, Soils and Materials Branch
Mr. R. Dubuisson	Technical Engineering Branch

NOD

Mr. R. J. Gannuch	Structural Design Section
Mr. J. H. Richardson	Foundations and Materials Branch
Mr. C. W. Soileau	Hydraulics and Hydrology Branch
Mr. M. A. Drake	Hydraulics and Hydrology Branch
Mr. H. P. Blanchard, Jr.	Mechanical-Electrical Section
Mr. H. L. Bracey	General Engineering Section
Mr. T. F. Mehrtens	General Engineering Section
Mr. A. Ramirez, Jr.	Construction Division
Mr. J. McFaul	New Orleans Area Office
Mr. G. E. Breerwood	Operations Division

Board of Commissioners, Orleans Levee District

Messrs. Willoz, Smith, Bodet, Ortego, Darby, Mauterer, Transhant

5-02 Orientation. Prior to the inspection, the team members were given a brief orientation on the following features of the structure: Hydraulics and hydrology, structural considerations, foundations, operating machinery, and construction histroy.

5-03 Observations. a. Structural. (1) At the time of the inspection, all concrete placement and construction of the guidewall fender system were complete and the sector gates were installed. Backfill was complete to approximately el. 0.0 and riprap was placed, however, final dressing of the riprap was not yet accomplished.

(2) Mr. Dubuisson recommended that a crack survey be made of the structure prior to flooding the excavation. The only cracks known at this time are a few minor hairline cracks in the walkway around

the gate recess, but prior to flooding the excavation, a crack survey will be made.

(3) Approximately 30 of the 37 concrete sheet piles (I-wall) were in place on the southeast side of the structure. According to the order of work established in the specifications, these concrete sheet piles were to be placed after the levee fill. The order of work established a maximum amount of time to elapse between placement of levee fill and the driving of the piles in order that a large portion of the levee settlement would take place prior to installation of the wall. These 30 piles however, were placed prior to placement of the levee fill. Since the fill material was not in place, these piles were only embedded approximately 5 feet. This, together with the poor soil conditions at the site resulted in the piles settling and rotating in the plane of driving. The contractor was ordered to pull the piles in order that the levee fill could be placed. In the pulling of the first pile, it was noted that the plastic interlock was torn the entire length of the pile. The contractor was then ordered to stop the pulling operation. A system of cables and come-alongs were then installed to hold the piles in a plumb position. At that time, it was the intention to try to hold the piles with the cable arrangement while backfilling operations proceeded. See also Paragraph 5-04a.

b. Soils and Foundation. The soil and foundation observations were limited because the structure was not complete at the time of the inspection. The tie-in levees, I-walls, and approach channels were yet to be constructed.

No evidence of structural cracking due to differential settlement was observed mainly because the structure and inverted T-walls are new and are supported on piles. Instrumentation had not been installed at the time of the inspection; therefore, settlement and alinement readings were not available.

The excavation slopes of the approach channels extended only to the limit of the riprap at the time of the inspection. The slopes appeared to be in good condition. The riprap and derrick stone were in place; however, at several locations the shell blanket material could be seen beneath the stone. The Project Engineer advised that the contractor had not yet dressed the riprap and stone and that the condition would be corrected within a short time.

c. Operating Machinery. The inspection of the operating machinery consisted of visually inspecting the installation of all components for conformance with plans and specifications, with approved changes. No discrepancies were noted. At the time of the inspection the machinery and controls had not yet been connected, and an operational check could not be made.

5-04 Actions Subsequent to Inspection. a. Concrete Sheet Piles. Since the subject inspection, NOD has been advised by LMVD that it would be more appropriate to pull the concrete sheet piles and replace all concrete sheet piles on both sides of the structure with either longer concrete sheet piles or steel sheet piles coated with coal tar epoxy. NOD requested LMVD approval to modify the existing contract by deleting the driving of the "I" wall concrete sheet piles. Damaged concrete sheet piles would be replaced and all "I" wall sheet piles stockpiled at the structure in order that driving could commence upon stabilization of levee settlement. Deletion of the driving of the "I" wall piles in the existing contract was approved by LMVD with the further recommendation to accelerate levee settlement by constructing the levee adjacent to the structure to final grade under the present contract. A final decision to install the shorter concrete sheet pile or longer steel or concrete sheet pile would then be based on the observed magnitude and rate of fill settlement as the section is raised in lifts to compensate for settlement. When the remaining concrete sheet piles were pulled, it was noted that the plastic interlocks were all in good condition. Therefore, it is highly possible that the plastic interlocks in the pile that had been pulled prior to the inspection (paragraph 5-03a(3)) were damaged during the driving rather than during the pulling operation.

b. Crack Survey. A crack survey was made prior to flooding the excavation. Results of this survey are shown on Plate V-1.

c. Operating Machinery. (1) On 6 December 1973 a field test on the machinery installation at Bayou Bienvenue control structure was performed by the contractor. The following is an evaluation of the field test.

(a) Sector gate operating machinery. Each leaf of the structure was fully opened and closed using electrical power. All components of the system performed as intended and no major discrepancies were noted. One minor discrepancy existed that the contractor was aware of and would correct. The discrepancy was that the lights on the control cabinets would not illuminate when the gate was fully opened or fully closed. This condition was corrected by changing the limit switches on the gate.

(b) Engine-generator unit. The engine-generator was operated during all electrical portions of the test. The unit performed satisfactorily during all phases of the test and no discrepancies were noted.

(c) Emergency hand operator. The emergency hand operator was used to partially open and close each gate leaf of the structure. The operator performed as intended and no discrepancies were noted.

(2) All electrical installation was considered satisfactory.

d. Derrick Stone and Riprap. On 6 December 1973 it was noted that the derrick stone and riprap on the channel slopes and bottom adjacent to the structure had been dressed by the Contractor, and the voids had been filled.

5-05 Engineering Data File The data to be included in the

* Engineering Data File is being accumulated during the construction* of the structure. When construction has been completed and the structure is turned over to the Orleans Levee Board for operation and maintenance, one set of all the data in the file will be furnished to the levee board and one set will be retained in the NOD Engineering Division for use in future evaluations.

*Revised September 1974

SECTION VI - CONCLUSIONS AND PROPOSED REMEDIAL ACTION

6-01 Conclusions. It can be concluded that the structure is safe and stable, and will serve its intended purpose.

6-02 Proposed Remedial Action. The only condition that requires remedial action is the replacement of the concrete sheet pile I-wall, which will be corrected by modification of the construction contract prior to turning the structure over to the local interests.

6-03 Next Inspection. The next periodic inspection of the structure is scheduled for November, 1974.