NEW ORLEANS TO VENICE, LOUISIANA

HURRICANE PROTECTION

REACH B-1 - TROPICAL BEND TO FORT JACKSON

EMPIRE FLOODGATE

PERIODIC INSPECTION REPORT NO. 4

United States Army
Corps of Engineers
...Serving the Army
...Serving the Nation

New Orleans District

LMVED-GS (NOD 6 Jul 84) 5th Ind
SUBJECT: New Orleans to Venice, Louisiana (Hurricane Protection);
Reach B-1 - Tropical Bend to Fort Jackson, Empire Floodgate,
Periodic Inspection Report No. 4, 31 January 1984

DA, Lower Mississippi Valley Division, Corps of Engineers, Vicksburg, MS 39180-0080

04 JAN '85
TO: Commander, New Orleans District, ATTN: LMNED-G

The disposition of comments in the preceding 4th Ind is satisfactory. No further action is required on this correspondence chain.

FOR THE COMMANDER:

wd incl

R. H. RESTA, P.E.
Chief, Engineering Division

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

REPLY TO
ATTENTION OF:

LMNED-DG

6 July 1984

SUBJECT: New Orleans to Venice, Louisiana (Hurricane Protection); Reach B-1 - Tropical Bend to Fort Jackson, Empire Floodgate, Periodic Inspection Report No. 4, 31 January 1984

Commander, Lower Mississippi Valley Division
ATTN: LMVED-G

Subject report is submitted herewith for your approval.

FOR THE COMMANDER:

FREDERIC M. CHATRY
Chief, Engineering Division

1 Incl (6 copies)
as

S: 19 Oct 84

LMVED-GS (NOD 6 Jul 84) 1st Ind
SUBJECT: New Orleans to Venice, Louisiana (Hurricane Protection); Reach B-1 - Tropical Bend to Fort Jackson, Empire Floodgate, Periodic Inspection Report No. 4, 31 January 1984

DA, Lower Mississippi Valley Division, Corps of Engineers, Vicksburg, MS 39180

20 SEP '84

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

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

a. Para 3-02b. It was understood by LMVD personnel who participated in the third periodic inspection of this project that the joint between the sheet pile I-wall and the concrete T-wall will be modified and made watertight when the I-wall is capped with concrete. This procedure was documented in the 1st and 2d Inds to LMNED-DG letter, 23 Nov 81, subject: New Orleans to Venice, Louisiana (Hurricane Protection); Reach B-1 - Tropical Bend to Fort Jackson, Empire Floodgate, Periodic Inspection Report No. 3, 29 Jul 81. We still concur in this plan of action.

b. Para 4-02d.

(1) This paragraph should contain a complete discussion on all settlement reference marks. In this regard, the discussion on settlement data for the sheet pile I-walls should be included in this paragraph in lieu of para 5-03.C.1. In the discussion of settlement data for the T-walls, it should be indicated that the settlement data on Plates I-3 and I-4 show that settlement of the T-walls is essentially complete with the exception of settlement mark 20 which indicates that the east end of the east T-wall is continuing to settle.

(2) This report should include time-settlement plots for the I-wall settlement reference marks. Note that this was discussed in para g(2) of the 1st Ind to the LMNED-DG letter of 23 Nov 81 referenced in para 1a above.

c. Para 5-03A.1.b and 5-03C.3.

(1) There appears to be a conflict between these two paragraphs. Paragraph 5.03A.1.b indicates that there is no substantial change in recent joint measurements between reference marks RM-18 and RM-19 and concludes that the wall foundation seems to have stabilized. However, paragraph 5-03C.3 indicates that the joint between T-wall monoliths T-4R and T-3R is continuing to widen as seen from the measurement of distances between RM-18 and RM-19. This discrepancy should be reconciled. In this regard, settlement data for RM-20 indicate that the east end of monolith T-4R is continuing to settle, as discussed in para 1b above, therefore, the joint between monolith T-4R and T-3R will likely continue to widen until settlement is complete.

S: 19 Oct 84

LMVED-GS (NOD 6 Jul 84) 1st Ind 20 SEP '84
SUBJECT: New Orleans to Venice, Louisiana (Hurricane Protection); Reach B-1 - Tropical Bend to Fort Jackson, Empire Floodgate, Periodic Inspection Report No. 4, 31 January 1984

(2) These paragraphs should discuss the condition of the waterstop at the joint between monoliths T-4R and T-3R. If the waterstop is ruptured or if it becomes ruptured due to increased widening of the joint, this joint will have to be resealed.

d. Para 5-03A.1.d. The decayed timbers addressed in this paragraph should be replaced prior to any future dewatering operation.

e. See additional comments in red on pages III-1 and V-1 through V-4. These corrections may be made in your file copies of the report.

2. The report should be revised in accordance with above comments in paras 1a through 1d and revised pages of the report should be furnished to this office by 19 Oct 84.

FOR THE COMMANDER:

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

1 Incl (dupe)
wd 4 cy

LMNED-DG (6 July 1984) 2d Ind
SUBJECT: New Orleans to Venice, Louisiana (Hurricane Protection);
Reach B-1-Tropical Bend to Fort Jackson, Empire Floodgate,
Periodic Inspection Report No. 4, 31 January 1984

DA, New Orleans District, Corps of Engineers, P. O. Box 60267, New Orleans, Louisiana 70160-0267 23 Oct 84

TO: Commander, Lower Mississippi Valley Division, ATTN: LMVED-DG

1. The disposition of comments presented in the 1st Ind follows. Paragraph numbers refer to like numbered paragraphs in the indorsement. Duplicate copies of inclosures are submitted for your files.

a. Para 3-02b. The sheet pile I-wall will be capped with concrete upon completion of primary consolidation, at which time the joint between the I-wall and T-wall will be modified and made watertight. Monitoring of the sheet piling will continue until primary consolidation has leveled off.

b. Para 4-02d.

(1) Concur. See Inclosure 2.

(2) Concur. Time settlement plots for the I-wall settlement reference marks for 1984 data are being completed by our drafting personnel. They will be distributed to your office upon completion within 45 days.

c. Para 5-03 A1.b and 5-03C.3.

(1) Reference to RM-18 and RM-19 has been deleted in paragraph 5-03A.1.b. Inclosure 3.

(2) The waterstop at the joint between monoliths T-4R and T-3R was in good condition at the time of inspection. If it becomes ruptured due to increased widening of the joint, this joint will be resealed as indicated. See Inclosures 2 and 3.

d. Para 5-03A.1.d.. Concur. See Inclosure 3.

e. The additional comments in red on Pages III-1, V-1 and V-4 have been made in our file copy.

FOR THE COMMANDER:

FREDERIC M. CHATRY
Chief, Engineering Division

2 Incls
wd Incl 1
Added 2 Incls (dupe)
2 & 3
as

S: 21 Dec 84

LMVED-GS (NOD 6 Jul 84) 3d Ind
SUBJECT: New Orleans to Venice, Louisiana (Hurricane Protection);
Reach B-1 - Tropical Bend to Fort Jackson, Empire Floodgate,
Periodic Inspection Report No. 4, 31 January 1984

DA, Lower Mississippi Valley Division, Corps of Engineers, Vicksburg, MS 39180-0080

14 NOV '84
TO: Commander, New Orleans District, ATTN: LMNED-G

The disposition of comments in the preceding 2d Ind is satisfactory subject to the following comment:

Para 1b(2). The time-settlement plots discussed in this paragraph should be submitted by 4th Ind to this correspondence chain NLT 21 Dec 84.

FOR THE COMMANDER:

wd incl

R. H. RESTA, P.E.
Chief, Engineering Division

LMNED-DG (6 July 1984) 4th End Mr. Drummond/ds/2711
SUBJECT: New Orleans to Venice, Louisiana (Hurricane Protection); Reach B-1-Tropical Bend to Fort Jackson, Empire Floodgate, Periodic Inspection Report No. 4, 31 January 1984

DA, New Orleans District, Corps of Engineers, P. O. Box 60267, New Orleans, Louisiana 70160-0267, 13 Dec 84

TO: Commander, Lower Mississippi Valley Division,
ATTN: LMVED-DG

The disposition of comments presented in the 3d End follows. Paragraph numbers refer to like numbered paragraphs in the endorsement. Duplicate copies of enclosures are submitted for your files.

Para 1b(2). The time settlement plots for the I-wall settlement reference marks for 1984 data are submitted for your files. See Encl 4.

FOR THE COMMANDER:

1 Encl (Dupe)

William B. Seale
FREDERIC M. CHATRY
Chief, Engineering Division

NEW ORLEANS TO VENICE, LOUISIANA

HURRICANE PROTECTION

REACH B-1 - TROPICAL BEND TO FORT JACKSON

EMPIRE FLOODGATE

PERIODIC INSPECTION REPORT NO. 4

31 JANUARY 1984

U.S. ARMY ENGINEER DISTRICT

CORPS OF ENGINEERS

NEW ORLEANS, LOUISIANA

S U M M A R Y

The Empire Floodgate was inspected on 31 January 1984 by representatives of NOD and the Plaquemines Parish Commission Council and found to be stable and structurally sound. Minor discrepancies are noted within.

EMPIRE FLOODGATE

PHOTO TAKEN 28 JULY 1976

EMPIRE FLOODGATE

PERIODIC INSPECTION NO. 4

TABLE OF CONTENTS

SECTION I - INTRODUCTION

1-01 Authority. Authority is provided by ER 1110-2-100, subject, "Periodic Inspection and Continuing Evaluation of Completed Civil Works Structures."

1-02 Purpose and Scope. The results and conclusions of the inspection and evaluation for assuring the structural integrity and operational adequacy of the structure are presented herein.

1-03 Datum. All elevations, except where otherwise indicated, are in feet and refer to the National Geodetic Vertical Datum (NGVD), formerly Mean Sea Level (m.s.l.).

1-04 Previous Inspections.

Report No.	Date of Inspection	Date Report Approved
1	4 Sep 75	7 Apr 76
2	4 Oct 78	13 Aug 79
3	29 Jul 81	20 Oct 82

SECTION II - PROJECT DESCRIPTION AND BACKGROUND

2-01 General. The description of the structure, historical and other general background information, are included in report no. 1 which also contains selected construction drawings illustrating typical sections and details. A location map for this project is included in this report (plate I-1). This report is supplementary to previously numbered reports.

SECTION III - OPERATING AND MAINTENANCE DATA

3-01 Operation and Maintenance Problems. The following work was done at the structure since the last inspection.

a. May 1982 - dredged gate area.

b. June 1982 - replaced lights & shutters, dredged gate area.

c. December 1982 - shelled bank.

d. January 1983 - maintenance work on handrails, miscellaneous cleaning and painting.

3-02 Action on Deficiencies From Last Inspection. Refer to Periodic Inspection Report No. 3, Section VI - Conclusions and Remedial Actions.

a. Item 6-02(a), monitor T-wall monoliths for further signs of movement, is being accomplished by Government hired labor forces.

b. Item 6-02(b), openings between the sheetpiling and T-wall monolith interfaces, has not been repaired at the time of this inspection but will be monitored by Government hired labor forces for further movement.

c. All other remedial actions, Items 6-02(c) thru (k), have been accomplished by the Plaquemines Parish Commission Council during regular scheduled maintenance periods.

SECTION IV - REVIEW OF DESIGN & ANALYSIS OF INSTRUMENTATION

4-01 Review of Design. A detailed comparison of the original design criteria to current design criteria was recorded in Periodic Inspection Report No. 1, dated September 1975. A review of this comparison shows that the original design is equal to or is more conversative than current design criteria. 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 November 1963, through change 2 dated 17 January 1972, which is still current. The actual conditions experienced at the floodgate since design and construction have not exceeded the conditions investigated in the design review. There have been no appreciable changes in design criteria, assumptions or function of this structure; therefore, a detailed design analysis is not required.

4-02 Analysis of Instrumentation Data.

a. General. The following chart indicates the type, location and schedule for reading of each type of instrumentation:

Instrumentation Devices	Observation Schedule
1. Settlement	
20 reference marks on structure & floodwall	Annually
18 reference marks on steel sheet pile walls	Annually

2. Scour Survey 20 ranges in approach channels	Annually
3. Floodwall Alinement 16 measurements on floodwalls	Annually
4. Distance Across Chamber 2 measurements across chamber	Annually
5. Joint Measurement 12 measurements across joints	Annually

The concrete T-walls are instrumented with reference marks in order to measure settlement, changes in alignment, and movement at the joints while the sheetpile I-walls are instrumented with settlement reference marks to determine when settlement of the levee is essentially completed.

b. Scour Survey. Recent scour surveys indicate no appreciable scouring has occurred since the last inspection.

c. Alinement. The alinement surveys indicate an apparent movement to the north.

* d. Settlement. Plates I-4 and I-4A indicate rather excessive settlement at reference mark 20 and the steel sheet piling at both ends of the structure. Settlement of the T-walls is essentially complete with the exception of settlement mark 20 which indicates that the east end of the east T-wall is continuing to settle. All settlement reference marks indicate that the levee supporting the sheet piling sections on each end of the structure is undergoing consolidation.

However, the resulting settlements have been anticipated and will continue until the completion of primary consolidation, at which time the sheet pile will be capped. Monitoring of the sheet piling should be continued until primary consolidation has leveled off.

2. Scour Survey

20 ranges in approach channels	Annually

3. Floodwall Alinement

16 measurements on floodwalls	Annually

4. Distance Across Chamber

2 measurements across chamber	Annually

5. Joint Measurement

12 measurements across joints	Annually

The concrete T-walls are instrumented with reference marks in order to measure settlement, changes in alignment, and movement at the joints while the sheetpile I-walls are instrumented with settlement reference marks to determine when settlement of the levee is essentially completed.

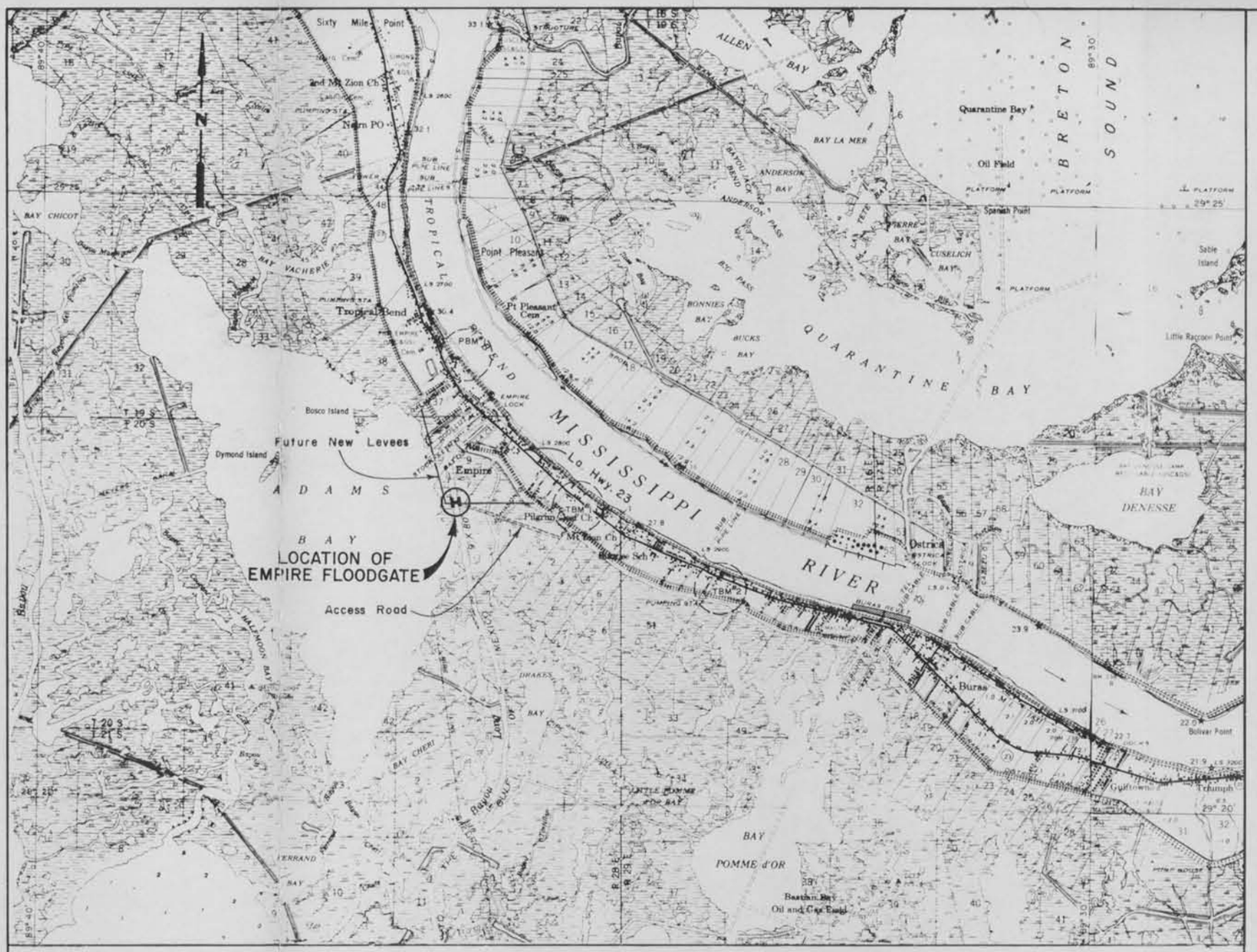
b. Scour Survey. Recent scour surveys indicate no appreciable scouring has occurred since the last inspection.

c. Alinement. The alinement surveys indicate an apparent movement to the north.

d. Settlement. Plates I-4 and I-4A indicate rather excessive settlement at reference mark 20 and the steel sheet piling at both ends of the structure.

4-03 Instrumentation Plates.

Plate No.	Title	File No.
1	Location Map	H-4-26081
I-1	Location of Instrumentation	H-4-27323
I-2	Alinement and Settlement Reference Marks - Tabulation	H-4-27323
I-2A	Alinement Differential Chart	H-4-27323
I-3	Settlement and Reference Marks Differential Movement	H-4-27323
I-4	Settlement and Reference Marks Differential Movement	H-4-27323
I-4A	Differential Chart	
I-5	Profile Survey N. App. Channel	H-4-27323
I-5A	Profile Survey S. App. Channel	
I-6	Scour Survey	
I-7	Scour Survey	
I-8	Scour Survey	
I-9	Scour Survey	
I-10	Scour Survey	
I-11	Scour Survey	



LOCATION MAP

SCALE 1:31,680

VICINITY MAP

SCALE IN MILES

INDEX TO DRAWINGS

DWG.	TITLE	DWG.	TITLE	DWG.	TITLE	DWG.	TITLE
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1	LOCATION MAP, VICINITY MAP, AND INDEX	19	GATE BAY SLAB REINFORCEMENT	36	FLAP GATE - PLAN AND SECTIONS	54	PUMPING UNIT DETAILS
2	SITE PLAN	20	GATE BAY SLAB REINFORCEMENT	37	FLAP GATE SECTION AND HINGE DETAILS		
3	SOIL BORINGS	20-A	GATE BAY SLAB REINFORCEMENT	38	GATE SEAL DETAILS		
4	SOIL BORING LEGEND	21	FLOODWALL MASONRY AND REINFORCEMENT	39	HINGE LUBRICATION DETAILS		ELECTRICAL
5	COMPLETED PLAN	22	FLOODWALL TRANSITION SECTIONS	40	TRASH PLATE - PLAN AND SECTIONS	55	SCHEMATIC WIRING DIAGRAM
6	COMPLETED SECTION	23	EXPANSION JOINT DETAILS	41	NEEDLE GIRDER - PLAN AND DETAILS	56	CONTROL WIRING DIAGRAMS
7	TYPICAL SECTIONS	24	CONTROL HOUSE PLAN AND ELEVATIONS	42	COUNTERWEIGHT CAGE SECTIONS AND DETAILS	57	SWITCHBOARD, CONTROL CENTER, AND DESK
8	INITIAL EXCAVATION	25	CONTROL HOUSE ELEVATIONS AND DETAILS			58	CONDUIT LAYOUT
9	INITIAL EXCAVATION	26	CONTROL HOUSE REINFORCEMENT		GUIDE WALL	59	CONDUIT LAYOUT
10	STRUCTURE EXCAVATION AND SECURITY FENCE	27	CONTROL HOUSE REINFORCEMENT	43	TIMBER GUIDE WALL - PLAN AND SECTIONS	60	LIGHTING AND DETAILS
		28	PUMP PLATFORM	44	TIMBER DOCK AND DOLPHINS	61	CATHODIC PROTECTION
	FLOODGATE STRUCTURE	29	PUMP PLATFORM				
11	GATE BAY AND FLOODWALL PILING LAYOUT	29A	PUMP PLATFORM - MISCELLANEOUS DETAILS		OPERATING MACHINERY		
12	PLAN OF GATE BAY MONOLITH	30	NEEDLES AND STORAGE RACK	45	PLAN - MACHINERY ARRANGEMENT		
13	SECTIONAL ELEVATION OF GATE BAY MONOLITH	31	MISCELLANEOUS EMBEDDED METALS	46	ELEVATION - MACHINERY ARRANGEMENT		
14	TRANSVERSE SECTION OF GATE BAY MONOLITH	32	MISCELLANEOUS EMBEDDED METALS	47	MACHINERY BASE		
15	GATE BAY WALL REINFORCEMENT PLAN AT EL. 15.0	33	EMBEDDED METAL - CORNER PROTECTION	48	MACHINERY HOUSING		
16	GATE BAY WALL REINFORCEMENT PLAN AND SECTIONS	34	LADDER AND STAFF GAGE DETAILS	49	MISCELLANEOUS DETAILS		
16A	GATE BAY WALL REINFORCEMENT PLAN AND SECTION	35	HANDRAILING LAYOUT - SECTIONS AND DETAILS	50	CHAIN AND SHAFT DETAILS		
17	GATE BAY WALL REINFORCEMENT SECTIONS			51	LOCKING DEVICE AND SHOCK ABSORBER DETAILS		
				52	ENGINE GENERATOR LAYOUT		

Note:
See dwg. 2 for tabulation of bench marks.

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

William E. Sommer

Jerome C. Baehr

William E. Read Jr. LTC
For

NEW ORLEANS TO VENICE, LOUISIANA
HURRICANE PROTECTION, REACH B-I

EMPIRE FLOODGATE

PLAQUEMINES PARISH, LA.

LOCATION MAP VICINITY MAP AND INDEX

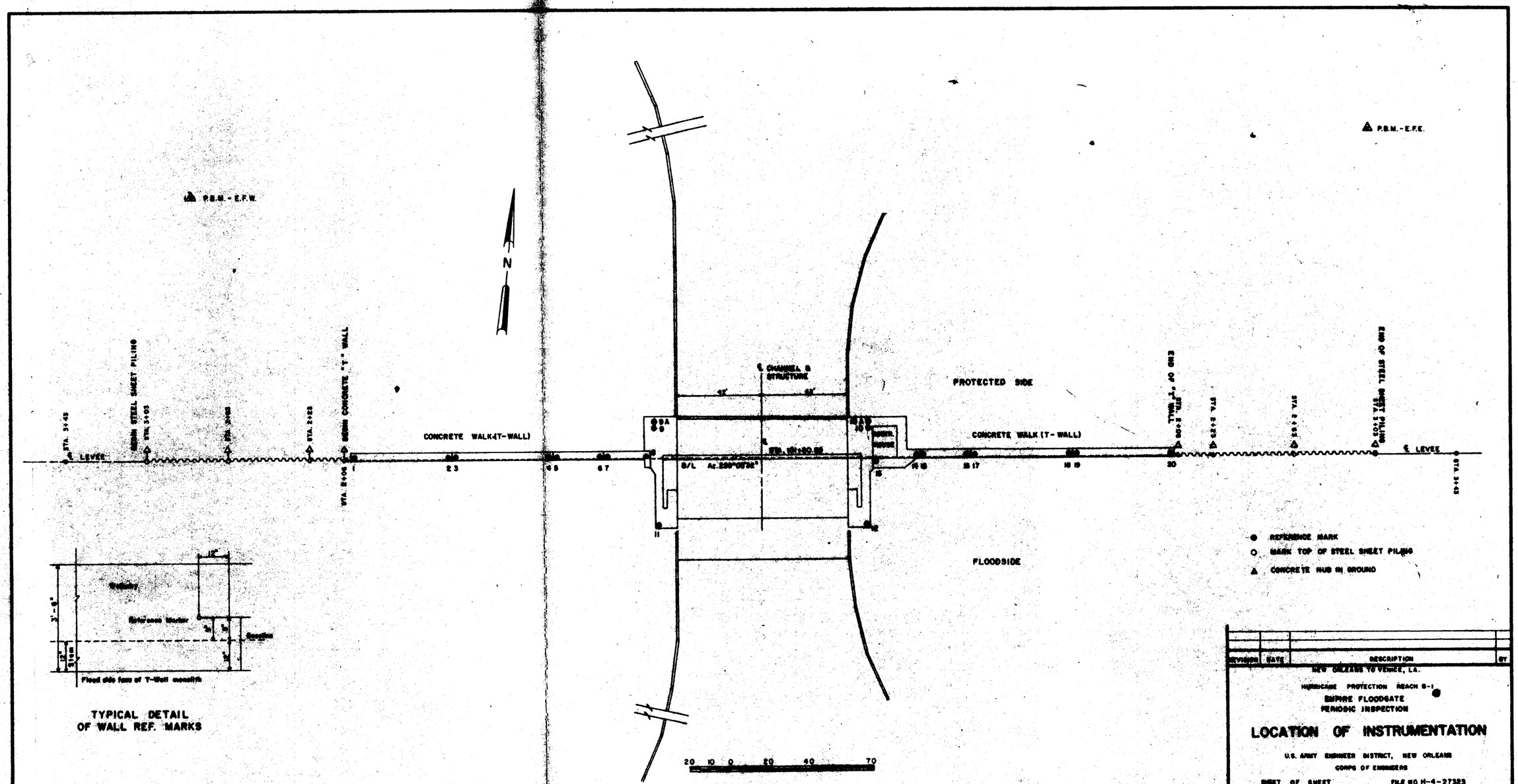
D.A.M. R.G.S. F.N.J. FEB. 1973

H-4-26081

Jed L Henderson, Jr DACW29-73-B-0111

1 64

PLATE-1



TYPICAL DETAIL
OF WALL REF. MARKS

REVISION	DATE	DESCRIPTION	BY

NEW ORLEANS TO VENICE, LA.

HURRICANE PROTECTION REACH B-1

EMPIRE FLOODGATE
PERIODIC INSPECTION

LOCATION OF INSTRUMENTATION

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

SHEET OF SHEET FILE NO. H-4-27323

PLATE I-1

SETTLEMENT REFERENCE MARK - SHEET PILING & LEVEE

REFERENCE MARK EAST OR WEST	2+06E	2+06E	2+23E	2+23E	2+63E	2+63E	3+03E	3+03E	3+43E	E-W	2+06W	2+06W	2+23W	2+23W	2+63W	2+63W	3+03W	3+03W	3+43W
INITIAL DATE	12-2-75	12-2-75	12-2-75	12-2-75	12-2-75	12-2-75	12-2-75	12-2-75	12-2-75		12-2-75	12-2-75	12-2-75	12-2-75	12-2-75	12-2-75	12-2-75	12-2-75	12-2-75
ORIGINAL READINGS (FT)	14.13	7.65	13.89	8.13	13.78	7.96	13.76	14.45	14.11		13.87	7.11	13.38	7.56	13.03	7.60	12.65	13.91	11.69
DATE OF OBSERVATIONS: 19 MAY 1976	14.01	7.46	13.69	7.92	13.45	7.62	13.33	13.96	13.64		13.82	7.04	13.31	7.48	12.94	7.66	12.52	13.75	11.49
16 APRIL 1977	13.86	7.25	13.51	7.70	13.20	7.34	13.02	13.54	13.31		13.74	6.90	13.22	7.35	12.80	7.52	12.36	13.53	13.03
5 JULY 1977	13.84	7.21	13.46	7.65	13.16	7.29	12.98	13.47	13.24		13.74	6.87	13.22	7.31	12.79	7.49	12.34	13.48	11.21
9 NOVEMBER 1977	13.82	7.18	13.45	7.62	13.12	7.24	12.92	13.37	13.17		13.71	6.84	13.17	7.28	12.74	7.45	12.28	13.43	11.06
23 MARCH 1978	13.79	7.14	13.44	[illegible] *	13.12	7.20	12.86	13.15	13.06		13.72	6.82	13.18	7.28	12.67	7.44	12.26	13.39	10.85 *
21 SEPTEMBER 1978	13.83	7.16	13.42		13.08	7.12	12.87	13.11	13.06		13.82	6.88	13.27	7.33	12.82	7.52	12.33	13.45	10.89
① 9 APRIL 1980	13.49	6.73	13.07	7.27	12.72	6.70	12.44	12.60	12.60		13.50	6.48	12.98	6.93	12.46	7.08	11.93	13.02	10.43
① 5 JANUARY 1981	13.43	6.62	13.00	●	12.60	6.56	12.36	12.86	12.45		13.47	6.41	12.91	6.83	12.42	6.99	11.89	12.91	10.35
① 30 JUNE 1982	13.36	6.49	12.92	●	12.56	—	12.20	12.26	12.26		13.44	6.31	12.86	6.70	12.36	6.86	11.84	12.77	10.24
① 5 JANUARY 1983	13.34	6.46	12.90	●	12.48	6.40	12.23	12.17	12.23		13.42	●	12.84	●	12.33	●	11.79	12.81	10.22
① 27 MARCH 1984	13.27	6.37	12.81	●	12.39	6.31	12.14	12.00	12.10		13.42	●	12.83	●	12.31	●	11.78	12.53	10.19

NOTE: FIRST STATIONINGS LISTED ARE ON STEEL SHEET PILINGS. ELEVATIONS FOR 3+43 E.&W. ARE ON CONCRETE MONUMENTS.

* Appears to be field error

ALINEMENT

REFERENCE MARK	3+43W	RM-1	RM-2	RM-3	RM-4	RM-5	RM-6	RM-7	RM-8	RM-13**	RM-14	RM-15	RM-16	RM-17	RM-18	RM-19	RM-20	3+43E	TEMP
INITIAL DATE	12-2-75	12-2-75	12-2-75	12-2-75	12-2-75	12-2-75	12-2-75	12-2-75	12-2-75	12-2-75	12-2-75	12-2-75	12-2-75	12-2-75	12-2-75	12-2-75	12-2-75	12-2-75	54°
ORIGINAL DISTANCE (IN)		11.844	11.750	11.938	12.219	12.063	12.219	11.813	12.063	21.563	11.438	11.500	11.750	11.563	11.563	11.469	11.344		
DATE OF OBSERVATIONS: 24 MAY 1976		12.438	12.344	12.375	12.812	12.938	12.750	12.562	12.781	[illegible]	12.187	12.375	12.562	12.312	12.406	12.500	12.531		78°
5 JULY 1977		12.562	12.500	12.300	12.750	[illegible]	12.750	12.531	12.656	20.500	12.375	12.625	12.781	12.593	12.531	12.718	12.531		
19 SEPTEMBER 1978		12.750	12.812	12.812	13.093	12.437	12.568	12.250	12.531	20.437	12.625	12.625	12.968	13.656	12.750	12.875	13.000		86°
9 APRIL 1980		12.718	12.625	12.531	13.000	13.469	13.719	13.125	13.313	20.281	12.938	12.938	13.250	12.875	12.875	13.063	13.250		70°
5 JANUARY 1981		12.781	12.593	12.590	12.906	13.531	13.750	13.156	13.344	20.250	12.906	12.844	13.188	12.813	12.813	13.063	13.219		47°
30 JUNE 1982		12.750	12.844	12.844	13.031	13.094	13.156	12.969	13.219	19.969	13.031	13.000	13.469	13.094	13.094	13.344	13.531		89°
6 JANUARY 1983		12.875	12.969	12.969	12.906	13.813	13.344	13.469	13.469	[illegible]	12.969	13.063	13.344	13.031	13.250	13.531	13.844		52°

NOTE: RM-1 THRU RM-8 ALINEMENT SHOTS ARE TAKEN WITH INSTRUMENT SET UP ON 3+43 W. RM-13 THRU RM-20 ALINEMENT SHOT ARE TAKEN WITH INSTRUMENT SET UP ON 3+43 E.

** RM-13 IS SOUTH OF BASELINE. ALL OTHER REFERENCE MARKS ARE NORTH OF BASELINE.

① NOTE: THE DIFFERENTIAL GRAPHS (1975 - DATE) ARE PLOTTED USING THE EQUATION (R-R) - .151' = DIFF. THE 0.151 IS CAUSED BY THE FOLLOWING BENCH MARK (N.G.V.D.) CONNECTIONS; PBM E.F.E. (1975-76 (ELEV.) 3.122' - 1979 (ELEV) 2.971' = 0.151'

● NOTE: CAP DESTROYED; SHOT NATURAL GROUND.

** RM-13 IS SOUTH OF BASELINE.
ALL OTHER REFERENCE MARKS ARE NORTH OF BASELINE

P.B.M. - E.F.E. (USE) 1975-76 ELEVATION 3.122 FEET N.G.V.D TOP OF 1 1/2 INCH PIPE CAP.

P.B.M. WAS SET AS FOLLOWS: IS TOP OF 1 1/2 INCH DIA. GALVANIZED PIPE SET IN BORE HOLE AT 200 FEET THEN DRIVEN AN ADDITIONAL 5 FEET INTO STRATA. P.B.M. IS LOCATED ON THE EAST BANK OF THE WATERWAY FROM EMPIRE TO GULF OF MEXICO JUST NORTH OF THE EMPINE FLOODGATE EAST LEVEE AT STATION [illegible] (BASELINE OF STRUCTURE) AND 100 FT. NORTH OF THE EAST AND WEST LEVEE. PIPE AND CAP ARE ENCLOSED IN A 3 INCH PIPE CASING WHICH IS APPROX. 12 INCHES ABOVE THE GROUND AND SURROUNDED WITH CONCRETE FLUSH WITH THE GROUND. THE 3 INCH PIPE IS GUARDED BY FOUR 1 DIA. PIPES AND ALL ARE PAINTED YELLOW.

P.B.M. - E.F.W. (USE) 1975-76 ELEVATION 4.363 FEET N.G.V.D TOP OF 1 1/2 INCH PIPE CAP.

P.B.M. WAS SET AS FOLLOW: IS TOP OF 1 1/2 INCH DIA. GALVANIZED PIPE SET IN BORE HOLE AT 200 FEET THEN DRIVEN AN ADDITIONAL 5 FEET INTO STRATA. P.B.M. IS ON THE WEST BANK OF THE WATERWAY FROM EMPIRE TO GULF OF MEXICO. JUST NORTH OF EMPIRE FLOODGATE, AT LEVEE STATION 99+00 (BASELINE OF STRUCTURE) AND 130 FEET NORTH OF THE EAST AND WEST LEVEE. PIPE AND CAP ARE ENCLOSED IN A 3 INCH PIPE CASING WHICH IS APPROX. 12 INCHES ABOVE THE GROUND AND SURROUNDED WITH CONCRETE FLUSH WITH THE GROUND. THE 3 INCH PIPE IS GUARDED BY FOUR 1 DIA. PIPES AND ALL ARE PAINTED YELLOW.

PBM EFE 3.12

SETTLEMENT REFERENCE MARKS - STRUCTURE & T-WALL

NO. OF REFERENCE MARKS	RM-1	RM-2	RM-3	RM-4	RM-5	RM-6	RM-7	RM-8	RM9	RM-9A	RM-10	RM-10A	RM-11	RM-12	RM-13	RM-14	RM-15	RM-16	RM-17	RM-18	RM-19	RM-20	Temp	Gage1	Gage2	Remarks	P.B.M.** E.F.E	P.B.M.** E.F.W
INITIAL DATE	12-2-75	12-2-75	12-2-75	12-2-75	12-2-75	12-2-75	12-2-75	12-2-75	12-2-75	5-19-76	12-2-75	5-19-76	12-2-75	12-2-75	12-2-75	12-2-75	12-2-75	12-2-75	12-2-75	12-2-75	12-2-75	12-2-75	49°	0.32			12-2-75	
ORIGINAL READINGS (FT)	14.59	14.72	14.73	14.78	14.76	14.77	14.79	14.74	14.76	14.77	14.71	14.70	14.74	14.73	14.75	14.68	14.67	14.67	14.66	14.61	14.61	14.57					3.122	
DATE OF OBSERVATIONS: 19 MAY 1976	14.56	14.71	14.72	14.77	14.74	14.75	14.76	14.70	14.73	14.72	14.67	14.66	14.71	14.69	14.71	14.65	14.63	14.63	14.63	14.58	14.58	14.51	71°	0.30			3.122	
5 JULY 1977	14.51	14.68	14.68	14.72	14.70	14.70	14.71	14.64	14.68	14.67	14.62	14.61	14.66	14.64	14.65	14.59	14.58	14.59	14.58	14.53	14.53	14.43	88°	0.00				4.363
15 SEPTEMBER 1978	14.49	14.66	14.66	14.70	14.68	14.68	14.68	14.62	14.64	14.64	14.56	14.56	14.63	14.59	—	14.54	14.53	14.54	14.53	14.48	14.48	14.36		0.90			3.122	4.396
① 9 APRIL 1980	14.29	14.47	14.48	14.53	14.51	14.51	14.51	14.43	14.47	14.46	14.40	14.39	14.48	14.42	14.43	14.37	14.36	14.37	14.35	14.29	14.29	14.15	73°	0.20	0.20		2.971	4.281
① 5 JANUARY 1981	14.27	14.46	14.46	14.51	14.49	14.49	14.49	14.45	14.42	14.46	14.37	14.37	14.44	14.40	14.41	14.36	14.34	14.34	14.33	14.25	14.25	14.10	51°	-0.9	-0.8		2.971	4.206
① 30 JUNE 1982	14.24	14.44	14.45	14.50	14.47	14.47	14.49	14.41	14.44	14.43	14.35	14.34	14.48	14.34	14.39	14.31	14.31	14.31	14.29	14.21	14.20	14.05	89°	0.90			2.971	4.200
① 5 JANUARY 1983	14.23	14.42	14.43	14.48	14.46	14.46	14.46	14.40	14.43	14.43	14.34	14.34	14.41	14.37	14.38	14.31	14.30	14.30	14.29	14.20	14.20	14.03	63°	0.73	0.73		2.971	4.198
① 27 MARCH 1984	14.22	14.43	14.43	14.49	14.47	14.47	14.47	14.41	14.44	14.44	14.34	14.34	14.42	14.37	14.38	14.31	14.30	14.30	14.29	14.18	14.18	13.98		1.85	1.85		2.971	4.240

** ELEVATION OF BENCH MARK USED

DISTANCES TO REFERENCE MARKS

NO. OF REFERENCE MARKS	RM2 - RM3	RM4 - RM5	RM6 - RM7	RM9A-RM10A	RM11 - RM12	RM14 - RM15	RM16 - RM17	RM18 - RM19	TEMP	Remarks
INITIAL DATE	12-2-75	12-2-75	12-2-75	12-2-75	12-2-75	12-2-75	12-2-75	12-2-75	54°	
ORIGINAL DISTANCE (IN.)	24.313	24.500	23.750	105.83 *	103.96 *	24.000	24.094	24.313		
DATE OF OBSERVATIONS: 24 MAY 1976	24.312	24.500	23.406	106.86	104.98	24.000	24.094	—	78°	
1 JULY 1977	24.437	24.531	23.750	106.82	104.97	23.968	24.125	24.531	88°	
14 SEPTEMBER 1978	24.468	24.500	23.625	106.92	105.07	23.937	24.250	24.531	89°	
9 APRIL 1980	24.688	24.750	24.750			24.031	24.281	24.781	70°	
5 JANUARY 1981	24.844	24.875	24.625			24.156	24.281	24.906	55°	
30 JUNE 1982	24.594	24.625	23.688			23.969	24.250	24.688	89°	
6 JANUARY 1983	24.813	24.844	23.813	—	—	24.063	24.375	24.875	51°	
27 MARCH 1984	24.845	24.875	23.781	—	—	23.968	24.281	24.812		

NOTE: * APPEARS TO BE SURVEY ERROR.

P.B.M. J-279 (1971 ADJUSTMENT) ELEVATION 0.766 FEET N.G.V.D

P.B.M WAS SET AS FOLLOWS: ABOUT 1.5 MILES SOUTHEAST ALONG STATE HIGHWAY 23 FROM THE DRAW BRIDGE OVER THE DOULLUT CANAL AT EMPIRE, THENCE 0.1 MILE NORTHEAST ALONG A SHELL DRIVEWAY, 200 FEET NORTH OF THE CENTER OF THE CROSSING OF THE DRIVEWAY AND THE MISSOURI PACIFIC RAILROAD, 174 FEET NORTHWEST OF THE CENTER LINE OF THE DRIVE, 86.6 FEET NORTHEAST OF THE NORTHEAST RAIL, 48 FEET SOUTHWEST OF THE CENTER LINE OF A SHELL ROAD WHICH FOLLOWS THE TOP OF THE MISSISSIPPI RIVER LEVEE, 1 1/2 FEET SOUTHEAST OF A POWER POLE, 0.6 FOOT NORTHWEST OF A METAL WITNESS POST, ABOUT LEVEL WITH THE TRACK, AND ON THE TOP OF A COPPER - COATED ROD THAT IS DRIVEN TO A DEPTH OF 80 FEET AND THAT IS ENCASED IN A 6 - INCH METAL PIPE THAT PROJECTS 0.2 FOOT.

P.B.M. - K - 195 (1971 ADJUSTMENT) ELEVATION 7.320 FEET N.G.V.D

P.B.M. WAS SET AS FOLLOWS: AT EMPIRE, SET IN THE TOP OF THE NORTHEAST END OF THE NORTHWEST CONCRETE ABUTMENT OF THE STATE HIGHWAY 23 DRAW BRIDGE OVER THE DOULLUT CANAL AT EMPIRE, 21.4 FEET NORTHEAST OF THE CENTER OF THE HIGHWAY, 4.3 FEET NORTHWEST OF THE BRIDGE OPERATORS HOUSE, 0.8 FOOT SOUTHWEST OF THE NORTHEAST END OF THE ABUTMENT AND 1 FOOT BELOW THE LEVEL OF THE HIGHWAY.

NOTE: THE ABOVE P.B.M. ELEVATIONS WERE DERIVED FROM THE LATEST LEVELING AND ARE BASED ON A SUPPLEMENTARY ADJUSTMENT OF 1971. COPIED FROM VERTICAL CONTROL DATA BY THE GEODETIC SURVEY QUAD 290893, PAGES 1, 5 AND 6. LINE 101 ADJUSTED ELEVATIONS OF 1971. THIS INFORMATION IS ON FILE IN THE SURVEY BRANCH.

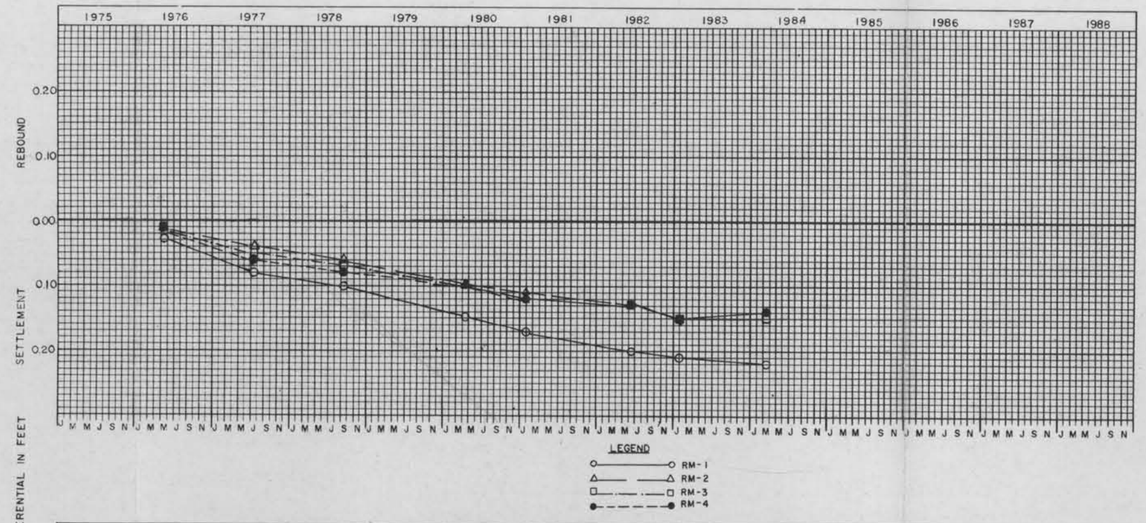
NEW ORLEANS TO VENICE, LA.
HURRICANE PROTECTION REACH B-1

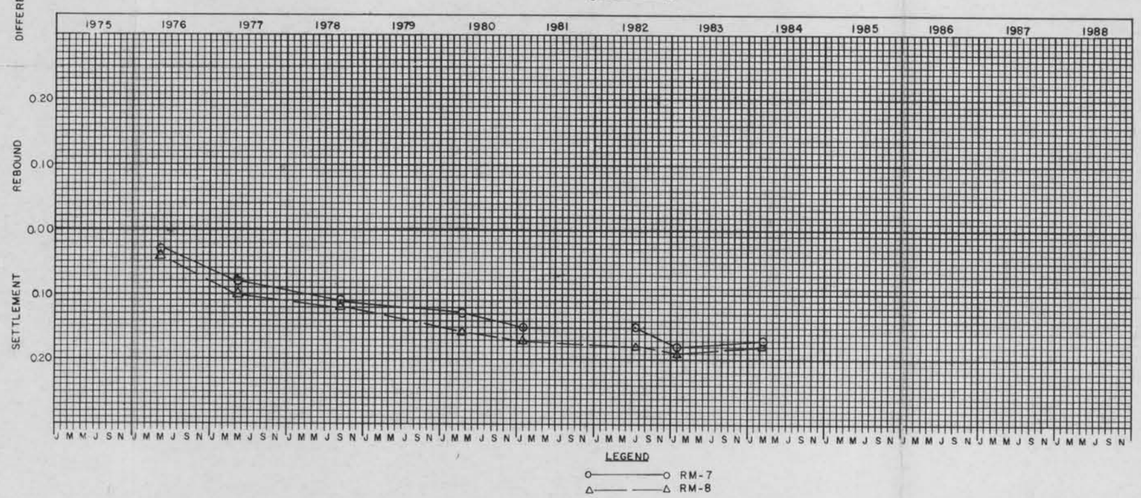
PERIODIC INSPECTION
EMPIRE FLOODGATE

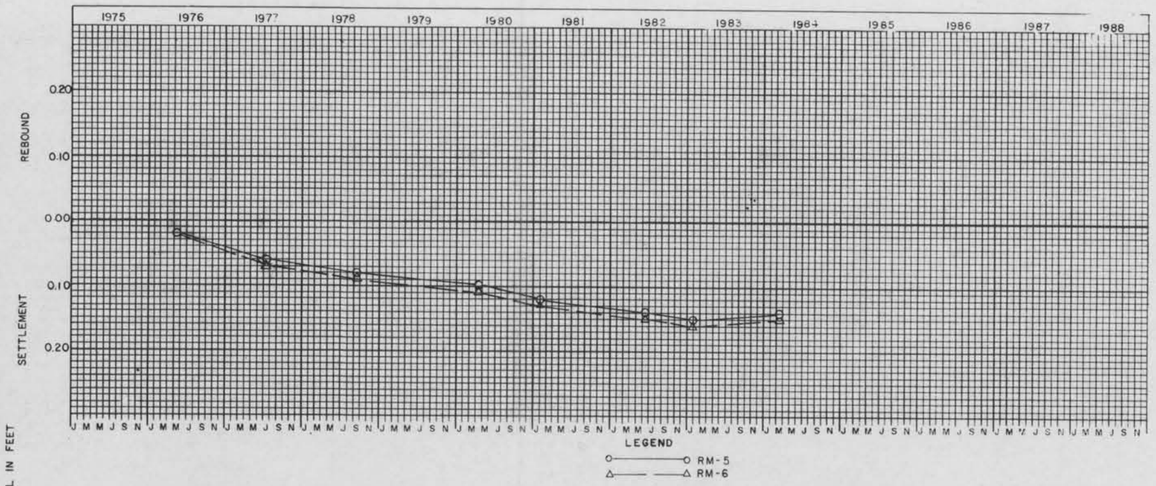
ALINEMENT AND SETTLEMENT REFERENCE MARKS - TABULATIONS

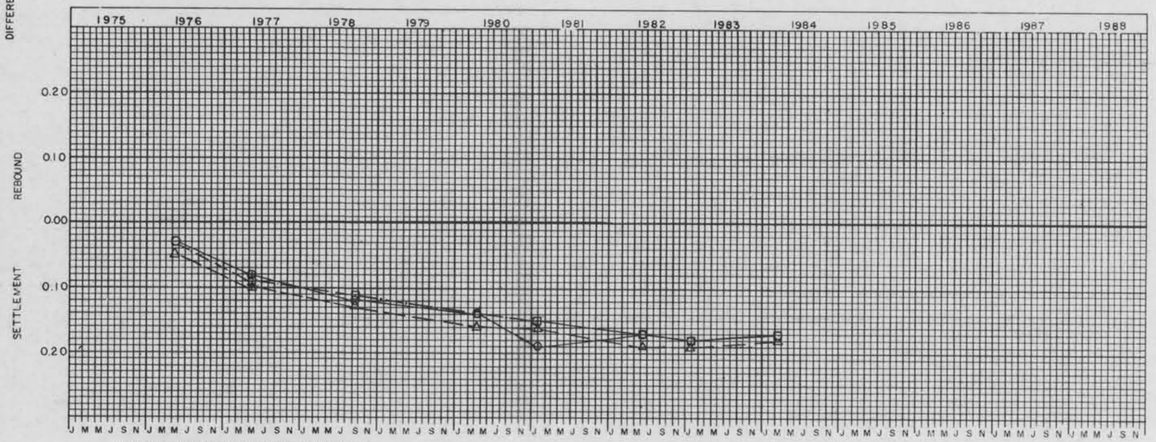
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS

SHEET OF SHEET | FILE NO. H-4-27323/









NOTE: FOR LOCATION OF SETTLEMENT REFERENCE MARKS SEE PLATE.
FOR TABULATION OF ELEVATIONS SEE PLATE.

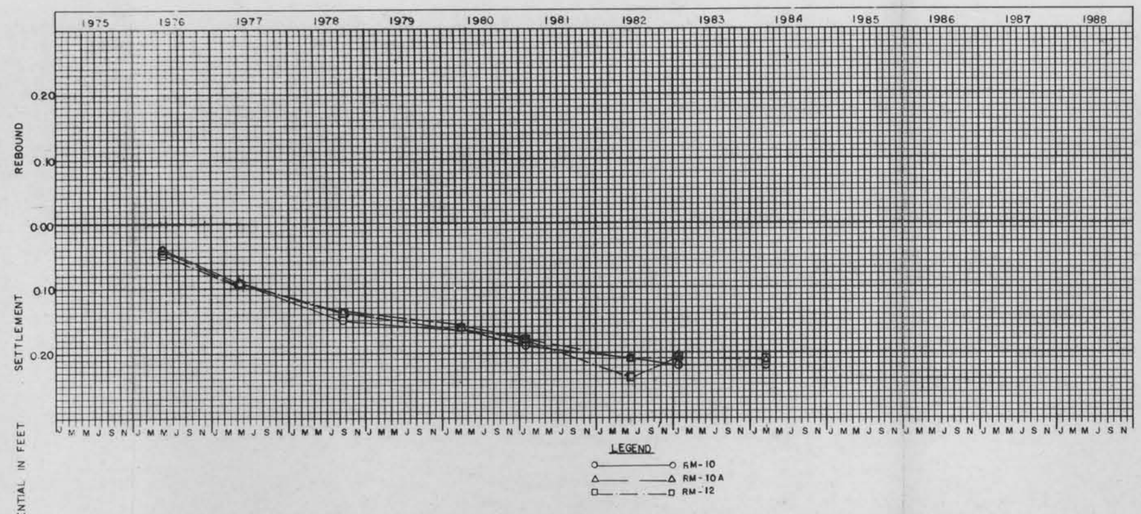
NOTE: ALL POINTS PLOTTED AFTER 1979 ARE USING THE EQUATION (R-R)-.151 = DIFF.; SEE TABULATION CHART FOR FURTHER INFORMATION.

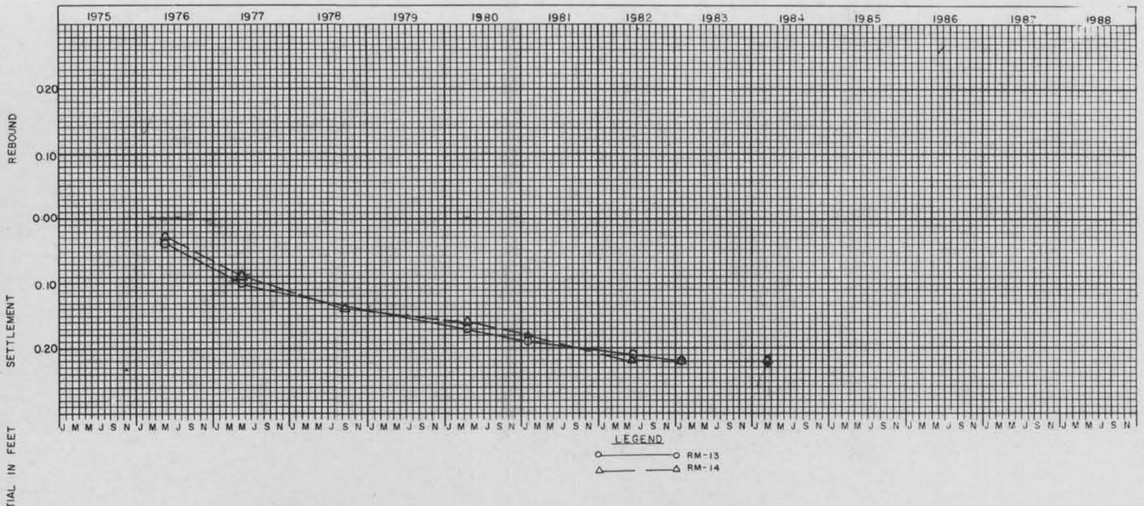
NEW ORLEANS TO VENICE, LA.
HURRICANE PROTECTION REACH B-1
PERIODIC INSPECTION
EMPIRE FLOODGATE

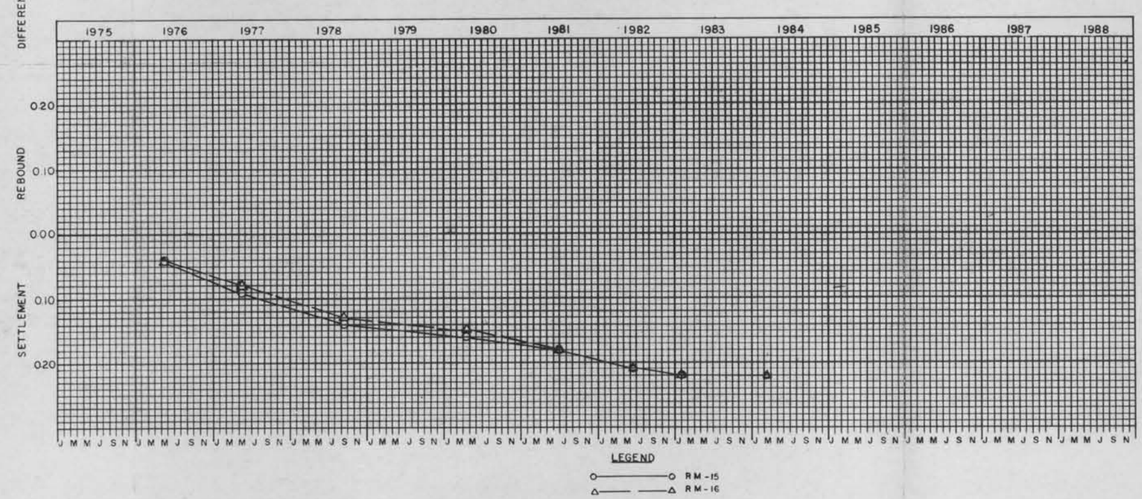
SETTLEMENT AND REFERENCE MARKS DIFFERENTIAL'S MOVEMENT

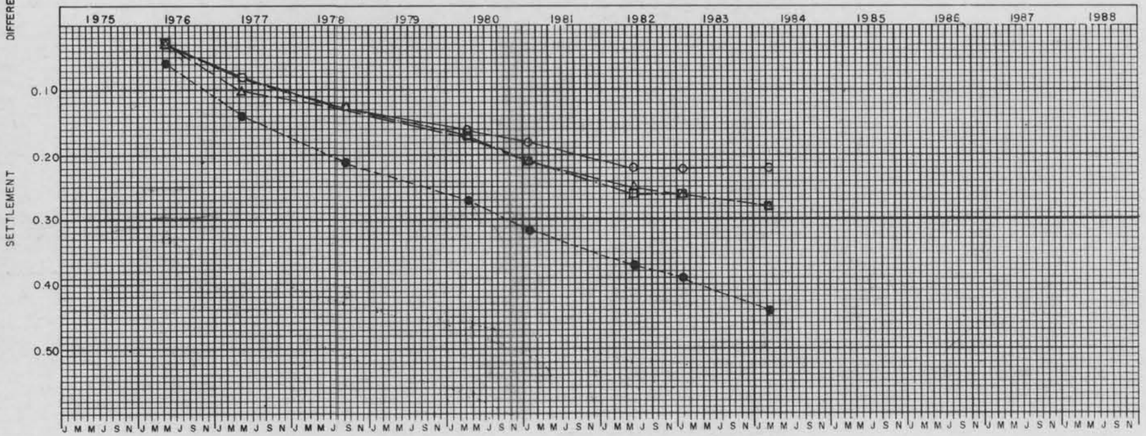
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
FILE NO H-4-27323

PLATE I-3









NOTE: FOR LOCATION OF SETTLEMENT REFERENCE MARKS SEE PLATE.
FOR TABULATION OF ELEVATIONS SEE PLATE.

NOTE: ALL POINTS PLOTTED AFTER 1979 ARE USING THE EQUATION (R-R)-.151 = DIFF.; SEE TABULATION CHART FOR FURTHER INFORMATION.

LEGEND
RM-17
RM-18
RM-19
RM-20

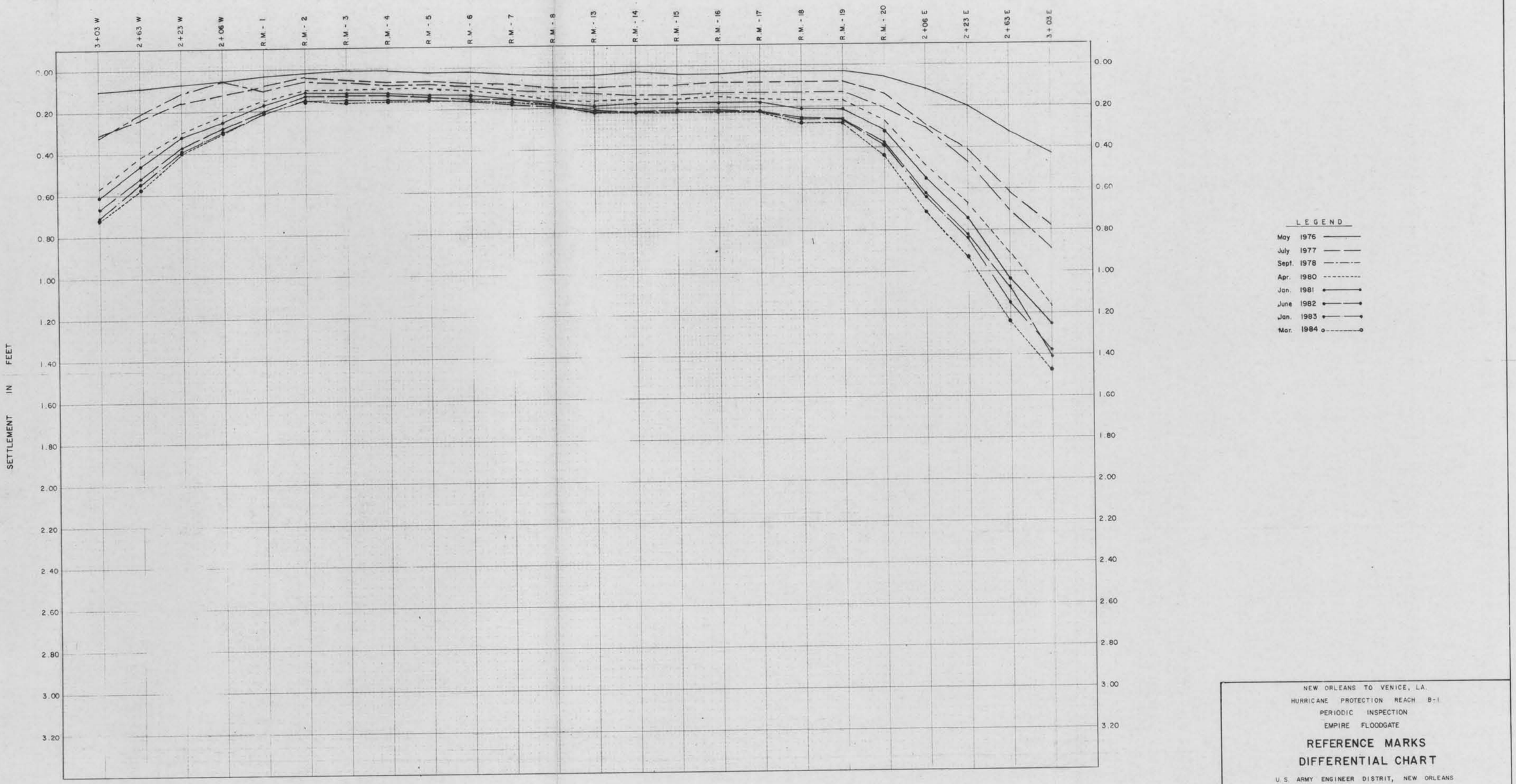
NEW ORLEANS TO VENICE, LA.
HURRICANE PROTECTION REACH B-1
PERIODIC INSPECTION
EMPIRE FLOODGATE

SETTLEMENT AND REFERENCE MARKS DIFFERENTIAL'S MOVEMENT

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

FILE NO H-4-27323

PLATE I-4



NEW ORLEANS TO VENICE, LA.
HURRICANE PROTECTION REACH B-1
PERIODIC INSPECTION
EMPIRE FLOODGATE

REFERENCE MARKS DIFFERENTIAL CHART

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

PLATE I-4A

LEGEND

	DESIGN	JOB NO. 75-724
	07 APR 80	JOB NO. 80-269
	05 JAN 81	JOB NO. 81-41
	29 JUN 82	JOB NO. 82-169
	06 JAN 83	JOB NO. 83-32

NOTE
SECTIONS PLOTTED LOOKING NORTH

N.O. TO VENICE

HURR PROT REACH

EMPIRE FLOODGATE N. APP. CHANN

PROFILE SURVEY (77-83)

U.S. ARMY ENGINEERS NEW ORLEANS CORPS OF ENGINEERS

SHEET OF APR. 1983 FILE NO.

PLATE I-5

LEGEND

	DESIGN	JOB NO. 75-724
	07 APR 80	JOB NO. 80-269
	05 JAN 81	JOB NO. 81-41
	29 JAN 82	JOB NO. 82-169
	08 JAN 83	JOB NO. 83-32

NOTE
SECTIONS PLOTTED LOOKING NORTH

N.O. TO VENICE
HURR PROT REACH
EMPIRE FLOODGATE S. APP. CHANN
PROFILE SURVEY (77-83)
U.S. ARMY ENGINEERS NEW ORLEANS CORPS OF ENGINEERS
SHEET OF APR. 1983 FILE NO.
PLATE I-5A

WEST
EAST
0+37.00
0+51.00
0+57.00
0+79.00
ELEVATIONS IN FEET NGVD
LEGEND
NOTE
SECTIONS PLOTTED LOOKING NORTH
N.O. TO VENICE
HURR PROT REACH
EMPIRE FLOORTE S. APP. CHANN
SCOUR SURVEY (77-83)
PLATE I-6

LEGEND

NOTE
SECTIONS PLOTTED LOOKING NORTH

N.O. TO VENICE
HURR PROT REACH
EMPIRE FLOODGATE & APP. CHANN
SCOUR SURVEY (77-83)

PLATE I-7


WEST
EAST
4+00.00
6+00.00
LEGEND
NOTE
N.O. TO VENICE
EMPIRE FLOODGATE & APP. CHANN
SCOUR SURVEY (77-83)
FILE NO.

PLATE I-8


WEST
EAST
0
50
100
150
200
250
300
350
400
450
500
550
600
ELEVATIONS IN FEET NGVD
0+19.00
0+37.00
0+55.00
0+74.00
LEGEND
DESIGN
NOTE
SECTIONS PLOTTED LOOKING NORTH
N.O. TO VENICE
HURR PROT REACH
EMPIRE FLOGATE N. APP. CHANN
SCOUR SURVEY (77-83)
U.S. ARMY ENGINEERS NEW ORLEANS CORPS OF ENGINEERS
PLATE II-9


WEST
EAST
0+96.00
1+06.00
2+00.00
3+00.00
LEGEND
NOTE
SECTIONS PLOTTED LOOKING NORTH
N.O. TO VENICE
HURR PROT REACH
EMPIRE FLOODGATE N. APP. CHANN
SCOUR SURVEY (77-83)
PLATE I-10

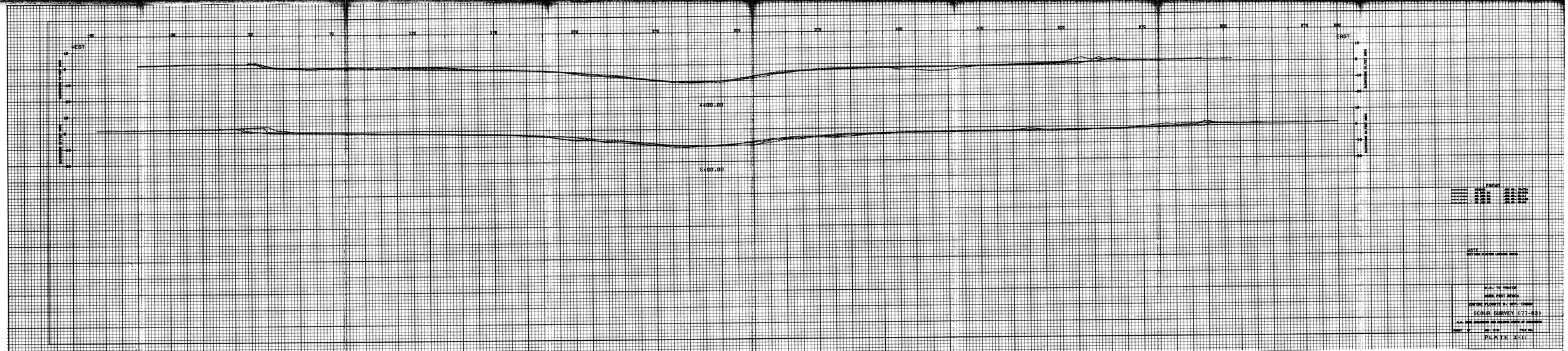


PLATE X-11

SECTION V- INSPECTION

5-01 Inspection Team. The inspection of the structure was conducted on 31 January 1984 by the following personnel:

NOD

Johnny Drummond	General Engineering Section
Harvey Sims	General Engineering Section
Angel Misland	Hydraulics & Hydrologic Branch
Kevin Healy	Foundations & Materials Branch
Richard Baldini	Operation Division
Mohan Desai	Structural Design Section

PLAQUEMINES PARISH COMMISSION COUNCIL

Henry Urban

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

5-03 Observations. The floodgate was not dewatered at the time of the inspection, therefore, the following observations were limited to those visible above the water surface.

A. Structure.

1. Reinforced Concrete. The overall appearance of the concrete was good. With the exception of a few minor flaws, no unusual deterioration was noticed.

a. Floodwall. There were some temperature and shrinkage cracks on the stem and walkway area of T-wall monolith T-4R. Some of

Incl 3

these cracks were noted in previous inspection reports and showed no signs of activity.

b. Joints. The recent joint measurements between *reference marks RM2-RM3 and RM-4-RM-5 show no substantial change from the previous ones. The wall foundation seems to have stabilized but these measurements will continue to be monitored. The waterstop at the joint between monoliths T-4R and T-3R was in good condition.*

c. Gatebay Monolith. A minor concrete popout was noticed on the top surface of the west side wall (Photo 1). Some handrail post anchors and a safety chain at a bulkhead recess were missing. To avoid further deterioration of the concrete, the spall should be repaired with epoxy concrete. Also, the missing post anchors and chain should be installed to avoid hazardous conditions.

d. Needle Storage Rack. The steel girders are well painted and the concrete needles are in very good condition. Some timbers are decayed but have no significant effect on structure. They *should be replaced prior to any future dewatering operation.

2. The gate seems to be in good condition except for damage to the gate skin plate due to an accidental impact by a vessel (Photo 2). This damage is not effecting the operational condition of the gate.

3. Timber Guidewalls. Timber guidewalls are in good condition.

*Revised 15 Oct 84.

B. Hydraulic & Hydrology.

1. The breakwater dike on the west bank of the south approach channel has lost practically all the riprap. The embankment seems to be lower than the design elevation which is +3.0 feet MSL.

2. The staff gage on the guidewall should be painted again. It is difficult to read the elevations. The lowest elevation that can be read is 4 feet.

C. Foundations & Materials.

* 1. All banks are in good condition.

2. Reference mark No. 20 shows excessive settlement at the east edge of the outer T-wall monolith T-4R. It was observed that the joint between monolith T-4R and the adjoining T-3R is widening at the top as can also be seen from the measurements of distance between marks 18 and 19 (Photo 3) presented on Plate I-2. It appears from these observations that monolith T-4R is rotating due to settlement under its outermost edge. Minor cracks were also observed at the top of monolith T-4R, one of which continued down each side of the monolith. It is recommended that monolith T-4R be monitored closely in the future to determine if the rate of settlement of the monolith and its pile foundation will decrease as primary consolidation of the surrounding *soils levels off. The waterstop at the joint between monoliths T-4R and T-3R was in good condition. If it becomes ruptured due to increased widening of the joint, this joint will be resealed.*

*Revised 15 Oct 84

SECTION V - INSPECTION

5-01 Inspection Team. The inspection of the structure was conducted on 31 January 1984 by the following personnel:

NOD

Johnny Drummond	General Engineering Section
Harvey Sims	General Engineering Section
Angel Mislan	Hydraulics & Hydrologic Branch
Kevin Healy	Foundations & Materials Branch
Richard Baldini	Operations Division
Mohan Desai	Structural Design Section

PLAQUEMINES PARISH COMMISSION COUNCIL

Henry Urban

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

5-03 Observations. The floodgate was not dewatered at the time of the inspection, therefore, the following observations were limited to those visible above the water surface.

A. Structure.

1. Reinforced Concrete. The overall appearance of the concrete was good. Excluding few minor flaws, no unusual deterioration was noticed.

a. Floodwall. There were some temperature and shrinkage cracks on the stem and walkway area of the T-wall

monolith T-4R. Some of these cracks were noted in previous inspection reports and showed no signs of activity.

b. Joints. The recent joint measurements between reference marks RM2-RM3, RM4-RM5 and RM18-RM19 show no substantial change from the previous ones. The wall foundation seems to have stabilized but these measurements will continue to be monitored.

c. Gatebay Monolith. A minor concrete popout was noticed on the top surface of the west side wall (Photo 1). Some handrail post anchors and a safety chain at bulkhead recess were missing. To avoid further deterioration of the concrete, pot hole should be repaired with epoxy concrete. Also, the missing post anchors and chain should be installed to avoid hazardous conditions.

d. Needle Storage Rack. The steel girders are well painted and the concrete needle is in very good condition. Some timbers are decayed but have no significant effect to structure.

2. The gate seems to be in good condition except for damage to the gate skin plate due to an accidental hit by a vessel (Photo 2). This damage is not effecting the operational condition of the gate.

3. Timber Guidewalls. Timber guidewalls are in good condition.

B. Hydraulic & Hydrology.

1. The breakwater dike on the west bank of the south approach channel has lost practically all the riprap. The embankment seems to be lower than the design elevation which is +3.0 feet MSL.

2. The staff gage on the guidewall should be painted again. It is difficult to read the elevations. The lowest elevation that can be read is 4 feet.

C. Foundations & Materials.

1. Instrumentation has shown that the levee supporting the sheet piling sections on each end of the structure is undergoing consolidation. However, the resulting settlements have been anticipated in the GDM and will continue until the completion of primary consolidation, at which time the sheet pile will be capped. Monitoring of the sheet piling should be continued until primary consolidation has leveled off.

2. All banks are in good condition.

3. Reference mark No. 20 shows excessive settlement at the east edge of the outer T-wall monolith T-4R. It was observed that the joint between monolith T-4R and the adjoining T-3R is widening at the top as can also be seen from the measurements of distance between marks 18 and 19 (Photo 3) presented on Plate I-2. It appears from these observations that monolith T-4R is rotating due to settlement under its outermost edge. Minor

cracks were also observed at the top of monolith T-4R, one of which continued down each side of the monolith. It is recommended that close attention be paid to monolith T-4R in the future to determine if the rate of settlement of the monolith and its pile foundation will decrease as primary consolidation of the surrounding soils levels off.

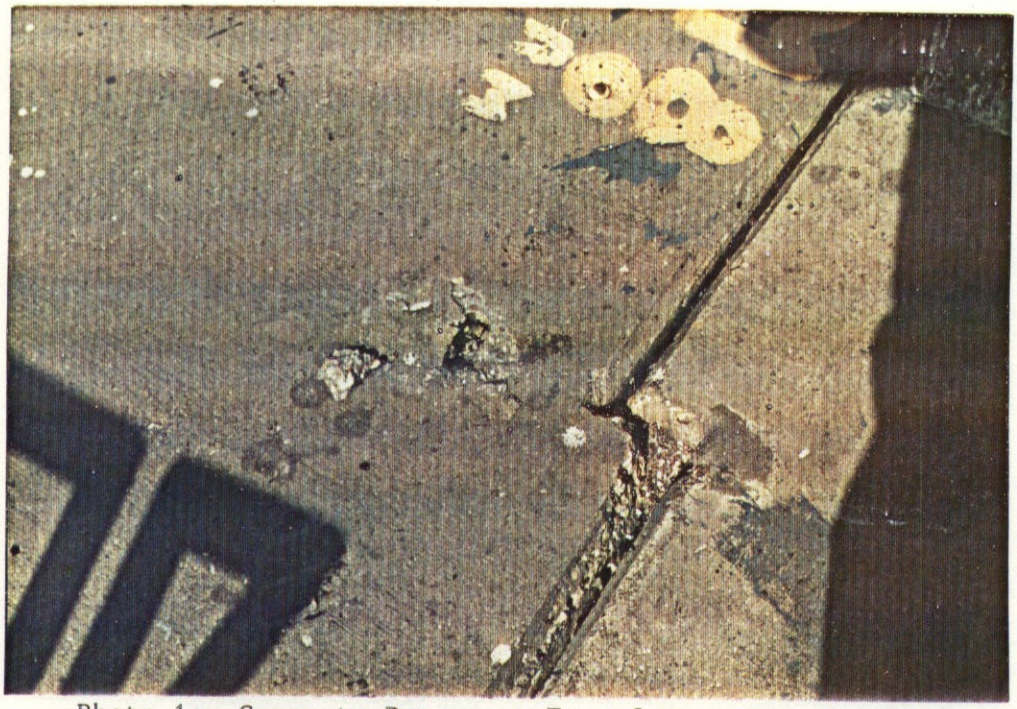


Photo 1: Concrete Popout on Top of West Side Wall

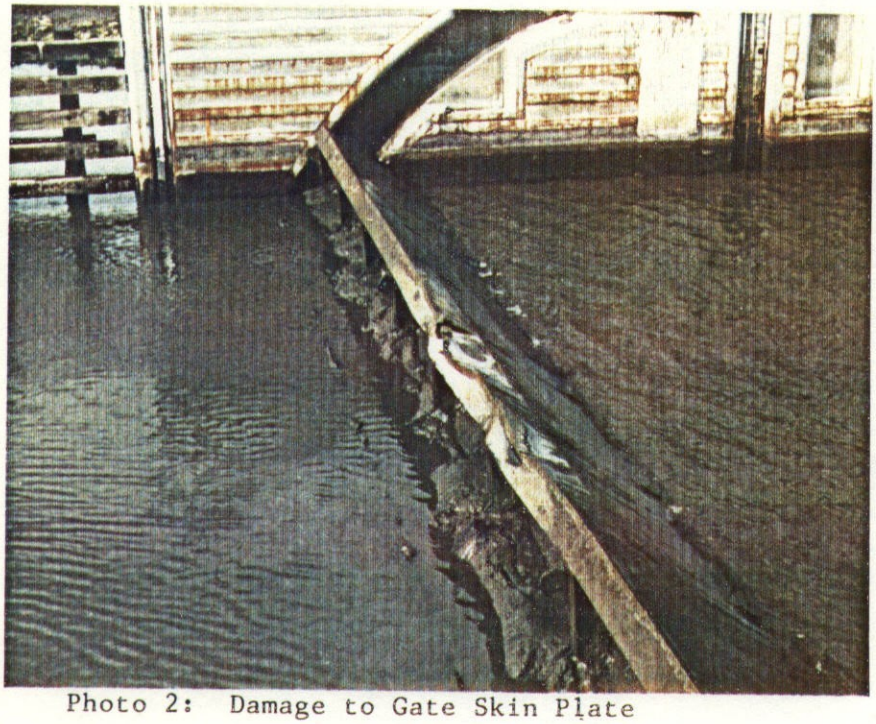


Photo 2: Damage to Gate Skin Plate

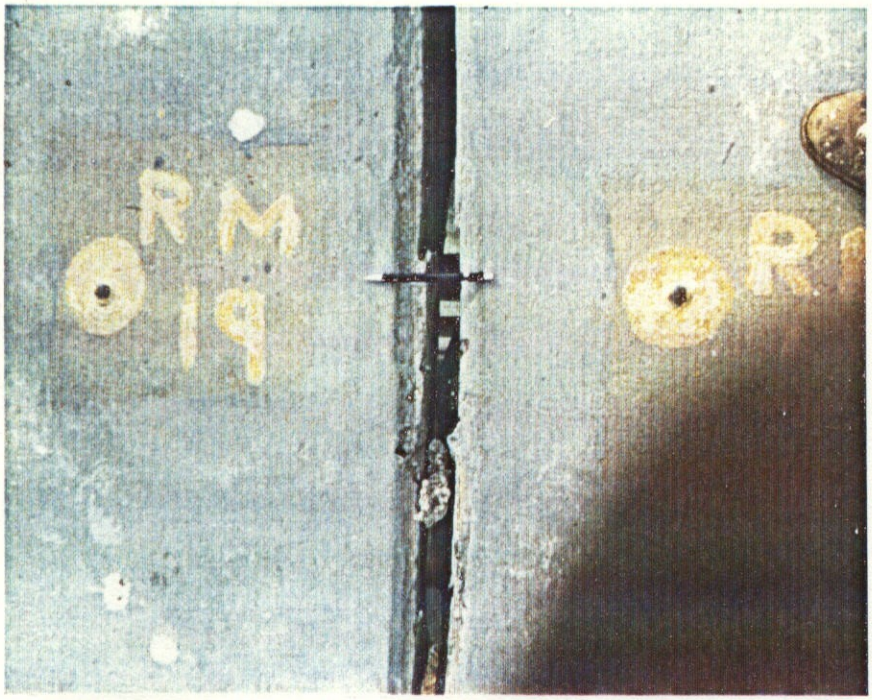


Photo 3: Excessive Gap Between RM 19 and RM 18

SECTION VI - CONCLUSIONS AND REMEDIAL ACTIONS

6-01 Conclusion. It is concluded that Empire Floodgate is a stable, safe, well maintained structure in satisfactory operating condition.

6-02 Remedial Action. The following remedial actions will be accomplished by the local interest (Plaquemines Parish Commission Council) in FY 85.

a. The gate skin plate will be repaired.

b. Riprap will be replaced at the breakwater dike on the west bank of the south approach channel.

c. The staff gage on the guidewall will be repainted.

The following remedial actions will be accomplished by Government hired labor forces at scheduled periodic surveys and inspections:

d. The temperature and shrinkage cracks on the stem and walkway area of the T-wall monolith T-4R will continue to be monitored for signs of activity.

e. The measurements for RM2-RM3, RM4-RM5, RM18-RM19 and RM20 will be monitored for substantial changes.

f. Monitoring of the sheet piling will be continued until primary consolidation has leveled off.

g. Monolith T-4R will be monitored in the future for settlement as primary consolidation of the surrounding soils levels off.

6-03 Next Inspection. The next inspection of Empire Floodgate is scheduled for Jan 1987. The structure will not be dewatered at that time.