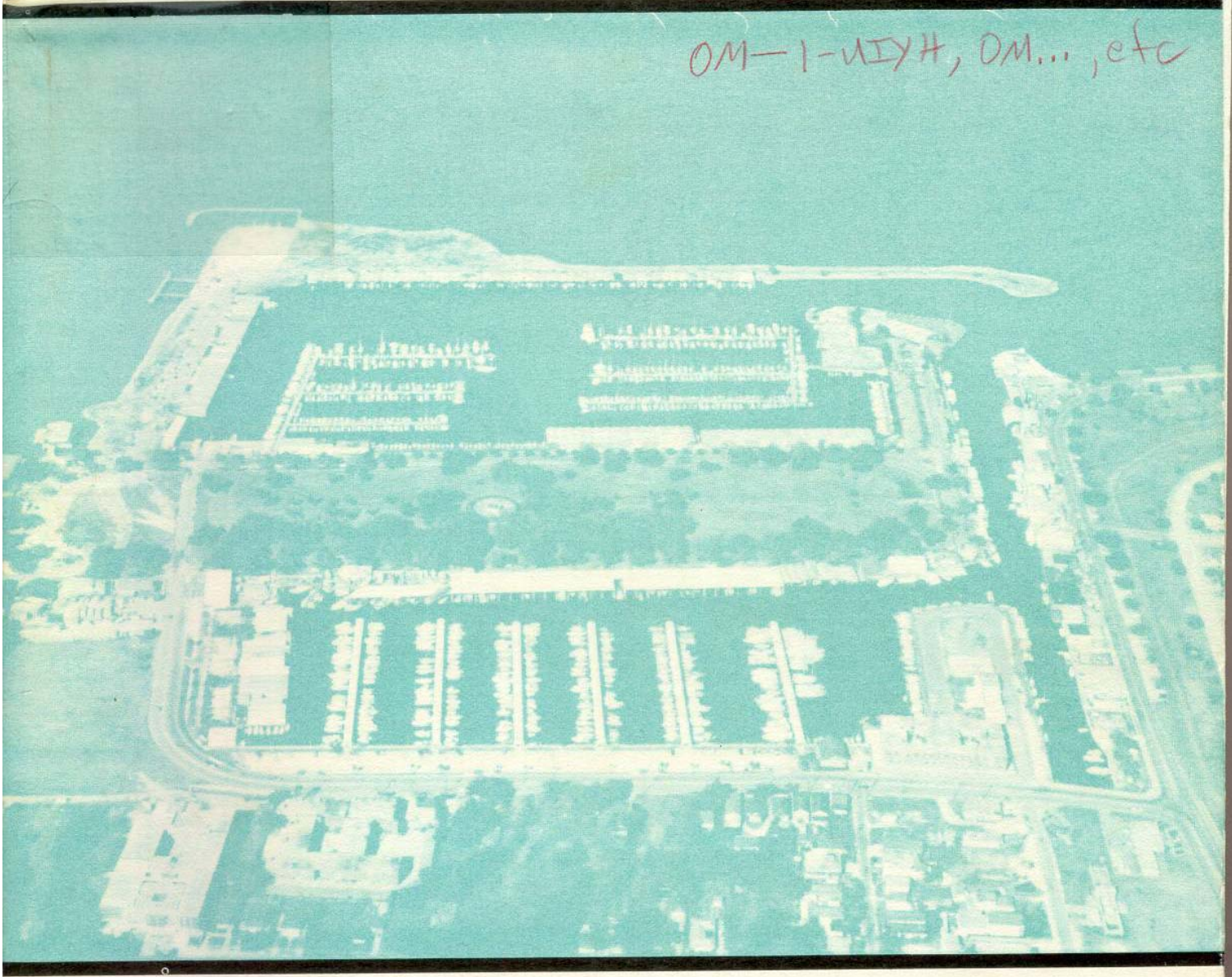
LAKE PONTCHARTRAIN, LOUISIANA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 5D

OM—1-MIXH, OM..., etc



ORLEANS PARISH LAKEFRONT LEVEES, ORLEANS MARINA

PREPARED IN THE OFFICE OF THE DISTRICT ENGINEER
NEW ORLEANS DISTRICT, CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA

42

APRIL 1978

INCL 4

LMVED-TD (NOD 25 Apr 78) 3d Ind
SUBJECT: Lake Pontchartrain, Louisiana and Vicinity, Lake Pontchartrain Barrier Plan, Design Memorandum No. 2 - General Design - Supplement No. 5D, Orleans Marina

DA, Lower Mississippi Valley Division, Corps of Engineers, Vicksburg, Miss. 39180 16 AUG 78

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

The information furnished and actions proposed by 2d Ind are satisfactory.

FOR THE DIVISION ENGINEER:

wd incl

R. H. RESTA
Chief, Engineering Division

CF:
DAEN-CWE-B (12 cy)
w 12 cy 2d Ind & Incl 2

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

IN REPLY REFER TO
LMNED-MP

25 April 1978

SUBJECT: Lake Pontchartrain, Louisiana and Vicinity, Lake Pontchartrain Barrier Plan, Design Memorandum No. 2 - General Design - Supplement No. 5D, Orleans Marina

Division Engineer, Lower Mississippi Valley
ATTN: LMVED-TD

1. The subject supplement is submitted herewith for review and approval, and has been prepared in accord with the provisions of ER 1110-2-1150. The Orleans Marina is a part of the Orleans Parish Lakefront Levees and this document has been prepared separately in order to expedite approval of plans and specifications for construction of the floodwall in this critical area.

2. Concerning cultural resources, it is noted that this area has been filled and developed during the 20th century. Urban and business development preclude the discovery of historic or prehistoric remains. Examination of existing site records shows no known sites in or near the project area.

3. The final environmental impact statement (EIS) was filed with the Council on Environmental Quality on 9 January 1975; notice of this was published in the Federal Register on 17 January 1975. On 30 December 1977, the U.S. District Court in New Orleans issued an order enjoining any further construction of the Chef Menteur and Rigolets Complexes, New Orleans East Area, and the Chalmette Area portions of the project, until a new EIS has been prepared. Subsequent modification of the injunction has released the Chalmette and New Orleans East Area portions. The Orleans Marina is not a portion of the project which is enjoined. It was not contested during the litigation procedure, but will be addressed along with the rest of the project in the new EIS. No environmental problems are anticipated.

4. Section 404 of the Federal Water Pollution Control Act of 1972 is not applicable to the Orleans Marina floodwall.

LMNED-MP 25 April 1978

SUBJECT: Lake Pontchartrain, Louisiana and Vicinity, Lake Pontchartrain Barrier Plan, Design Memorandum No. 2 - General Design - Supplement No. 5D, Orleans Marina

5. The actual submission date of this supplement is about 1 month behind the schedule leading to award of the construction contract for the Orleans Marina included in this fiscal year's budget. In order to not slip the scheduled award date of August 1978, we need approval to request the rights-of-way for this work by the middle of May. Approval of this supplement is needed by the end of May to preclude some of the scheduled construction funds having to slip into FY 79. There is no work on any other part of the project that could be initiated in FY 78 if some of the funds slip into FY 79.

6. Approval of this supplement is recommended.

EARLY J. RUSH III
Colonel, CE
District Engineer

1 Incl (16 cy)
DM No. 2,
Suppl. No. 5D (fwd sep)

LMVED-TD (NOD 25 Apr 78) 1st Ind
SUBJECT: Lake Pontchartrain, Louisiana and Vicinity, Lake Pontchartrain Barrier Plan, Design Memorandum No. 2 - General Design - Supplement No. 5D, Orleans Marina

DA, Lower Mississippi Valley Division, Corps of Engineers, Vicksburg, Miss. 39180 24 MAY 78

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

1. Approved subject to the following comments:

a. Para 8d, page 6. The last sentence is misleading as the agreements were approved by the Secretary of the Army on 7 Dec 77.

b. Para 8e, page 6. With respect to the first sentence, Section 92 of Public Law 93-251, reads as follows:

> ". . .(c) Any payment agreement pursuant to the provisions of this Act shall be in writing, and the provisions of subsections (b), (c), and (e) of Section 221 of the Flood Control Act of 1970 (Public Law 91-611) shall be applicable to such written agreement."

The agreements recognized the aforesaid subsections.

c. Para 14, page 7. The subject report does not explain why the space required by a levee would be prohibitive nor what the cost for this space would be. Paragraph 52, page 24, implies that the levee would be more economical; however, this may not be the fact of the matter. Supplemental information should be furnished to verify that the floodwall is superior to the levee either from the standpoint of cost effectiveness or due to social or other considerations.

d. Table 2, page 26. The estimated cost of the levee plan--which is said to be prohibitive--should be presented. These costs should be adequately discussed.

e. Plates 5 and 6. The typical sections through the I-wall shown on these drawings indicate the bottom elevation of the sheet piling to vary. However, the profiles on Plates 2 through 4 indicate the bottom elevation of the sheet pile in the I-wall to be constant at el -37.0. This discrepancy should be resolved.

f. Plates 4 and 29. The sheet-pile penetration analysis at the bottom of Plate 29 indicates that the bottom of the sheet pile between about sta 11+20 to sta 12+91.50 (the area of the existing road ramp as shown on Plate 4) could be stepped up in elevation from -37.0 to -20.0 with a savings in sheet pile and cost. The reason for not doing this is not apparent, and the bottom elevation of sheet pile in this reach should be reevaluated.

LMVED-TD (NOD 25 Apr 78) 1st Ind 24 MAY 78
SUBJECT: Lake Pontchartrain, Louisiana and Vicinity, Lake Pontchartrain Barrier Plan, Design Memorandum No. 2 - General Design - Supplement No. 5D, Orleans Marina

g. Annotations in red on pages 11 and 16 and Plates 5, 6, and 10.

2. Reference para 5 of basic letter. Approval to request rights-of-way was not granted earlier because rights-of-way requests should be based on an approved design memorandum.

FOR THE DIVISION ENGINEER:

R. H. RESTA
Chief, Engineering Division

1 Incl
wd 15 cy

CF: DAEN-CWE-BB (12 cy)
w 12 cy Incl 1

LMNED-MP (25 Apr 78) 2d Ind
SUBJECT: Lake Pontchartrain, Louisiana and Vicinity, Lake Pontchartrain Barrier Plan, Design Memorandum No. 2 - General Design - Supplement No. 5D, Orleans Marina

DA, New Orleans District, Corps of Engineers, P.O. Box 60267, New Orleans, Louisiana 70160 13 Jul 78

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

1. The following paragraphs are in response to the first indorsement of this chain of correspondence.

2. Para. 1a. Eliminate the last sentence and replace with: "These agreements were approved by the Secretary of the Army on 7 Dec 77."

3. Para. 1b. Comment is noted.

4. Para. 1c & d. In the development of the GDM supplement, several alternative alinements through the Orleans Marina area were considered and, based on cost considerations, esthetics, and/or impact on marina operations, an alinement south of the marina utilizing floodwall construction was selected. Two alinements utilizing basically levee construction were considered. One was located north of the marina on lake's edge and required a navigable structure across the entrance to the marina harbor. The second essentially bisected the marina area and also required a navigable structure across a primary marina waterway. Besides having more negative esthetic impacts, the two levee alinements were also judged to be more costly due to the navigable structures and relocations required. Formal cost estimates were not then, and do not now, appear to be necessary in light of the above considerations.

The cost estimate shown in GDM No. 2 assumed levee construction for the full length of the New Orleans lakefront from the IHNC to the Jefferson Parish line. Based on detailed studies subsequent to GDM No. 2, it was determined that in several reaches along the New Orleans lakefront (the subject reach, the Pontchartrain Beach Amusement Park and the tie-in with the IHNC west levee at Seabrook) floodwall was a more practical means of protection.

5. Para. 1e. The typical sections are incorrect. The bottom elevation of the sheet pile in the I-wall is constant at -37.0 except for the reach discussed in para. 6 below.

6. Para. 1f. We concur that the elevation of the bottom of the sheet pile should be changed in the area of the existing road ramp from about station 11+20 to station 12+91.50 as shown on Incl 2.

LMNED-MP (25 Apr 78) 2d Ind 13 Jul 78
SUBJECT: Lake Pontchartrain, Louisiana and Vicinity, Lake Pontchartrain Barrier Plan, Design Memorandum No. 2 - General Design - Supplement No. 5D, Orleans Marina

7. Para. 1g. We concur with the minor annotations marked in red as follows:

a. Page 11, para. 30d, line 6. Change "EM-110-2-2906" to "EM 1110-2-2906".

b. Page 16, para. 37b(2), line 1. Delete "gates" and replace with "swing gate monoliths".

c. Plate 5, Typical Section thru Gates 2 and 3. The note "Top existing pave parking" should read "Top of existing parking area".

d. Plate 5, station 11+96.55. Delete the word "provide" and replace with "provided".

e. Plate 6, Typical T-wall Sections for Gate 1 and for Gates 2 & 3 Monoliths. Tension hooks will be required on all piles.

f. Plate 10, Section thru Bottom Seal. The dimension on the bottom seal detail will be corrected on the P&S.

g. Plate 10, Latching Assembly. Change the spelling of "adjectable" to "adjustable".

FOR THE DISTRICT ENGINEER:

FREDERIC M. CHATRY
Chief, Engineering Division

1 Incl
wd incl 1
Added 1 incl
2. as

LEGEND

EXISTING IMPROVEMENTS

- Levee
- Seawall
- Location of work covered in this document
- Portion of U.S. Hwy 90 to serve as part of Barrier Embankment

AUTHORIZED IMPROVEMENTS

- New Levee
- Levee Enlargement
- Control Structure
- Drainage Structure
- Lock
- Floodgate
- Navigation Channel
- Floodwall
- Seawall Strengthening
- Rock Fill

Mandeville

Seawall
* Indefinitely Deferred

PASS MANCHAC

LAKE MAUREPAS

LAKE PONTCHARTRAIN CAUSEWAY

LAKE PONTCHARTRAIN

ST. JOHN THE BAPTIST PARISH / ST. CHARLES PARISH

ST. CHARLES PARISH / JEFFERSON PARISH

JEFFERSON PARISH / ORLEANS PARISH

* Location of work

* Indefinitely Deferred

ST. TAMMANY PARISH / ORLEANS PARISH

Apple Pie Ridge

THE RIGOLETS

South Point

New Orleans Lakefront Airport

Seabrook Lock

Seawall

NEW ORLEANS EAST

CITRUS

CHEF MENTEUR PASS

WATERWAY

ORLEANS PARISH / ST. BERNARD PARISH

GULF INTRACOASTAL

LAKE BORGNE

BONNET CARRÉ SPILLWAY

ST CHARLES PARISH

JEFFERSON PARISH

NEW ORLEANS

FLORIDA AVE. BRIDGE

INNER HARBOR NAVIGATION CANAL

EXISTING LOCK

CHALMETTE

Bayou Bienvenue

MISSISSIPPI RIVER – GULF OUTLET

Chalmette

Violet

Bayou Dupre

Verret

Caernarvon

MISSISSIPPI RIVER

SCALE OF MILES

1 0 1 2 3 4 5

LAKE PONTCHARTRAIN AND VICINITY, LA. (HURRICANE PROTECTION)

AUTHORIZED PLAN OF PROTECTION

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

NOVEMBER 1965 FILE NO. H-2-23693

REV. DEC. 1970 AND APRIL 1978*

LAKE PONTCHARTRAIN, LOUISIANA AND VICINITY

STATUS OF DESIGN MEMORANDUMS

Design Memo No.	Title	Status
1	Hydrology and Hydraulic Analysis	
	Part 1 - Chalmette	Approved 27 Oct 66
	Part II - Barrier	Approved 18 Oct 67
	Part III- Lakeshore	Approved 6 Mar 69
	Part IV - Chalmette Extension	Approved 1 Dec 67
2	Lake Pontchartrain Barrier Plan, GDM, Advance Supplement, Inner Harbor Navigation Canal Levees	Approved 31 May 67
2	Lake Pontchartrain Barrier Plan, GDM, Citrus Back Levee	Approved 29 Dec 67
2	Lake Pontchartrain Barrier Plan, GDM, Supplement No. 1, Lake Pontchartrain Barrier, Rigolets Control Structure, Closure Dam, and Adjoining Levees	Approved 10 Nov 70
2	Lake Pontchartrain Barrier Plan, GDM Supplement No. 2, Lake Pontchartrain Barrier, Rigolets Lock and Adjoining Levees	Approved 19 Oct 71
2	Lake Pontchartrain Barrier Plan, GDM, Supplement No. 3, Lake Pontchartrain Barrier, Chef Menteur Pass Complex	Approved 19 Sep 69
2	Lake Pontchartrain Barrier Plan, GDM, Supplement No. 4, New Orleans East Back Levees	Approved 18 Aug 71
2	Lake Pontchartrain Barrier Plan, GDM, Supplement No. 5, Orleans Parish Lakefront Levees - West of IHNC	Scheduled Dec 78
2	Lake Pontchartrain Barrier Plan, GDM, Supplement 5A, Citrus Lakefront Levees - IHNC to Paris Road	Approved 12 Jul 76

STATUS OF DESIGN MEMORANDUMS (cont'd)

Design Memo No.	Title	Status
2	Lake Pontchartrain Barrier Plan, GDM, Supplement No. 5B, New Orleans East Lakefront Levee - Paris Road to South Point	Approved 5 Dec 72
2	Lake Pontchartrain Barrier Plan, GDM, Supplement No. 5C, Orleans Parish Outfall Canals - West of the IHNC	Scheduled Feb 80
2	Lake Pontchartrain Barrier Plan, GDM, Supplement No. 5D, Orleans Parish Lakefront Levees, Orleans Marina	Submitted Apr 78
	Lake Pontchartrain Barrier Plan, GDM Supplement No. 6, St. Charles Parish Lakefront Levees	Approved 4 Nov 70
2	Lake Pontchartrain Barrier Plan, GDM, Supplement No. 7, St. Tammany Parish, Mandeville Seawall	Indefinite
2	Lake Pontchartrain Barrier Plan, GDM, Supplement No. 8, IHNC Remaining Levees	Approved 6 Jun 68
2	Lake Pontchartrain Barrier Plan, GDM, Supplement No. 9, New Orleans East Levee from South Point to GIWW	Approved 1 May 73
2	Lake Pontchartrain Barrier Plan, GDM, Supplement No. 10, Jefferson Parish Lakefront Levees	Scheduled Dec 79
3	Chalmette Area Plan, GDM	Approved 31 Jan 67
3	Chalmette Area Plan, GDM, Supplement No. 1, Chalmette Extension	Approved 12 Aug 69
4	Lake Pontchartrain Barrier Plan, and Chalmette Area Plan, GDM, Florida Avenue Complex, IHNC	Scheduled Jun 79
5	Chalmette Area Plan, DDM, Bayous Bienvenue and Dupre Control Structures	Approved 29 Oct 68
6	Lake Pontchartrain Barrier Plan, DDM, Rigolets Control Structure and Closure	Indefinite

STATUS OF DESIGN MEMORANDUMS (Cont'd)

Design Memo No.	Title	Status
7	Lake Pontchartrain Barrier Plan, DDM, Chef Menteur Control Structure and Closure	Indefinite
8	Lake Pontchartrain Barrier Plan, DDM, Rigolets Lock	Approved 20 Dec 73
9	Lake Pontchartrain Barrier Plan, DDM, Chef Menteur Navigation Structure	Indefinite
10	Lake Pontchartrain Barrier Plan, Corrosion Protection	Approved 21 May 69
12	Sources of Construction Materials	Approved 30 Aug 66
1	Lake Pontchartrain, Louisiana, and Vicinity, and Mississippi River-Gulf Outlet, Louisiana, GDM, Seabrook Lock	Approved 4 Nov 70
2	Lake Pontchartrain, Louisiana and Vicinity, and Mississippi River-Gulf Outlet, Louisiana, DDM, Seabrook Lock	Scheduled Jun 78
Report	Lake Pontchartrain Barrier Plan, Seabrook Lock Breakwater	Scheduled Sep 79
12	Lake Pontchartrain and Vicinity, Louisiana, Sources of Construction Materials (Revised)	Scheduled Jul 78

LAKE PONTCHARTRAIN, LOUISIANA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 5D
ORLEANS PARISH LAKEFRONT LEVEES
ORLEANS MARINA

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PLATES

APPENDICES

PERTINENT DATA

Location of project		Southeastern Louisiana in Orleans Parish
Hydrologic data		
Temperature:	Maximum monthly	89.8° Fahrenheit
	Minimum monthly	46.3° Fahrenheit
	Average annual	69.3° Fahrenheit
Annual precipitation:	Maximum	85.73 inches
	Minimum	31.07 inches
	Average	60.07 inches
Hydraulic design criteria--tidal		
Design hurricane--Standard Project		
Hurricane (SPH) Frequency		1 in 300 yrs.
Central Pressure Index (CPI)		27.4 inches of mercury
Maximum 5-min. average wind		100 m.p.h.
Floodwall (I and T)		
Floodwall (I and T)		0.2 miles
Elevation, varies		10.5' to 11.0'[1]
Gates		
Location		
W/L Stations 0+70.46, 4+67.03 and 7+73.65		Three (3) steel swing type in concrete monoliths
Rights-of-way		
Permanent rights-of-way		0.5 acres
Construction easements		1.9 acres
Estimated first cost		
Levees and floodwalls		$ 957,000
Engineering and design		135,000
Supervision and administration		122,000
Relocations		196,000
Lands and damages		155,000
TOTAL		$1,565,000

[1]Elevations contained herein are in feet referred to mean sea level unless otherwise noted.

LAKE PONTCHARTRAIN, LOUISIANA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
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ORLEANS PARISH LAKEFRONT LEVEES
ORLEANS MARINA

1. Authority.

a. Public Law. Public Law 298, 89th Congress, 1st Session, approved 27 October 1965, authorized the "Lake Pontchartrain, Louisiana, and Vicinity," hurricane protection project, substantially in accordance with the recommendations of the Chief of Engineers in House Document No. 231, 89th Congress, 1st Session, except that the recommendations of the Secretary of the Army in that document shall apply with respect to the Seabrook Lock feature of the project.

b. House Document. The report of the Chief of Engineers dated 4 March 1964 printed in House Document No. 231, 89th Congress, 1st Session, submitted for transmission to Congress the report of the Board of Engineers for Rivers and Harbors, accompanied by the reports of the District and Division Engineers and the concurring report of the Mississippi River Commission for those areas under its jurisdiction. The report of the Board of Engineers for Rivers and Harbors stated: "For protection from hurricane flood levels, the reporting officers find that the most suitable plan would consist of a barrier extending generally along US Highway 90 from the easternmost levee to high ground east of the Rigolets, together with floodgates and a navigation lock in the Rigolets, and flood and navigation gates in Chef Menteur Pass; construction of a new lakeside levee in St. Charles Parish extending from the Bonnet Carre' Spillway guide levee to and along the Jefferson Parish line; extension upward of the existing riprap slope protection along the Jefferson Parish levee; enlargement of the levee landward of the seawall along the 4.1 mile lakefront, and construction of a concrete-capped sheet pile wall along the levee west of the Inner Harbor Canal in New Orleans; raising the rock dikes and landward gate bay of the planned Seabrook Lock; construction of a new levee lakeward of the Southern Railway extending from the floodwall at New Orleans Airport to South Point; enlargement of the existing levee extending from US Highway 90 to the Gulf Intracoastal Waterway, thence westward along the waterway to the Inner Harbor Canal, together with riprap slopes along the canal; construction of a concrete capped sheet pile wall along the east levee of the Inner Harbor Canal between the Gulf Intracoastal Waterway and the New Orleans Airport...."

c. BERH recommendation. The report of the Chief of Engineers stated: "...The Board (of Engineers of Rivers and Harbors) recommends authorization for construction essentially as planned by the reporting officers...I concur in the recommendation of the Board of Engineers for Rivers and Harbors."

2. Purpose and scope. This memorandum presents the essential data, assumptions, criteria, and computations for developing the plan, design, and cost for the project floodwall feature along the Orleans Marina. Its purpose is to present sufficient detail to provide an adequate basis for preparing plans and specifications for the floodwalls without additional design analysis, and is accordingly presented in feature design memorandum scope.

3. Local cooperation.

a. Flood Control Act of 1965 (Public Law 89-298). The conditions of local cooperation pertinent to this supplement and as specified in the report of the Board of Engineers for Rivers and Harbors and concurred in by the report of the Chief of Engineers are as follows: "...That the barrier plan for protection from hurricane floods of the shores of Lake Pontchartrain...be authorized for construction,... Provided that prior to construction of each separable independent feature local interests furnish assurances satisfactory to the Secretary of the Army that they will, without cost to the United States:

"(1) Provide all lands, easements, and rights-of-way, including borrow and spoil disposal areas, necessary for construction of the project;

"(2) Accomplish all necessary alterations and relocations to roads, railroads, pipelines, cables, wharves, drainage structures, and other facilities made necessary by the construction works;

"(3) Hold and save the United States free from damages due to the construction works;

"(4) Bear 30 percent of the first cost, to consist of the fair market value of the items listed in subparagraphs (1) and (2) above and a cash contribution presently estimated at $14,384,000 for the barrier plan...to be paid either in a lump sum prior to initiation of construction or in installments at least annually in proportion to the Federal appropriation prior to start of pertinent work items, in accordance with construction schedules as required by the Chief of Engineers, or, as a substitute for any part of the cash contribution, accomplish in accordance with approved construction schedules items of work of equivalent value as determined by the Chief of Engineers, the final apportionment of costs to be made after actual costs and values have been determined;

"(5) For the barrier plan, provide an additional cash contribution equivalent to the estimated capitalized value of operation and maintenance of the Rigolets navigation lock and channel to be undertaken by the United States, presently estimated at $4,092,000, said amount to be paid either in a lump sum prior to initiation of construction of the barrier or in installments at least annually in proportion to the Federal appropriation for construction of the barrier;

"(6) Provide all interior drainage and pumping plants required for reclamation and development of the protected areas;

"(7) Maintain and operate all features of the works in accordance with regulations prescribed by the Secretary of the Army, including levees, floodgates, and approach channels, drainage structures, drainage ditches or canals, floodwalls, seawalls, and stoplog structures, but excluding the Rigolets navigation lock and channel and the modified dual purpose Seabrook Lock; and

"(8) Acquire adequate easements or other interest in land to prevent encroachment on existing ponding areas unless substitute storage capacity or equivalent pumping capacity is provided promptly; Provided that construction of any of the separable independent features of the plan may be undertaken independently of the others, whenever funds for that purpose are available and the prescribed local cooperation has been provided..."

b. Water Resources Development Act of 1974 (Public Law 93-251). The local interest payment procedures outlined in the original conditions of local cooperation were modified in 1974 as follows: "The hurricane-flood protection project on Lake Pontchartrain, Louisiana, authorized by section 204 of the Flood Control Act of 1965 (Public Law 89-298) is hereby modified to provide that non-Federal public bodies may agree to pay the unpaid balance of the cash payment due, with interest, in yearly installments. The yearly installments will be initiated when the Secretary determines that the project is complete but in no case shall the initial installment be delayed more than ten years after the initiation of project construction. Each installment shall not be less than one twenty-fifth of the remaining unpaid balance plus interest on such balance, and the total of such installments shall be sufficient to achieve full payment, including interest, within twenty-five years of the initiation of project construction."

INVESTIGATIONS

4. Project document investigations. Studies and investigations made in connection with the report on which authorization is based (H.D. No. 231, 89th Congress, 1st Session) consisted of: research of information which was available from previous reports and existing projects in the area; extensive research in the history and records of hurricanes; damage and characteristics of hurricanes; extensive tidal hydraulics investigations involving both office and model studies relating to the ecological impact of the project on Lakes Pontchartrain and Borgne; an economic survey; and survey scope design and cost studies. A public hearing was held in New Orleans on 13 March 1956 to determine the views of local interests.

5. Investigations made subsequent to project authorization. Surveys and studies made subsequent to project authorization for this reach of the Orleans Parish Lakefront levees include:

a. Alternate plan studies to include alternative alinement studies and alternative construction method studies;

b. Aerial and topographic surveys;

c. Soils investigations including general and undisturbed type borings and associated laboratory evaluations;

d. Detailed design studies for concrete floodwall and gap closure construction including stability analyses.

e. Tidal hydraulic studies required for establishing design grades for protective works based on revised hurricane parameters furnished subsequent to project authorization by the National Weather Service;

f. Real estate requirements and appraisals;

g. Cost estimates for the concrete floodwalls and gap closures and utility relocations;

h. Environmental effects and evaluations;

i. Comprehensive public meeting held on 22 February 1975.

6. Planned future investigations. Upon completion of the entire reach, this feature will be turned over to local interests. Accordingly, any future investigations would be performed by local interests and no future investigations will be required by and/or for the Government.

LOCAL COOPERATION

7. Local cooperation requirements. The conditions of local cooperation as specified in the authorizing laws are quoted in paragraph 3.

8. Status of local cooperation.

a. Assurances from the Board of Levee Commissioners of the Orleans Levee District for the Barrier Plan portion of the project, of which the Orleans Marina Floodwall is a part, were originally accepted on 10 October 1966. Because of the rising non-Federal cost of participation and the widespread benefits to be derived by surrounding parishes, the Orleans Levee District requested assistance in carrying out the assurances. Accordingly, the Governor of the State of Louisiana by Executive Order Number 80, dated 5 March 1971, designated the Louisiana Department of Public Works as the local coordinating agency. Through this procedure the Orleans Levee District, the Pontchartrain Levee District and the St. Tammany Parish Police Jury were designated the assurers of local cooperation for the portions of the subject project within their respective jurisdictions. The designation was under the authority of Section 81, Title 38, Louisiana Revised Statutes of 1950.

b. Assurances of local cooperation were received from the Orleans Levee District on 16 September 1971 and from the Pontchartrain Levee District on 7 October 1971. Due to the reluctance of the St. Tammany Parish Police Jury to furnish required assurances of local cooperation for that portion of the project within St. Tammany Parish, the Governor of the State of Louisiana executed assurances on behalf of the St. Tammany Parish Police Jury on 8 May 1972 under authority of Section 81, Title 38, Louisiana Revised Statutes of 1950.

c. Recognizing the increasing burden of providing required matching local funds, Representative F. Edward Hebert sponsored Congressional legislation to defer required local payments over an extended period of time. This legislation was enacted in March 1974 as section 92 of the Water Resources Development Act of 1974. This act modified the authorizing law by providing that non-Federal public bodies may agree to pay the unpaid balance of their required cash payment due, with interest, in annual installments in accordance with a specified formula. A plan for the application of the provisions of this legislation is now being implemented.

d. We have received the necessary agreements, legal opinions, and resolutions from the Orleans Levee District, jointly from the Lake Borgne Basin Levee District and the St. Bernard Parish Police Jury and from the Pontchartrain Levee District approving the deferred payment plan and incorporating the requirements of Public Law 91-646 ("Uniform Relocation and Real Property Acquisition Policies Act of 1970"). We have also received the required agreements, legal opinions and assurances from the Louisiana Department of Transportation, Office of Public Works and the Governor of Louisiana stating that the Office of Public Works is now the local sponsor in behalf of the St. Tammany Parish Police Jury and that the Office of Public Works will lend financial assistance, when required, to the Pontchartrain Levee District. All of these agreements and assurances are being reviewed by the Government.

e. Section 221 of the Flood Control Act of 1970 (Public Law 91-611) is not applicable to this project since construction of the Lake Pontchartrain, Louisiana and Vicinity project commenced prior to 1 January 1972. A description of the overall plan of protection is included in the report of the Chief of Engineers dated 4 March 1964.

9. Views of local interests. The Orleans Levee District is the agency responsible for providing local interest assurances for this feature of the project. The plan presented herein was coordinated in detail with the Orleans Levee District engineering staff and bears the approval of that agency. The intention and capability of this sponsor to provide the required non-Federal contribution for this feature have been amply demonstrated; in fact, considerable work on other completed features of the overall project has already been accomplished by this sponsor.

LOCATION OF PROJECT AND TRIBUTARY AREA

10. Project location. The Orleans Marina floodwall segment of the Lake Pontchartrain, Louisiana and Vicinity hurricane protection project, as shown on plate 1, is located in southeastern Louisiana in the northern portion of New Orleans on the southern shore of Lake Pontchartrain. The project area covered in this memorandum is located in Orleans Parish.

11. Tributary area. The tributary area of Lake Pontchartrain varies in character from flat tidal marsh at or near sea level to upland areas of significant relief with natural ground elevations as high as 250 feet above mean sea level (m.s.l.). Runoff from within the project area drains into either Lake Borgne or Lake Pontchartrain, generally by pumping from within the protected areas, although some developed

areas located on alluvial ridges in St. Charles, St. Bernard, and St. Tammany Parishes are drained by gravity. In addition to runoff from the project area, Lake Pontchartrain receives the runoff of 4,700 square miles located to the north and west of the lake. During major floods on the Mississippi River and its tributaries, floodflows may be diverted from the Mississippi River to Lake Pontchartrain through the Bonnet Carre' Spillway, a controlled overbank floodway constructed under the Flood Control, Mississippi River and Tributaries project.

PROJECT PLAN

12. General. The Lake Pontchartrain, Louisiana and Vicinity hurricane protection project, as shown on the flyleaf map, consists of two separate and distinct major features--the Chalmette Area Plan and the Lake Pontchartrain Barrier Plan. This memorandum is concerned only with a segment of the latter, the Orleans Parish Lakefront levees - Orleans Marina floodwall. The overall Lake Pontchartrain Barrier Plan is described in GDM No. 2, Citrus Back Levee, approved 29 December 1967.

13. Orleans Parish Lakefront Levees - Orleans Marina Floodwall. This floodwall (T- and I-type) will be located along the south side of the Orleans Marina north of Lake Marina Avenue and extends from a tie-in with the existing sheet pile wall along Lake Marina Avenue at base line station 325+68.70 to an intersection with the Lake Marina Avenue road ramp at base line station 338+04.20. See plates 1-4 for details. This feature of the project will also include installation of three steel swing gates for access to the marina through the floodwall and modifications of the drainage facilities of the Orleans Marina parking area by installation of new catch basins, manholes, drain lines, and a new knife-gate valve.

14. Departures from the project document plan. The project document plan envisioned that this portion of the lakefront hurricane protection plan would consist of a levee. However, a change to a floodwall became necessary due to development in the area. The space required by a levee would be prohibitive in this congested area.

HYDROLOGY AND HYDRAULICS

15. General. The Hydrology and Hydraulic Analysis design memorandum for the Lake Pontchartrain Barrier Plan was presented in a series of three separate reports entitled Design Memorandum No. 1 and subtitled

Part I - Chalmette, Part II - Barrier, and Part III - Lakeshore. Part I - Chalmette was approved on 27 October 1966; Part II - Barrier was approved on 18 October 1967; and Part III - Lakeshore was approved on 6 March 1969. These documents present detailed descriptions and analyses of the tidal hydraulic methods and procedures used in the tidal hydraulic design of the features for the plan and include the essential data, assumptions, and criteria used and results of studies which provide the bases for determining surges, routing, wind tides, runup, overtopping, and frequencies. The criteria applicable to this floodwall feature is presented in Appendix C to this memorandum.

GEOLOGY

16. Physiography. The project area is located within the Gulf Coastal Plain on the deltaic plain of the Mississippi River. Dominant physiographic features are the marshes, the lake, and the lake shoreline. Maximum elevations are slightly above m.s.l. Minimum elevations are slightly below m.s.l.

17. General geology. Only the geologic history since the end of the Pleistocene Period significantly influences the project area. When sea level reached its present level, the Mississippi River began to migrate laterally back and forth across the alluvial valley. Each time the river migrated toward the eastern margin of the valley, the project area was subjected to heavy sedimentation. However, construction of levees along the Mississippi River has eliminated the introduction of sediment into the project area.

18. Subsidence. Continued subsidence and downwarping have been occurring since the end of the Pleistocene. As a result, the Pleistocene surface has been downwarped toward the south and west. The Pleistocene surface outcrops along the north shore of Lake Pontchartrain and dips gradually to an elevation of -500 m.s.l. at the edge of the continental shelf approximately 80 miles south of New Orleans. Subsidence in the Pleistocene surface within the study area is at a rate of about .39 foot per century, whereas subsidence in the recent sediments is at a rate of approximately 0.78 ft. per century and greater.

19. Investigations performed. A total of three undisturbed borings and one general type boring were taken in the project area.

20. Foundation conditions. The subsurface, as plate 27 shows, consists of Holocene deposits approximately 60 feet thick underlain by sediments of Pleistocene Age. Generally, the Holocene sediments consist of a surface layer approximately 6 to 10 feet thick of fill

material, underlain by a 5 to 10 feet thick layer of soft marsh clays and organic material. The marsh deposits are underlain by a layer of interdistributary clays approximately 20 to 25 feet thick which are in turn underlain by a layer of sand representing a buried beach approximately 3 to 6 feet thick. At the base of the Holocene deposits is a layer of prodelta clays between 15 and 20 feet thick.

21. Mineral resources. Oil and gas production is not found within the immediate vicinity of the project. Likewise, development of sand, gravel, shell or other construction materials is not found within the project area.

22. Sources of construction materials. Design Memorandum, "Lake Pontchartrain Hurricane Protection, Sources of Construction Materials," DM 12, contains a listing of the sources of sand, gravel, shell, and rocks available in the region. A revised DM 12 is being prepared and is scheduled for completion in April 1978.

23. Conclusions. Stability and settlement will be major problems to contend with due to the low shear strengths and high compressibility of the recent sediments.

FOUNDATIONS INVESTIGATION AND DESIGN

24. General. This section covers the soil and foundation investigations and design for approximately 1,500 feet of floodwall (I-wall, T-wall, and road gates) along Lake Avenue and adjacent to the Orleans Marina, New Orleans, Louisiana. This is a portion of the hurricane protection plan that is contained in the larger project feature, Lake Pontchartrain, Louisiana & Vicinity, Orleans Parish Lakefront Levees, West of IHNC, GDM No. 2., Supplement No. 5. The proposed floodwall ties into the existing Lake Avenue ramp which is also part of the hurricane protection in the area. Design analyses for the Lake Avenue ramp are also included in this section.

25. Field exploration. Undisturbed 5-inch-diameter borings were made at two locations (borings 1-UIYH, 2-UIYH) along the alinement. Undisturbed boring 8-ULO was taken immediately outside of the project area. The boring logs and laboratory test data are shown on plates 15 through 17. A general type core boring, 1-7/8-inch I.D. (boring 15-LO) was made in the vicinity of the project. The soil boring logs for the general type boring logs and the undisturbed borings are shown plotted as general-type on plate 26. The boring locations are shown on plates 2 thru 4.

26. Laboratory tests. Visual classifications were made for all samples obtained from the borings. Water content determinations were made on all cohesive soil samples. Unconfined compression (UC), unconsolidated-undrained (Q), consolidated-undrained (R), and consolidated-drained (S) shear tests, and consolidation (C) tests were performed on representative soil samples from the undisturbed borings. Liquid and plastic limits were obtained on the undisturbed test specimens. The undisturbed test data are shown on plates 15 thru 17. The detail shear strength data sheets are shown on plates 18 thru 24. See plate 25 for design shear strength parameters.

27. Foundation conditions. The soil types and stratifications along the project alinement are shown on the soil and geologic profile on plate 27. Design shear strengths and stratifications are shown on plate 25. Generally, very soft to soft clays and organic materials are underlain by a strata of beach sand and medium clays to the Pleistocene formations that are encountered at approximately -60.0 m.s.l.

28. Lake Avenue ramp.

a. Shear stability. Using cross sections representative of existing conditions at the ramp, the road ramp was designed for the most critical conditions with the shear stability being determined by the method of planes and minimum factor of safety of 1.3. See plate 30 for presentation of ramp cross section and stability analysis.

b. Settlement. The ramp has been in place many years and consolidation is complete.

29. I-walls.

a. General. The protection along the project alinement will consist predominantly of a cantilever I-type floodwall of sheet piling driven through the existing parking lot adjacent to the Marina, and capped with a concrete wall. (See plates 2 thru 4.)

b. Cantilever I-wall analyses. The stability and required penetration of the steel sheet pile below the earth's surface was determined by the method of planes using the (S) shear strengths shown on plate 29. The (Q) analysis was performed to confirm that the (S) case governed for design. A factor of safety of 1.5 was applied to the design shear strengths as follows: (c=0), $\emptyset$ developed = $\tan^{-1}$ (tan $\emptyset$ available) / (factor of safety). Using the resulting shear strengths, net lateral water and earth pressure diagrams were determined for movement toward each side of the sheet pile. Using these distributions of pressure, the summation of horizontal forces was equated to zero for various tip penetrations. At these penetrations summations of overturning moments

about the tip of the sheet pile were determined. The required depths of penetrations to satisfy the stability criteria were determined as those where the summation of moments were equal to zero.

c. Shear stabilities. The stability of the levees with I-walls was determined by the method of planes using the design (Q) shear strengths and conditions shown on the stability plate and applying a minimum factor of safety of approximately 1.3. The shear stability analysis is shown on plate 30.

30. T-walls and gates.

a. General. T-type floodwalls supported by bearing piles will provide the protection adjacent to the inverted T-type gates supported by bearing piles to provide access to the Orleans Marina.

b. Steel sheet pile cutoff. A steel sheet pile cutoff will be used beneath the gates and T-walls to provide protection against hazardous seepage during a hurricane. The sheet pile penetration required to satisfy Lane's weighted creep ratio (LWCR) of 3 was determined for the gates and the T-wall sections. This analysis is shown on plate 30.

c. Deep seated stability analysis. A conventional stability analysis utilizing a 1.30 factor of safety incorporated into the soil parameters was performed for various failure surfaces beneath the T-wall sections. In all cases below the base the summation of horizontal driving and resisting forces indicated excess resistance. Therefore, the bearing piles are not required to carry any additional lateral load resulting from unbalanced loads transmitted to the structures. See plate 30.

d. Bearing pile foundations.

(1) Ultimate compression and tension pile capacities versus tip elevations were developed for 12-inch and 14-inch square concrete piles. In determining the normal pressure on the pile surface for the (S) case, lateral earth pressure coefficient (K_o) of 1.0 and 0.7 were used in compression and tension, respectively. Values of adhesion and soil to pile frictional resistance shown in EM-110-2-2906 were used to compute pile capacities. The results of pile design loads versus tip elevations analysis are shown on plate 28. The recommended tip elevations for cost estimating purposes are based on applying factors of safety of 2.0 in compression and tension.

(2) During construction, 12-inch square prestressed concrete test piles will be driven and tested along the project alinement.

The results of the pile tests will be used to determine the length of the service piles.

e. Soil moduli. Bearing pile subgrade moduli curves for estimating lateral restraint of the soil beneath the gates and T-walls are shown on plate 28. The procedures used in the development of these data are as stated in the notations on the design plate.

f. Settlement.

(1) Consolidation data from boring 1-UIYH and 2-UIYH indicate some areas of the foundation to be under-consolidated with respect to its existing overburden. Maximum past pressures indicate under-consolidated strata from approximately El. -8.0 m.s.l. to El.-33.0 m.s.l. and from El. -38.0 m.s.l. to El. -53.0 m.s.l. Settlement computations show settlement to be on the order of 7.6 inches and 1.3 inches for the respective strata. A time-settlement curve indicates that approximately 6.5-inches of settlement has taken place since the borings were taken. The remaining 1 inch of future settlement will have little affect on the floodwall foundation.

(2) Assuming the foundation to be normally consolidated, a settlement analysis was performed for a T-wall section not on pilings. The results of this analysis indicate approximately 1.0 feet of settlement above the beach sand deposits and 0.1 foot in the medium clays below the beach sand. These strata may still be partially under-consolidated, and more settlement actually realized. Settlement of this magnitude would cause differential movements along the floodwall between the T-wall and I-wall sections and threaten the integrity of the floodwall. For this reason, T-wall sections and gate structures will be pile supported.

DESCRIPTION OF PROPOSED STRUCTURES AND IMPROVEMENTS

31. Floodwalls and gates.

a. Floodwalls. I-type floodwall will be provided from the west end of the existing sheet pile wall along Lake Marina Avenue at base line station 325+68.70 (W/L sta. 0+32.52) to the intersection with the Lake Marina Avenue road ramp at base line sta. 338+04.20 (W/L sta. 12+92.00). The general location and alinement of the proposed floodwall are shown on plate 1. The detailed alinement and profile of the floodwall and features contiguous thereto are shown on plates 2 thru 4. Typical design sections are shown on plate 5. Since the floodwall is located in a major recreational area, a bushhammer finish will be

applied to both the flood side and protected side surface to provide an aesthetically pleasing appearance.

b. Gates.

(1) Swing gates. Three steel swing gates will be included in the floodwall. The locations are across the service entrance of the Harbor Master's building (centerline at W/L station 0+70.46), across the entrance to the Orleans Marina Parking area (centerline at W/L station 4+67.03), and across the exit from the Orleans Marina parking area (centerline at W/L sta. 7+73.65). Horizontal clearances are 12 feet, 24 feet, and 24 feet respectively. Details of these gates are shown on plates 8 and 9. The gates will be painted in a color aesthetically compatible with the area.

32. Drainage facilities. The drainage facilities for the Orleans Marina parking area will be modified by installation of new catch basins, manholes, drain lines, and a new knife-gate valve as shown on plate 12. The knife-gate valve is required for positive closure during hurricane conditions.

STRUCTURAL DESIGN

33. Criteria for structural design. The structural designs presented herein comply with standard engineering practice and criteria set forth in engineering manuals for civil work construction published by the Office, Chief of Engineers, subject to modifications indicated by engineering judgement and experience to meet local conditions. The floodwall design is similar to the design presented for the New Orleans East Back Levee. (See Lake Pontchartrain, Louisiana and Vicinity, Lake Pontchartrain Barrier Plan, DM No. 2 - General Supplement No. 4 - New Orleans East Back Levee approved January 1972).

34. Basic data. Basic data relevant to the design of the protective works are shown in the following table:

a. Water elevation	Elevation (ft. m.s.l.)
wind tide level (IHNC)	13.0
wind tide level (Lake Pontchartrain)	8.5
landside of floodwall	0.0

b. Floodwall gross grade

	Elevation (ft. m.s.l.)
I-wall (sta. 0+33.13 to sta. 0+60.96)	11.0
T-wall and gate (sta. 0+60.96 to sta. 0+79.96)	10.5
I-wall (sta. 0+79.96 to sta. 4+50.53)	11.0
T-wall and gate (sta. 4+50.53 to 4+83.53)	10.5
I-wall (sta. 4+83.53 to sta. 7+57.15)	11.0
T-wall and gate (sta. 7+57.15 to sta. 7+90.15)	10.5
I-wall (sta. 7+90.15 to sta. 12+92.00)	11.0

c. Unit weights

	lb. per cu. ft.
Water	62.5
Concrete	150
Steel	490

d. Design loads

Wind loads	50 p.s.f.
Water loads	62.5 p.c.f.

e. Allowable working stresses. The allowable working stresses for concrete and structural steel are in accordance with those recommended in "Working Stresses for Structural Design," EM 1110-1-2101 dated 1 November 1963 and amendment no. 1 dated 14 April 1965. The basic minimum 28-day compressive strength for concrete will be 4,000 p.s.i. except for prestressed concrete piling where the minimum will be 5,000 p.s.i. Steel for steel piling will meet the requirements of ASTM A32869, "Standard Specification for Steel Sheet Piling." For convenient reference, pertinent allowable stresses are tabulated below:

(1) Reinforced concrete

fc'	4,000 p.s.i.
fc	1,400 p.s.i.
Vc (without web reinforcement)	60 p.s.i.
Vc (with web reinforcement)	274 p.s.i.
fs	20,000 p.s.i.
minimum area steel	0.0025 bd
shrinkage and temperature steel area	0.0020 bt

(2) Structural steel (ASTM A-36)

Basic working stress	18,000 p.s.i.

35. Location and alinement. The new floodwall will tie into an existing floodwall at W/L station 0+32.52 (base line sta. 325+68.70) at the southwest corner of the Sailboat Bay Apartment complex and continue along the north side of Lake Marina Avenue and end at W/L sta. 12+92.00 (base line sta. 338+04.20). In lieu of a gate, Lake Marina Avenue is ramped over the flood protection to elevation 10.5 (centerline at B/L sta. 338+74.60±). The ramp was constructed by the Orleans Levee District under contract no. OLD70-14 at a cost of $120,817.63. The contract was awarded in April 1970 and completed in July 1970.

36. I-type floodwall.

a. General. The floodwall from W/L station 0+32.52 to W/L sta. 12+90.00 will be concrete I-wall except for three gate monoliths. The I-wall will consist of sheet piling driven into the existing ground and the upper portion of the sheet piling will be capped with concrete. The sheet piling will be driven to the required depth with 1 foot of the sheet pile extending above the finished ground elevation. The concrete portion of the floodwall will extend from 2 feet below the finished ground elevation to the required protection height. See plate 5.

b. Loading cases. In the design of the I-wall, one loading case was considered.

Case I. Static water at top of wall, no wind, no dynamic wave force.

c. Joints. Expansion joints in the I-wall will be spaced 30 feet apart, adjusted to fall at sheet pile interlocks. Where the I-wall joins the gate monoliths, the deflection of the I-wall will produce a lateral displacement. To take care of this displacement a special seal located in a notch in the I-wall has been designed to prevent from flowing through this joint. See plate 7 for details.

37. Gates and gate monoliths.

a. General. Three gates will be constructed to provide access to the Harbor Master's building complex and the Orleans Marina parking area. Each gate monolith will include a steel swing gate which will be closed by local interests when a hurricane approaches. See plates 8 and 9 for locations and details of these gates and gate monoliths. The gate monoliths were designed for the load cases indicated below.

b. Swing gate.

(1) Description. Three swing gates will be constructed in the vicinity of the Orleans Marina at the following locations; one at the service entrance on the east side of the Harbor Master's building with centerline at W/L sta. 0+70.46, and two between Lake Marina Avenue and the Orleans Marina paved parking area with centerlines at W/L sta. 4+67.03 and W/L station 7+73.65. To assure a proper seal, each gate will be constructed so that it can be adjusted in either the horizontal or the vertical direction. The side and bottom seals can also be adjusted in either the horizontal or the vertical direction. The side and bottom seals can also be adjusted as alternate or supplemental means to assure that a proper seal is obtained. Plan elevation and details are shown on plate 10.

(2) Loading cases. The gates were designed for the following conditions:

Case I Gate closed, water at top of wall, no wind, impervious sheet pile cutoff.

Case II Gate closed, water at top of wall, no wind, pervious sheet pile cutoff.

Case III Gate opened, no water, no wind, truck on edge of slab, floodside.

Case IV Gate opened, no water, no wind, truck on edge of slab, protected side.

Case V — Gate opened, no water, wind from protected side, truck on edge of slab on floodside, 33-1/3 percent increase in allowable stresses.

Case VI — Gate opened, no water, wind from floodside, truck on edge of slab on protected side, 33-1/3 percent increase in allowable stresses.

38. Electrical continuity. Except for bonding, no corrosion protection measures are proposed, since all steel sheet piling shall be bonded together to obtain electrical continuity and provide for installation of cathodic protection if the need arises in the future. The piles shall be bonded together with no. 6 reinforcing bars welded to each of the piles near the top. Flexible jumpers insulated with cross-linked polyethelene shall be welded or brazed to adjacent sheet piles at the monolith joints 3 inches below the bottom of the concrete. See plate 6.

39. Corrosion control. The swing gates, corner plates, and all ferrous metal components which are not galvanized or stainless steel will be coated with a 5-coat vinyl paint system as required for corrosion control. Where appropriate, colors will be selected to be aesthetically compatible with the area.

REAL ESTATE REQUIREMENTS

40. General. All rights-of-way and construction easements required for construction of this project will be acquired by the Orleans Levee District and furnished without cost to the United States. There will be no acquisition by the United States. Right-of-way and construction easement limits are shown on plates 2 through 4.

RELOCATIONS

41. General. Under the authorizing law, local interests are responsible for the accomplishment of "...all necessary alterations and relocations to roads, pipelines, cables, wharves, drainage structures and other facilities made necessary by the construction..." Included in the required modifications are utilities and drainage rectification work.

42. Utilities crossing I-wall. Details of pipeline crossings through the I-wall are shown on plate 12. Each utility crossing will be so constructed that any anticipated settlement or deflection of the I-wall or any small movements of the pipe will not seriously affect either the wall or pipeline.

COORDINATION WITH OTHER AGENCIES

43. General. As previously mentioned, the State of Louisiana, Department of Public Works, was appointed project coordinator for the State by the Governor of Louisiana. This agency has functioned to coordinate the needs, desires, and interests of state agencies and the Corps of Engineers. The Orleans Levee District will provide the local cooperation for this feature of the hurricane protection project. The project plan presented herein is acceptable to both of the above agencies. The entire Lake Pontchartrain hurricane protection project, including this project feature, has been discussed at numerous public and private meetings since its authorization. Such meetings have been held before regional, state, local, community, social, and educational organizations and have served generally to inform the public of the proposed works, to explain project functions, and to solicit the public viewpoint. The latest public meeting was held in New Orleans on 22 February 1975. It was a combined public information meeting and a meeting to discuss the plan for disposal of dredged material as per Section 404 of the Federal Water Pollution Control Act of 1972. A statement of findings has been prepared and approved by the Environmental Protection Agency. The project has also been described and discussed in press and by communications media, as well as by organizational and individual correspondence.

44. U.S. Department of the Interior, Fish and Wildlife Service. Extensive coordination with the U.S. Fish and Wildlife Service was accomplished during preauthorization studies and subsequent to authorization of the project. By letter dated 2 April 1968, the Regional Director, U.S. Fish and Wildlife Service, Atlanta, Georgia, was informed of the current layout for the Lake Pontchartrain Barrier Plan feature of the Lake Pontchartrain, Louisiana and Vicinity, hurricane protection project and requested to furnish views and comments on the entire Lake Pontchartrain Barrier Plan. By letter dated 15 May 1968, the Acting Regional Director stated "...We are of the opinion that hurricane control structures in the Rigolets and Chef Menteur tidal passes have little appreciable effect on salinities in Lakes Maurepas, Pontchartrain, and Borgne. Therefore, no adverse effects on fish and wildlife resources in these areas are expected." Any significant modifications to the current plan will be forwarded to the Regional Director for further review and comment.

45. U.S. Department of the Interior, Federal Water Pollution Control Administration (now Environmental Protection Agency).

a. Review and recommendations. By letter dated 8 April 1968, the Regional Director, Federal Water Pollution Control Administration, was informed of the current layout for the Lake Pontchartrain Barrier Plan feature of the Lake Pontchartrain, Louisiana and Vicinity, hurricane protection project and requested to furnish views and comments on the project. The Regional Director requested in his letter of response dated 15 May 1968 that consideration be given to the following:

(1) Minimizing water quality degradation during construction.

(2) Minimizing the accidental spillage of petroleum products or other harmful materials and maintenance of sanitary facilities to adequately treat domestic wastes.

(3) Constructing and operating water quality control structures so as to insure that ecological conditions remain unchanged.

b. Project incorporation of recommendations. Provisions relative to water quality degradation during construction, control of accidental spillages, and maintenance of adequate sanitary facilities by construction contractors will be incorporated into the construction plans and specifications. The Seabrook Lock will be operated to provide a desirable salinity regimen in Lake Pontchartrain to the end that deleterious alterations in the lake ecology will be avoided. The Regional Director has been advised of the action to be taken in connection with his comments.

46. Orleans Levee District.

a. Review and recommendations. Extensive coordination has occurred both oral and written, with the Orleans Levee District. The Levee District recommended a T-wall floodwall alinement that was closer to the existing marina bulkhead.

b. Project incorporation of recommendations. The alternative alinement was considered to be feasible; however, the Corps' position was to implement the plan as presented in this DM. There is an agreement that the Orleans Levee District will proceed with installation of the sheet pile portion of the floodwall due to the excessive seepage problem at the bulkhead on the south side of the marina. In a letter dated 28 October 1977, the Orleans Levee District requested authority, subject to being given credit for the

work in kind, to proceed with installation of the sheet pile portion of the floodwall. In a letter dated 18 November 1977, the New Orleans District Corps of Engineers agreed to this request; however, it was noted that credits for Orleans Levee District expenditures are contingent upon approval of this design memorandum. Then the credit would be directly applicable to the annual cash payments required for the project under the deferred payment plan. Refer to details in copies of pertinent correspondence in appendix A.

ENVIRONMENTAL ANALYSIS

47. Environmental quality.

a. General. The engineering treatment required for preserving and maintaining the environmental quality of the project has been considered during preparation of this memorandum.

b. Enhancement. Construction of the project works in the Lakefront Marina area will alter the existing terrain only to the extent of development of a floodwall in an area which has previously been altered by man's activities. A bushhammer finish will be applied to both sides of the floodwall to provide an aesthetically pleasing appearance. The gates will be painted in a color aesthetically pleasing with the area. Construction and maintenance of the floodwall will interfere with the view of the marina from Lake Marina Avenue; however, construction of this feature of the project will result in enhancement for long-term human occupation of the area.

48. Environmental statement.

a. Initial EIS. The final environmental statement for the entire Lake Pontchartrain, Louisiana and Vicinity, Hurricane Protection project was filed with the President's Council on Environmental Quality on 9 January 1975; notice of this was published in the Federal register on 17 January 1975.

b. New EIS. On 30 December 1977, the U.S. District Court in New Orleans issued an order enjoining any further construction of the Chef Menteur and Rigolets Complexes, New Orleans East Area, and the Chalmette Area portions of the project, until a new EIS has been prepared. The Orleans Marina floodwall is not a portion of the project which is enjoined. It was not contested during the litigation procedure, but will be addressed along with the rest of the project in the new EIS. No environmental problems are anticipated.

49. Cultural resources. This area has been filled and developed during the 20th century. Urban and business development preclude the discovery of historic or prehistoric remains. Examination of existing site records shows no known sites in or near the project area. If cultural resources are uncovered during construction, work will cease and the contractor will immediately notify the District Engineer.

ESTIMATE OF COST

50. General. Based on February 1978 price levels, the estimated first cost of construction of the Orleans Marina floodwall is $1,565,000. This estimate consists of $155,000 for lands and damages, $196,000 for relocations, $957,000 for the floodwall, $135,000 for engineering and design, and $122,000 for supervision and administration. The detailed estimate of first cost is shown on table 1.

LAKE PONTCHARTRAIN BARRIER PLAN
ORLEANS PARISH LAKEFRONT LEVEES
ORLEANS MARINA

TABLE 1

ESTIMATE OF FIRST COST
(February 1978 Price Levels)

Cost Acct. No.	Item	Estimated Quantity	Unit	Unit Price $	Estimated Amount $
LANDS AND DAMAGES					
01	Lands				
	Right-of-way	1	Job	l.s.	88,600
	Construction easement	1	Job	l.s.	34,900
	Subtotal				123,500
	Contingencies 25%±				31,000
	Acquisition by others				500
	TOTAL LANDS AND DAMAGES				155,000
RELOCATIONS					
02	Relocations				
	12"ø steel drain pipe	140	l.f.	18.00	2,520
	24"ø steel drain pipe	340	l.f.	36.00	12,240
	27"ø steel drain pipe	180	l.f.	40.00	7,200
	Knife gate valve structure (24")	1	Ea.	15,000.00	15,000
	Relocate catch basins	7	Ea.	1,500.00	10,500
	Relocate & reinstall manhole structures	2	Ea.	2,500.00	5,000
	Remove & replace street curb	1,130	l.f.	10.00	11,300
	Remove & repave street	4,276	s.f.	1.50	6,414
	*Ramping Lake Ave. (completed in 1970)	Lump Sum	l.s.		100,700
	Subtotal				170,874
	Contingencies 15%±				25,126
	Subtotal				196,000
30	Engineering & Design 10%±				20,000
	Subtotal				216,000
31	Supervision & Administration 7%±				15,000
	TOTAL RELOCATIONS FOR FLOODWALL				231,000

*Completed by the Orleans Levee District in July 1970 under contract No. OLD 70-14. The total contract cost was $120,817.63.

ESTIMATE OF FIRST COST (cont'd)
(February 1978 Price Levels)

Cost Acct. No.	Item	Estimated Quantity	Unit	Unit Price $	Estimated Amount $
CONSTRUCTION					
11	Floodwalls				
	Compression pile test	1	Ea.		10,000
	Additional comp. pile test	1	Ea.		2,000
	Tension pile test	1	Ea.		2,000
	Steel sheet piling PZ-38	49,300	s.f.	9.00	443,700
	Steel sheet piling PMA-22	1,320	s.f.	8.00	10,560
	Steel sheet piling PSA-23	690	s.f.	8.00	5,520
	Prestressed conc. piles 12"X12"	1,140	l.f.	15.00	17,100
	Conc. in stabilization slab	8	c.y.	90.00	720
	Conc in T-wall base	60	c.y.	90.00	5,400
	Conc. in walls, cols & beams	790	c.y.	150.00	118,500
	Portland cement	4,412	cwt	3.00	13,236
	Steel reinforcement	103,640	lbs.	0.35	36,274
	Structural steel	19,500	lbs.	1.75	34,125
	Waterstops, L-type	60	l.f.	20.00	1,200
	Waterstops, 3-bulb type	350	l.f.	5.00	1,750
	Gate seals	103	l.f.	20.00	2,060
	Thoroseal finish	6,420	s.f.	1.00	6,420
	Bushammer finish	13,000	s.f.	1.00	13,000
	Structural excavation	820	c.y.	5.00	4,100
	Structural backfill	560	c.y.	5.50	3,080
	24"ø steel drain pipe	1,000	l.f.	36.00	36,000
	24"ø manhole	11	Ea.	2,500.00	27,500
	30"ø steel drain pipe	70	l.f.	45.00	3,150
	Expansion joint filler	750	s.f.	1.00	750
	Miscellaneous metal	1	ton		2,000
	21"ø steel drain pipe	700	l.f.	31.00	21,700
	18"ø steel drain pipe	120	l.f.	27.00	3,240
	10"ø steel drain pipe	210	l.f.	15.00	3,150
	Environmental protection (0.005)				3,900
	Subtotal				832,135
	Contingencies 15%±				124,865
	Subtotal				957,000
30	Engineering & Design 12%±				115,000
	Subtotal				1,072,000
31	Supervision & Administration 10%±				107,000
TOTAL CONSTRUCTION FOR FLOODWALL					1,179,000
	TOTAL PROJECT COST				1,565,000

51. Comparison of costs. The project document included a cost for the Orleans Parish Lakefront, which consisted of strictly levee enlargement; no floodwalls along the lakefront were included. The design memorandum entitled "Lake Pontchartrain, La. and Vicinity, Lake Pontchartrain Barrier Plan, Design Memorandum No. 2 - General Design, Citrus Back Levee" dated August 1969 (the DM this report supplements) included a cost for the Orleans Parish Lakefront, which was a price escalation of the project document estimate. The cost shown in GDM No. 2 was $1,021,000, including the construction and relocations costs, but no right-of-way costs. This estimate was not broken down into different reaches of this feature. Therefore, a valid cost estimate for the Orleans Marina reach, against which a comparison of the estimate presented in this report can be made, is not available. A very rough estimated cost, using a ratio of the length of floodwall at the Marina to the total length of the Orleans Parish lakefront feature applied to the construction cost in GDM No. 2, would be $27,700, including E&D and S&A. No relocations and rights-of-way for the marina were included in the GDM No. 2 estimate. This very rough estimate is used in table 2.

52. Reasons for the differences.

a. 01 Lands and Damages

(1) Sundry. An estimate for the lands and damages was omitted from the previous estimate. Therefore, this item increased by the cost of the lands and damages for the recommended floodwall which is $155,000.

b. 02 Relocations.

(1) Design changes. Because a floodwall is being recommended for the Orleans Marina instead of a levee, relocations are required that were not required for the levee. This increased the cost by $196,000.

c. 11 Levees and floodwalls

(1) Design changes. Because of the congestion of the Orleans Marina area, a floodwall with roadgates will be used instead of a levee. This increased the cost by $895,400.

d. 30 Engineering and Design.

(1) Design changes. This item increased $129,400 due to the increased design efforts required for the change to a floodwall with roadgates from a levee as described above.

e. 31 Supervision and Administration

(1) Design changes. An increase of $118,500 occurred in this item due to the increased supervision and administration required for the increased engineering and design and for the increased supervision and inspection effort required because of the more complex construction methods.

SCHEDULE FOR DESIGN AND CONSTRUCTION

53. Schedule. The estimated schedule is as follows:

a. Design plans and specifications.

Start - April 1978
Complete - May 1978

b. Construction.

Start - August 1978
Complete - February 1979

OPERATION AND MAINTENANCE

54. General. The Orleans Marina floodwall will be maintained and operated at the expense of local interests as a feature of local cooperation for the project. The estimates of annual operations and maintenance costs for different features of the project are as follows:

(1) floodwall - $600

(2) gates - $1,700

The floodwall annual cost includes grass cutting of embankments and debris removal from manholes; the gates annual cost includes periodic painting, cleaning, and test operation.

ECONOMICS

55. Economic justification. The current economic analysis for the entire Lake Pontchartrain, Louisiana and Vicinity hurricane protection project, at the October 1977 price level, indicated a benefit-cost ratio of 13.7 to 1. An economic reanalysis of the entire Lake Pontchartrain, Louisiana and Vicinity hurricane protection project is presently being prepared and will be submitted at a later date. This reanalysis will include incremental justification for each portion of the entire project, including the Orleans Parish Lakefront levee.

TABLE 2
COMPARISON OF ESTIMATES

Cost Acct. No.	Feature	GDM No. 2 (Jul 67 Prices) $	PB-3 (Oct 77 Prices) $	GDM Supp. (Feb 78 Prices) $	Difference GDM Supp. PB-3 $
01	Lands and Damages	0	0	155,000	+155,000
02	Relocations	0	0	196,000	+196,000
11	Levees and Floodwalls	24,200	61,600	957,000	+895,400
	Construction Cost	24,200	61,600	1,308,000	1,246,400
30	Engineering and Design	1,900	5,600	135,000	+129,400
31	Supervision and Administration	1,600	3,500	122,000	+118,500
TOTAL		27,700	70,700	1,565,000	+1,494,300

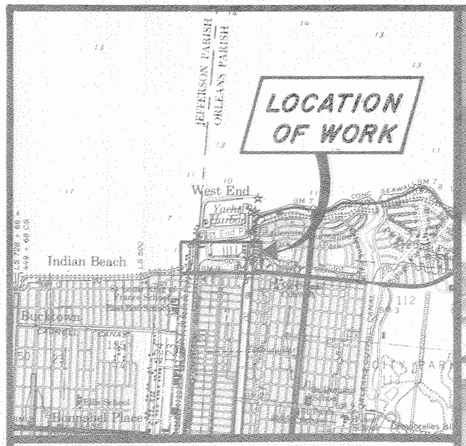
56. Federal and non-Federal cost breakdown. The breakdown of the construction cost into the Federal and non-Federal shares are shown in Table 3 below:

TABLE 3
FEDERAL AND NON-FEDERAL
COSTS BREAKDOWN

Item	Federal	Non-Federal	Total
Floodwall	$1,095,000	$119,000	$1,214,000
Lands & damages	-	155,000	155,000
Relocations	-	196,000	196,000
	$1,095,000	$470,000	$1,565,000

RECOMMENDATION

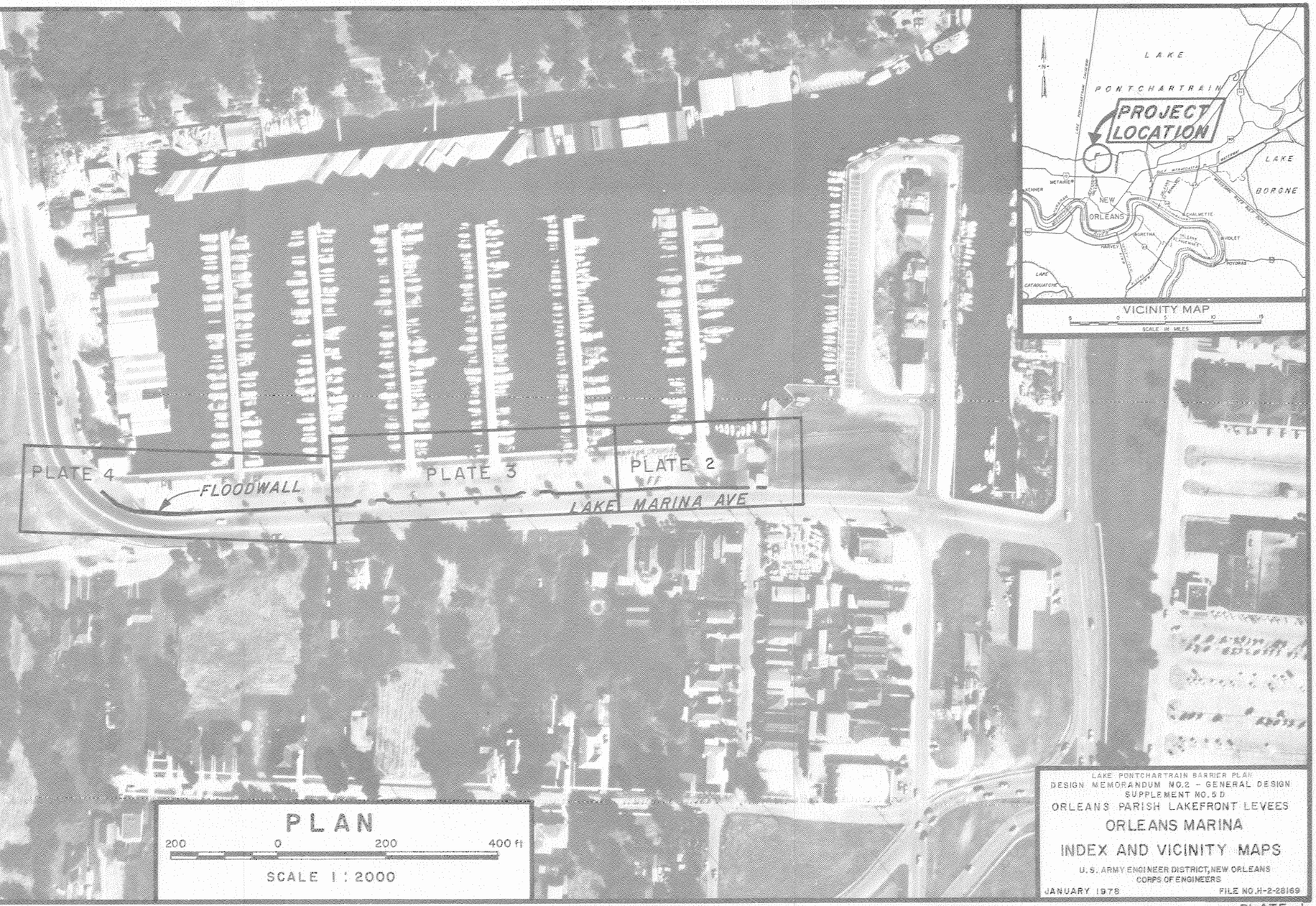
57. Recommendation. In partial response to Public Law 298, 89th Congress, 1st session, approved 27 October 1965, it is recommended that the plan presented herein be constructed in order to provide hurricane protection for the Orleans Marina portion of the Lake Pontchartrain, Louisiana and vicinity hurricane protection project.



LOCATION MAP

1 1/2 0 1

SCALE IN MILES



PLAN

200 0 200 400 ft

SCALE 1 : 2000

VICINITY MAP

5 0 5 10 15

SCALE IN MILES

LAKE PONTCHARTRAIN BARRIER PLAN

DESIGN MEMORANDUM NO.2 - GENERAL DESIGN

SUPPLEMENT NO.5 D

ORLEANS PARISH LAKEFRONT LEVEES

ORLEANS MARINA

INDEX AND VICINITY MAPS

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS

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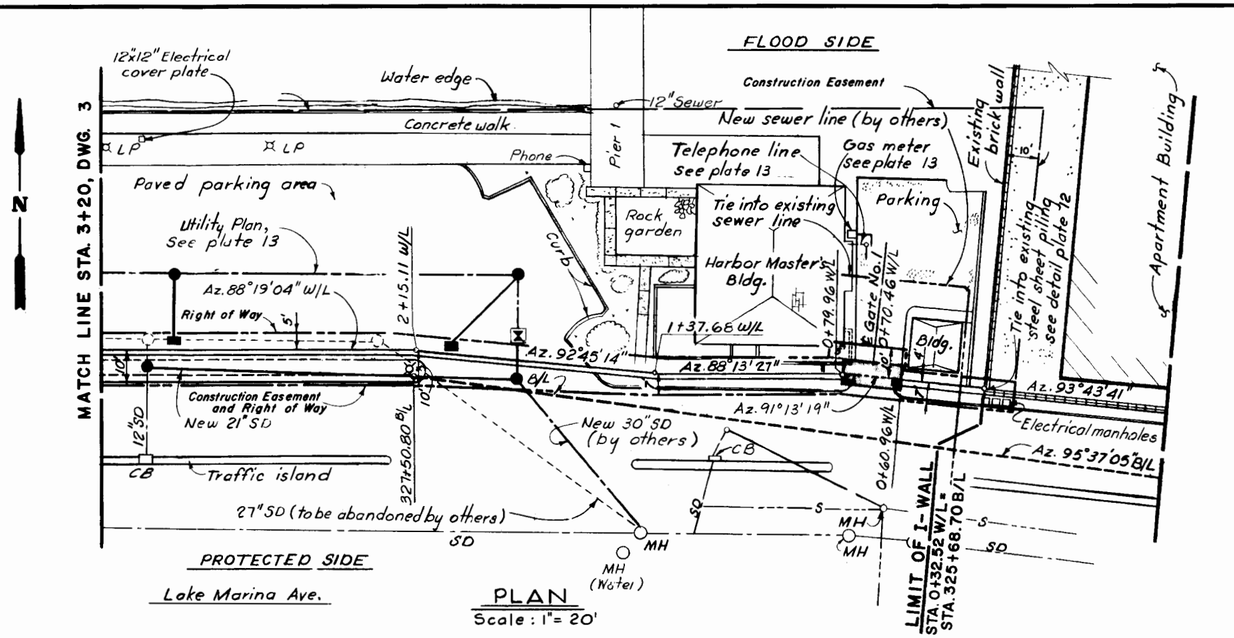
PLATE 1



Notes:
1. Wall faces will be bushhammered on both sides.
2. For utility locations, see Plate 13.
3. Undisturbed boring B-ULO is located at Sta. 323+00 50' right of the baseline.
4. SD - Storm drain
   CB - Catch basin
   MH - Man hole

PROFILE
Scale: 1" = 20' Horiz.
1" = 5' Vert.

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 5D
ORLEANS PARISH LAKEFRONT LEVEES
ORLEANS MARINA
STA. 0+32.52 W/L TO STA. 3+20 W/L
PLAN AND PROFILE
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
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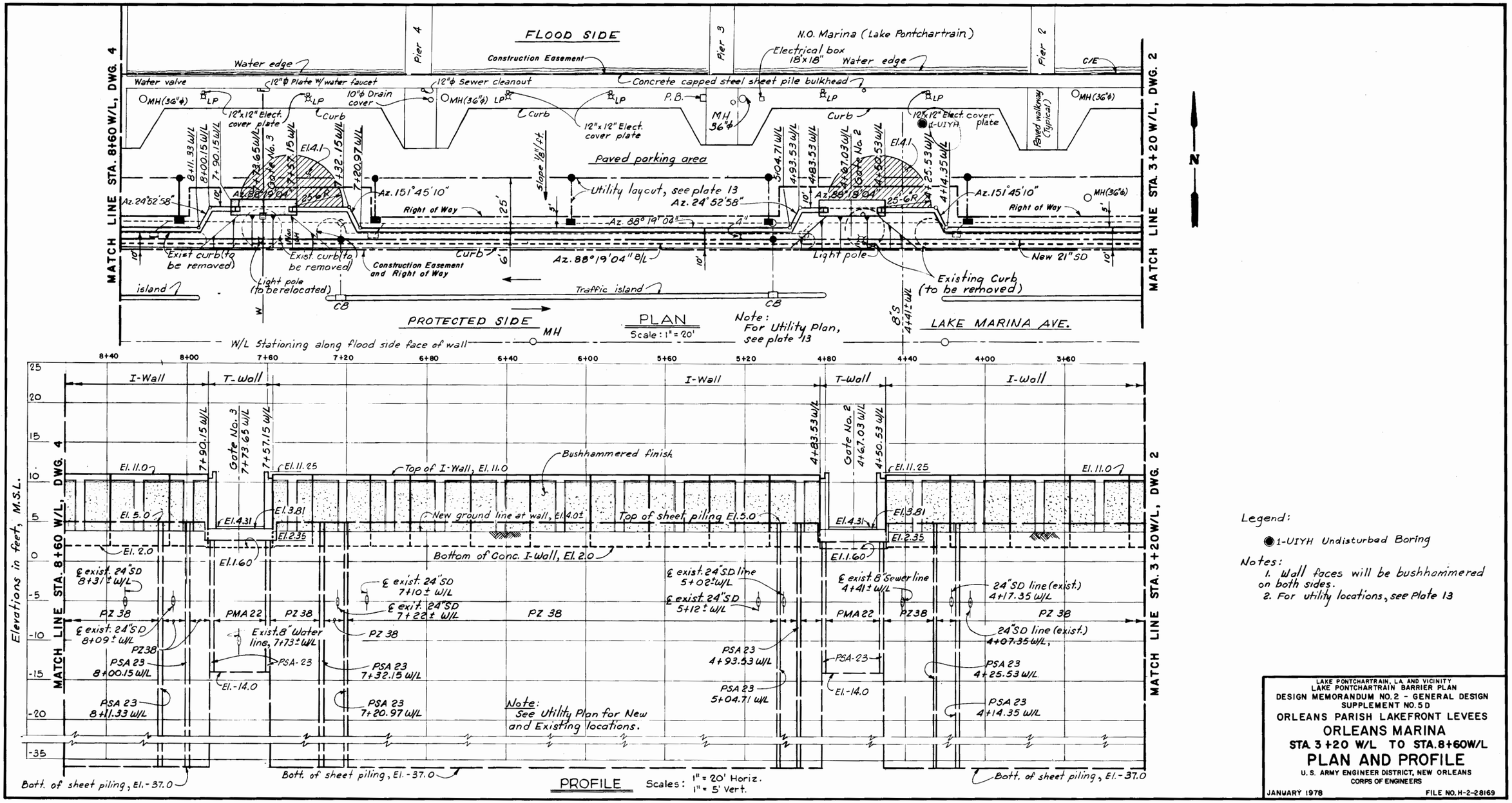
PLATE 2



LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 5 D
ORLEANS PARISH LAKEFRONT LEVEES
ORLEANS MARINA
STA. 3+20 W/L TO STA. 8+60 W/L
PLAN AND PROFILE
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
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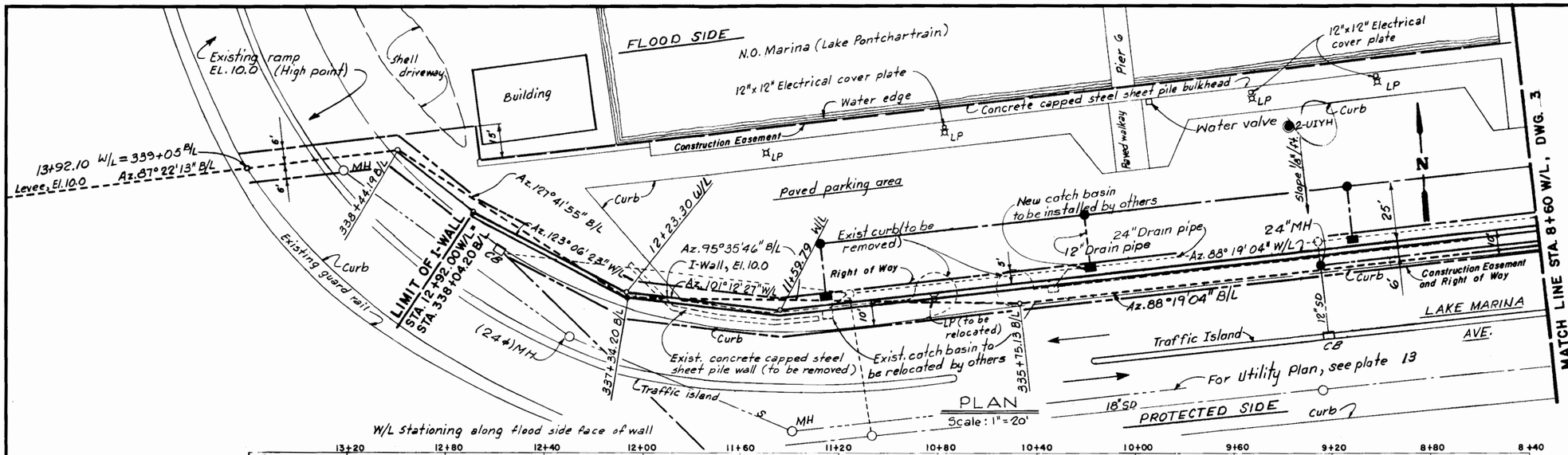
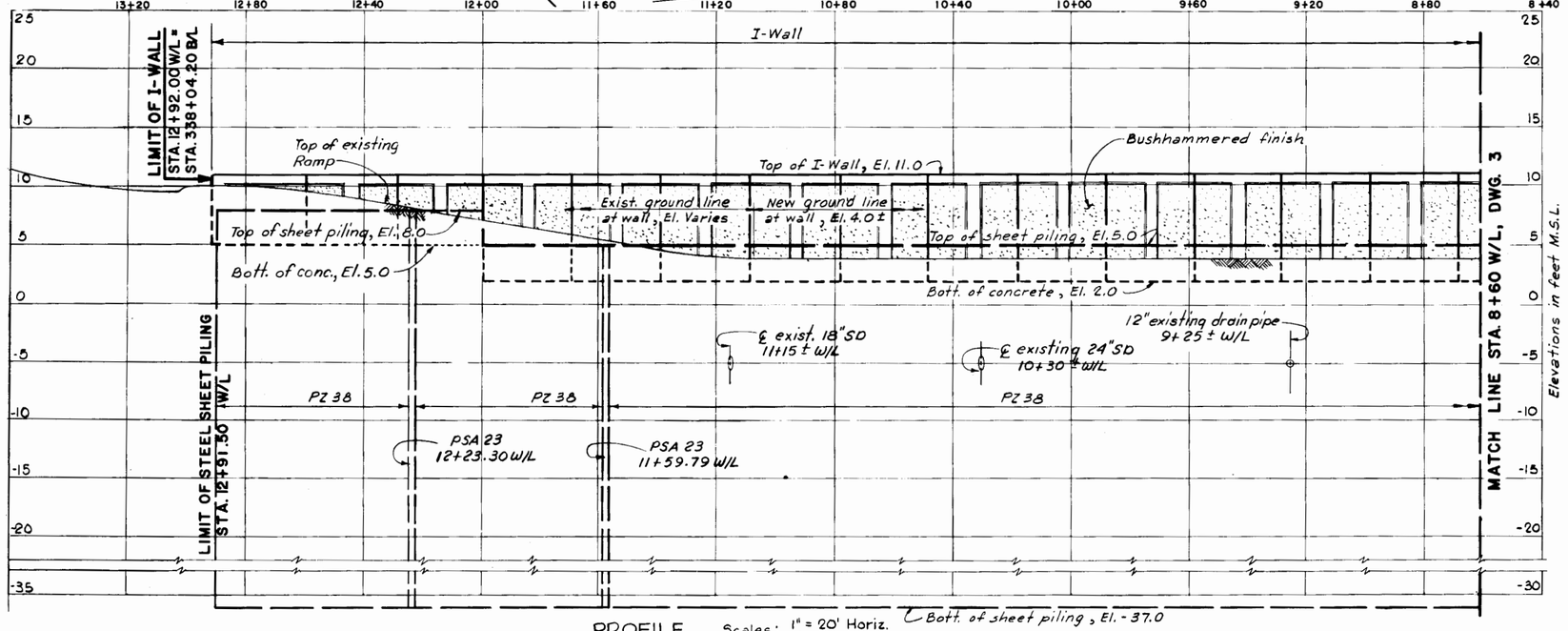
PLATE 3



PLAN

Scale: 1" = 20'

W/L Stationing along flood side face of wall



PROFILE Scales: 1" = 20' Horiz. 1" = 5' Vert.

Legend:

● 2-UIYH Undisturbed Boring

Notes:

1. Wall faces will be bushhammered on both sides.
2. For utility locations, see Plate 13.
3. General type boring 15-LO is located at sta 341+00 100' left of the baseline.

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 – GENERAL DESIGN
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ORLEANS MARINA
STA. 8+60 W/L TO STA. 12+92.50 W/L
PLAN AND PROFILE
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
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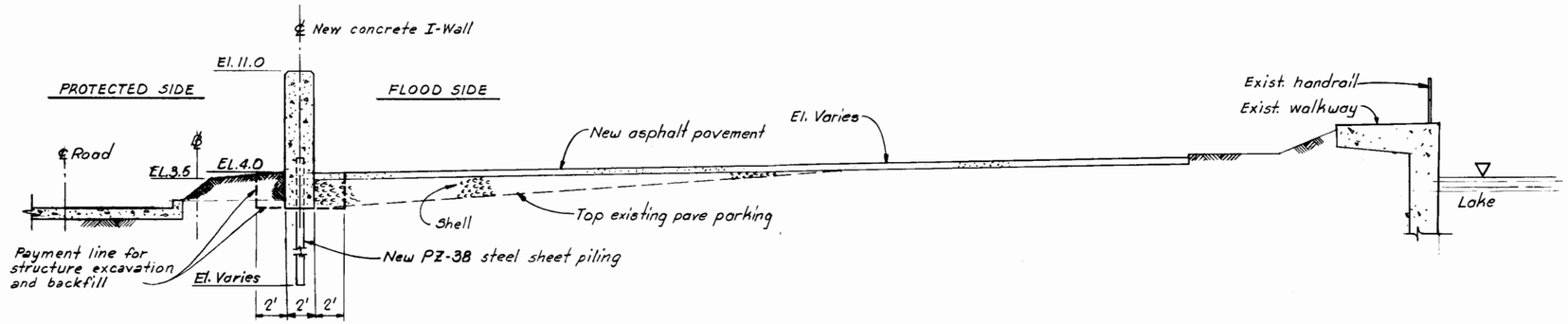
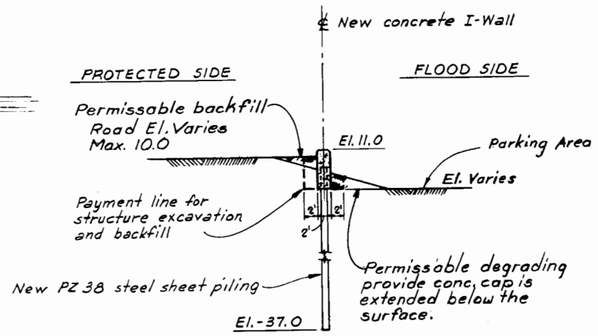
PLATE 4



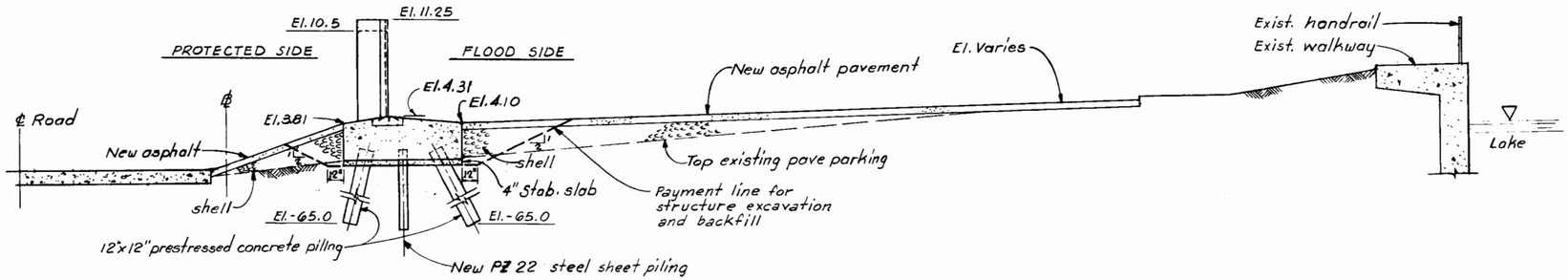
TYPICAL SECTION THRU I-WALL

Scale: 1" = 4'



STATION 11+96.55

SCALE: 1" = 10'



TYPICAL SECTION THRU GATES 2 AND 3

Scale: 1" = 4'

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
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DESIGN SECTIONS

U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
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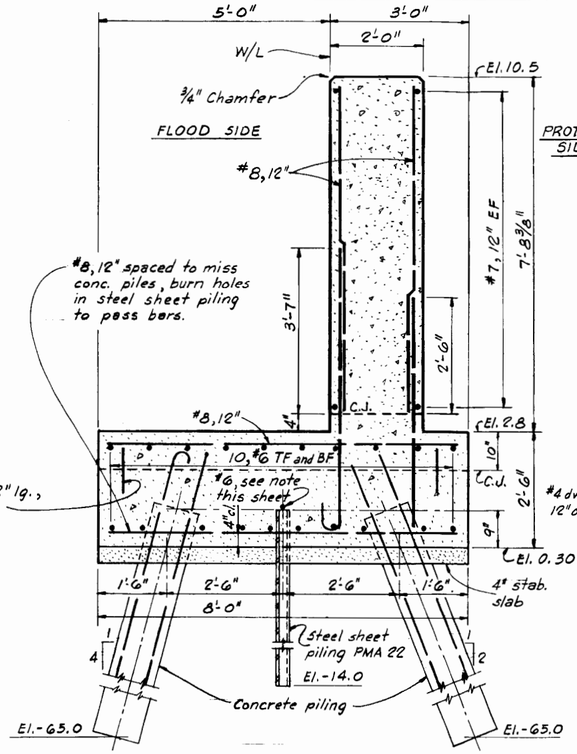
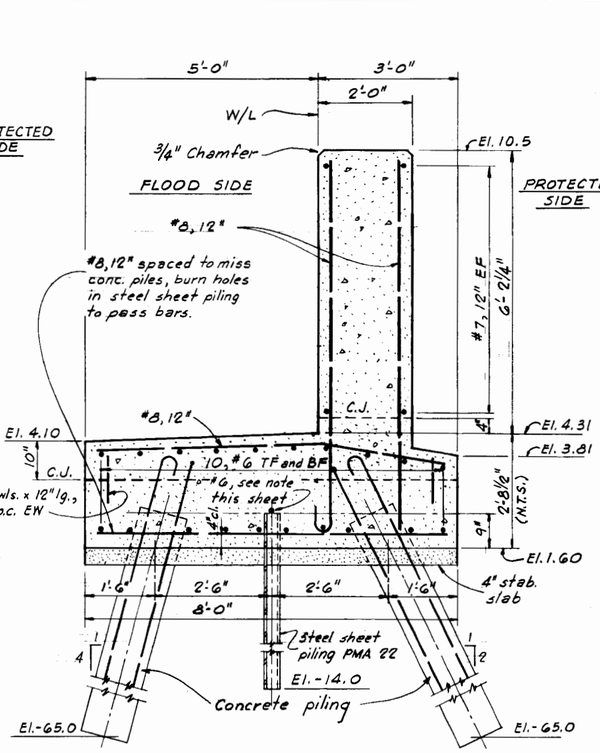
PLATE 5



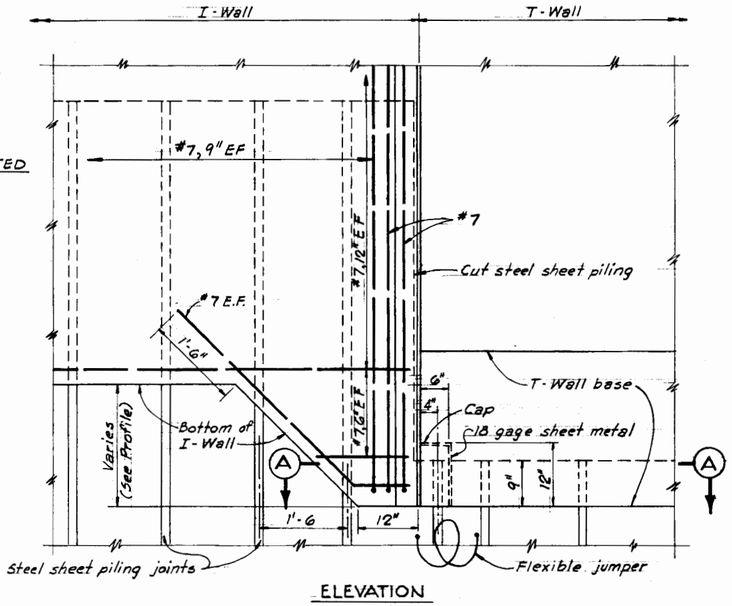
TYPICAL T-WALL SECTION
FOR GATE 1 MONOLITH

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



TYPICAL T-WALL SECTION
FOR GATE 2+3 MONOLITH

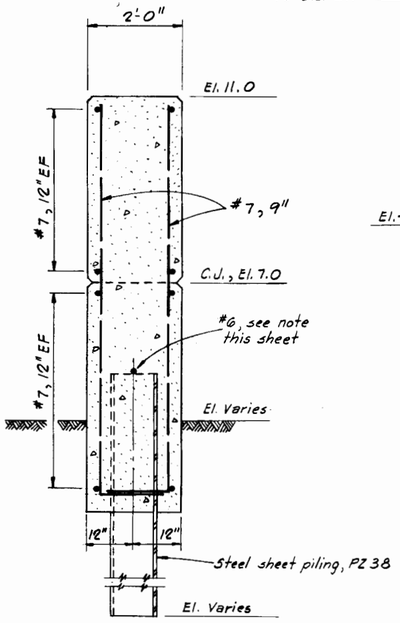
Scale : 3/4" = 1'-0"



ELEVATION

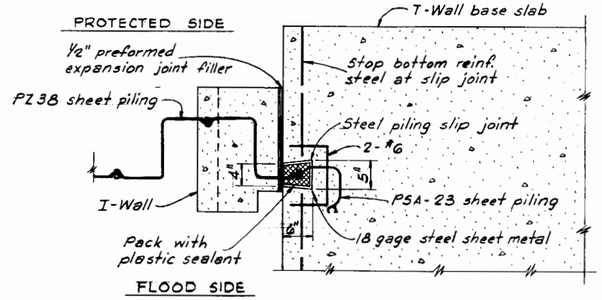
TYPICAL DETAIL FOR I-WALL TO T-WALL AT BASE

Scale : 1" = 1'-0"



TYPICAL I-WALL SECTION

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



SECTION (A)

Scale : 1" = 1'-0

NOTE

1. Weld a No.6 reinf. rod to top of each steel sheet pile. Install flexible jumper at all monolith joints. Jumpers shall be No. 1/0 A.W.G. copper insulated with cross linked polyethylene in an 8" dia. loop. Jumper shall be welded to adjacent steel sheet piles 3 inches below bottom of concrete cap. Welded connections shall be coated with splicing epoxy to obtain a moisture proof connection.
2. Holes cut in sheet piling shall not exceed 1 1/2"ϕ and to miss interlocks.

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TYPICAL WALL SECTIONS

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
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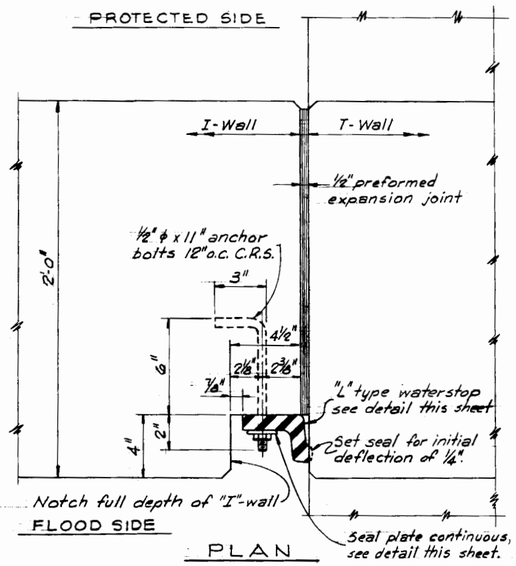
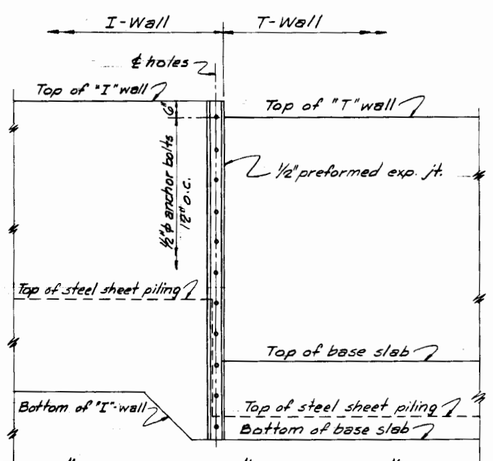
PLATE 6



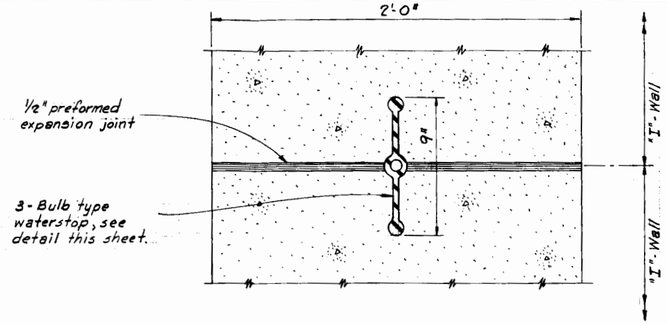
PLAN

Scale : 3" = 1'-0"



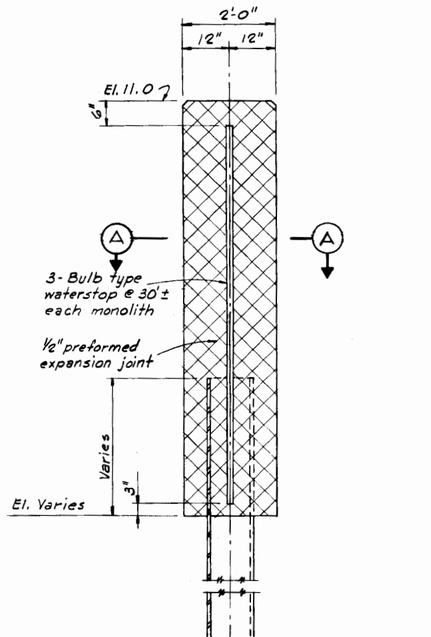
FLOOD SIDE ELEVATION

Scale : ½" = 1'-0"



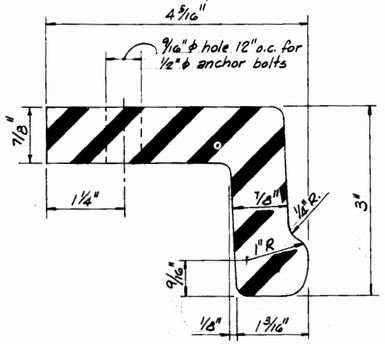
SECTION Ⓐ

Scale : 3" = 1'-0"



TYPICAL "I"-WALL JOINT

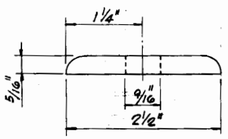
Scale : ¾" = 1'-0"



"L" TYPE WATERSTOP

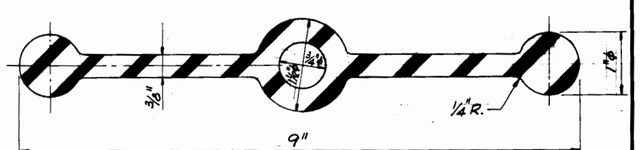
SEAL DETAIL

Scale : Full Size



SEAL PLATE

Scale : Full Size



3 BULB TYPE

WATERSTOP

Scale : Full Size

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
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TYPICAL WALL JOINTS

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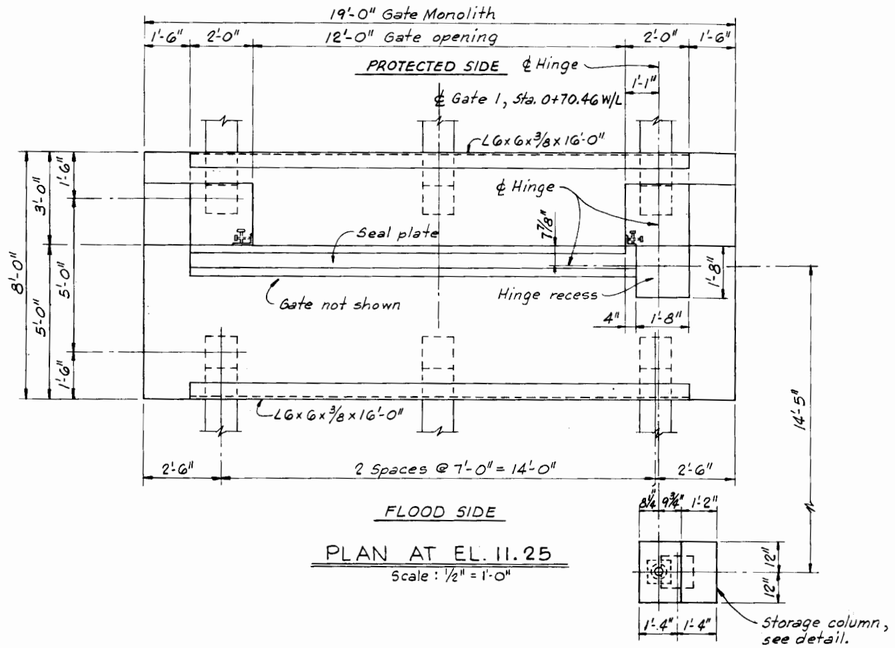
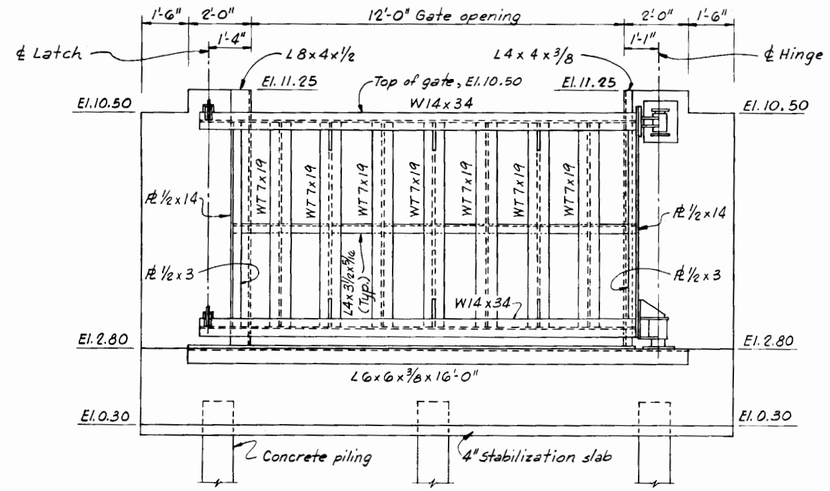
PLATE 7



PLAN AT EL. 11.25

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



FLOOD SIDE ELEVATIONS

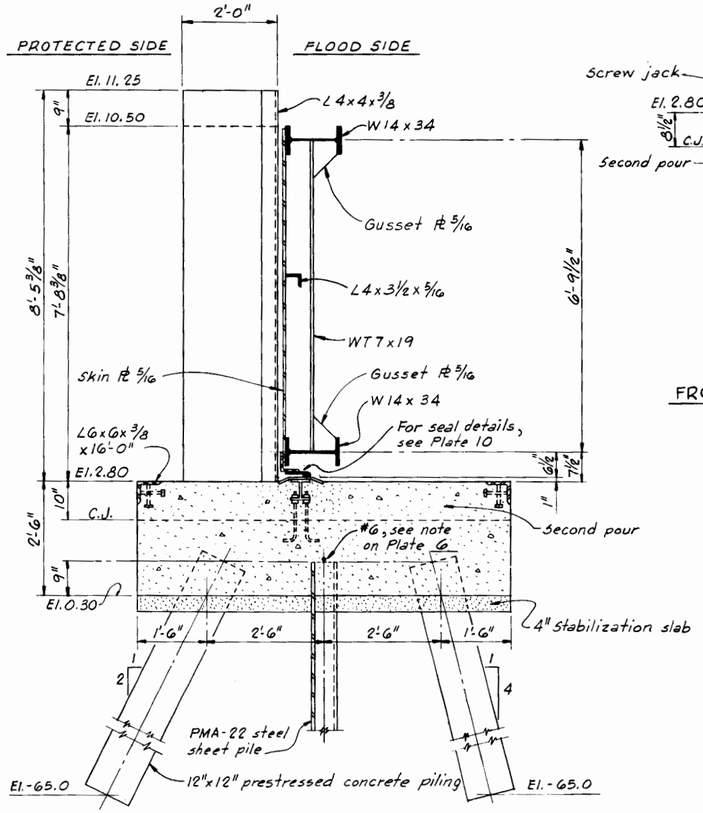
Scale : 1/2" = 1'-0"

LEGEND

Vertical pile

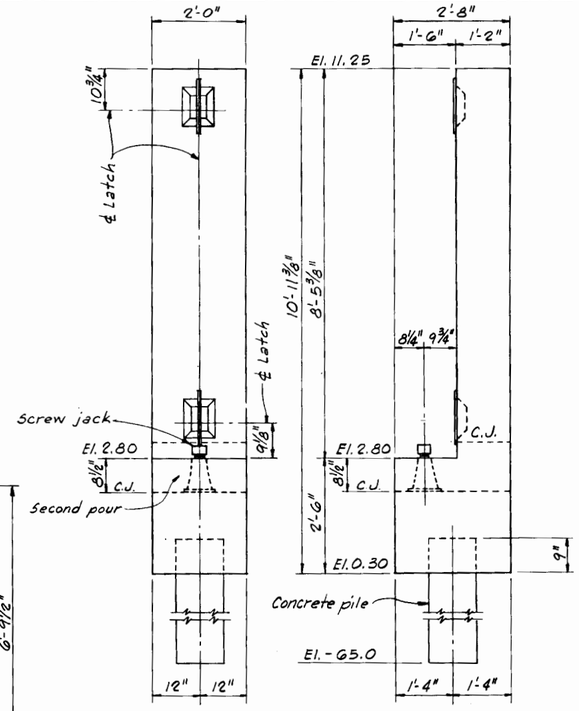
Batter pile

Note: All piles 12"x12" prestressed Concrete



TYPICAL SECTION

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



FRONT ELEVATION SIDE ELEVATION

STORAGE COLUMN

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

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
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SWING GATE 1 - DETAILS

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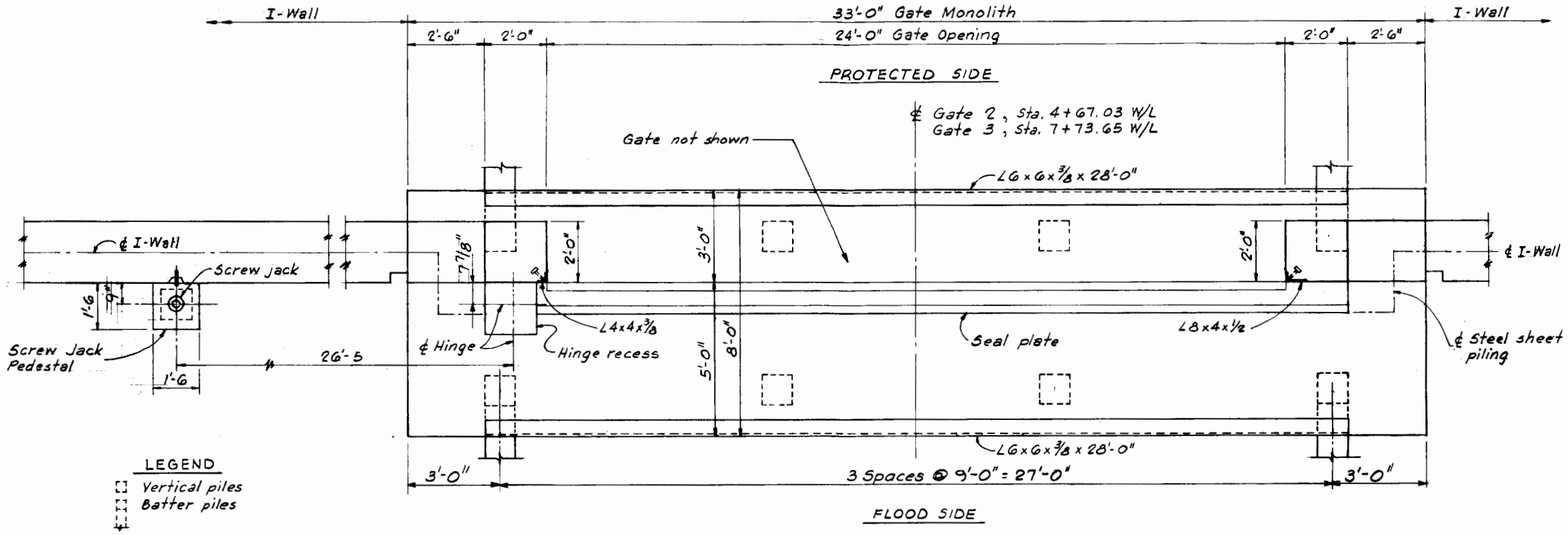
PLATE 8

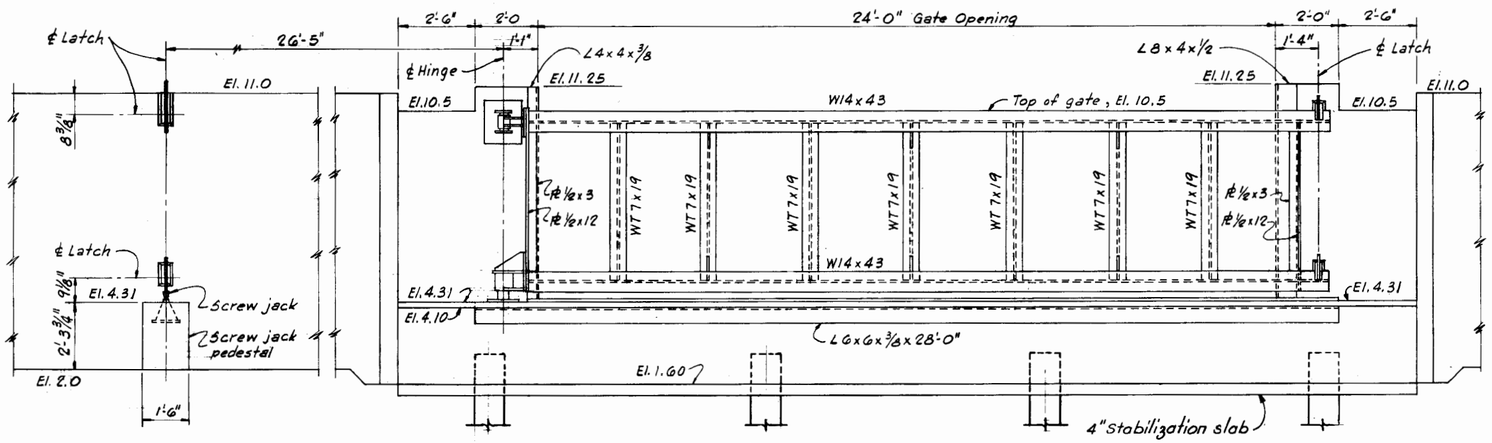


LEGEND
- Vertical piles
- Batter piles

NOTE: All piles 12"x12" prestressed concrete

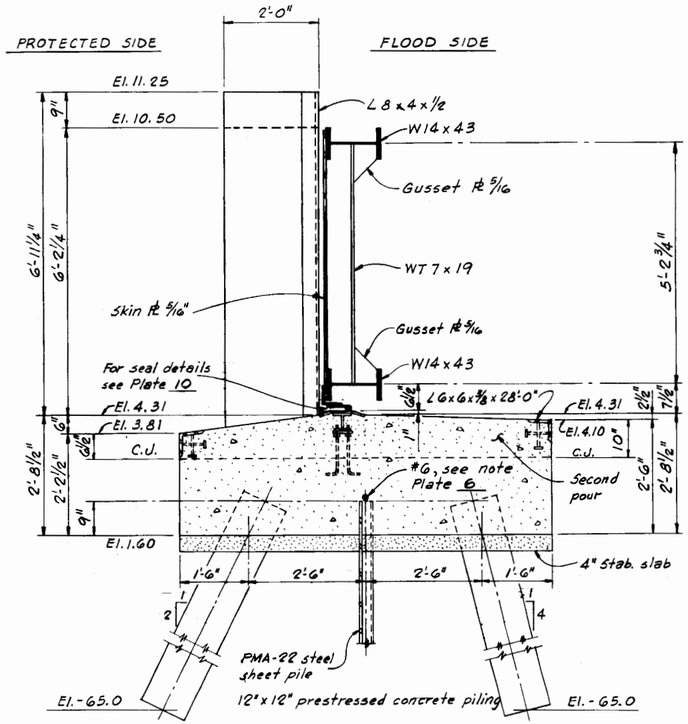
PLAN AT ELEVATION 11.25

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



FLOOD SIDE ELEVATION

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



TYPICAL SECTION

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

LAKE PONTCHARTRAIN, LA. AND VICINITY
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SWING GATE 2 AND 3
DETAILS

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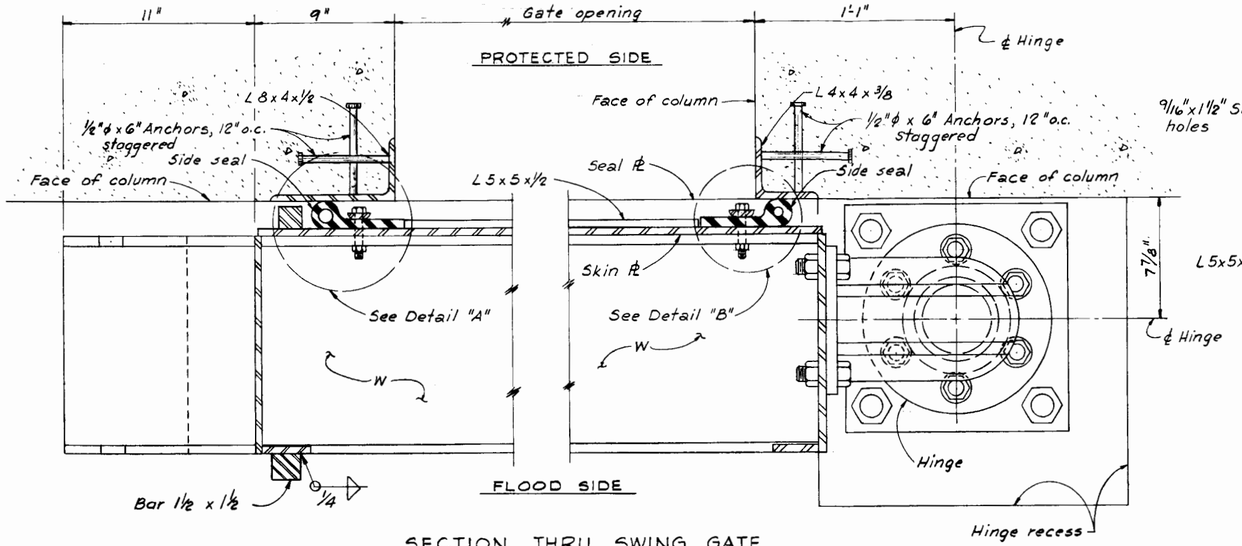
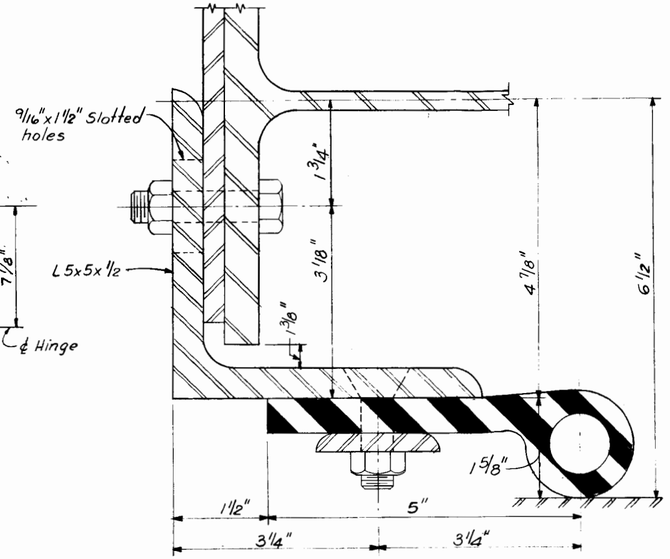
PLATE 9



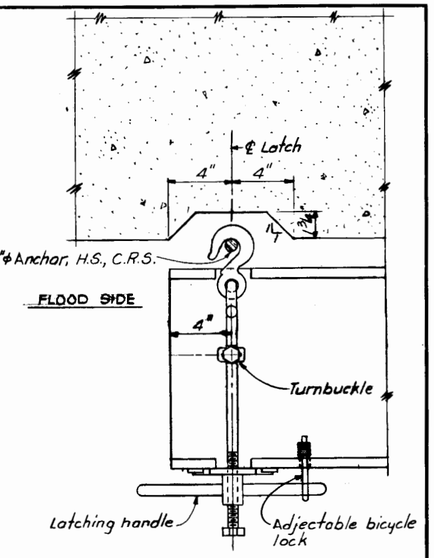
SECTION THRU SWING GATE

Scale : 3" = 1'-0"



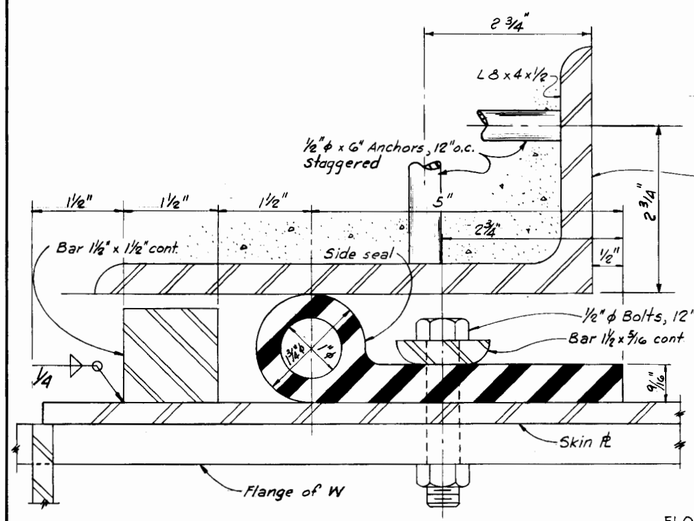
SECTION THRU BOTTOM SEAL

Scale : Full Size



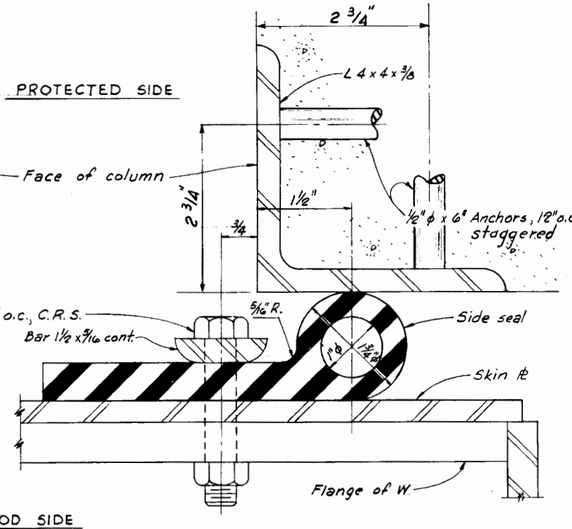
LATCHING ASSEMBLY

Scale: 3" = 1'-0"



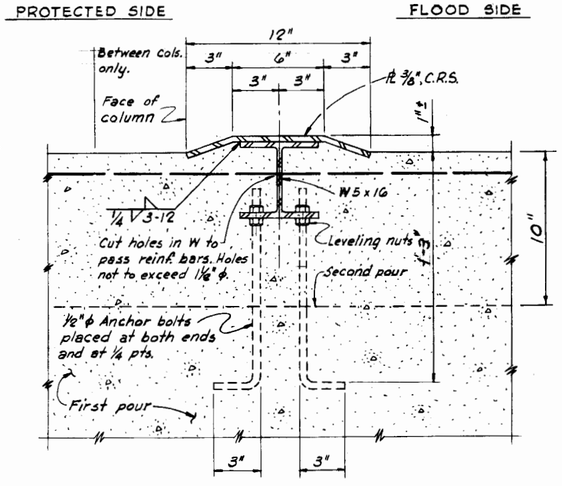
DETAIL "A"

Scale : Full Size



DETAIL "B"

Scale : Full Size



SEAL PLATE DETAIL - GATES 1, 2 & 3

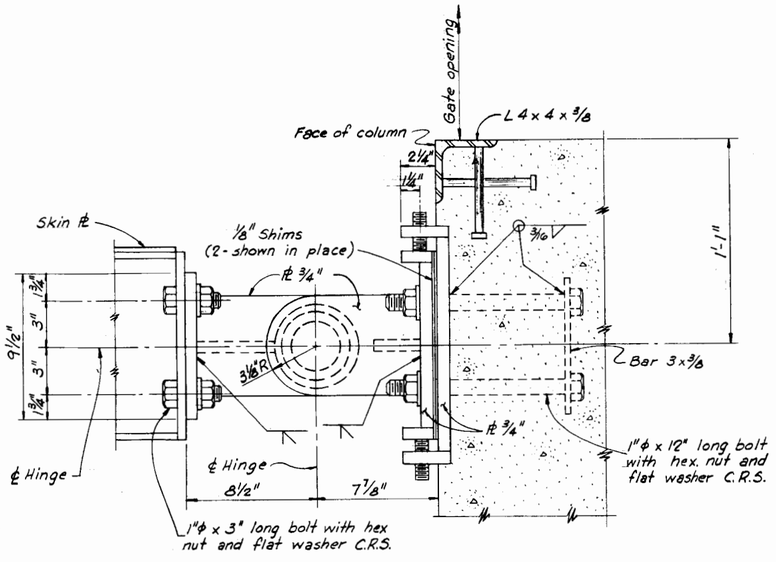
Scale : 3" = 1'-0"

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 5D
ORLEANS PARISH LAKEFRONT LEVEES
ORLEANS MARINA

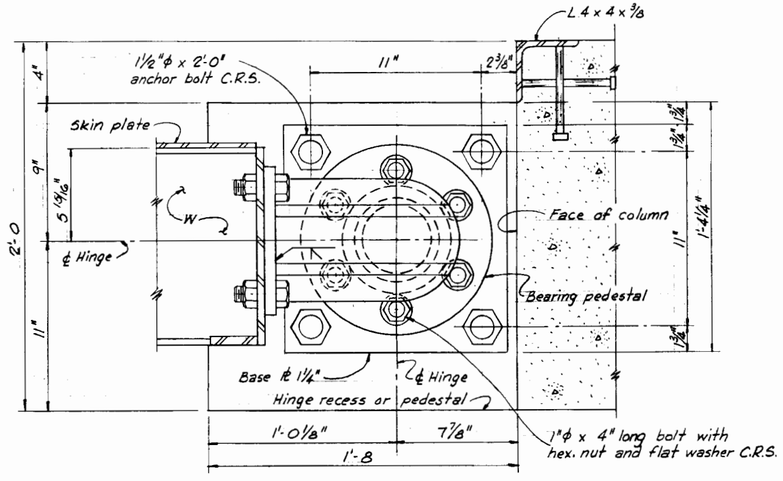
SWING GATE SEAL DETAILS AND LATCHING DEVICE

U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JANUARY 1978
FILE NO. H-2-28169

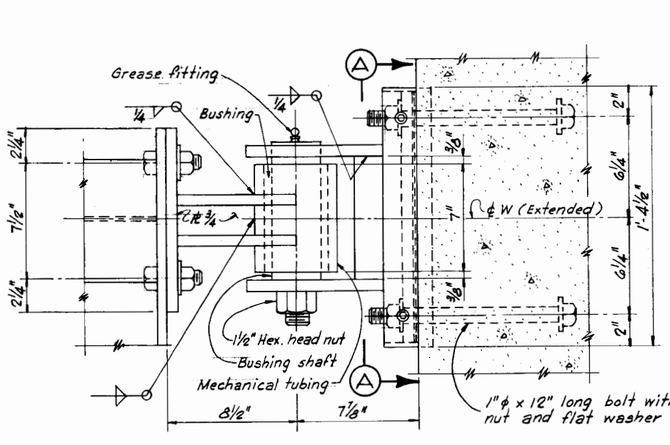
PLATE 10



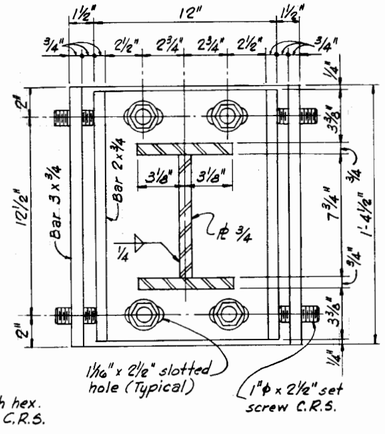
PLAN



PLAN



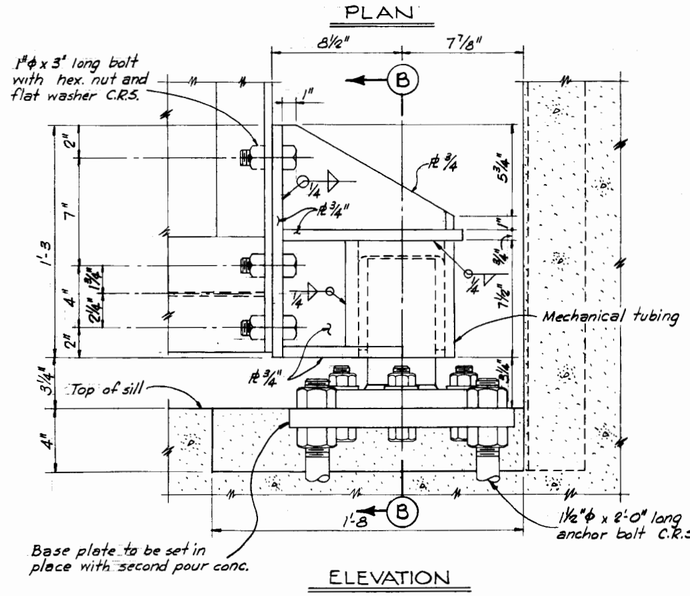
ELEVATION



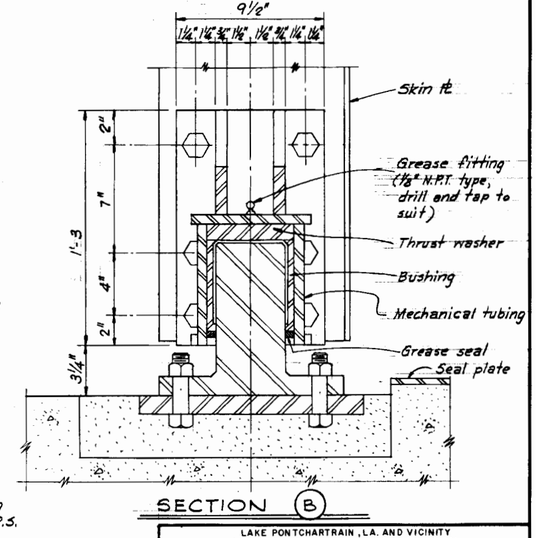
SECTION (A)

UPPER HINGE

Scale : 3" = 1'-0"



ELEVATION



SECTION (B)

LOWER HINGE

Scale : 3" = 1'-0"

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 5 D
ORLEANS PARISH LAKEFRONT LEVEES

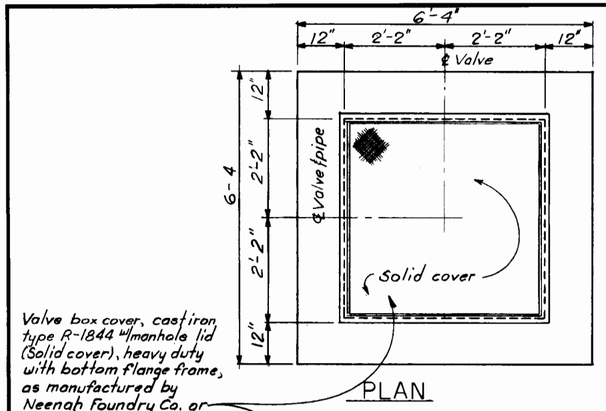
ORLEANS MARINA
SWING GATE HINGE DETAILS
GATES 1, 2 AND 3

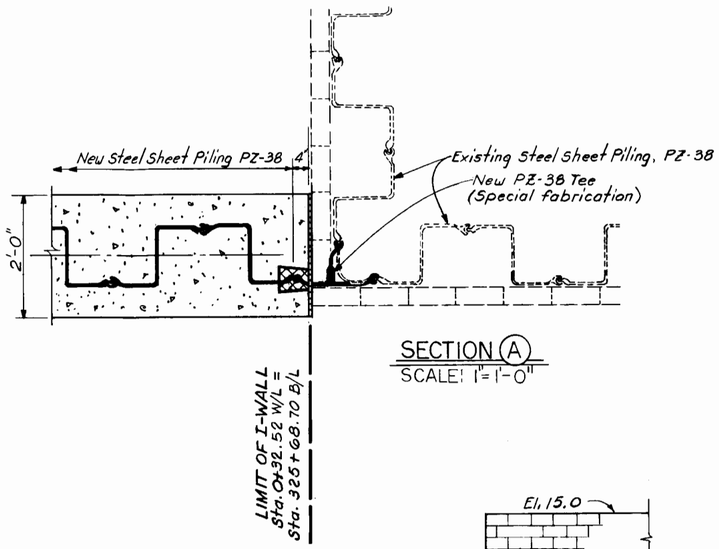
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

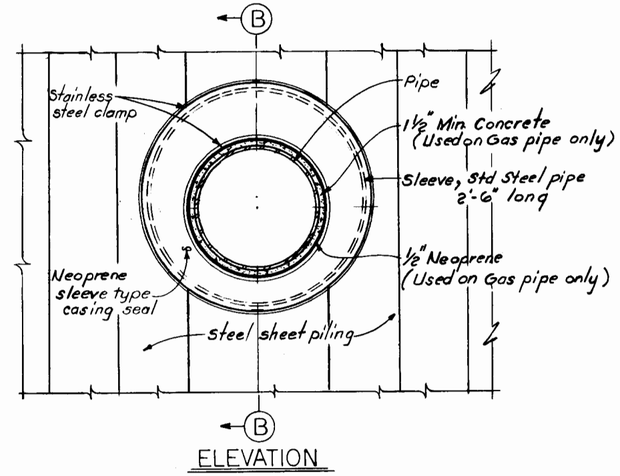
JANUARY 1978

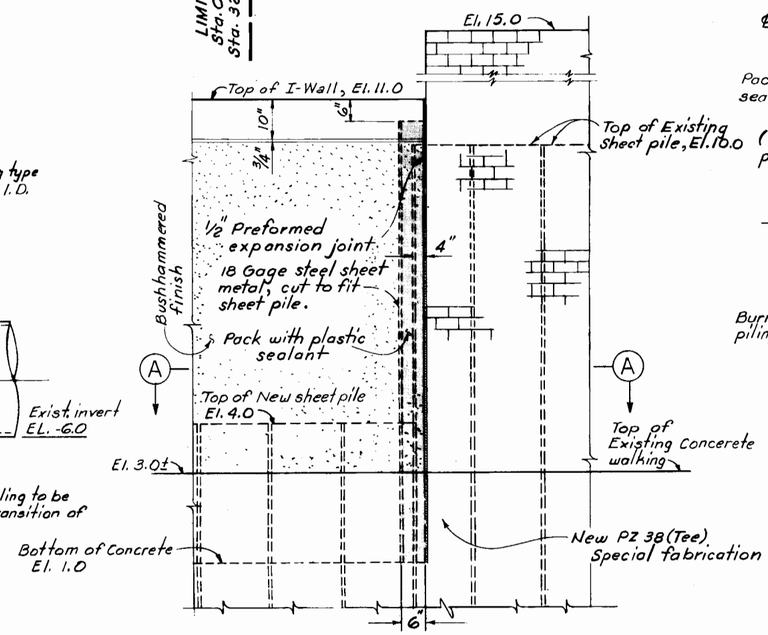
FILE NO. H-2-28169

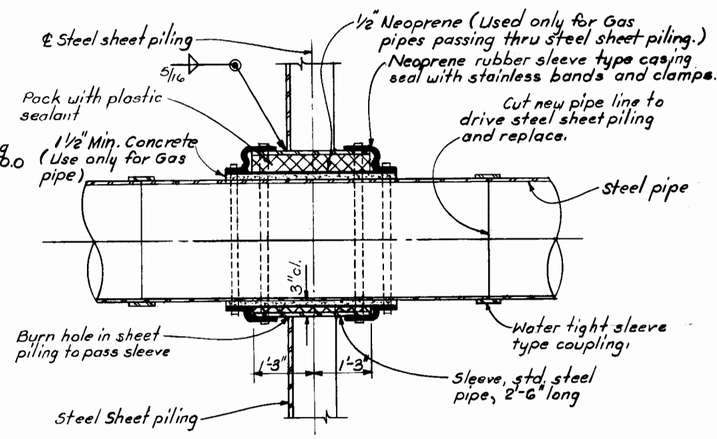
PLATE 11







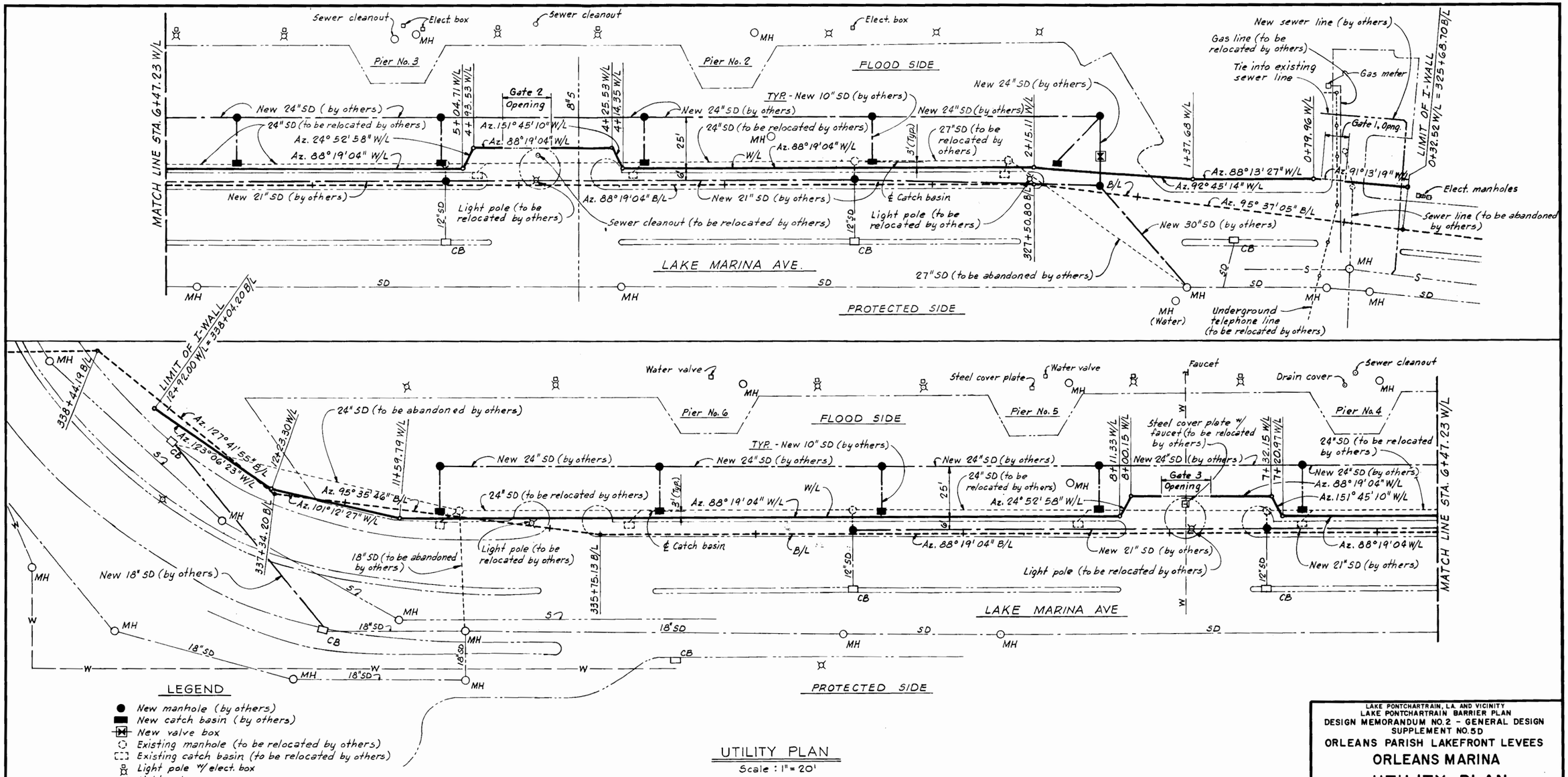




TYPICAL PIPE THRU STEEL SHEET PILING
SCALE: 3/4"=1'-0"

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 – GENERAL DESIGN
SUPPLEMENT NO. 5 D
ORLEANS PARISH LAKEFRONT LEVEES
ORLEANS MARINA
MISCELLANEOUS DETAILS
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JANUARY 1978
FILE NO. H-2-28169

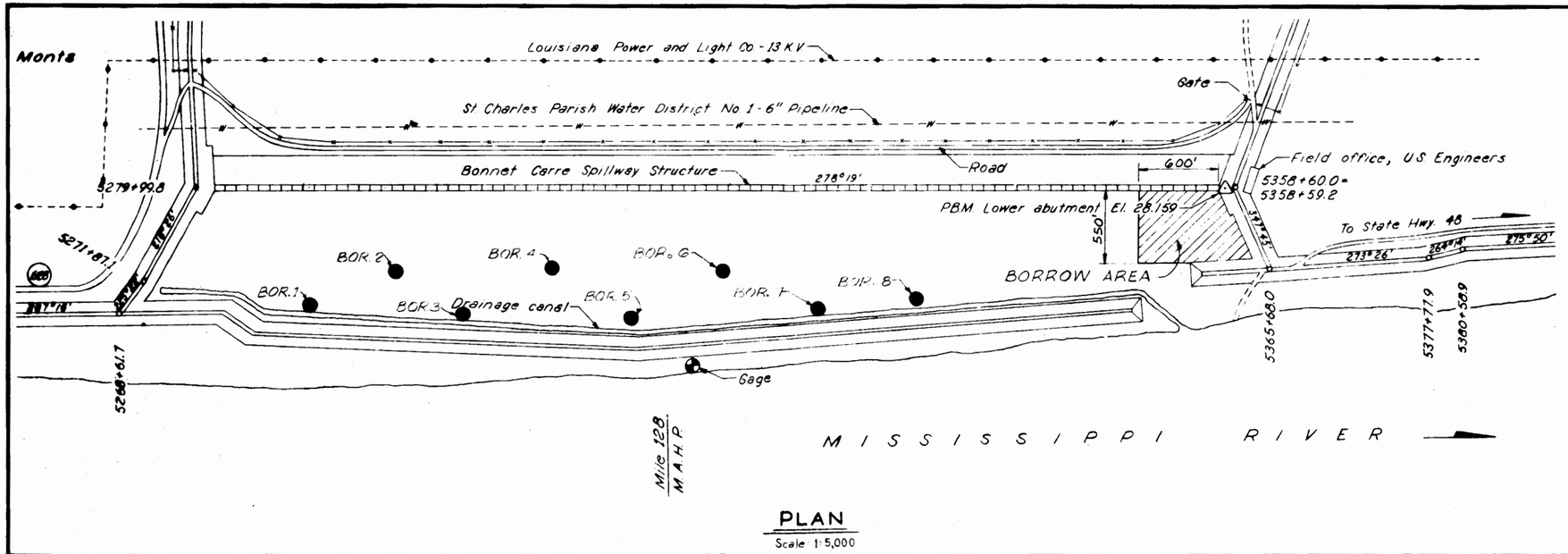
PLATE 12



UTILITY PLAN
Scale : 1" = 20'

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 5D
ORLEANS PARISH LAKEFRONT LEVEES
ORLEANS MARINA
UTILITY PLAN
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JANUARY 1978
FILE NO. H-2-28169

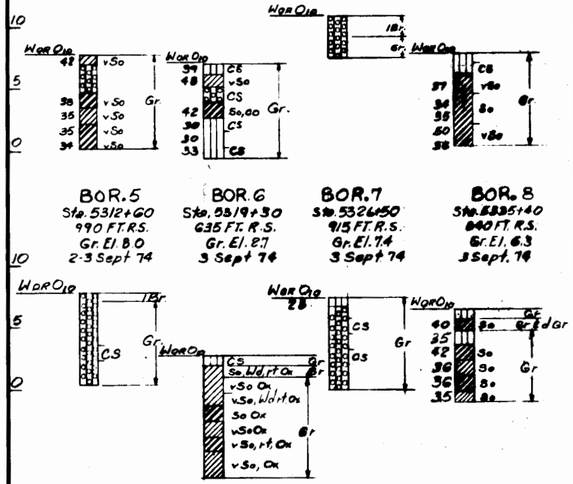
PLATE 13



PLAN

Scale 1:5,000

BOR. 1	BOR. 2	BOR. 3	BOR. 4
Sta. 5288+50	Sta. 5294+90	Sta. 5300+05	Sta. 5306+70
890 FT. R.S.	630 FT. R.S.	950 FT. R.S.	610 FT. R.S.
Gr. El. 7.8	Gr. El. 6.9	Gr. El. 10.8	Gr. El. 7.1
30 Aug. 74	30 Aug. 74	30 Aug. 74	30 Aug. 74

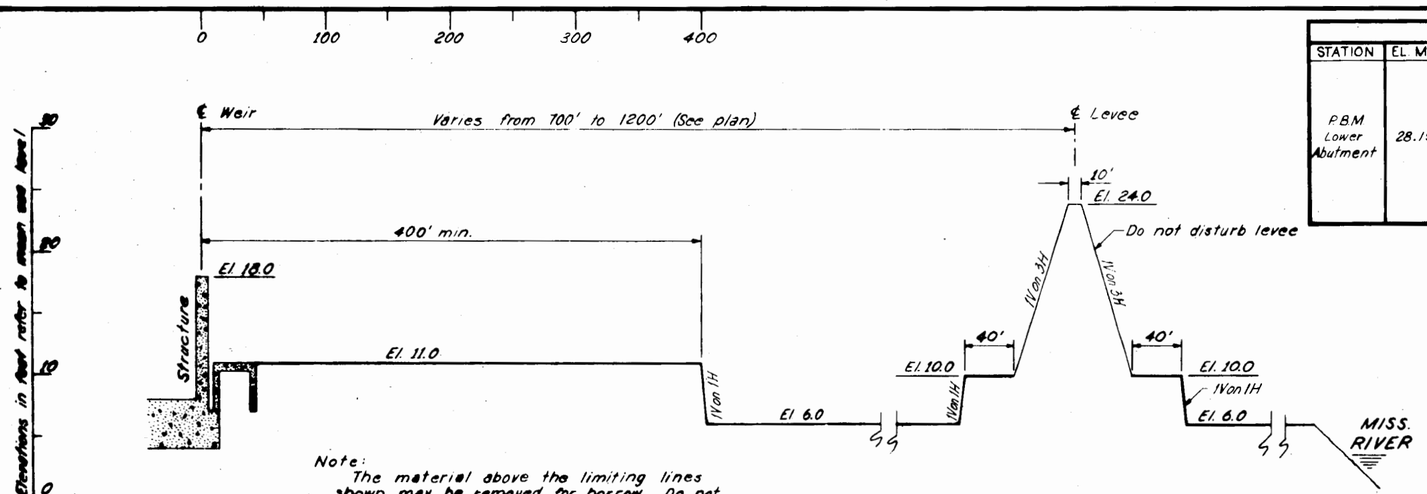


BOR. 5	BOR. 6	BOR. 7	BOR. 8
Sta. 5312+60	Sta. 5319+30	Sta. 5326+50	Sta. 5335+40
990 FT. R.S.	635 FT. R.S.	915 FT. R.S.	840 FT. R.S.
Gr. El. 8.0	Gr. El. 2.7	Gr. El. 7.4	Gr. El. 6.3
2-3 Sept 74	3 Sept 74	3 Sept 74	3 Sept 74

Note:
Elevations are expressed in feet and refer to mean sea level.
Soil samples were taken with a 4" diameter post hole auger.

BORINGS

Vert. Scale: 1"=5'

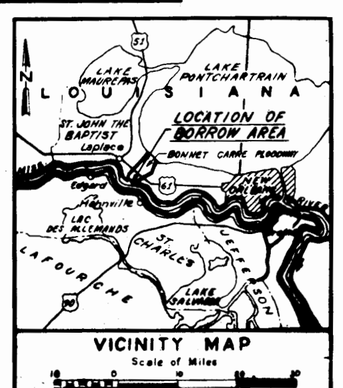


Note:
The material above the limiting lines shown may be removed for borrow. Do not remove any material below these lines.

TYPICAL SECTION FOR BORROW

Scales: Hor. 1"=50'
Vert. 1"=5'

BENCH MARK		
STATION	EL. M.S.L.	LOCATION AND DESCRIPTION
PBM Lower Abutment	28.159	Set on the top and near the center of the east concrete abutment of the spillway weir for the Bonnet Carre Spillway, between two tracks, 56 feet north of the north rail of the south track, 63 feet south of the south rail of the north track.



VICINITY MAP

Scale of Miles

LAKE PONTCHARTRAIN, LA., AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 8D
ORLEANS PARISH LAKEFRONT LEVEES
ORLEANS MARINA
BORROW AREA LOCATION
BONNET CARRE

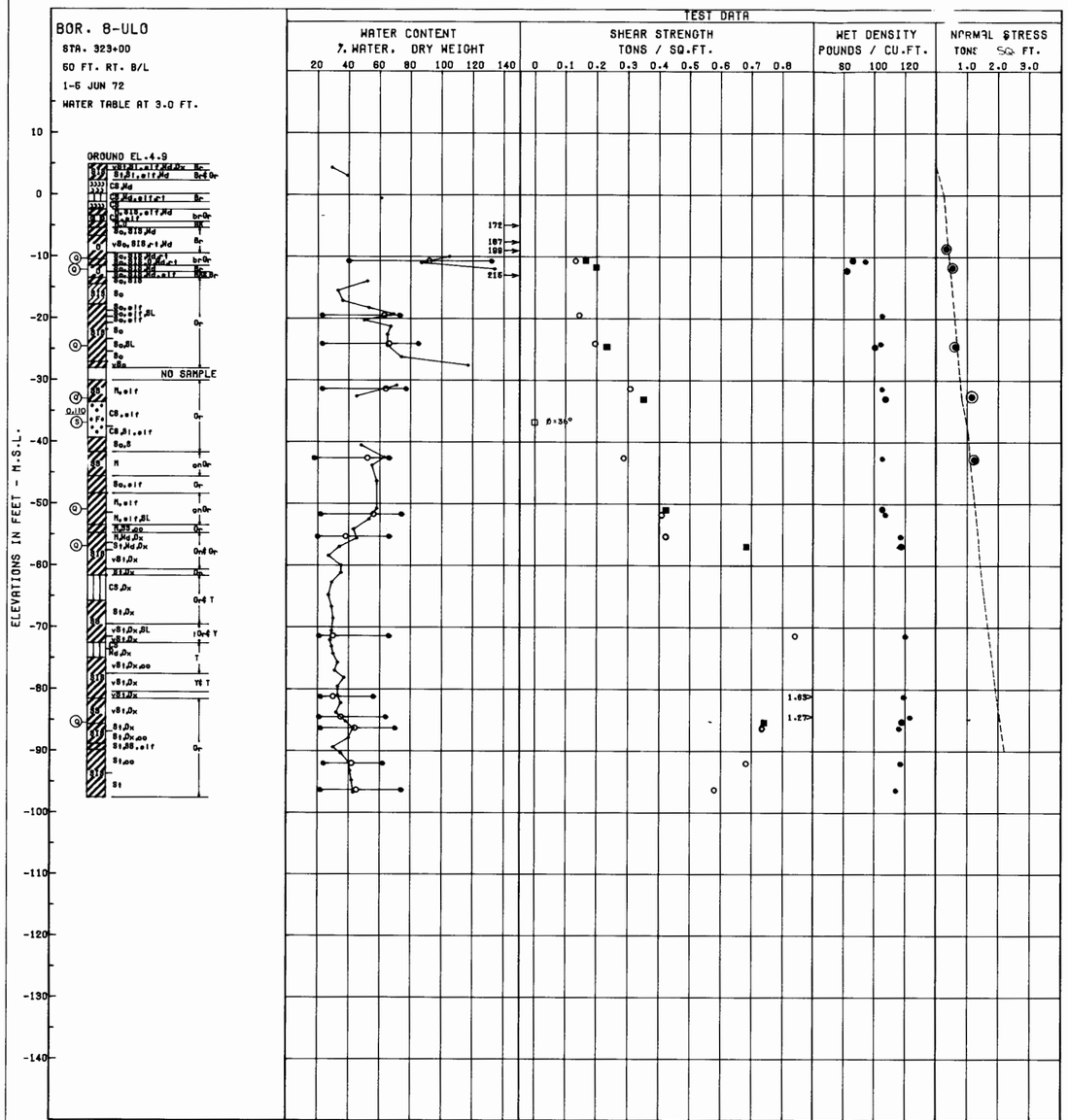
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

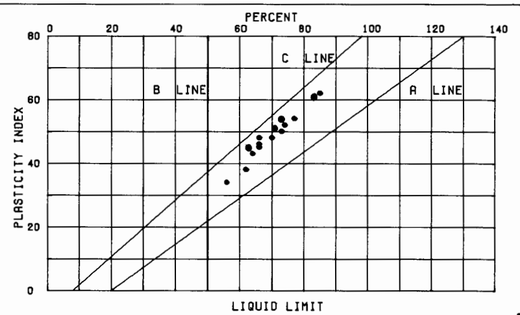
JANUARY 1978

FILE NO. H-2-28169

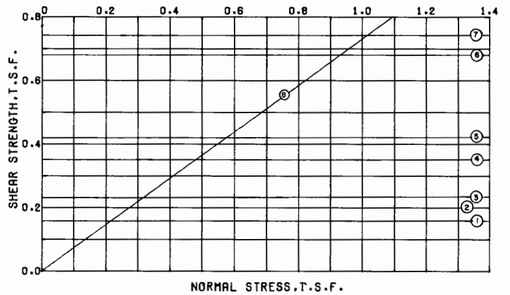
PLATE 14

BOR. 8-ULO
STA. 323+00
50 FT. RT. B/L
1-5 JUN 72
WATER TABLE AT 3.0 FT.



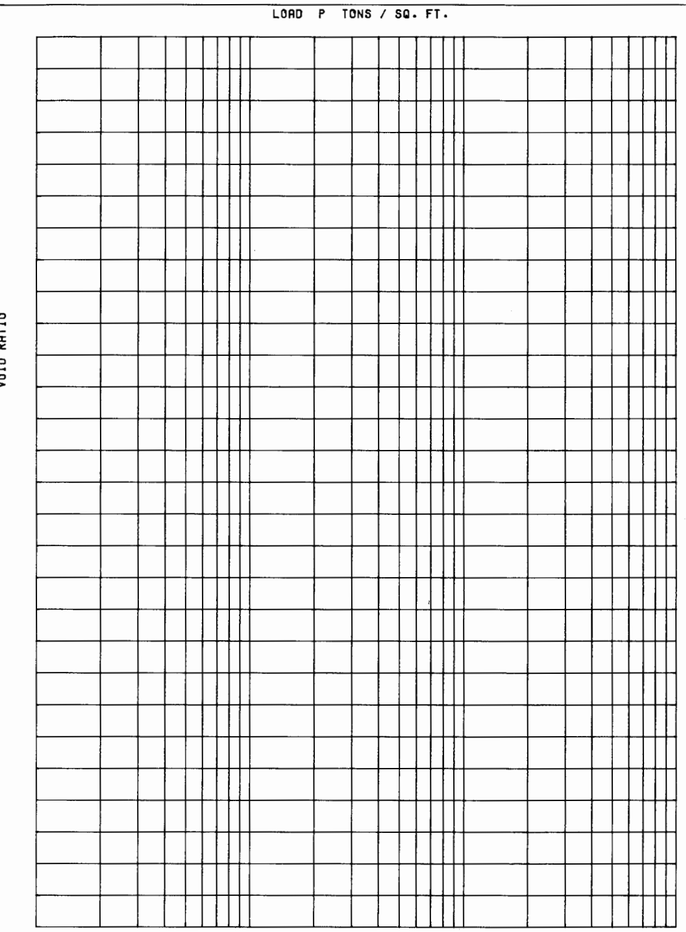


PLASTICITY CHART



SHEAR STRENGTH DATA

ENVELOPE NO.	ENVELOPE EL.	TYPE	STRENGTH Φ	STRENGTH C - TSF	CLASS
1	-10.3'	Q	0	0.16	CH
2	-12.0	Q	0	0.20	CH
3	-24.7	Q	0	0.23	CH
4	-33.0	Q	0	0.35	CH
5	50.9	Q	0	0.42	CH
6	-56.8	Q	0	0.68	CH
7	-85.3	Q	0	0.74	CH
8	-37.0	S	36	0	SM



CONSOLIDATION DATA

- (UC) UNCONFINED COMPRESSION TEST
- (Q) UNCONSOLIDATED - UNDRAINED SHEAR TEST
- (R) CONSOLIDATED - UNDRAINED SHEAR TEST
- (S) CONSOLIDATED - DRAINED SHEAR TEST

BORINGS WERE TAKEN WITH A 6 INCH DIAMETER STEEL TUBE PISTON TYPE SAMPLER

FOR SOIL BORING LEGEND SEE PLATE A

FOR LOCATION OF BORINGS SEE PLATES 2-4

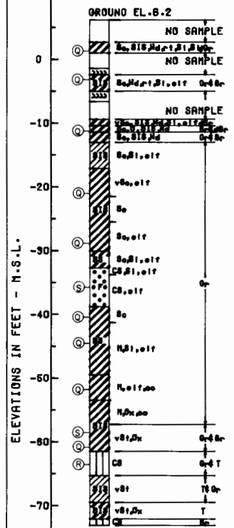
SEE PLATES 18 THRU 24 FOR DETAIL SHEAR STRENGTH AND CONSOLIDATION DATA SHEETS.

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 5D
ORLEANS PARISH LAKEFRONT LEVEES
ORLEANS MARINA
UNDISTURBED BORING DATA
BORING 8-ULO
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JANUARY 1978 FILE NO. H-2-28169

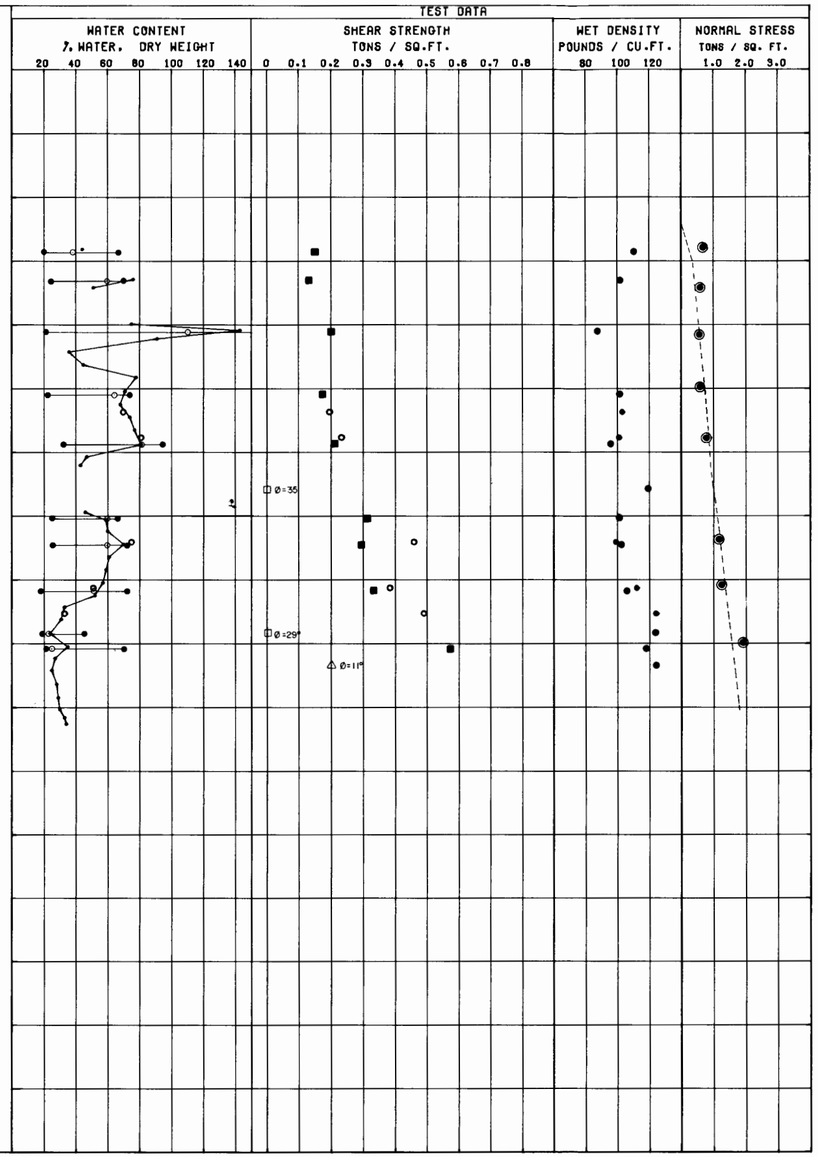
PLATE 15

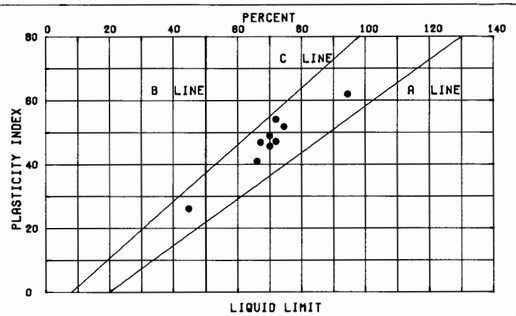
BOR. 1-UIYH
STA. 329+50
60' NORTH OF B/L
27-28 JAN. 71



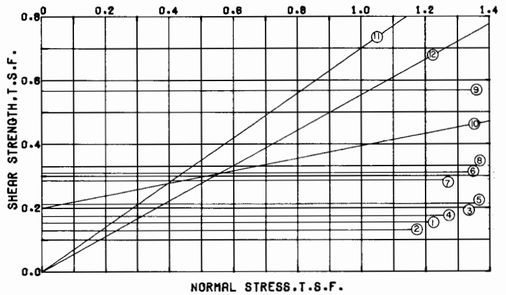
ELEVATIONS IN FEET - M.S.L.

TEST DATA





PLASTICITY CHART



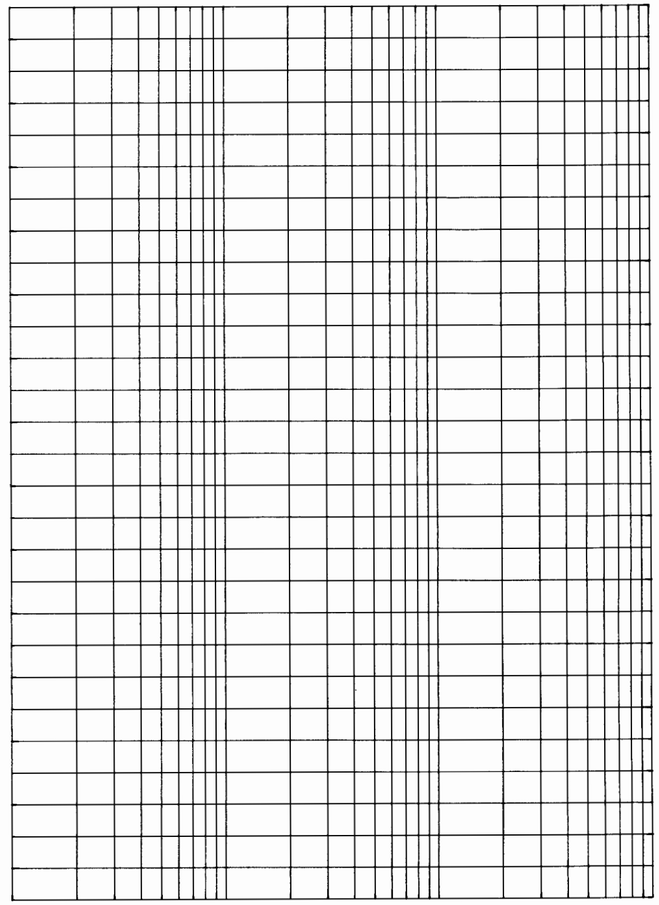
SHEAR STRENGTH DATA

ENVELOPE NO.	ENVELOPE EL.	TYPE	STRENGTH Φ	STRENGTH C - TSF	CLASS
1	1.3	Q	0	0.15	CH
2	-3.1	Q	0	0.13	CH
3	-11.1	Q	0	0.20	CH
4	-21.0	Q	0	0.17	CH
5	-28.7	Q	0	0.21	CH
6	-40.4	Q	0	0.31	CH
7	-44.7	Q	0	0.29	CH
8	-51.8	Q	0	0.33	CH
9	-60.9	Q	0	0.57	CH
10	-63.6	R	11°	0.20	ML
11	-35.8	S	35°	0	SM
12	-58.4	S	29°	0	CL

SEE PLATE FOR DESIGN SHEAR STRENGTH TREND

VOID RATIO

LOAD P TONS / SQ. FT.



CONSOLIDATION DATA

- (UC) UNCONFINED COMPRESSION TEST
■ - (Q) UNCONSOLIDATED - UNDRAINED SHEAR TEST
△ - (R) CONSOLIDATED - UNDRAINED SHEAR TEST
□ - (S) CONSOLIDATED - DRAINED SHEAR TEST

BORINGS WERE TAKEN WITH A 5 INCH DIAMETER STEEL TUBE PISTON TYPE SAMPLER

FOR SOIL BORING LEGEND SEE PLATE A

FOR LOCATION OF BORINGS SEE PLATES 2-4

SEE PLATES 18 THRU 24 FOR DETAIL SHEAR STRENGTH AND CONSOLIDATION DATA SHEETS.

LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 5D
ORLEANS PARISH LAKEFRONT LEVEES
ORLEANS MARINA
UNDISTURBED BORING DATA
BORING 1-UIYH
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JANUARY 1978 FILE NO. H-2-28169

PLATE 16

BOR. 2-UIYH
STA. 329+50
60' NORTH OF B/L
26-27 JAN. 71

GROUND EL. 6.4

NO SAMPLE

NO SAMPLE

NO SAMPLE

ELEVATIONS IN FEET - M.S.L.

TEST DATA

WATER CONTENT
%, WATER, DRY WEIGHT

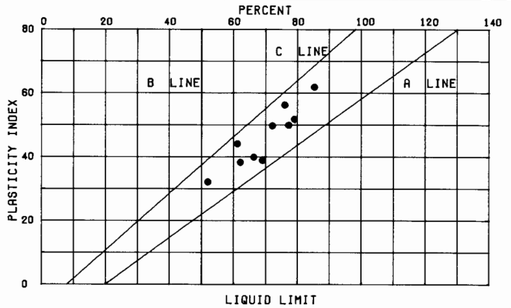
SHEAR STRENGTH
TONS / SQ.FT.

WET DENSITY
POUNDS / CU.FT.

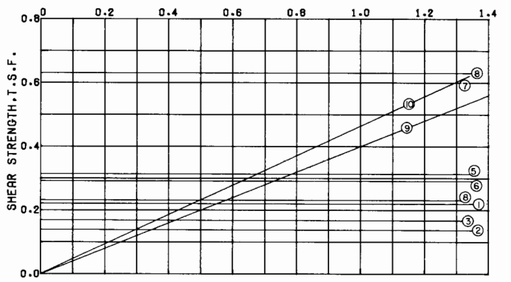
NORMAL STRESS
TONS / SQ. FT.

Ø = 22

Ø = 25



PLASTICITY CHART



SHEAR STRENGTH DATA

ENVELOPE NO.	EL.	TYPE	STRENGTH Φ	STRENGTH C - TSF	CLASS
1	0.0	Q	0	0.22	CH
2	-2.8	Q	0	0.14	CH
3	-24.6	Q	0	0.17	CH
4	-31.7	Q	0	0.23	CH
5	-42.8	Q	0	0.31	CH
6	-52.6	Q	0	0.29	CH
7	-62.8	Q	0	0.60	CH
8	-70.7	Q	0	0.63	CH
9	-20.7	S	22	0	CH
10	-47.8	S	25	0	CH

SEE PLATE FOR DESIGN SHEAR STRENGTH TREND

LOAD P TONS / SQ. FT.

VOID RATIO

CONSOLIDATION DATA

- (UC) UNCONFINED COMPRESSION TEST
■ - (Q) UNCONSOLIDATED - UNDRAINED SHEAR TEST
- (R) CONSOLIDATED - UNDRAINED SHEAR TEST
□ - (S) CONSOLIDATED - DRAINED SHEAR TEST

BORINGS WERE TAKEN WITH A 6 INCH DIAMETER STEEL TUBE PISTON TYPE SAMPLER

FOR SOIL BORING LEGEND SEE PLATE A

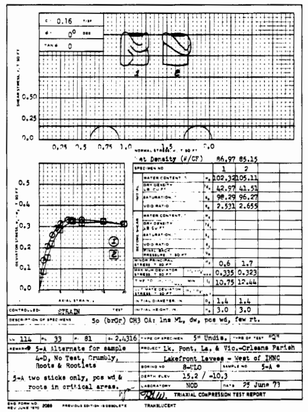
FOR LOCATION OF BORINGS SEE PLATES 2-4

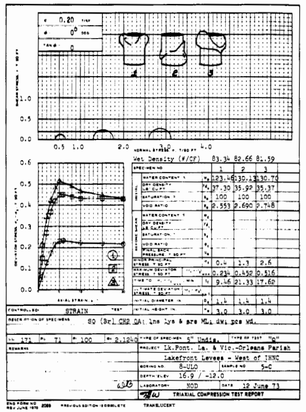
SEE PLATES 18 THRU 24 FOR DETAIL SHEAR STRENGTH AND CONSOLIDATION DATA SHEETS.

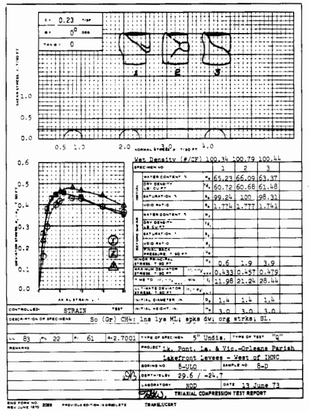
LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 5D
ORLEANS PARISH LAKEFRONT LEVEES
ORLEANS MARINA
UNDISTURBED BORING DATA
BORING 2-UIYH
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

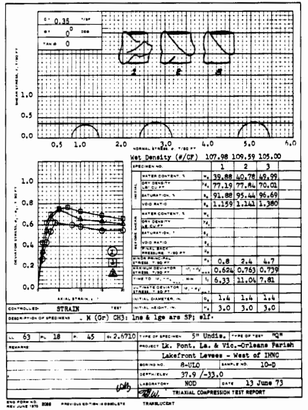
JANUARY 1978 FILE NO. H-2-28169

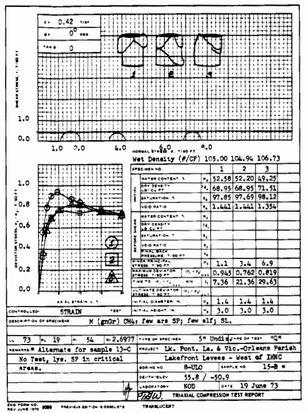
PLATE 17

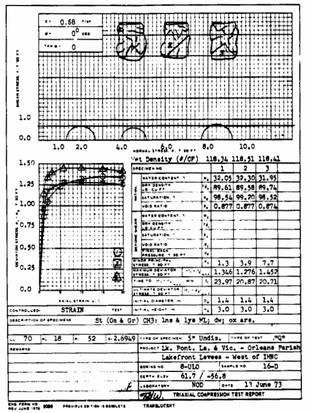


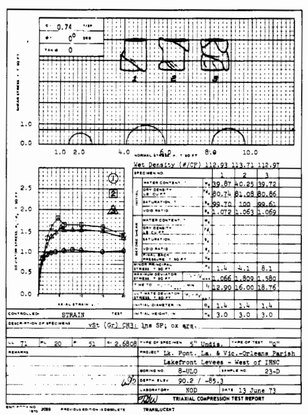


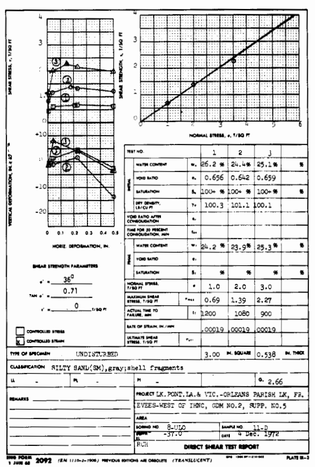












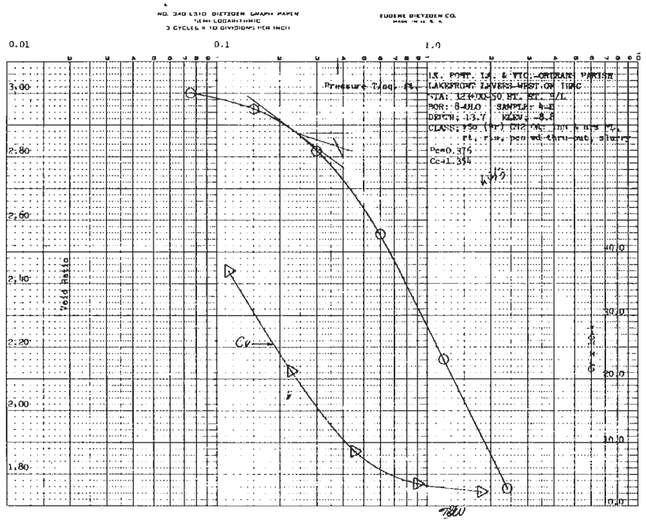
LAKE PONTCHARTRAIN, LA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO.2 - GENERAL DESIGN
SUPPLEMENT NO. 5D
ORLEANS PARISH LAKEFRONT LEVEES
ORLEANS MARINA

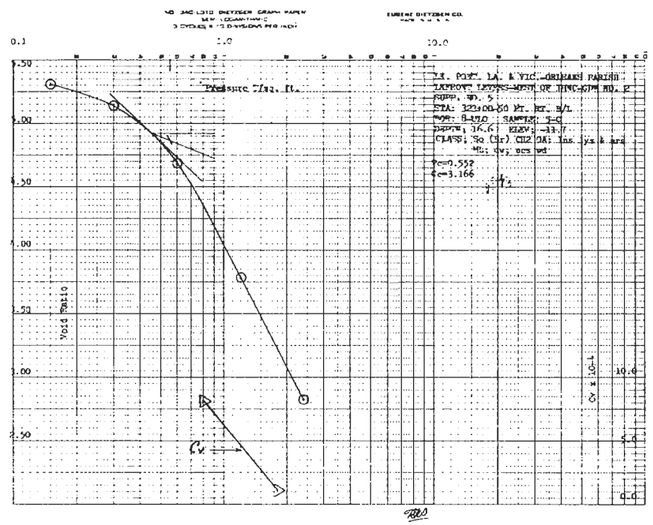
DETAIL SHEAR STRENGTH DATA
BORING 8-ULO

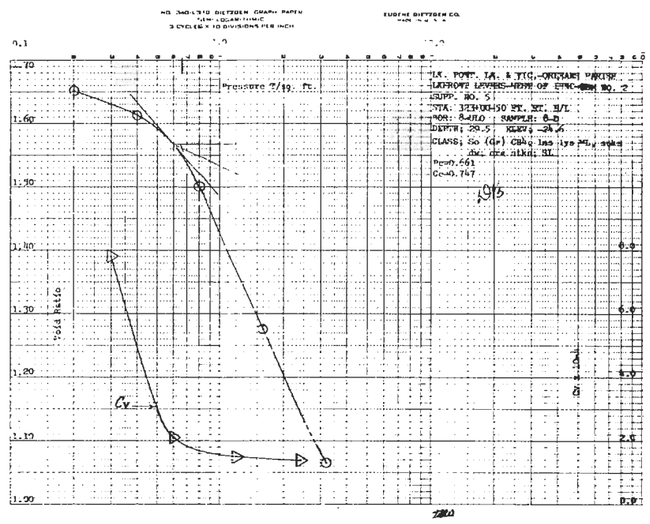
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

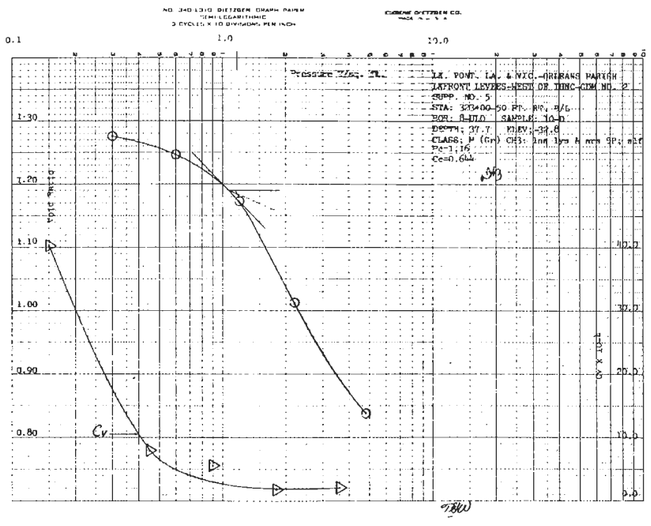
JANUARY 1978 FILE NO. H-2-28169

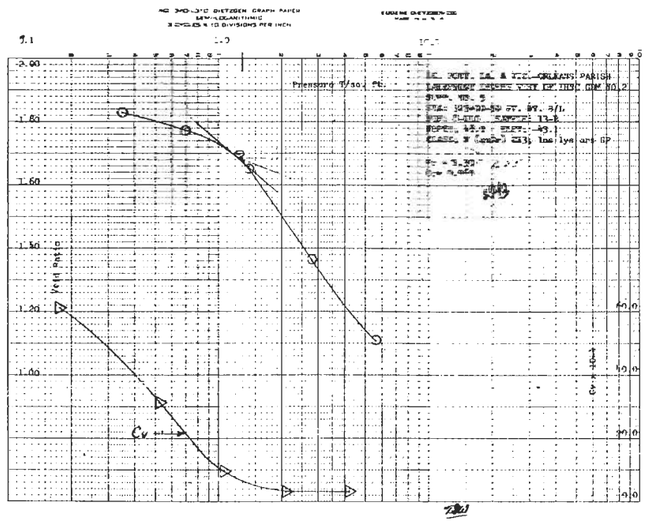
PLATE 18











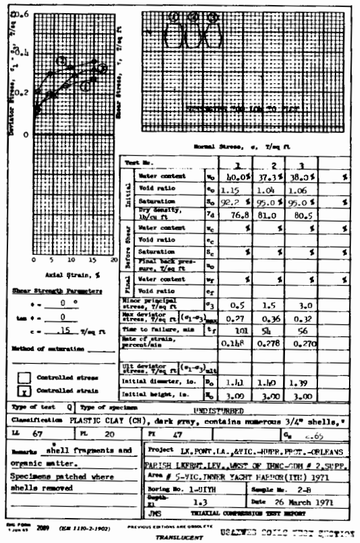
NOTE : SAMPLE 15c, BORING 8 ULO
(CONSOLIDATION TEST)
SHOWN ON PLATE 24

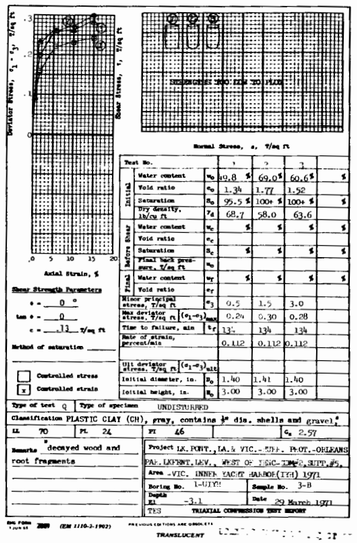
LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 – GENERAL DESIGN
SUPPLEMENT NO. 5D
ORLEANS PARISH LAKEFRONT LEVEES
ORLEANS MARINA

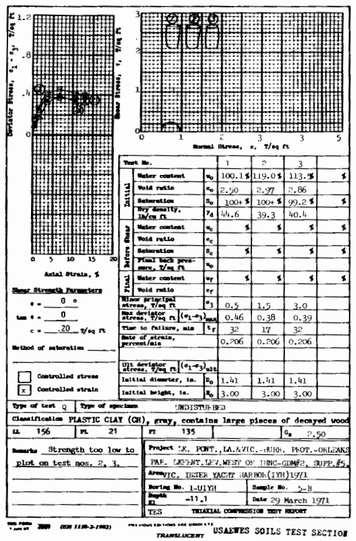
DETAIL SHEAR STRENGTH DATA BORING 8-ULO

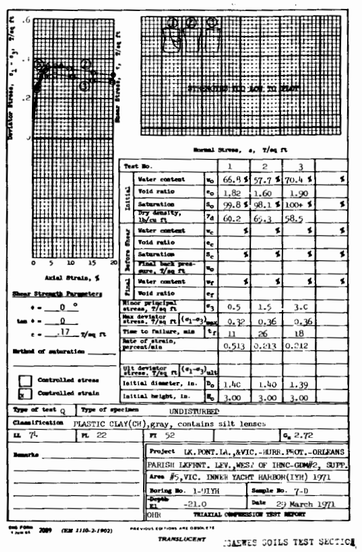
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

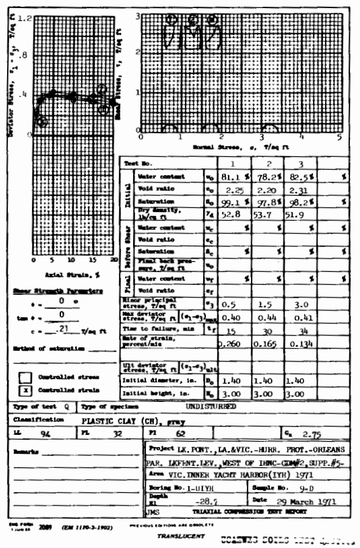
JANUARY 1978 FILE NO. H-2-28169

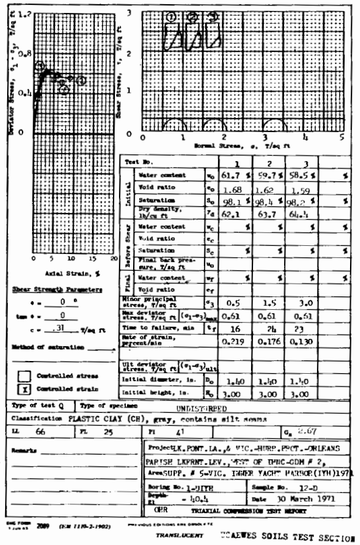


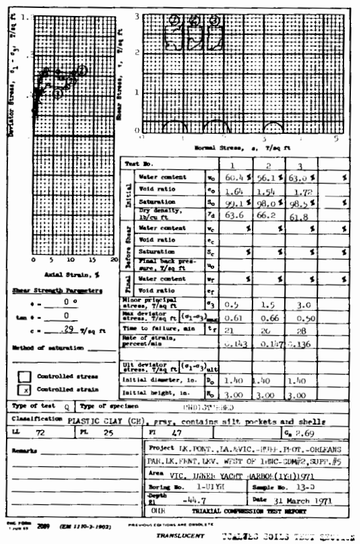


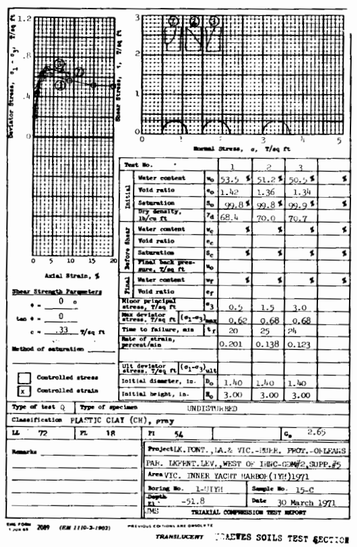


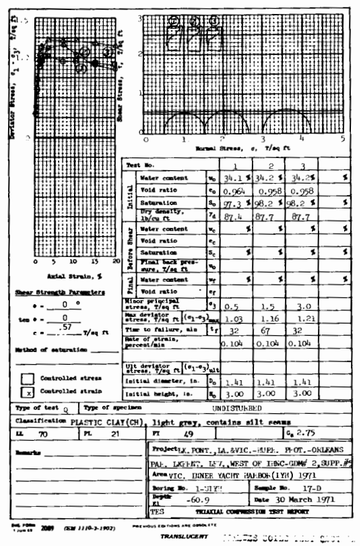












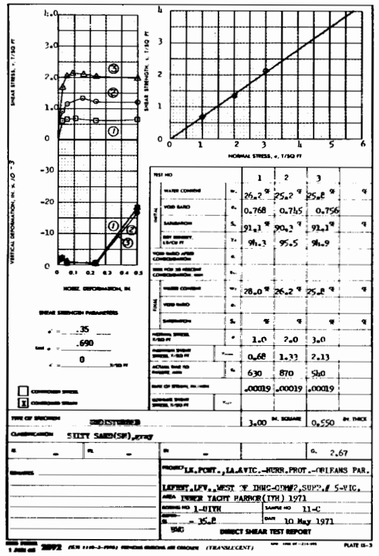
LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 5D
ORLEANS PARISH LAKEFRONT LEVEES
ORLEANS MARINA

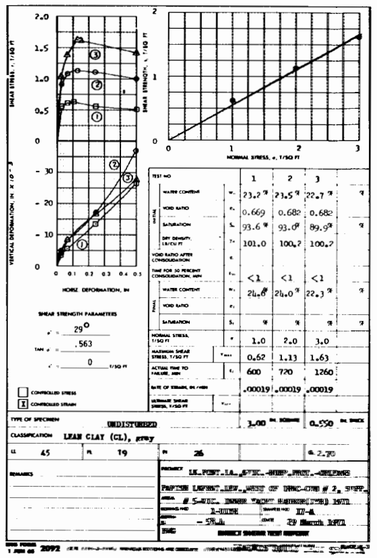
DETAIL SHEAR STRENGTH DATA
BORING 1-UIYH

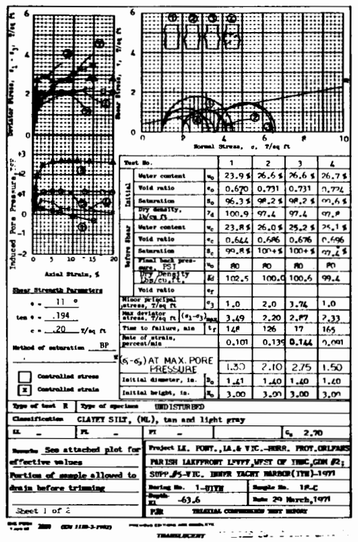
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JANUARY 1978 FILE NO. H-2-28169

PLATE 20







Test No.		1	2	3	4
Initial	Water content w_o	23.9 %	26.6 %	26.6 %	26.7 %
	Void ratio e_o	0.670	0.731	0.731	0.734
	Saturation S_o	96.3 %	98.2 %	98.2 %	99.6 %
	Dry density, lb/cu ft γ_d	100.9	97.4	97.4	97.2
Before Shear	Water content w_c	23.8 %	26.0 %	25.2 %	24.1 %
	Void ratio e_c	0.661	0.696	0.676	0.656
	Saturation S_c	96.8 %	100+ %	100+ %	99.4 %
	Final back pressure, psi u_c	80	80	80	80
	Dry density, lb/cu ft γ_c	102.5	100.0	100.6	99.4
	Void ratio e_f				
Minor principal stress, T/sq ft	σ_3	1.0	2.0	3.74	1.0
Max deviator stress, T/sq ft	$(\sigma_1-\sigma_3)_{max}$	3.49	2.20	2.87	2.33
Time to failure, min	t_f	148	126	17	165
Rate of strain, percent/min		0.101	0.139	0.144	0.091
$(\sigma_1-\sigma_3)$ AT MAX. PORE PRESSURE		1.30	2.10	2.75	1.50
Initial diameter, in.	D_o	1.41	1.40	1.40	1.40
Initial height, in.	H_o	3.00	3.01	3.00	3.01

Type of test: R | Type of specimen: UNDISTURBED

Classification: CLAYEY SILT, (ML), tan and light gray

LL – | PL – | PI – | G_s 2.70

Remarks: See attached plot for effective values. Portions of sample allowed to drain before trimming.

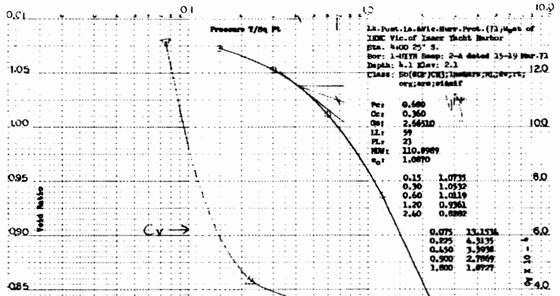
Project: LK. PONT., LA. & VIC.--HURR. PROT.-ORLEANS PARISH LAKEFRONT LEVEE, WEST OF HNC, GEN #2; SHEET #5-VIC. INNER YACHT HARBOR (ITH)-1971

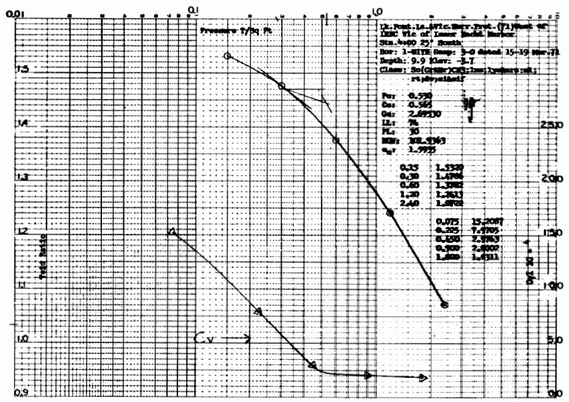
Boring No. 1-UIYH | Sample No. 18-C | Depth: -63.6 | Date: 29 March, 1971

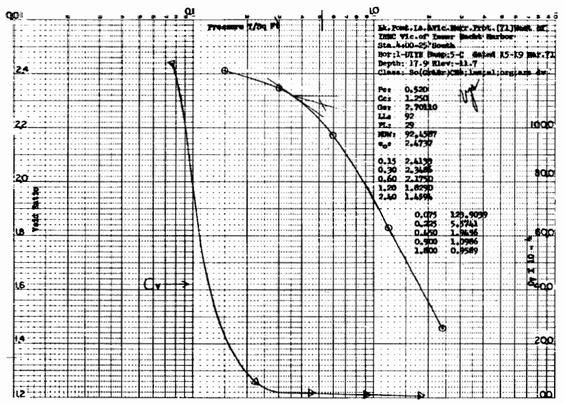
File: TRIAXIAL CONSOLIDATED QUICK REPORT

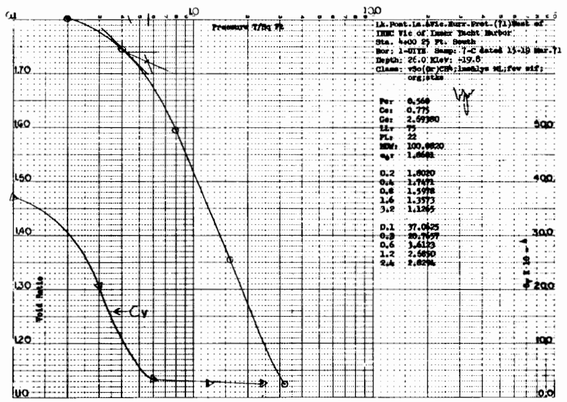
Sheet 1 of 2

TRANSLUCENT





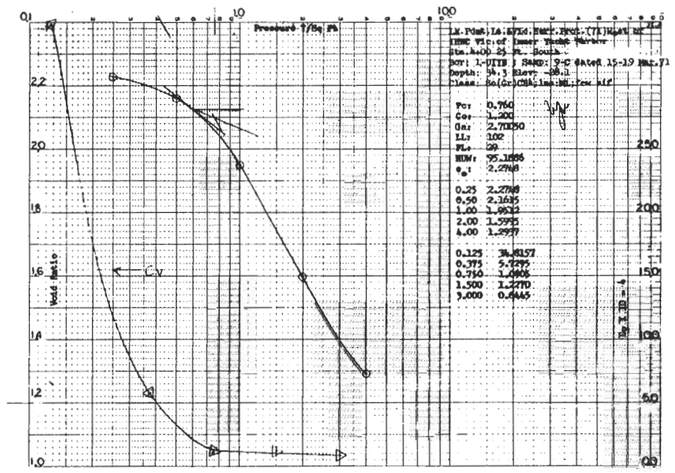


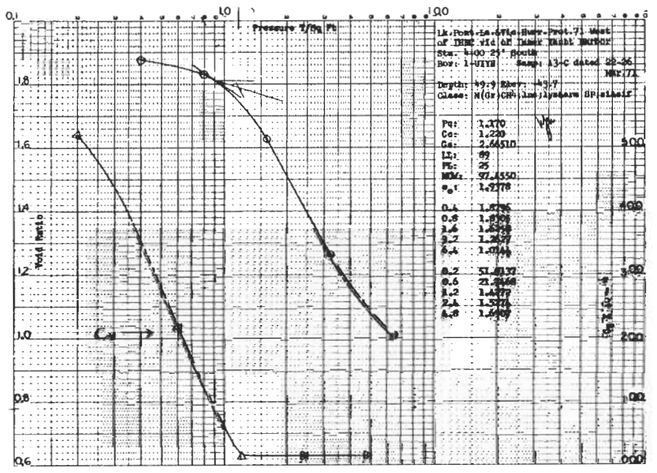


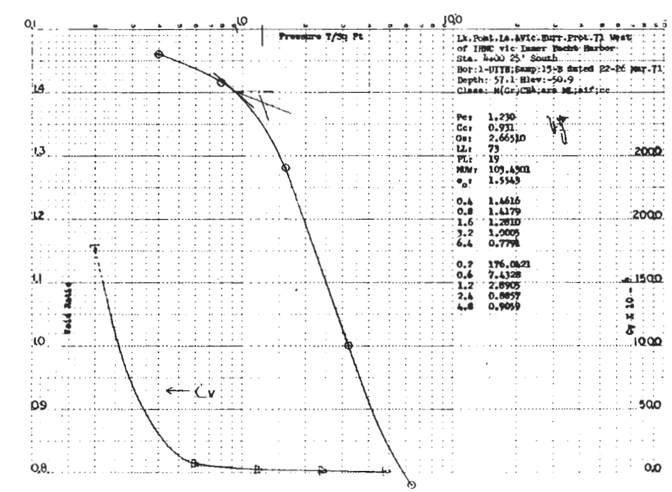
LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 5D
ORLEANS PARISH LAKEFRONT LEVEES
ORLEANS MARINA
DETAIL SHEAR STRENGTH DATA
BORING 1-UIYH
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

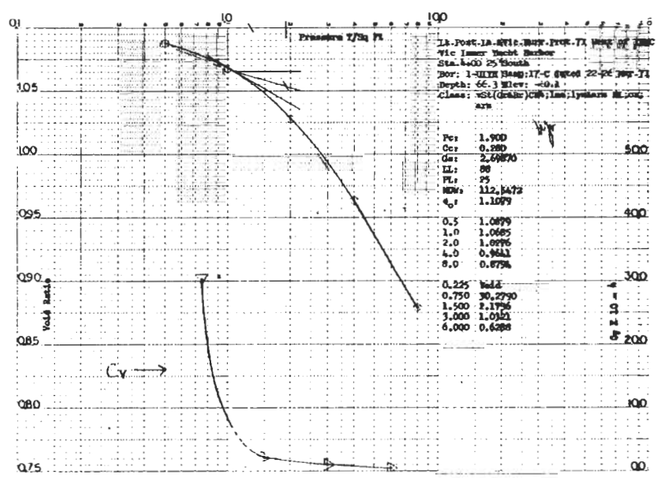
JANUARY 1978 FILE NO. H-2-28169

PLATE 21



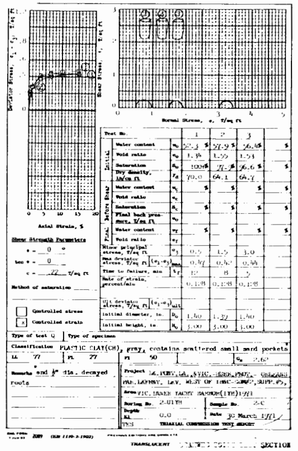


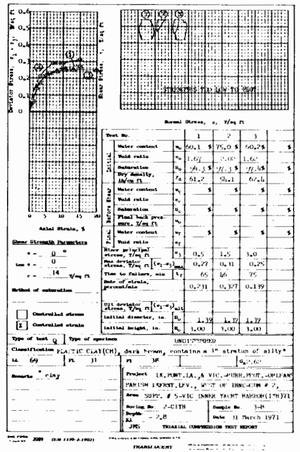


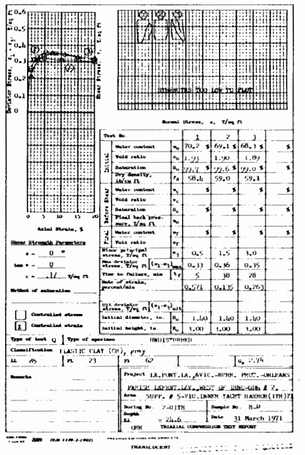


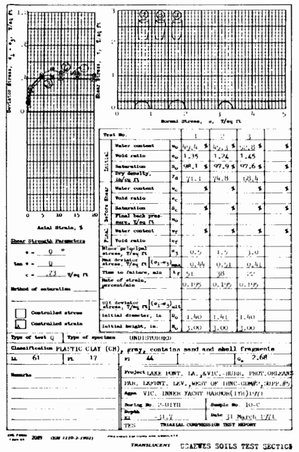
LAKE PONTCHARTRAIN, LA. AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 5D
ORLEANS PARISH LAKEFRONT LEVEES
ORLEANS MARINA
DETAIL SHEAR STRENGTH DATA
BORING 1-UIYH
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JANUARY 1978 FILE NO. H-2-28169

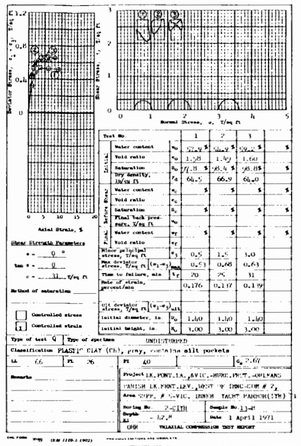
PLATE 22

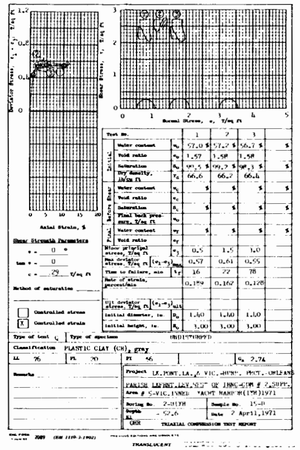


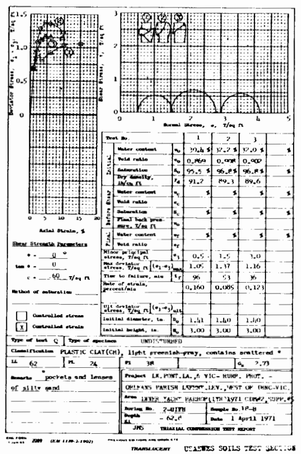


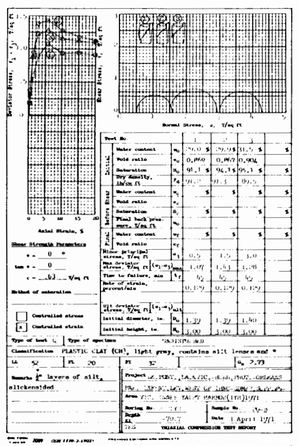


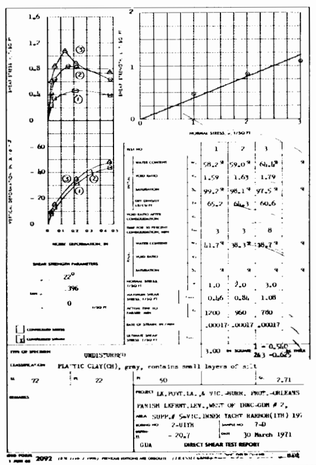


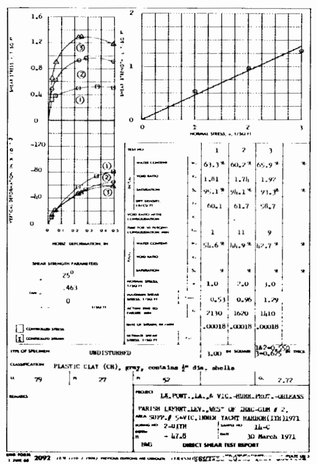


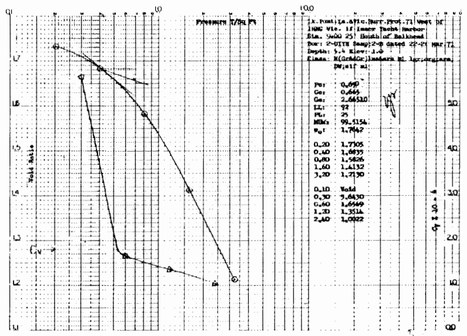












LAKE PONTCHARTRAIN, LA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO.2 - GENERAL DESIGN
SUPPLEMENT NO.5D

ORLEANS PARISH LAKEFRONT LEVEES

ORLEANS MARINA

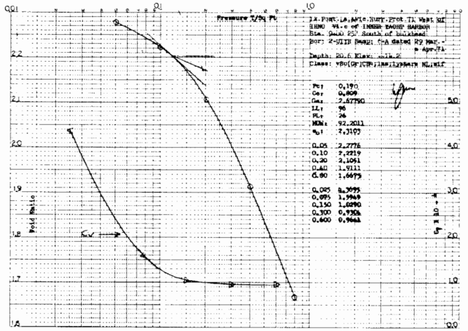
DETAIL SHEAR STRENGTH DATA
BORING 2-UIYH

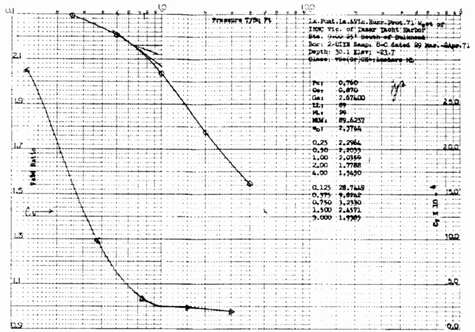
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

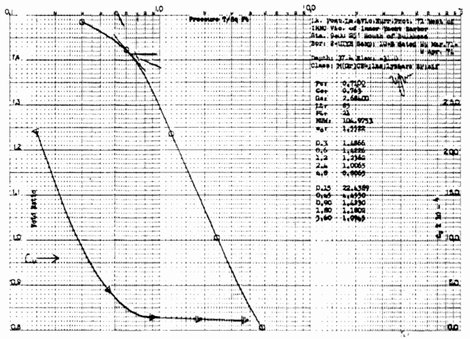
JANUARY 1978

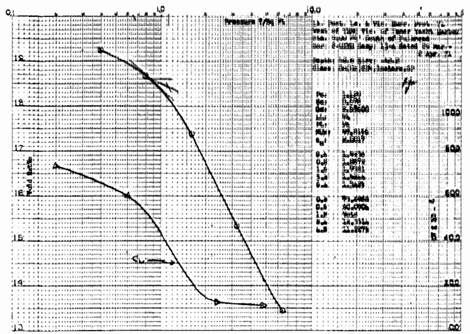
FILE NO H-2-28169

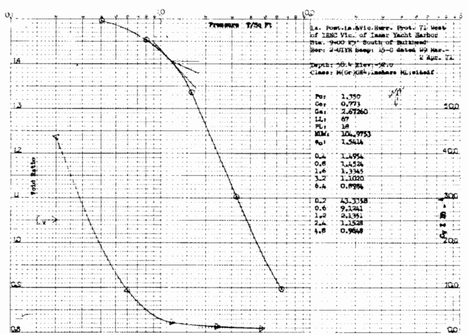
PLATE 23

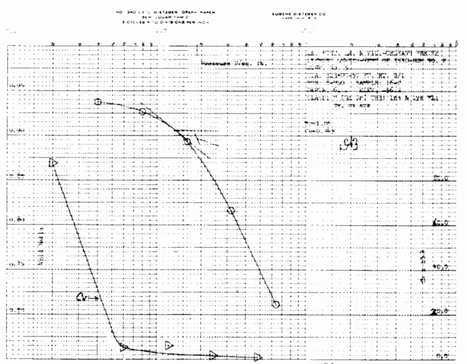


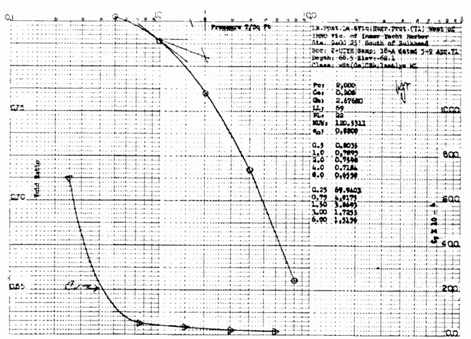






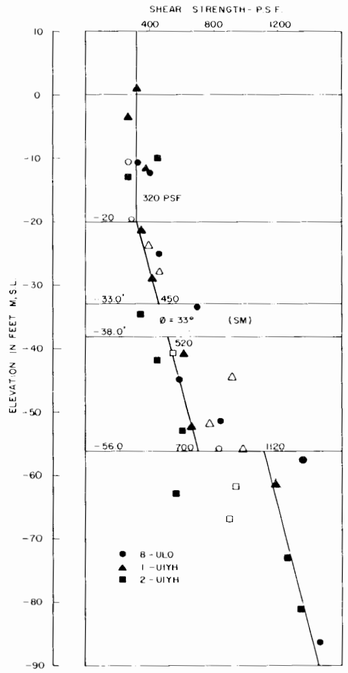




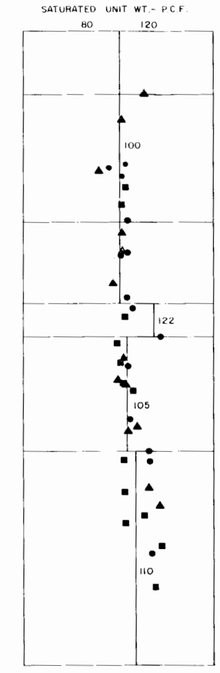


LAKE PONTCHARTRAIN, LA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO.2 - GENERAL DESIGN
SUPPLEMENT NO.50
ORLEANS PARISH LAKEFRONT LEVEES
ORLEANS MARINA
DETAIL SHEAR STRENGTH DATA
BORING 2-UIYH
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
JANUARY 1978
FILE NO H-2-28169

PLATE 24

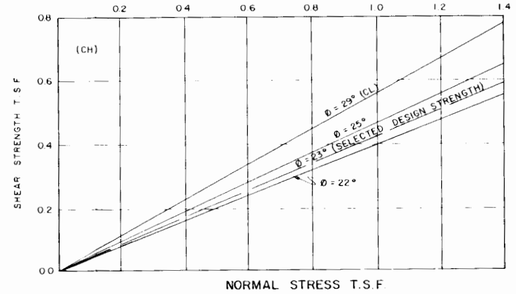


(Q) SHEAR STRENGTHS

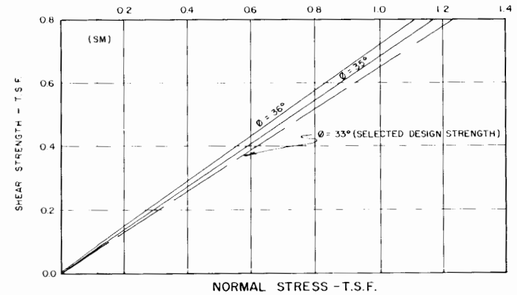


DENSITIES

NOTE: CLOSED SYMBOLS INDICATE UNCONSOLIDATED UNDRAINED TRIAXIAL TEST, OPEN SYMBOLS INDICATE UNCONFINED COMPRESSION TESTS



(S) SHEAR STRENGTHS



NOTE:
SEE PLATES 18 THRU 24 FOR RESULTS OF SHEAR STRENGTH TESTS

LAKE PONTCHARTRAIN, LA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO.2 - GENERAL DESIGN
SUPPLEMENT NO.5D
ORLEANS PARISH LAKEFRONT LEVEES
ORLEANS MARINA

DESIGN SHEAR STRENGTHS

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

JANUARY 1978 FILE NO. H-2-28169

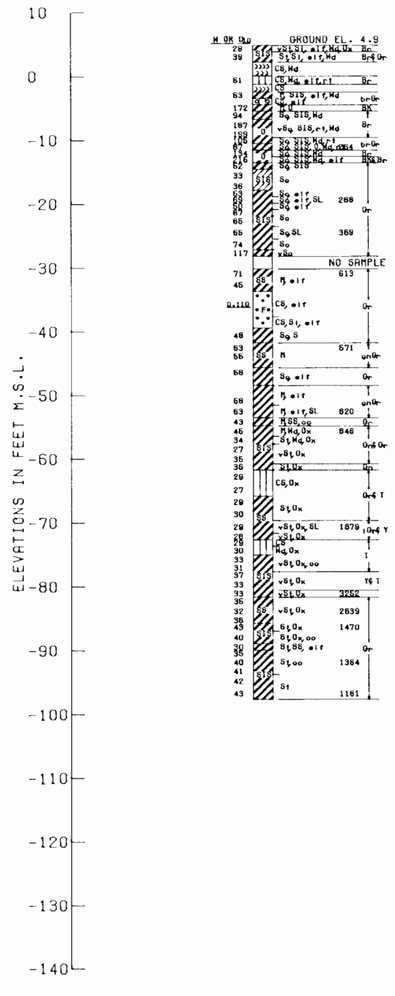
BOR. 8-ULO

STA. 323+00

60 FT. RT. B/L

1-6 JUN 72

WATER TABLE AT 3.0 FT.

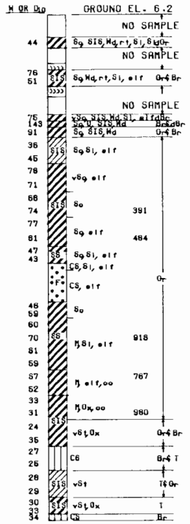


BOR. 1-UIYH

STA. 329+50

60 FT. NORTH OF B.L.

27-28 JAN. 71

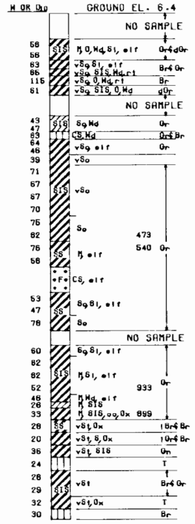


BOR. 2-UIYH

STA. 334+50

60 FT. NORTH OF B.L.

26-27 JAN. 71

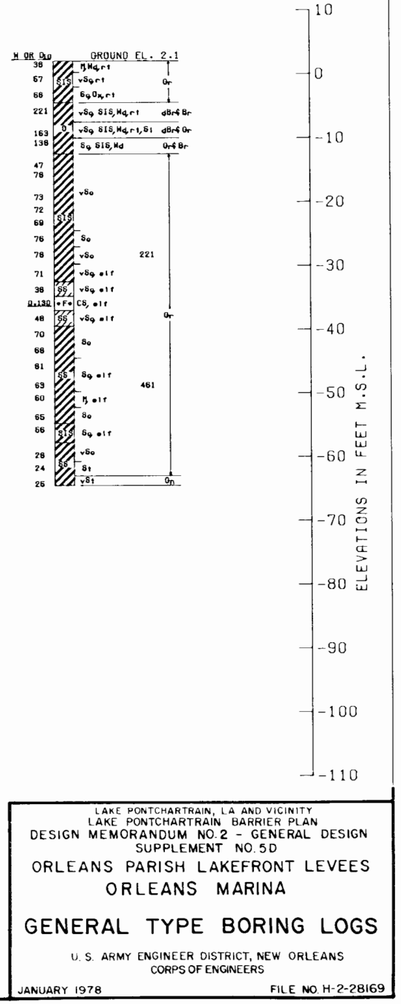


BOR. 15-LO

STA. 341+00

100 FT. LEFT OF B.L.

20 SEP 72



NOTES:

GENERAL TYPE BORINGS OBTAINED WITH 1-7/8 IN. I.D. X 29 INCH SAMPLER. UNDISTURBED BORINGS INDICATED BY LETTER "U" TAKEN WITH 5 IN. I.D. X 4 FOOT PISTON TYPE SAMPLER.

LAKE PONTCHARTRAIN, LA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO.2 - GENERAL DESIGN
SUPPLEMENT NO.5D
ORLEANS PARISH LAKEFRONT LEVEES
ORLEANS MARINA

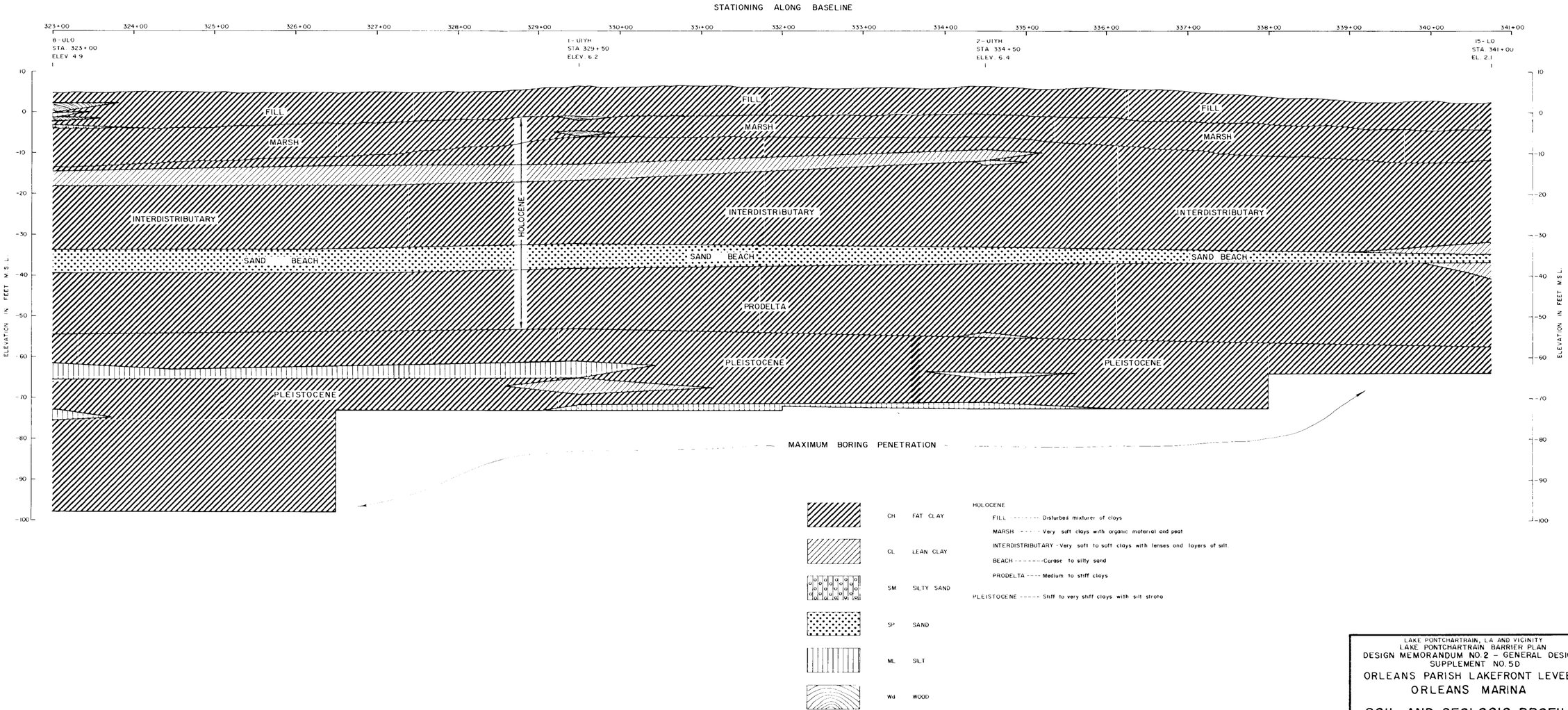
GENERAL TYPE BORING LOGS

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

JANUARY 1978

FILE NO. H-2-28169

PLATE 26



LAKE PONTCHARTRAIN, LA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO.2 - GENERAL DESIGN
SUPPLEMENT NO.5D

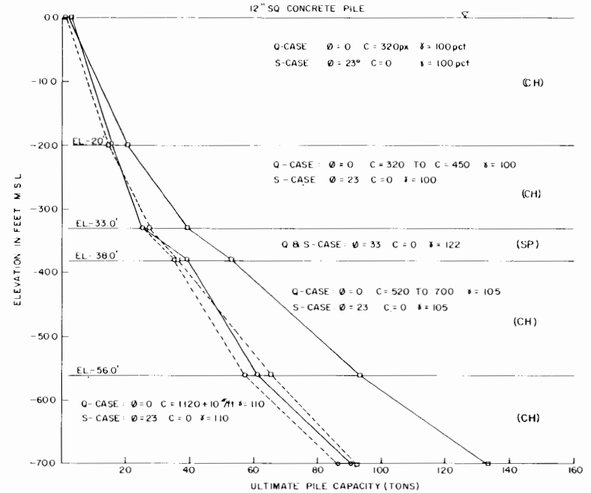
ORLEANS PARISH LAKEFRONT LEVEES
ORLEANS MARINA

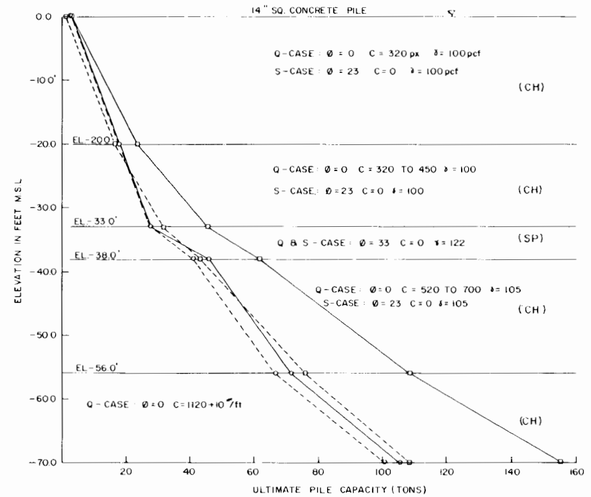
SOIL AND GEOLOGIC PROFILE

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

JANUARY 1978 FILE NO. H-2-28169

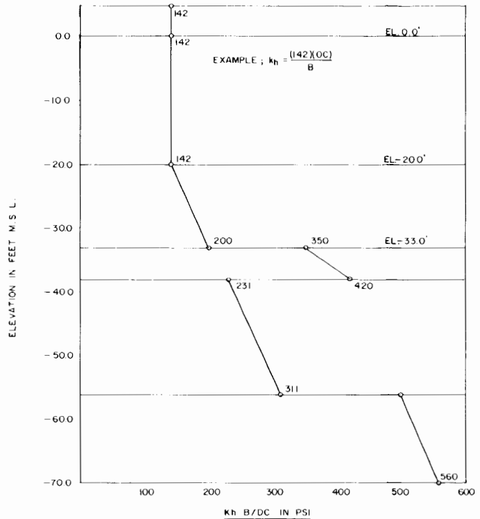
PLATE 27

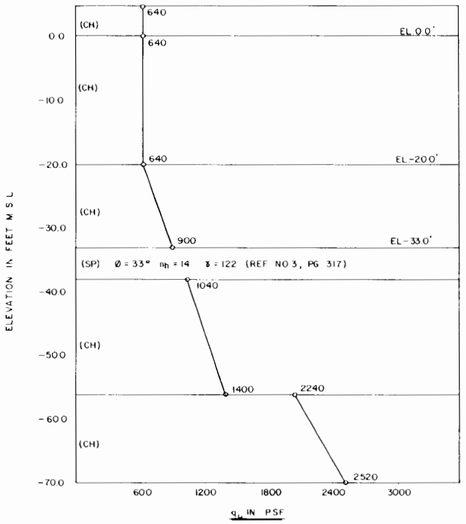




LEGEND
□ - Q - CASE
○ - S - CASE
——— COMPRESSION (K = 1.0)
– – – – – TENSION (K = 0.7)

NOTE:
ALLOWABLE CAPACITIES SHOULD BE DETERMINED INCORPORATING A FACTOR OF SAFETY EQUAL TO 2.0





MODULUS HORIZONTAL OF SUBGRADE REACTION
FOR LATERALLY LOADED PILES

NOTATION
1. k_h (pounds in^{-3}) = Modulus of horizontal subgrade reaction
2. k_1 (pounds in^{-3} = Modulus of subgrade reaction of square or circular plate
3. B_1 (in) = Width or diameter of load test plate
4. K_1 (pounds in^{-2}) = $k_1 B_1$
5. q_u (pounds ft^{-2}) = Unconfined compressive strength of soil
6. B (in) = Width of pile measured at right angles to direction of displacement
7. D = Reduction factor for effect of group action
8. C = Reduction factor cycle loading
9. α = Factor which is a function of the unconfined compressive strength of the supporting soil and of the pile material
10. n_h(pounds in^{-3}) = Coefficient of horizontal subgrade reaction
11. Z_2 (in.) = Depth below top of stratum
12. Z_1 (in.) = Equivalent height of submered sond above top of stratum
13. Z (in.) = Depth below equivalent ground surface ($Z = Z_1 + Z_2$)

EQUATIONS:

FOR COEHESIVE SOILS

$$k_h = \frac{\alpha k_1}{B} \text{ [from Brom (1964)]}$$

where $\alpha = 0.4$ (varies from 0.32 to 0.52)

$$K_1 = k_1 B_1 = 80\, q_u$$

and $$K_1 = \frac{80\, q_u}{144} = 0.5556\, q_u$$

substituting : $$k_h = \frac{(0.4)(0.5556)}{B}$$

OR

$$k_h = \frac{0.2222 q_u}{B}$$

to which reduction factor and group effects are applied as follows

$$k_h = \frac{(0.2222\, q_u)(D)(C)}{B}$$

where C = 0.3 for cyclic loading and 1.0 for inital loading
D = Group effect reduction factor (see table 1)

FOR COHESIONLESS SOILS

When n_h is assumed constant with depth =

$$k_h = n_h \frac{Z}{B} \text{ [from Broms (1964) and Terzaghi (1955)]}$$

to which the reduction factor for cyclic loading and group effects are applied as follows : $k_h = n_h \frac{Z}{B} (C)(D)$

Where C = 0.3 for cyclic loading and 1.0 for initial loading
D = group effect reduction factor (see table 1)

REFERENCES

1. Brom, B.B., "Lateral Resistance of Piles in Cohesive Soils" Journal of Soil Mechanics and Foundations Division, ASCE, Vol. 90, No. SM2, March 1964
2. Broms, B.B., "Lateral Resistance of Piles in Cohesionless Soils" Journal of Soil Mechanics and Foundations Division, ASCE, Vol. 90, SM3, Pt. 1, May 1974
3. Terzaghi, Karl, "Evaluation of Coefficient of Subgrade Reaction," Geetechnique, Vol. 5, 1955
4. Davisson, M.T., "Lateral Load Capacity of Piles", Highway Research Record, No. 333, 1970
5. Teng, Wayne C., "Foundation Design", Prentice – Hall
6. Bowles, Joseph E., "Analytical and Computer Methods in Foundation Engineering", Mc Graw – Hill, 1974

TABLE 1

D	PILE SPACING IN DIRECTION OF LOADING
1.00	8B
0.85	7B
0.70	6B
0.55	5B
0.40	4B
0.25	3B

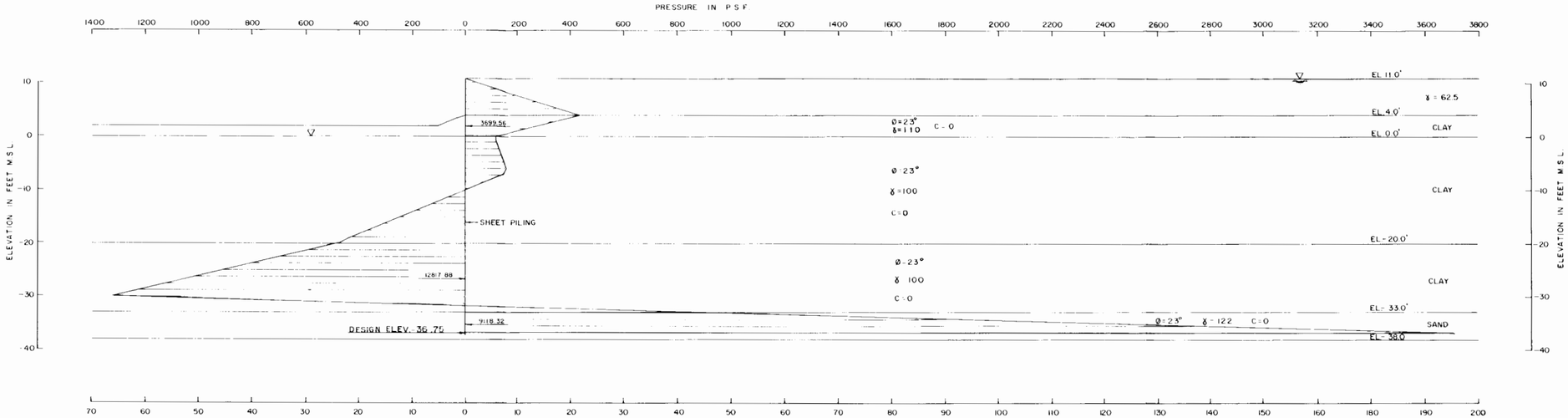
LAKE PONTCHARTRAIN, LA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO.2 – GENERAL DESIGN
SUPPLEMENT NO.5D
ORLEANS PARISH LAKEFRONT LEVEES
ORLEANS MARINA

PILE CAPACITIES & SUBGRADE MODULI

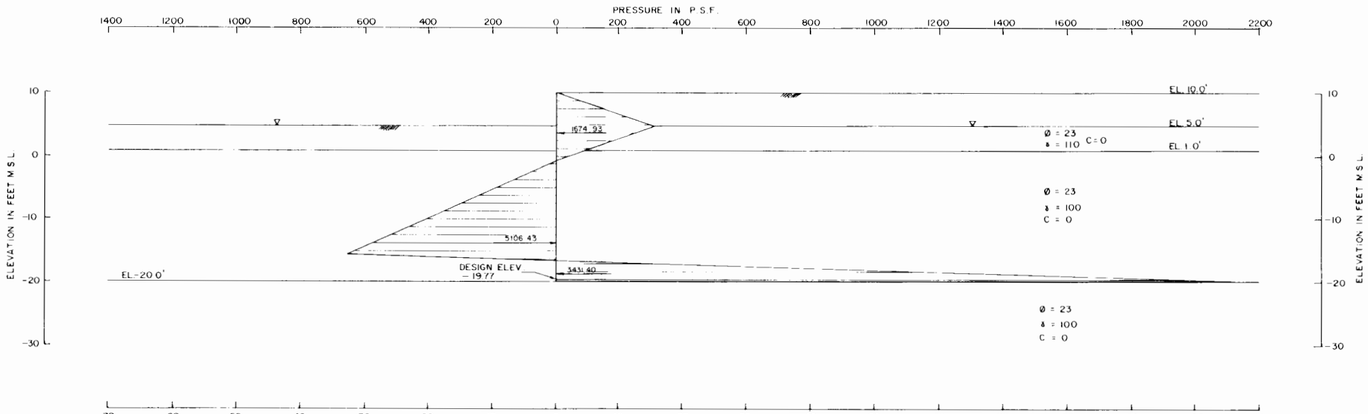
U. S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

JANUARY 1978 FILE NO. H-2-28169

PLATE 28



ΣF = 0
ΣM = 109.82
FS = 1.5
(S) CASE
APPROXIMATE STA 335+00 B/L



F = 0
M = 212.86
FS = 1.5
(S) CASE
APPROXIMATE STA 337+50 B/L

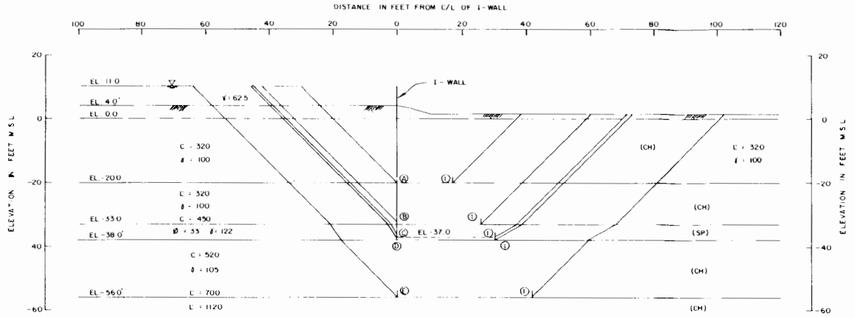
LAKE PONTCHARTRAIN, LA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 5D
ORLEANS PARISH LAKEFRONT LEVEES
ORLEANS MARINA

CANTILEVER SHEET PILE ANALYSIS

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

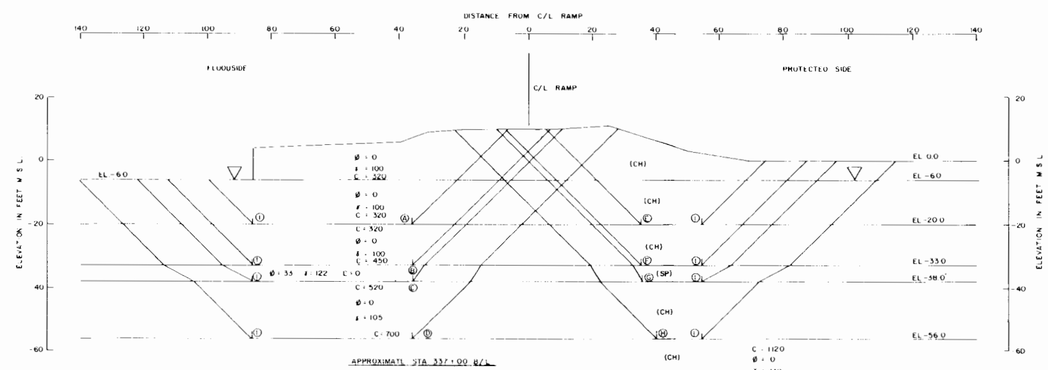
JANUARY 1978 FILE NO. H-2-28169

PLATE 29



APPROXIMATE STA. 335+00 B/L

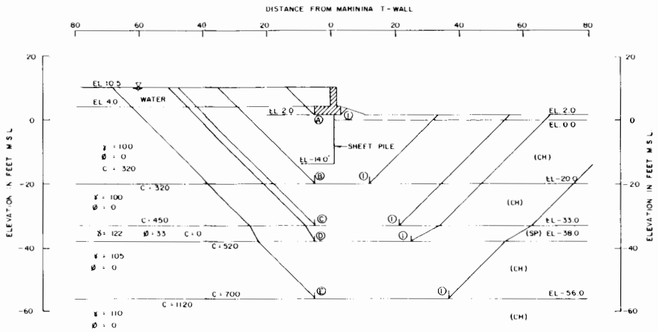
FAILURE SURFACE	ELEV	RESISTING FORCE R_A	RESISTING FORCE R_B	RESISTING FORCE R_P	DRIVING FORCE D_A	DRIVING FORCE D_P	SUMMATION OF FORCES ΣR	SUMMATION OF FORCES ΣD	FACTOR OF SAFETY
(A)-(I)	-20.0	15360	5440	13760	59797	23112	34560	16685	2.07
(B)-(J)	-33.0	25570	11700	23770	84809	59511	60840	25298	2.40
(C)-(K)	-37.0	31448	32576	38184	102215	74287	102208	27928	3.65
(D)-(L)	-38.0	33072	15600	42143	106872	78286	90814	26586	3.41
(E)-(L)	-56.0	55058	29400	64103	209032	168373	148561	40659	3.65



APPROXIMATE STA 337+00 B/L

FAILURE SURFACE	ELEV	RESISTING FORCES R_A	RESISTING FORCES R_B	RESISTING FORCES R_P	DRIVING FORCES D_A	DRIVING FORCES D_P	SUMMATION OF FORCES ΣR	SUMMATION OF FORCES ΣD	FACTOR OF SAFETY
(A) (I)	-20.00	19200	16000	8960	43612	9792	44160	33820	1.31
(B) (J)	33.00	29263	20250	18970	89348	36441	68483	52907	1.29
(C) (K)	38.00	38460	76000	32850	113799	51470	97310	62379	1.56
(D) (L)	-56.00	60969	35000	54818	220876	128048	150787	92828	1.62
(E) (L)	-20.00	19323	6080	12800	45595	21632	38203	23963	1.59
(F) (L)	33.00	29210	8550	22810	93092	56081	60570	37011	1.64
(G) (L)	-38.00	38322	9880	45746	115712	73447	93948	42265	2.22
(H) (L)	56.00	61006	9800	65834	220136	161494	136640	58642	2.33

Q - STABILITY ANALYSES



DEEP SEATED STABILITY ANALYSIS

NO	ELEV	U_A R_A	U_A D_A	U_P R_B	U_P R_P	U_P D_P	U_P	U_A	$U_A - U_P$ (RES.)
(A)-(I)	+ 2.0	984	1606	0	775	150	423	622	+301
(B)-(J)	- 20.0	11808	38981	4182	10824	24999	40017	24572	-15445
(K)-(L)	- 33.0	19504	83633	8996	18520	61248	89940	60349	-29591
(D)-(L)	- 38.0	24138	105566	16140	31300	80273	139933	75444	-64489
(E)-(L)	- 56.0	41042	207217	22596	48184	171261	258464	152699	-105765

NOTES: ANALYSIS RUN WITH FACTOR OF SAFETY OF 1.5 INCORPORATED INTO THE SOIL PARAMETERS. SOIL PARAMETERS

$C_D = C/1.50$

$\tan \phi_D = \tan \phi / 1.50$

A NEGATIVE TOTAL OF $U_A - U_P$ INDICATES THAT NO UNBALANCED LOAD EXISTS.

$U_A = D_A - R_A$

$U_P = R_B + R_P + D_P$

DEPTH OF SHEET PILE CALCULATION

BASED ON LANE'S WEIGHTED CREEP RATIO:

$LWCR = \frac{\text{WEIGHTED CREEP DISTANCE}}{\text{HEAD}}$

LWRC = 3 FOR SOFT TO MEDIUM CLAY

$3 = \frac{2+1/3(6)+d+d+1/3(2)}{9}$ (d = depth of sheetpile)

$= \frac{4.67+2d}{10.5}$

$2d = 26.8$

$d = 13.4$ (EL-14.0) *

* EL -14.0 BASED ON LOWEST BASE ELEVATION OF 0.3 M S L

GENERAL NOTES

ϕ - ANGLE OF INTERNAL FRICTION, DEGREES
C - UNIT COHESION, P S F
Σ - STATIC WATER SURFACE
D - HORIZONTAL DRIVING FORCE IN POUNDS
R - HORIZONTAL RESISTING FORCE IN POUNDS
A - AS A SUBSCRIPT, REFERS TO ACTIVE WEDGE
B - AS A SUBSCRIPT, REFERS TO CENTRAL BLOCK
P - AS A SUBSCRIPT, REFERS TO PASSIVE WEDGE
FACTOR OF SAFETY = $\frac{R_A + R_B + R_P}{D_A - D_P}$

CLASSIFICATION, STRATIFICATION, SHEAR STRENGTHS, AND UNIT WEIGHTS OF THE SOIL WERE BASED ON THE RESULTS OF THE UNDISTURBED BORINGS. SEE PLATE

LAKE PONTCHARTRAIN, LA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO.2 - GENERAL DESIGN
SUPPLEMENT NO.5D
ORLEANS PARISH LAKEFRONT LEVEES
ORLEANS MARINA

STABILITY ANALYSIS

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

JANUARY 1978 FILE NO. H-2-28169

PLATE 30

UNIFIED SOIL CLASSIFICATION

MAJOR DIVISION		TYPE	LETTER SYMBOL	SYMBOL	TYPICAL NAMES
COARSE – GRAINED SOILS More than half of material is larger than No 200 sieve size	GRAVELS More than half of coarse fraction is larger than No 4 sieve size	CLEAN GRAVEL (Little or No Fines)	GW		GRAVEL, Well Graded, gravel - sand mixtures, little or no fines
			GP		GRAVEL, Poorly Graded, grovel-sand mixtures, little or no fines
		GRAVEL WITH FINES (Appreciable Amount of Fines)	GM		SILTY GRAVEL, grovel - sand - silt mixtures
			GC		CLAYEY GRAVEL, grovel - sand - clay mixtures
	SANDS More than half of coarse fraction is smaller than No 4 sieve size	CLEAN SAND (Little or No Fines)	SW		SAND, Well - Graded, gravelly sands
			SP		SAND, Poorly - Graded, gravelly sands
		SANDS WITH FINES (Appreciable Amount of Fines	SM		SILTY SAND, sand - silt mixtures
			SC		CLAYEY SAND, sand - clay mixtures
FINE – GRAINED SOILS More than half the material is smaller than No. 200 sieve size		SILTS AND CLAYS (Liquid Limit < 50)	ML		SILT & very fine sand, silty or cloyey fine sand or clayey silt with slight plasticity
			CL		LEAN CLAY; Sandy Clay; Silty Clay, of low to medium plasticity
			OL		ORGANIC SILTS and organic silty clays of low plasticity
		SILTS AND CLAYS (Liquid Limit > 50)	MH		SILT, fine sandy or silty soil with high plasticity
			CH		FAT CLAY, inorganic clay of high plasticity
			OH		ORGANIC CLAYS of medium to high plasticity, organic silts
HIGHLY ORGANIC SOILS			Pt		PEAT, and other highly organic soil
WOOD			Wd		WOOD
SHELLS			Sl		SHELLS
NO SAMPLE					

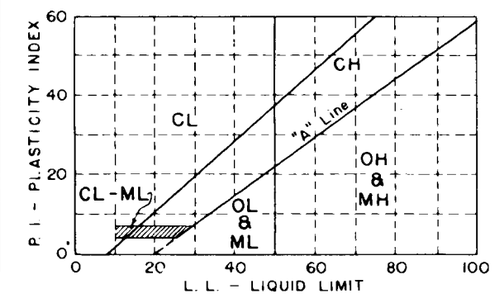
NOTE: Soils possessing characteristics of two groups are designated by combinations of group symbols

DESCRIPTIVE SYMBOLS

COLOR	
COLOR	SYMBOL
TAN	T
YELLOW	Y
RED	R
BLACK	BK
GRAY	Gr
LIGHT GRAY	lGr
DARK GRAY	dGr
BROWN	Br
LIGHT BROWN	lBr
DARK BROWN	dBr
BROWNISH-GRAY	brGr
GRAYISH-BROWN	gyBr
GREENISH-GRAY	gnGr
GRAYISH-GREEN	gyGn
GREEN	Gn
BLUE	Bl
BLUE-GREEN	BlGn
WHITE	Wh
MOTTLED	Mot

CONSISTENCY FOR COHESIVE SOILS		
CONSISTENCY	COHESION IN LBS./SQ.FT. FROM UNCONFINED COMPRESSION TEST	SYMBOL
VERY SOFT	< 250	vSo
SOFT	250 - 500	So
MEDIUM	500 - 1000	M
STIFF	1000 - 2000	St
VERY STIFF	2000 - 4000	vSt
HARD	> 4000	H

MODIFICATIONS	
MODIFICATION	SYMBOL
Traces	Tr-
Fine	F
Medium	M
Coarse	C
Concretions	cc
Rootlets	rt
Lignite fragments	lg
Shale fragments	sh
Sandstone fragments	sds
Shell fragments	slf
Organic matter	O
Clay strata or lenses	CS
Silt strata or lenses	SIS
Sand strata or lenses	SS
Sandy	S
Gravelly	G
Boulders	B
Slickensides	SL
Wood	Wd
Oxidized	Ox



PLASTICITY CHART

For classification of fine - grained soils

NOTES:

FIGURES TO LEFT OF BORING UNDER COLUMN "W OR D_{10}"

Are natural water contents in percent dry weight

When underlined denotes D_{10} size in mm *

FIGURES TO LEFT OF BORING UNDER COLUMNS "LL" AND "PL"

Are liquid and plastic limits, respectively

SYMBOLS TO LEFT OF BORING

▽ Ground-water surface and date observed

(C) Denotes location of consolidation test **

(S) Denotes location of consolidated-drained direct shear test **

(R) Denotes location of consolidated-undrained triaxial compression test **

(Q) Denotes location of unconsolidated-undrained triaxial compression test **

(T) Denotes location of sample subjected to consolidation test and each of the above three types of shear tests **

FW Denotes free water encountered in boring or sample

FIGURES TO RIGHT OF BORING

Are values of cohesion in lbs./sq.ft. from unconfined compression tests

In parenthesis are driving resistances in blows per foot determined with a standard split spoon sampler ($1\frac{3}{8}$" I.D., 2" O.D.) and a 140 lb. driving hammer with a 30" drop

Where underlined with a solid line denotes laboratory permeability in centimeters per second of undisturbed sample

Where underlined with a dashed line denotes laboratory permeability in centimeters per second of sample remoulded to the estimated natural void ratio

* The D_{10} size of a soil is the grain diameter in millimeters of which 10% of the soil is finer, and 90% coarser than size D_{10}.

**Results of these tests are available for inspection in the U.S. Army Engineer District Office, if these symbols appear beside the boring logs on the drawings.

GENERAL NOTES:

While the borings are representative of subsurface conditions at their respective locations and for their respective vertical reaches, local variations characteristic of the sub-surface materials of the region are anticipated and, if encountered, such variations will not be considered as differing materially within the purview of clause 4 of the contract.

Ground-water elevations shown on the boring logs represent ground-water surfaces encountered on the dates shown. Absence of water surface data on certain borings implies that no ground-water data is available, but does not necessarily mean that ground water will not be encountered at the locations or within the vertical reaches of these borings.

Consistency of cohesive soils shown on the boring logs is based on driller's log and visual examination and is approximate, except within those vertical reaches of the borings where shear strengths from unconfined compression tests are shown.

REVISION	DATE	DESCRIPTION	BY
3	5-3-71	ADDED UPPER LIMIT LINE (PI = 0.9(LL-8)) ON PLASTICITY CHART	LMVED-G LETTER DTD 29 APRIL 1971
2	6-8-64	SYMBOL FW, NOTE REVISED	ORAL FROM LMVCG 5 JUNE 1964
1	9-17-63	1ST PAR OF GENERAL NOTES REVISED	LMVD MULTIPLE LETTER, DATED 5 SEPT 1963

SOIL BORING LEGEND

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
FILE NO. H-2-21800

PLATE A

LAKE PONTCHARTRAIN, LOUISIANA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 5D
ORLEANS MARINA

APPENDIX A
CORRESPONDENCE RELATIVE TO COORDINATION WITH OTHER AGENCIES

C O P Y

IN REPLY REFER TO
LMNED-DD

18 November 1977

Mr. John P. McNamara, Chief Engineer
Orleans Levee District
Suite 202, Administration Building
New Orleans Lakefront Airport
New Orleans, Louisiana 70126

Dear Mr. McNamara:

Reference is made to your letter of 28 October 1977 and to a telephone conversation between yourself and Mr. Guizerix of this office on 15 November 1977, both relative to the Orleans Marina floodwall portion of the Lake Pontchartrain Hurricane Protection project.

We have no objection to the Orleans Levee Board performing portions of the floodwall construction, particularly in light of the immediate benefits which may be realized by the board in preventing seepage waters from flooding Lake Marina Avenue. However, the levee board is reminded that credits for its expenditures are contingent upon approval of the design memorandum which is presently scheduled for April 1978. Assuming the work is ultimately credited, it will be directly applicable against the annual cash payments required for the project under the deferred payment plan.

My staff would be happy to meet with you and/or your design consultant to discuss the design details. If you wish, you may contact Mr. Guizerix at 865-1121, extension 445 for a mutually agreeable meeting date.

Sincerely yours,

FREDERIC M. CHATRY
Chief, Engineering Division

246-4000

The Board of Levee Commissioners

OF THE

Orleans Levee District

SUITE 202 – ADMINISTRATION BUILDING
NEW ORLEANS LAKEFRONT AIRPORT

New Orleans, La.
70126

October 28, 1977

Mr. Frederic Chatry
Chief, Engineering Division
Department of the Army
New Orleans District
Corps of Engineers
Post Office Box 60267
New Orleans, Louisiana 70160

Re: New Orleans Lakefront Levee
Orleans Marina Section

Dear Mr. Chatry:

As you know we have been experiencing a severe seepage problem with the bulkhead on the south side of the Orleans Marina. The water seeps through the bulkhead and the parking area on to Lake Marina Avenue and the abutting property. Whenever there is a high tide in the Lake or a hurricane threat we have to sand bag the neutral ground of Lake Marina Avenue for a distance of approximately 1,000 feet, which needless to say is expensive and time consuming.

Inasmuch as we have agreed to the proposed alignment of the floodwall in the neutral ground between the Marina parking area and the north roadway of Lake Marina Avenue, we feel that the Levee Board would benefit tremendously if we were permitted to proceed with at least the steel sheet pile portion of the floodwall now rather than wait for you to have the complete New Orleans Lakefront G D M prepared and approved.

The Orleans Levee Board requests authority from the Corps of Engineers to proceed with the work subject to being given credit for the work in kind in lieu of the equivalent payments to be made under the Hebert Bill.

If authority is granted, we would hope to have the sheet piling in prior to the 1978 hurricane season.

Your favorable consideration of this request is appreciated.

Yours very truly,

John P. McNamara
Chief Engineer

JPMcN:gmb

XC: Mr. Guy F. LeMieux

C O P Y

IN REPLY REFER TO
LMNED-MP

4 August 1975

Mr. John P. McNamara
Board of Commissioners
Orleans Levee District
200 Wildlife and Fisheries Building
418 Royal Street
New Orleans, Louisiana 70130

Dear Mr. McNamara:

Reference is made to the 28 May 1975 meeting held in our offices concerning the Orleans Marina floodwall portion of the Lake Pontchartrain, Louisiana and Vicinity hurricane protection project. At this meeting you proposed a plan for a T-wall to be located near the existing bulkhead at water's edge to replace our plan for an I-wall to be located between the marina parking lot and Lake Avenue.

The report you submitted was of a preliminary nature; therefore, a detailed review was not possible. It appears, however, that your proposal is feasible. Your estimate of $2,087,000 for the T-wall apparently does not include the cofferdam lakeward of the T-wall and the connecting I-wall between the east end of the T-wall and Lake Avenue. Our survey scope estimate for the T-wall with these same exclusions, is $2,228,000. Our estimate for the connecting I-wall (approximately 75 feet) at the east end of the T-wall is $35,000. We are unable to estimate the cost of the cofferdam since no information was provided relative to its design. Our estimate for the appropriate reach of I-wall along Lake Avenue is $675,000, and the estimated engineering and design (E&D) and supervision and administration (S&A) costs for the I-wall plan are $75,000 and $69,000 respectively. It should be noted that approximately $37,000 has already been expended by the Corps of Engineers on the design of the I-wall plan. The estimated right-of-way requirements for the T-wall and I-wall plans are 1.13 acres and 0.55 acres respectively.

We believe the I-wall plan to be the most economical plan, satisfying all of our hurricane protection criteria. It is felt that a failure of the existing bulkhead under hurricane conditions would not affect the

stability of the proposed I-wall. We also believe that a beautified I-wall will have no greater impact on the aesthetics of the area than will the proposed T-wall. Therefore, if the levee board opts to implement the T-wall plan, its credit cannot exceed the estimated cost of the I-wall plan. The credit would be limited to the following estimated amounts: for construction, $675,000; for E&D, $38,000 ($75,000 less $37,000 expended); for S&A, $69,000; and the value of 0.55 acres of right-of-way.

Should you decide to continue your study of the T-wall plan, the following points should be considered:

a. Recent modifications to our freeboard criteria require an increase in the elevation of the top of the wall to 10.5 feet mean sea level (m.s.l.). The costs cited above would have to be revised accordingly.

b. Based on our topographic data in the marina, the bottom slopes to elevation -13 feet m.s.l. in a distance of about 70 feet from the proposed wall which results in an unbalanced horizontal earth load, below the base of the wall, of 856 pounds per linear foot of wall which will have to be carried by the piling to provide a minimum factor of safety of 1.3 against conventional shear.

c. The detailed report should be submitted for our review and comment. This should include pile capacity curves developed for twice the design loads and analyses of the proposed I-wall tie-ins at the east and west ends of the T-wall.

If you have any questions regarding this matter, please contact me.

Sincerely yours,

FREDERIC M. CHATRY
Chief, Engineering Division

LAKE PONTCHARTRAIN, LOUISIANA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 5D
ORLEANS MARINA

APPENDIX B
STRUCTURAL DESIGN CALCULATIONS

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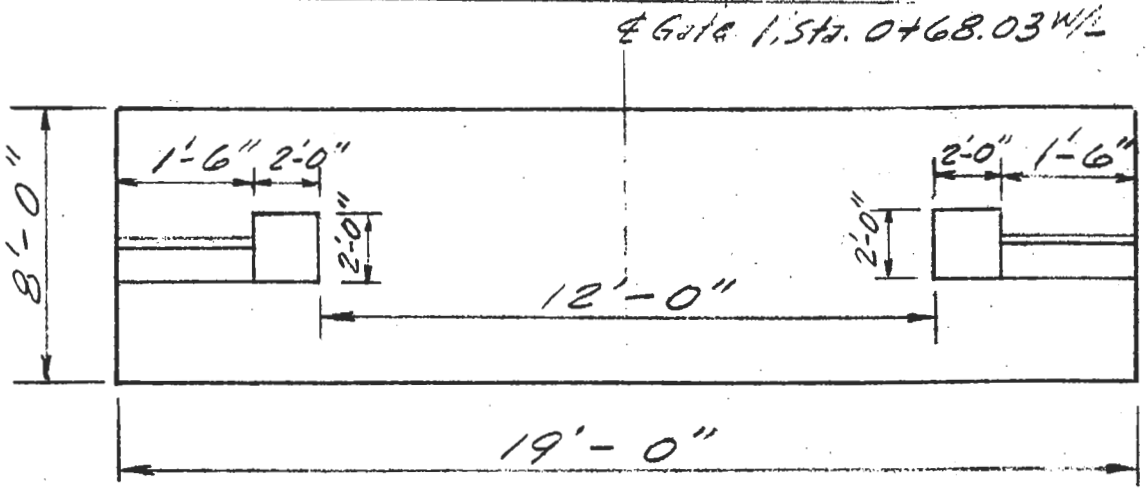
SWING GATE DESIGN (Gate 1)				

SWING GATE DESIGN CRITERIA



Gate Opening = 12'-0"

Top of Gate Elevation = 10'-6"

Sill Elevation = 2.80

Gate Monolith = 19'-0"

Gate #1 (Sta. 0+68.03 W/L)

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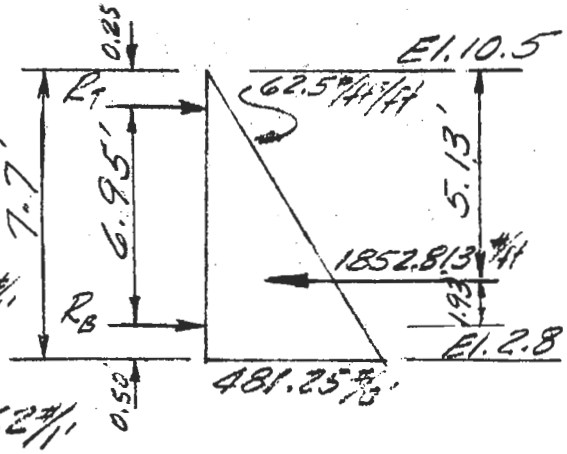
SWING GATE DESIGN (Gate 1)			

SWING GATE DESIGN

Water To El. 10.5, NO wave force, $F_b = 20{,}000$ psi

Reactions



$62.5 \times 7.7 = 481.25$ #/ft²

$0.5 \times 481.25 \times 7.7 = 1852.813$ #/ft

$$R_T = \frac{1852.813 \times 2.07}{6.95} = 551.85 \text{ #/ft}$$

$$R_B = \frac{1852.813 \times 5.13}{6.95} = 1367.62 \text{ #/ft}$$

Girder Design

1. Top Girder

Span = 12' + 2'-1" = 14.08'

Load = 551.85 #/ft

$$\text{Moment} = \frac{551.85(14.08)^2}{8} = 13675.28 \text{ ft-lb}$$

$$= 164103.41 \text{ in-lb}$$

$$S_{req'd} = \frac{164103.41}{20{,}000} = 8.21 \text{ in}^3$$

Try W14 x 34, $S_x = 48.6$ in³, $I = 340$ in⁴

$f_s = 3376.61$ psi $< 20{,}000$ psi

$$\Delta = \frac{5 \times 551.85 \times 14.08 (14.08 \times 12)^3}{384 \times 29 \times 10^6 \times 340} = 0.050'' < \frac{14.08 \times 12}{360}$$

$$= 0.47''$$

USE W14 x 34 (Based on Min. Req'd Metal Thickness)

2. Bottom Girder

Span = 14.08', Load = 1367.62 #/'

$$\text{Moment} = \frac{1367.62(14.08)^2}{8} = 33890.72 \text{ ft-lb}$$
$$= 406688.64 \text{ in-lb}$$

$$S_{req'd} = \frac{406688.64}{20{,}000} = 20.33 \text{ in}^3$$

Try W14 x 34; $S = 48.6 \text{ in}^3$; $I = 340 \text{ in}^4$

$f_s = 8368.08 \text{ ksi} < 20{,}000 \text{ psi}$

$$\Delta = \frac{5 \times 1367.62 \times 14.08 (14.05 \times 12)^3}{384 \times 29 \times 10^6 \times 340} = 0.1227"$$
(168.96)

$$< \frac{14.08 \times 12}{360}$$
$$= 0.47"$$

Use W14 x 34 (Based on Min. Req'd Metal Thickness)

3. Skin Plate

Use 5/16" skin pl

$$I = \frac{12 \times 0.3125^3}{12} = 0.0305 \text{ in}^4$$

$$S = \frac{2 \times 0.0305}{0.3125} = 0.195 \text{ in}^3$$

Load (Max.) = 62.5 x 7.55 = 471.88 #/'

$M_{max.} = S \times f_s = 0.195 \times 20{,}000 = 3900 \text{ in-lb}$

(Int. span) $M = \frac{471.88 \times L^2 \times 12}{12} = 3900$

$L = 2.875'$

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SWING GATE DESIGN (Gate 1)			

$$(\text{End Span})\ M = \frac{441.88 \times L^2 \times 12}{10} = 3900$$

$$L = 2.712'$$

Try End Span = 1'-7"

Interior Span = 1'-8"

$$(\text{Interior})\ M = \frac{441.88 \times \overline{1.67}^2 \times 12}{12} = 1232.36 \text{ in-lb}$$

$$f_s = \frac{1232.36}{0.195} = 6319.79 \text{ psi}$$

$$(\text{End})\ M = \frac{441.88 \times \overline{1.58}^2 \times 12}{10} = 1323.73 \text{ in-lb}$$

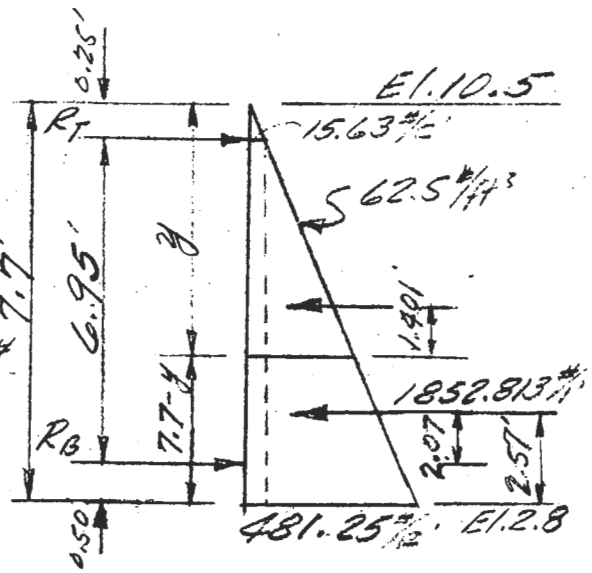
$$f_s = \frac{1323.73}{0.195} = 6788.4 \text{ psi}$$

$62.5 \times 0.25 = 15.63 \#/'$

$62.5 \times 7.7 = 481.25 \#/'$

$$R_T = \frac{1852.813(2.07)}{6.95} = 551.85\#$$

$$R_B = \frac{1852.813(4.87)}{6.95} = 1300.97\#$$



Pt. of Zero shear

$$\frac{62.5\,y^2}{2} = 551.85$$

$$y = \sqrt{\frac{1103.7}{62.5}} = 4.202'$$

Max. Moment

$$M_{max.} = 551.85 \times 3.952 - \tfrac{1}{2}(4.202)^2 \times 62.5 \times 1.401$$
$$= 2180.91 - 773.04 = 1407.87 \text{ ft-lb}$$

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SWING GATE DESIGN (Gate 1)				

Design Vertical Members

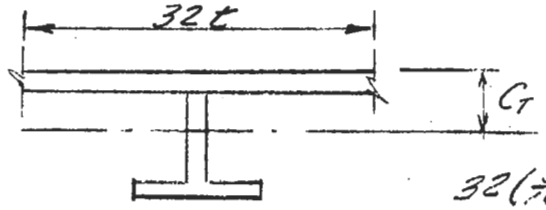
Spacing @ 1'-8"

$M = 1.408\,(1.67)(12) = 28.22$ "K

$S_{req'd} = \frac{28.22}{18.0} = 1.57\ in^3$

Try WT7x19 with 5/16" PL ($S = 4.27\ in^3$)

Properties of 5/16" skin PL with WT7x19.0



$32(\frac{5}{16}) + \frac{3}{8} = 10.375$"

Section	Area	$\bar{y}$	$A\bar{y}$	$A\bar{y}^2$	I_o
PL 10.375 x 5/16	3.24	0.156	0.505	0.079	—
WT 7x19.0	5.59	5.8225	32.548	189.51	23.50
	8.83		33.053	189.589	23.50

$$\bar{y} = \frac{\Sigma A\bar{y}}{\Sigma A} = \frac{33.053}{8.83} = 3.74"$$

$$I = I_o + \Sigma A\bar{y}^2 - (\Sigma A\bar{y} \times \bar{y})$$
$$= 23.50 + 189.589 - (33.053 \times 3.74)$$
$$= 213.089 - 123.618$$
$$= 89.471\ in^4$$

$$S_{TOP} = \frac{I}{C_T} = \frac{89.471}{3.74} = 23.92\ in^3$$

$$S_{BOT.} = \frac{I}{C_B} = \frac{89.471}{3.63} = 24.65\ in^3$$

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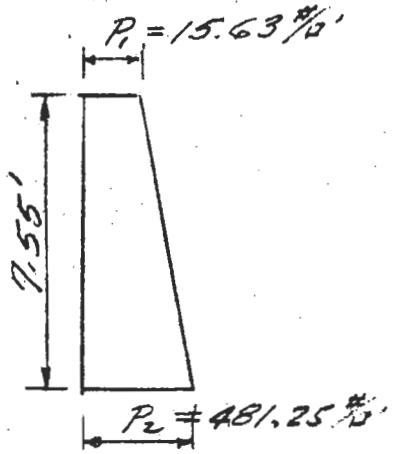
SWING GATE DESIGN (Gate 1)			



$m = 2.75'$

$h = 7.55'$

$E = 29 \times 10^6 \text{ psi}$

$I = 89.471 \text{ in}^4$

$$\Delta = \frac{5h^4m}{768EI}(P_1 + P_2)$$

$$= \frac{5(7.55\times12)^4(2.75\times12)}{768(29\times10^6)89.471}\left(\frac{15.63\times481.25}{144}\right)$$

$$= 0.0193''$$

USE WT7 x 19.0 with 5/16" skin PL

Biaxial Stresses of skinplates

$$\frac{S_1^2 - S_1S_2 + S_2^2}{F_y^2} \leq (0.75)^2 = 0.5625$$

S_1 = unit stress resulting from skinplate spanning horizontally

S_2 = unit stress resulting from skinplate acting as flange of vertical rib.

$$S_1 = \frac{3.90}{0.195} = 20 \text{ ksi}$$

$$S_2 = \frac{34.78}{19.14} = 1.828 \text{ ksi}$$

$$\frac{(20)^2 - 20(1.828) + (1.828)^2}{(36)^2} = 0.2830 < 0.5625 \quad \text{O.K.}$$

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SWING GATE DESIGN (Gate 1)			

Check unsupported Length

1. Top Girder (W14×34)

$$\frac{2400\,b_f}{\sqrt{F_y}} = \frac{2400\times 6.750}{\sqrt{36000}} = 85.3815'' = 7.1151' = 7'-1\tfrac{3}{8}'' < 3'-4''$$ o.k

$$\frac{20(10^6)A_f}{d\,F_y} = \frac{20(10)^6}{4.58(36)(10^3)} = 121.3003'' = 10.1084' = 10'-1\tfrac{3}{32}'' < 3'-4''$$ o.k.

$$F_b = \frac{10{,}000}{40(4.58)} = 54.59\ KSC > 18.0\ KSC$$

Use $F_b = 18.0\ KSC$

$$f_b = \frac{164103.41}{48.6} = 3376.6\ KSC$$

Use W14×34

2. Bottom Girder (W14×34)

$$\frac{2400\,b_f}{\sqrt{F_y}} = \frac{2400\times 6.750}{\sqrt{36000}} = 85.3815'' = 7.1151' = 7'-1\tfrac{3}{8}'' < 3'-4''$$

$$\frac{20(10^6)A_f}{d\,F_y} = \frac{20(10)^6}{4.58(4.58)(36)(10^3)} = 121.3003'' = 10.1084' = 10'-\tfrac{3}{32}'' < 3'-4''$$

$$F_b = \frac{10{,}000}{40(4.58)} = 54.59\ KSC > 18\ KSC$$

Use $F_b = 18.0\ KSC$

$$f_b = \frac{406688.64}{30.8} = 13.21\ KSC < 18.0\ KSC$$

Use W14×34

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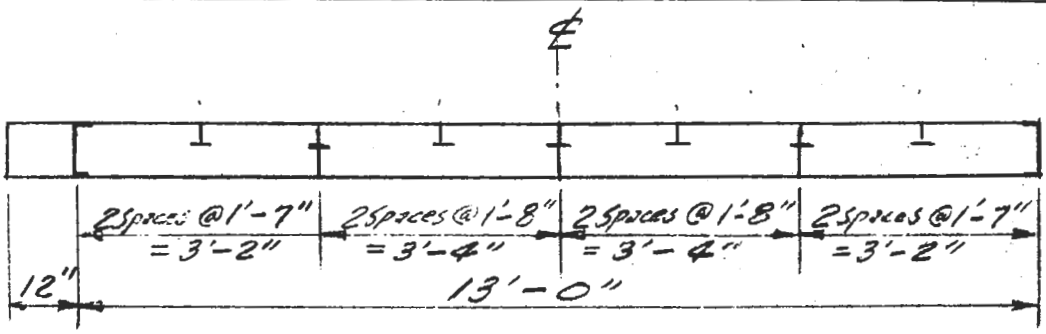
SWING GATE DESIGN (Gate 1)			



Gate Weight

Member	Size	№	Wt/Ft.	Length	Weight	Arm	Moment
Top Girder	W14×34	1	34	14.00	476.0	7.313	3481.00
Bot. Girder	W14×34	1	34	14.00	476.0	7.313	3481.00
Skin Pl	5/16×7.500ft	1	95.64	13.08	1250.97	0.156	195.15
Vert. Ts	WT7×19.0	7	19.0	6.88	915.04	4.396	4022.52
Seal Angle	L5×5×½	1	16.20	12.54	203.1	0.93	188.95
Bar	1½×1½	1	7.65	7.17	54.85	0.75	41.14
Stiff Pl	5/16×5"	6	5.313	0.46	14.664	8.043	117.94
End Pl	½×14"	2	23.80	6.19	294.644	5.438	1602.27
End Pl	½×3"	2	5.10	6.67	68.03	10.283	699.55
Horiz Bracing	L4×3½×5/16	1	7.70	13.00	100.10	3.133	313.61
Steel Gate Weight					3853.398	3.6703	14143.06

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SWING GATE DESIGN (Gate 1)				

Column Design

Load Cases

CASE I — Gate closed, water @ El. 10.5, No wind
100% Forces used.

CASE II — Gate closed, water @ El. 10.5, Wind from
Floodside — 75% Force used.

CASE III — Gate Open (Parallel to wall), no water,
no wind — 100% Forces used.

CASE IV — Gate Open (Perpendicular to wall), no
water, no wind — 100% Forces used.

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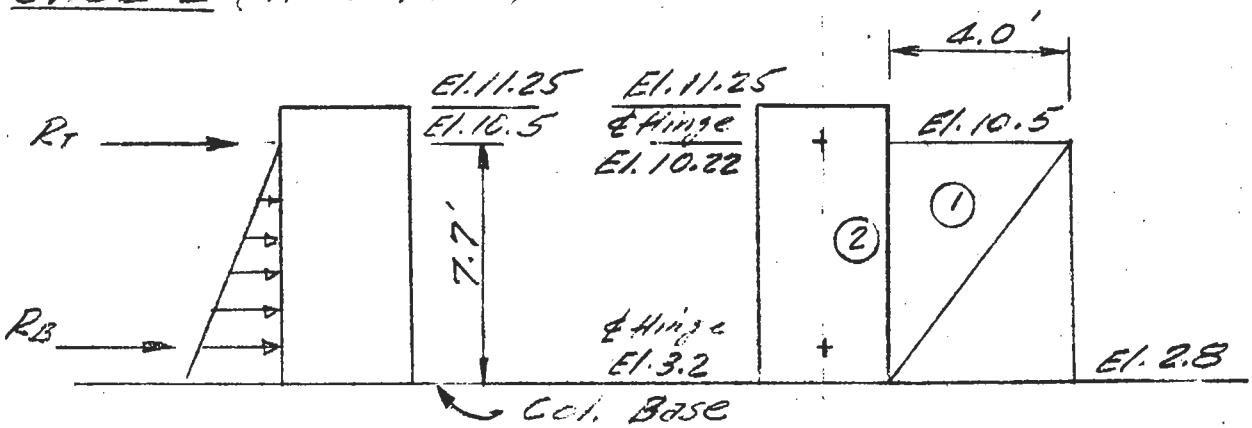
SWING GATE DESIGN (Gate 1)				

CASE I (X-X AXIS)



Gate Load

Water: $W_T = 0.552^K/_{1'}$; $W_B = 1.37^K/_{1'}$; $L = 12'-1'-7\frac{1}{2}'' = 13.65'$

$$R_T = \frac{0.50(13.65)}{2} = 3.77^K$$

$$M_T = 3.77 \times 7.55 = 28.464^{'K}$$

Wall Load

Water

① $\frac{1}{3}(\frac{1}{2})(7.8)(4.0)(0.0625)(7.8) = 2.54^K \times 3.90 = 9.91^{'K}$

② $\frac{1}{2}(7.8)(2)(0.0625)(7.8) = 3.803^K \times 2.60 = 9.89^{'K}$

6.343^K $19.80^{'K}$

Z-Z AXIS

① $2.54^K \times 2.60 = 6.604^{'K}$

$\Sigma H = 2.54^K$ $\Sigma M = 6.604^{'K}$

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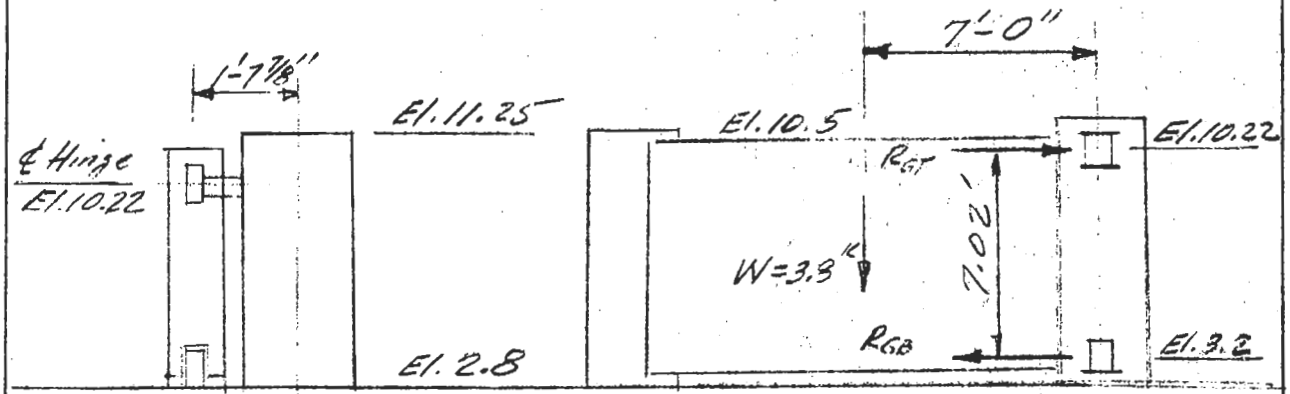
CASE I (Y-Y AXIS)



$$R_{GT} = \frac{3.8 \times 7.0}{7.02} = 3.79^K$$

$$M_{GT} = 3.79 \times 7.52 = 28.50^{IK}$$

Z-Z AXIS

$M = 3.79 \times 1.66 = 6.29^{IK}$

$M_2 = 6.604 - 6.29 = -0.314^{IK}$

CASE II Z-Z AXIS

$M1 = 6.29^{IK}$ (See Sht. 9)

Axial Load (P) —— Column Wt.

Column Wt. $= 2 \times 2 \times 8.55 \times 0.15 = 5.13^K$

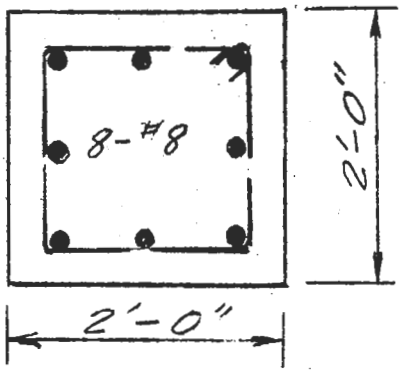
Summary

CASE	P	M_x	M_y	M_z
I	5.13	19.80	28.50	0.314
II	5.13	0	28.50	0.314
III	5.13	28.50	0	0

I Section Assumed – (Both columns)

Loading Condition — Case

$N = 5.13^{K}$
$M_x = 19.80^{IK}$
$M_y = 28.50^{IK}$
$f_y = 40.000\ psi$
$f_c' = 3000\ psi$
$n = 9$
$b = 24''$
$t = 24''$
$g_x = g_y = 0.30$
$A_g = 24 \times 24 = 576\ sq.\ in.$



$P = \frac{8 \times 0.79}{24 \times 24} = 0.01097$

$0.01 < P < 0.08$

(1) Compute $\frac{N}{f_c' A_g} = \frac{5.13}{3(24 \times 24)} = 0.0030$

From Table 26 $g_y = 0.85$, $\frac{P}{f_c' A_g} = 0.20 > 0.10$

(2) $A_{s1} = 8 \times 1.0 = 8.0\ sq.in$; $P_g = \frac{8}{576} = 0.01389$

$A_{s1} = 2 \times 3 \times 1.0 = 6.0\ sq.in$; $P_1 = \frac{6}{576} = 0.01042$

$A_{s2} = 2 \times 1 \times 1.0 = 2.0\ sq.in$; $P_2 = \frac{2}{376} = 0.00347$

$$P_y' = P_1 + 0.5 P_2$$
$$= 0.01042 + 0.5(0.00347)$$
$$= 0.01042 + 0.00174$$
$$= 0.012160$$

$$K = \frac{A_{s2}}{A_{s1}} = \frac{2}{6} = \frac{1}{3} = 0.333$$

(3) From Table 34, for $P_g = 0.01389$

$g_y = 0.85$

$K = 0.333$

Read $D' = 0.150$

Compute Equivalent pure Moment

$$Moe = My - D'\left(\frac{Nt}{12}\right)$$

$$= 28.50 - 0.150\left(\frac{5.13 \times 24}{12}\right)$$

$$= 26.96^{IK}$$

Then from Table 26, $C' = 1.76$

$$\text{Req'd } As/c = \frac{C'Moc}{t} = \frac{1.76(26.96)}{24} = 1.98 \text{ sq. in.}$$

$$\text{Req'd } P_g = \frac{As/c}{576} = \frac{1.98}{576} = 0.0034 < 0.01097 \text{ o.k.}$$

Shear

$$V_{max} = 6.343 + 3.79 = 10.133^{K}$$

$$v = \frac{V}{bd} = \frac{10.133}{(24)(20.5)} = 0.0206 KSI < 0.060 KSI \text{ o.k.}$$

Bond

$$u = \frac{V}{\Sigma o j d} = \frac{10.133}{(9.4)(0.875)(20.5)} = 0.0601 KSI < 0.263 KSI$$

Torsion (Hinge Column)

$M = 6.29^{k} = 75.48^{ik}$ (Case II)

$b = 24''$

$t = 24''$

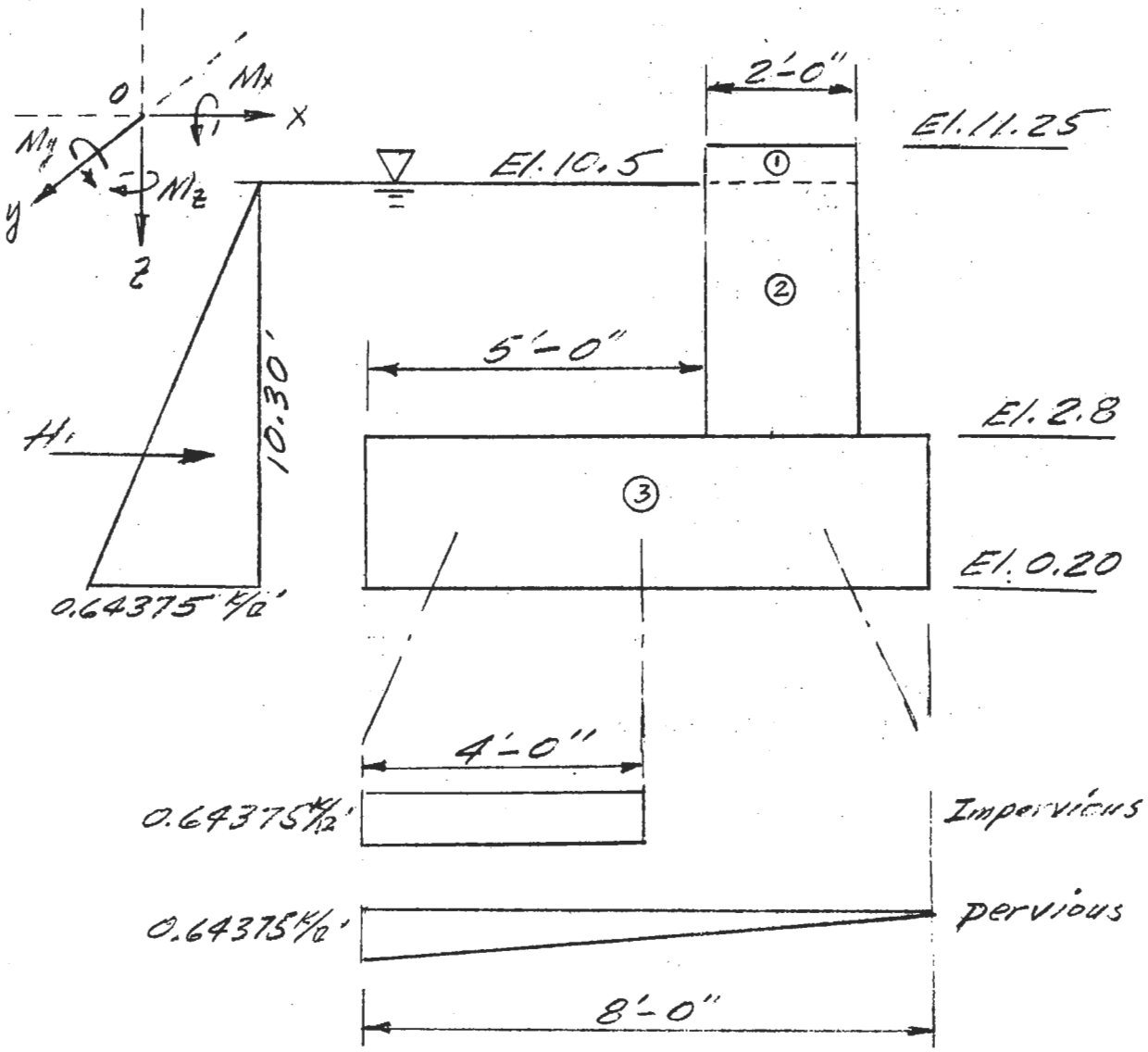
$v_t = \frac{5(75.48)}{24^2 \times 24} = 0.0273 ksi$

Combine Flexural shear stress with Torsion Shear Stresses:

$V = V_t + V_f = 0.0273 + 0.0206 = 0.0479 ksi < 0.060 ksi$ O.K

No stirrup is req'd.

But provide #4 stirrups @ 12" as tied Bar



LOAD CASES

CASE I — Water @ El. 10.5 No Wind, Impervious

CASE II — Water @ El. 10.5, No wind, Pervious

CASE III — No water, no wind, Truck on edge of slab, F.S.

CASE IV — No water, no wind, Truck on edge of slab, P.S.

CASE V — No water, wind from P.S, Truck on edge of slab F.S. (75%)

CASE VI — No water, wind from F.S., Truck on edge of slab P.S. (75%)

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SWING GATE DESIGN (Gate 1)				

Moment About X-X Axis

ITEM	COMPUTATION	F_z (K)	F_y (K)	Arm (K)	M_{x-x} (H-K)
Conc. Col. ①	2×2×8.55×0.15×2	10.26		-6.0	-61.56
Conc. Wall ②	8×2×7.8×0.15	18.72		-5.5	-102.96
Conc. Slab ③	19×8×2.5×0.15	57.00		-4.00	-228.00
SUB-Totals Concrete Only		85.98			-392.52
Water Wt.	5×7.8×19×0.0625	46.31		-2.50	-115.78
Water Force, H_1	0.5×10.30^2×19×0.0625		-62.99	3.27	-205.98
Imp. Uplift	4×10.30×19×0.0625	-48.93		-2.00	97.86
Gate Wt.	Closed	3.85		-4.13	-15.90
CASE I Totals (100%)		87.21	-62.99		-632.32
Water Wt.	5×7.8×19×0.0625	46.31		-2.50	-115.78
Water Force, H_1	0.5×10.30^2×19×0.0625		-62.99	3.27	-205.98
Perv. Uplift	0.5×10.3×8×19×0.0625	-48.93		-2.67	130.64
Gate Wt.	Closed	3.85		-4.13	-15.90
CASE II Totals (100%)		87.21	-62.99		-599.54
Truck Wt.	(H20-S16-44)	32.00		—	—
Gate Wt.	Opened	1.93		-4.13	-7.97
CASE III Totals (100%)		119.91	—		-400.49
Truck Wt.	(H20-S16-44)	32.00		-8.00	-256.00
Gate Wt.	Opened	1.93		-4.13	-7.97
CASE IV Totals (100%)		119.91			-656.49
Truck Wt.	(H20-S16-44)	32.00		—	—
Gate Wt.	Opened	1.93		-4.13	-7.97
Wind From Flood Side					
Wall	7.8×3×0.050		1.17	3.65	4.27
Cols	8.55×2×0.050		0.86	4.03	3.47
CASE V	Totals	119.91	203		-392.75
	75%	89.93	1.52		-294.56

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Moment About x-x Axis (cont'd)

ITEM	COMPUTATION	F_z (K)	F_y (K)	Arm (ft)	M_{x-x} (ft-K)
Truck Wt.	(H20-S16-44)	32.00		-8.00	-256.00
Gate Wt.	opened	1.93		-4.13	-7.97
Wind From Floodside					
Wall	7.8 x 3 x 0.050		-1.17	3.65	-4.27
Catwalks	8.55 x 2 x 0.050		-0.86	4.03	-3.47
Case III Totals		119.91	-203		-664.23
75%		89.93	-1.52		-498.17

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SWING GATE DESIGN (Gate 1)			

Moment About Y-Y Axis

ITEM	COMPUTATION	F_z (K)	F_x (K)	Arm (Ft.)	M_{y-y} (Ft-K)
Conc. Col. ①	2×2×8.55×0.15	5.13		-16.50	-79.70
Conc. Col. ①	2×2×8.55×0.15	5.13		-2.50	-12.08
Conc. Wall ②	7.8×2.0×4×0.15	9.36		-18.25	-170.82
Conc. Wall ②	7.8×2.0×4×0.15	9.36		-0.75	-7.02
Conc. Wall ④	8×2.5×19×0.15	57.00		-9.50	-541.50
SUB-Total Concrete only		85.98	—		-816.82
Water Wt.	5.0×7.8×19×0.0625	46.31		-9.50	-439.95
Gate Wt.	Closed	3.85		-2.42	-9.32
Imp. uplift	10.30×4×19×0.0625	-48.93		-9.50	464.84
Case I Totals (100%)		87.21	—		-801.75
Water Wt.	5.0×7.8×19×0.0625	46.31		-9.50	-439.95
Gate Wt.	closed	3.85		-2.42	-9.32
perv. uplift	½(10.30)8×19×0.0625	-48.93		-9.50	464.84
Case II Totals (100%)		87.21	—		-801.75
Truck Wt.	(H20-S16-44)	32.00		-9.50	-304.00
Gate Wt.	Opened	1.93		-2.42	-4.67
Case III & IV Totals (100%)		119.91	—		-1125.49
Truck Wt.	(H20-S16-44)	32.00		-9.50	-304.00
Gate Wt.	Opened	1.93		-2.42	-4.67
Case II & III Totals (100%)		119.91	—		-1125.49
	75%	89.93	—		-844.12

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SWING GATE DESIGN (Gate 1)				

Moment About Z-Z Axis

ITEM	COMPUTATION	Fy (K)	Fx (K)	Arm (Ft)	Mz-z (Ft-K)
Far Side	Water Force				
on Wall & Col.	$-\frac{1}{2}\times\overline{7.8}^2\times3.5\times0.0625$	-6.65		17.25	-114.71
on Gate @ Col.	$-\frac{1}{2}\times\overline{7.8}^2\times6.0\times0.0625$	-11.41		9.50	-108.40
Near Side					
on Gate @ Hinge	$-\frac{1}{2}\times\overline{7.3}^2\times6.0\times0.0625$	-11.41		2.42	-27.61
on Wall & Col.	$-\frac{1}{2}\times\overline{7.3}^2\times3.5\times0.0625$	-6.65		1.75	-11.64
on Base Slab	$-2.5\times19\times0.534375$	-26.87		9.50	-255.27
Case I & II Totals (100%)		-62.99	—		-517.63
Case III & IV Totals		0.00	—		0.00
Far Side	Wind Force				
Wall	$7.8\times1.5\times0.050$	0.59		18.25	10.77
Columns	$8.55\times2\times0.050$	0.86		16.50	14.19
Near Side					
Wall	$7.8\times1.5\times0.050$	0.59		0.75	0.44
Column	$8.55\times2\times0.050$	0.86		2.50	2.15
Case V Totals		2.90	—		27.55
75%		2.18	—		20.66
Case VI Totals		-2.90	—		-27.55
75%		-2.18	—		-20.66

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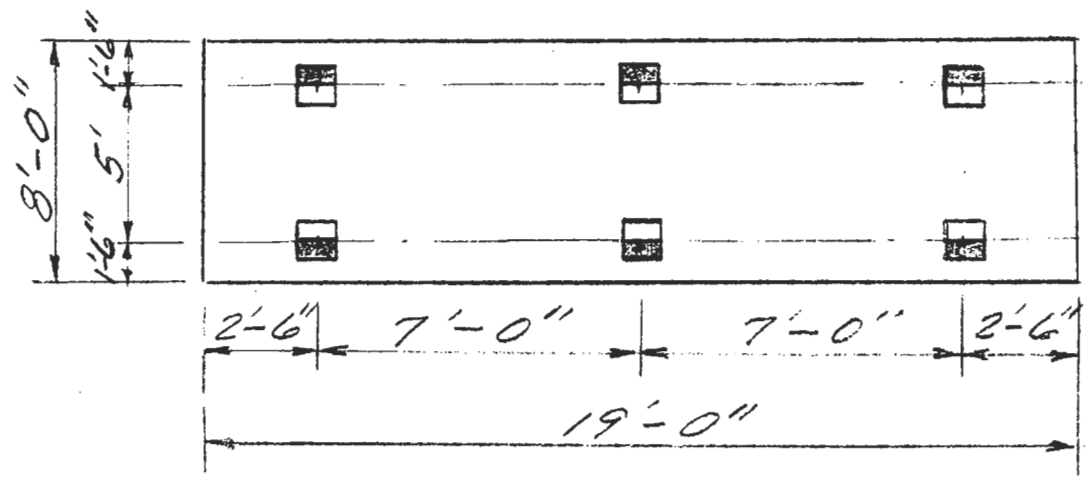
SUMMARY OF LOADS ON GATE MONOLITH

CASE	F_x (K)	F_y (K)	F_z (K)	M_{x-x} (Ft-K)	M_{y-y} (Ft-K)	M_{z-z} (Ft-K)
I	0.00	-62.99	87.21	-632.32	-801.75	-517.63
II	0.00	-62.99	87.21	-599.54	-801.75	-517.63
III	0.00	0.00	119.91	-400.49	-1125.49	0.00
IV	0.00	0.00	119.91	-656.49	-1125.49	0.00
V	0.00	2.18	89.93	-294.56	-844.12	20.66
VI	0.00	2.18	89.93	-498.17	-844.12	-20.66



PILE SPACING IN GATE MONOLITH

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PILE LOADING FROM COMPUTER PRINTOUT

	Fx (K)	Fy (K)	Fz (K)
1. CASE I (100%)			
Pile "A" Group	-1.60	0.0	-11.10
Pile "B" Group	1.60	0.0	47.00
2. CASE II (100%)			
Pile "A" Group	-2.30	0.0	-9.0
Pile "B" Group	2.40	0.0	45.0
3. CASE III (100%)			
Pile "A" Group	0.40	-0.0	26.8
Pile "B" Group	-0.60	-0.0	16.5
4. CASE IV (100%)			
Pile "A" Group	6.10	-0.0	10.60
Pile "B" Group	-6.70	-0.0	32.50
5. CASE V (75%)			
Pile "A" Group	0.50	-0.0	20.60
Pile "B" Group	-0.60	-0.0	11.90
6. CASE VI (75%)			
Pile "A" Group	4.40	-0.0	7.50
Pile "B" Group	-4.90	-0.0	24.90

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I For Top of Slab Reinforcing (Case I)

Pile "Rev": $-10.77 \times 3 \div 19 = -1.701 \times 3.5 = -5.95$

Pile "Axv": $-0.385 \times 3 \div 19 = -0.061 \times 3.5 = -0.21$

Water Wt.: $1 \times 5 \times 7.7 \times 0.0625 = 2.406 \times 2.5 = 6.02$

Slab Wt.: $1 \times 2.5 \times 5 \times 0.15 = 1.88 \times 2.5 = 4.70$

Uplift: $1 \times 10.20 \times 4 \times 0.0625 = -2.55 \times 2.5 = -6.38$

$EV = -0.026^K$ $EM = -1.82^{K'}$

$$A_s = \frac{1.82}{1.44(26)} = 0.049^{0''}$$

Min. $A_s = 0.0025 \times 26 \times 12 = 0.78^{0''}$

Use #8@12" in Top of Slab

II For Bottom of Slab Reinforcing (Case II)

Pile "Rev": $26.00 \times 3 \div 19 = 4.11 \times 3.5 = 14.39$

Pile "Axv": $0.097 \times 3 \div 19 = 0.015 \times 3.5 = 0.05$

Truck Load: $32 \div 19 = -1.684 \times 5.0 = -8.42$

Slab Wt.: $5 \times 1 \times 2.5 \times 0.15 = -1.88 \times 2.5 = -4.70$

$EV = 0.561^K$ $EM = 1.32^{K'}$

$b = 12''$

$$F = \frac{1.32}{152} = 0.00868421$$

$$d = \sqrt{\frac{12000 \times 0.00868421}{12}} = 2.95''$$

$t = 2.95 + 4 = 6.95'' < 30''$ o.k.

$$A_s = \frac{1.32}{1.44 \times 26} = 0.035^{0''}$$

Min. $A_s = 0.0025 \times 12 \times 26 = 0.78^{0''}$

Use #8@12" in Bottom of Slab

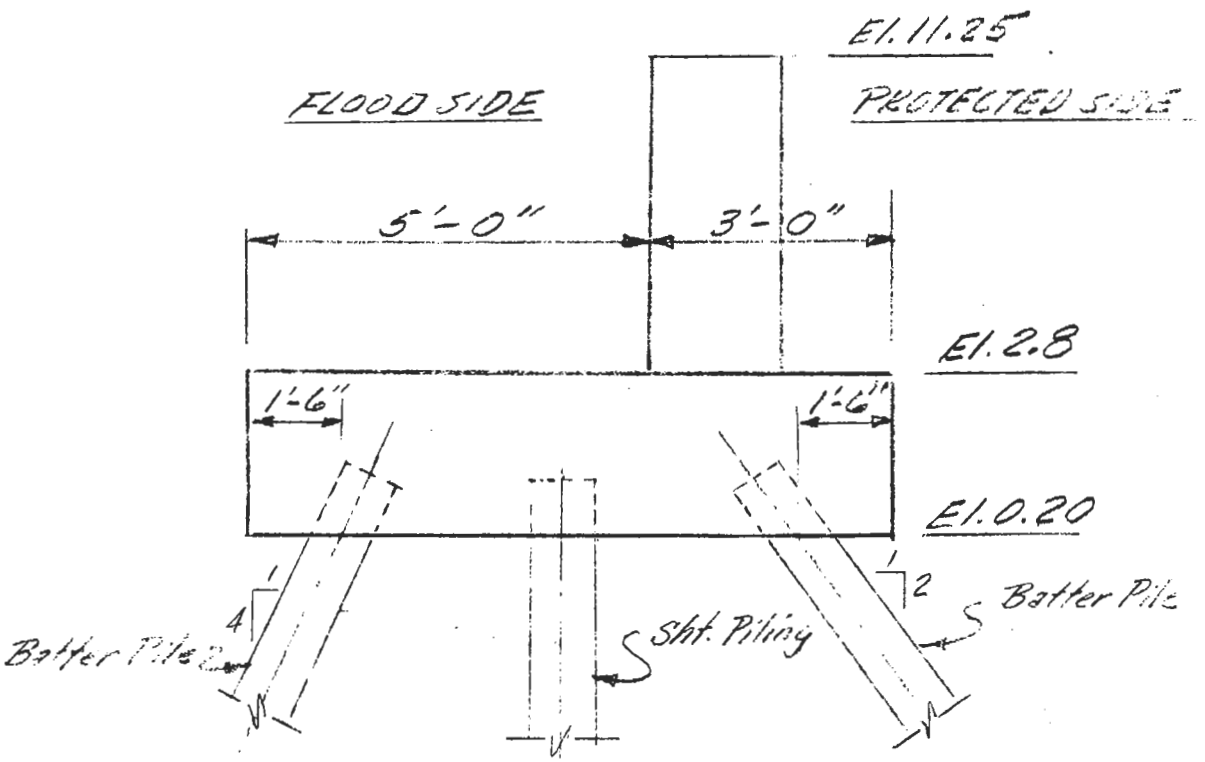
Longitudinal Steel

$0.0025bt = 0.0025 \times 12 \times 30 = 0.570''$

$0.45^{R}''$ in Each Face

use #6 @ 11" Each Face

Torsional Analysis on Swing Gate



Consider Case III Loading

Case III — No water, no wind, Truck on edge of slab, Floodside

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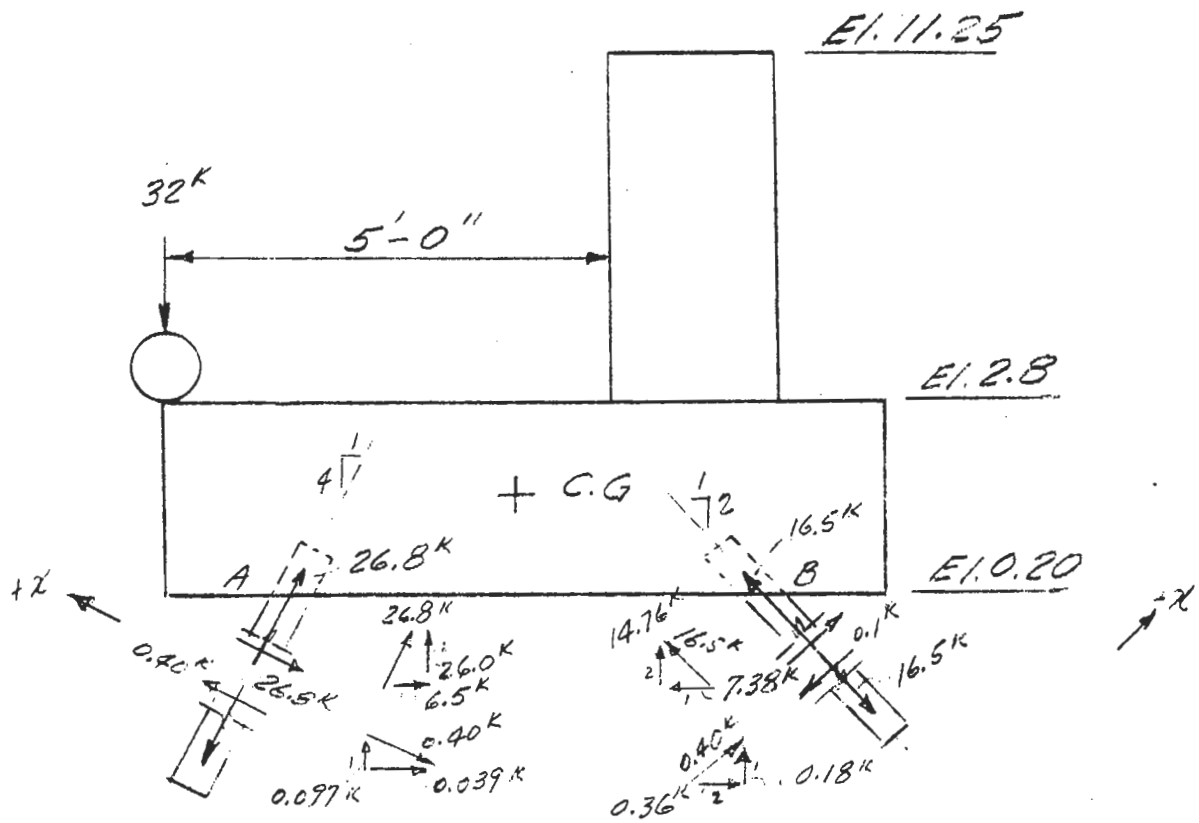
TORSIONAL ANALYSIS ON SWING GATE (CASE III)



ITEM	V	H	$\bar{x}$	M+↻
TRUCK	-32.0		4.0	-128.00 IK
$A_x = 2(6.50)$		13.00	-1.25	-16.25 IK
$A_y = 2(26.0)$	52.00		2.5	130.00 K
$B_x = 2(-6.50)$		-13.00	1.25	-16.25 IK
$B_y = 2(14.76)$	29.52		-2.5	-73.80 IK
$A_{Fx} = 2(0.39)$		0.78	-1.25	-0.975 IK
$A_{Fy} = 2(0.097)$	0.194		2.5	0.485 IK
$B_{Fx} = 2(0.36)$		0.72	-1.25	-0.900 IK
$B_{Fy} = 2(0.18)$	0.36		-2.5	-0.900 IK
			$\Sigma M =$	-106.59 IK

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Torsional Analysis on Swing Gate (Cont'd)

Torsional Moment divides equally between Columns

$$M_t = \frac{106.59}{2} = 53.30^{IK}$$

$n = 5$ (Based on Australian Code)
$b = 2.5'$
$h = 6.0'$

$$v_c = \frac{5 \times 53300 \times 12}{(30)^2(96)} = 37.01 PSI < 60 PSI \text{ o.k.}$$

No Stirrups Req'd

T-WALL STEM DESIGN

$$M = \tfrac{1}{2}(7.7^2)(0.0625)\left(\frac{7.7}{3}\right) = 4.76^{IK}$$

Stem Thickness @ Base = $14.8125" = 14\frac{13}{16}"$

$$F = \frac{4.76}{152} = 0.03131579$$

$$d = \sqrt{\frac{0.03131579 \times 12000}{12}} = 5.60"$$

$$t = 5.60 + 2.5 = 8.10" < 14.813" \text{ o.k.}$$

$$A_s = \frac{4.76}{1.44(12.313)} = 0.27^{0"}$$

$$\text{Min. } A_s = 0.0025(12)(12.313) = 0.370"$$

Use #6@12" in Floodside Face
#6@12" in Protected Face

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SWING GATE DESIGN				

Check shear & bond

$$v = \frac{1.8528}{(12)(12.313)} = 0.0125 \text{ ksi} < 0.060 \text{ ksi} \quad \text{o.k.}$$

$$u = \frac{1.8528}{(2.4)(0.875)(12.313)} = 0.0717 \text{ ksi} < 0.245 \text{ ksi} \quad \text{o.k.}$$

Temperature Reinforcing

$$A_s = 0.0018 \times 12 \times 14.513 = 0.31 \text{ in}^2, \; 0.32 \text{ in}^2 \text{ Ea face}$$

Use #6 @ 12" Ea. Face

LAKE PONTCHARTRAIN, LOUISIANA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
DESIGN MEMORANDUM NO. 2 - GENERAL DESIGN
SUPPLEMENT NO. 5D
ORLEANS MARINA

APPENDIX C
HYDROLOGY AND HYDRAULICS

LAKE PONTCHARTRAIN, LOUISIANA AND VICINITY
LAKE PONTCHARTRAIN BARRIER PLAN
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APPENDIX C

HYDROLOGY AND HYDRAULICS

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APPENDIX C

HYDROLOGY AND HYDRAULICS

1. General. This appendix presents all hydrologic and hydraulic design criteria and analyses associated with the Orleans Marina floodwall. The overall plan of improvement is described in detail in the main body of this memorandum and references to the main text are cited where appropriate.

2. Tidal Hydraulics.

a. General. The Hydrology and Hydraulic Analysis design memorandum for the Lake Pontchartrain and Vicinity Barrier-Low Level plan was presented in a series of three separate reports entitled Design Memorandum No. 1 and subtitled Part I - Chalmette, Part II - Barrier, and Part III - Lakeshore. The reports were approved on 27 October 1966, 18 October 1967, and 6 March 1969, respectively. These memorandums presented detailed descriptions of the climatology and hydrologic regimen of the area and detailed descriptions and analyses of the hydraulic methods and procedures used in design of the features for the plan. Also included in the memorandums are essential data, assumptions and criteria used, and results of studies which provide the basis for determining surges, routings, wind tides, wave runup and overtopping, and frequencies. All basic hydraulic information required for design of the Orleans Marina protective structure is included in Part III - Lakeshore.

b. Design hurricane.

(1) Selection of design hurricane. The standard project hurricane (SPH) was selected as the design hurricane (Des H) due to the urban nature of the project area. A design hurricane of lesser intensity would indicate a lower net floodwall grade and expose the project area to disastrous flooding in the event of the occurrence of a hurricane approximating SPH character.

(2) Description of design hurricane. The design hurricane for the Orleans Marina area is a hypothetical hurricane intended to

represent the most severe combination of hurricane parameters that is reasonably characteristic of the area, excluding extremely rare combinations. It was assumed that the design hurricane would approach the site from such a direction and at such a rate of movement as to produce the maximum hurricane surge at the location of interest. The design hurricane has a central pressure index of 27.4 inches of mercury; a maximum 5-minute average wind velocity offshore (in the Gulf of Mexico) of 100 mi/h 30 ft above the surface at a radius of about 30 nautical miles; a forward speed of 6 knots; a frequency of occurrence of once in about 300 yrs; and would progress along a path critical to the area of interest. Plate 1 shows the hurricane track, isovels and wind direction at the critical hour for the Orleans Marina area. Detailed information on the design hurricane is presented in Design Memorandum No. 1, Hydrology and Hydraulic Analysis, Part I - Chalmette.

c. Design floodwall height and freeboard.

(1) Pertinent data related to wave characteristics which are furnished usually for incorporation into the tidal hydraulics portion of the hydrology and hydraulics appensix are not pertinent for design of the protective floodwall. Therefore, these data have been omitted. Waves generated in the open water of Lake Pontchartrain, which would normally be critical to the floodwall site, would need to traverse a route free of large obstructions in order to maintain wave parameters of sufficient magnitude to produce wave runup on the structure.

(2) Located between Lake Pontchartrain and the floodwall site is an area of about 1,000 ft in width consisting of two recreation parks and a raised parking lot with elevations exceeding 5 ft. Concrete walls, building, boathouses and other structures are located around the perimeter of the lake and also just adjacent to and lakeward of the marina. The existence of these installations tends to minimize the wave heights prior to reaching the marina and waves reaching the floodwall would be of insignificant height and tend to make wave runup negligible on the floodwall.

(3) Occurrence of a design hurricane would produce a maximum wind tide level of 8.5[1] along the floodwall of the Orleans Marina, and wave runup would be practically nonexistent. In accordance with criteria previously approved by higher authority, the freeboard selected is 2 ft above stillwater level. Consequently, the final net grade design for the Orleans Marina floodwall is 10.5 ft.

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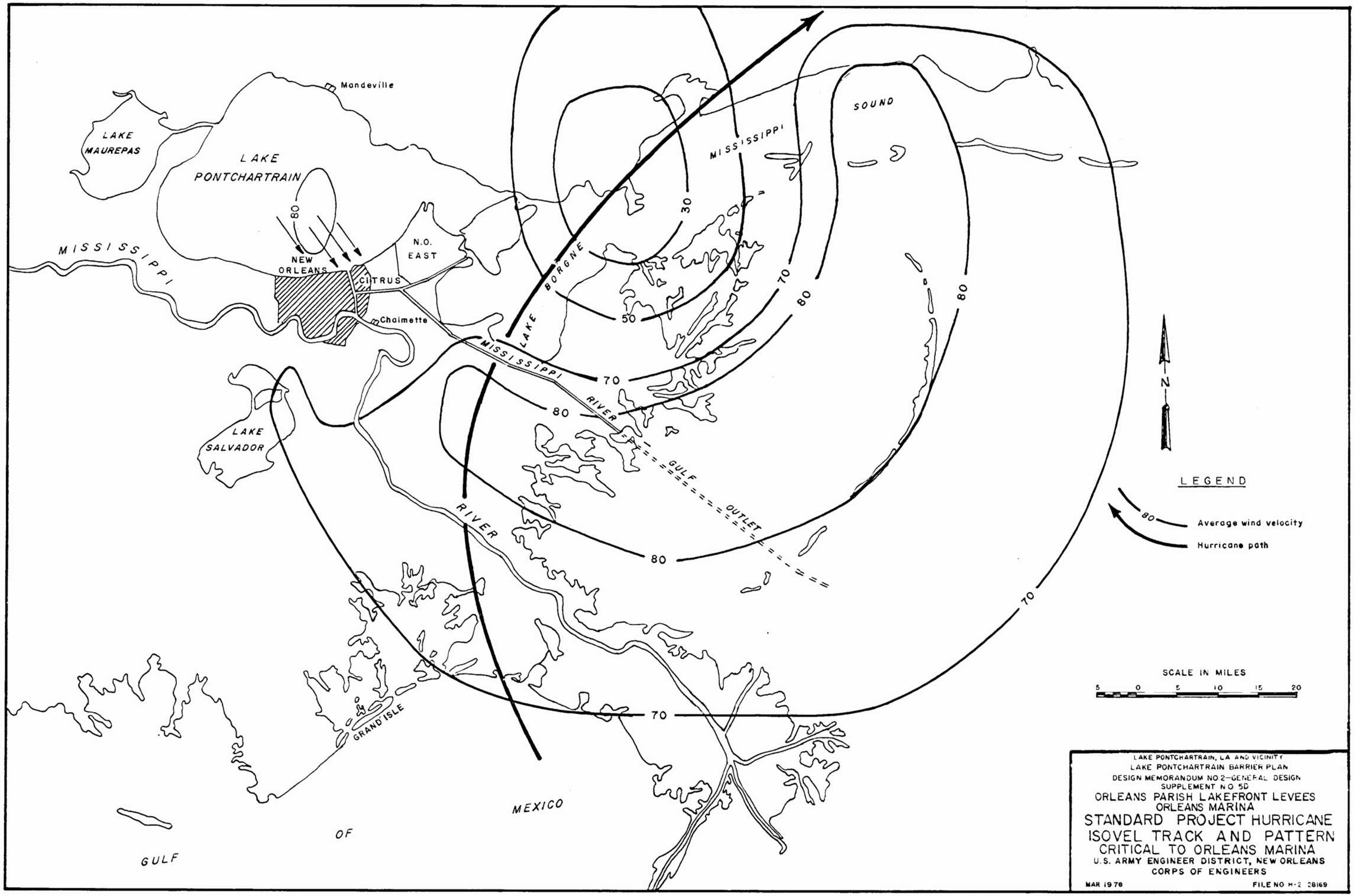
[1] Elevations shown herein are in ft referred to mean sea level datum unless otherwise noted.

3. Drainage. Existing gravity drainage structures and related works located in close proximity to the floodwall will be altered and relocated as necessary to avoid interference with the construction and location of the floodwall. The alterations and relocations will be done by local interests in accordance with the utility plan shown on plate 13 in the main text.


Mandeville
LAKE MAUREPAS
LAKE PONTCHARTRAIN
MISSISSIPPI
NEW ORLEANS
CITRUS
N.O. EAST
Chalmette
LAKE BORGNE
MISSISSIPPI
SOUND
MISSISSIPPI RIVER
GULF OUTLET
LAKE SALVADOR
GRAND ISLE
GULF OF MEXICO
30
50
70
80
80
70
80
70
N
LEGEND
80
Average wind velocity
Hurricane path
SCALE IN MILES
5 0 5 10 15 20
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LAKE PONTCHARTRAIN BARRIER PLAN
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SUPPLEMENT NO 5D
ORLEANS PARISH LAKEFRONT LEVEES
ORLEANS MARINA
STANDARD PROJECT HURRICANE
ISOVEL TRACK AND PATTERN
CRITICAL TO ORLEANS MARINA
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PLATE C-1