

Structures Inspection Unit

NEW ORLEANS TO VENICE, LOUISIANA

HURRICANE PROTECTION

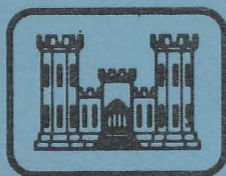
REACH B-1 - TROPICAL BEND TO FORT JACKSON

EMPIRE FLOODGATE

PERIODIC INSPECTION REPORT NO. 5

Structures Inspection Unit

29 JANUARY 1987



**United States Army
Corps of Engineers**

*... Serving the Army
... Serving the Nation*

New Orleans District

Structures Inspection Unit

CELMV-ED-G (CELMN-ED-DG/15 Jun 87) 3d End

Mr. Stegall/eb/5900

SUBJECT: New Orleans to Venice, Louisiana (Hurricane Protection); Reach
B-1 - Tropical Bend to Fort Jackson, Empire Floodgate, Periodic Inspection
Report No. 5, 29 January 1987

DA, Lower Mississippi Valley Division, CE, Vicksburg, MS 39180-0080

21 SEP '87

FOR: Commander, New Orleans District, ATTN: CELMN-ED-DG

The actions taken in the preceding 2d End are satisfactory. No further
action is required on this chain of correspondence.

FOR THE COMMANDER:



FRED H. BAYLEY III
Chief, Engineering Division

2 Encls
wd all encls



REPLY TO
ATTENTION OF:

DEPARTMENT OF THE ARMY
NEW ORLEANS DISTRICT, CORPS OF ENGINEERS
P.O. BOX 60267
NEW ORLEANS, LOUISIANA 70160-0267

1212
R 19300
S1504514
Step 11

CELMN-ED-DG

15 Jun 87

MEMORANDUM FOR: Commander, Lower Mississippi Valley Division,
ATTN: CELMV-ED-G

SUBJECT: New Orleans to Venice, Louisiana (Hurricane Protection);
Reach B-1 - Tropical Bend to Fort Jackson, Empire Floodgate,
Periodic Inspection Report No. 5, 29 January 1987

Subject report is submitted herewith for your approval.

FOR THE COMMANDER:

FREDERIC M. CHATRY
Chief, Engineering Division

1 Encl (6 cys)

S: 11 September 1987

CELMV-ED-G (CELMN-ED-DG/15 Jun 87) 1st End Mr. Stegall/caf/5900
SUBJECT: New Orleans to Venice, Louisiana (Hurricane Protection); Reach
B-1 - Tropical Bend to Fort Jackson, Empire Floodgate, Periodic Inspection
Report No. 5, 29 January 1987)

DA, Lower Mississippi Valley Division, CE, Vicksburg, MS 39180-0080

81 87

FOR: Commander, New Orleans District, ATTN: CELMN-ED-DG

1. The enclosed periodic inspection report is approved subject to the following comment:

Paras 5-03.11 and 6-02b. The riprap used to repair the damaged breakwater and also the approach channels should be designed, specified, and documented in this report. This will ensure that local interests will adequately repair these damaged areas.

2. The report should be revised in accordance with the comment in paragraph 1 above, and revised pages should be submitted to this office by 11 Sep 87.

FOR THE COMMANDER:



FRED H. BAYLEY III
Chief, Engineering Division

Encl (6 cys)
wd 2 cys

CELMN-ED-DG (NOD/15 Jun 87) 2d 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. 5, 29 January 1987

DA, New Orleans District Corps of Engineers, P. O. Box 60267, New Orleans,
LA 70160-0267 4 Sep 87

FOR: Commander, Lower Mississippi Valley Division, ATTN: CELMV-ED-G

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

Paras. 5-03II and 6-02b. Concur. A 24-inch layer of No. 2 riprap stone
will be recommended for repairing the breakwater protection and the
approach channels in order to ensure that local interests will adequately
repair these damaged areas. See Encl 2.

FOR THE COMMANDER:



FREDERIC M. CHATRY
Chief, Engineering Division

2 Encls
wd Encl 1
Added 1 Encl (dupe)

NEW ORLEANS TO VENICE, LOUISIANA

HURRICANE PROTECTION

REACH B-1 - TROPICAL BEND TO FORT JACKSON

EMPIRE FLOODGATE

PERIODIC INSPECTION REPORT NO. 5

29 January 1987

U.S. ARMY ENGINEER DISTRICT

CORPS OF ENGINEERS

NEW ORLEANS, LOUISIANA



PHOTO TAKEN 28 JULY 1976

EMPIRE FLOODGATE

S U M M A R Y

The Empire Floodgate was inspected on 29 January 1987 by representatives of NOD and the Plaquemines Parish Government and found to be stable and structurally sound. Minor discrepancies are noted within.

EMPIRE FLOODGATE

PERIODIC INSPECTION REPORT NO. 5

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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.

<u>Report No.</u>	<u>Date of Inspection</u>	<u>Date Report Approved</u>
1	4 Sep 75	7 Apr 76
2	4 Oct 78	13 Aug 79
3	29 Jul 81	20 Oct 82
4	31 Jan 84	4 Jan 85

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 1). This report is supplementary to previously numbered reports.

SECTION III - OPERATION AND MAINTENANCE DATA

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

- a. April 1986 - dredged gate area
- b. May 1986 - painted handrails and stairs

3-02 Action on Deficiencies From Last Inspection. The proposed remedial work included in the last inspection report will be accomplished by the Plaquemines Parish Government during the dewatering of the structure scheduled for March 1988.

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 conservative 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:

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

SCOUR SURVEYS DISCONTINUED
IN 1983. *Ham*

2. <u>Scour Survey</u>	Annually
20 ranges in approach channels	Annually
3. <u>Floodway Alinement</u>	
16 measurements on floodwalls	Annually
4. <u>Distance Across Chamber</u>	
2 measurements across chamber	Annually
5. <u>Joint Measurement</u>	
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.

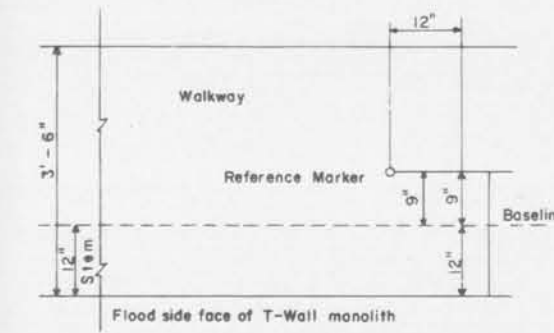
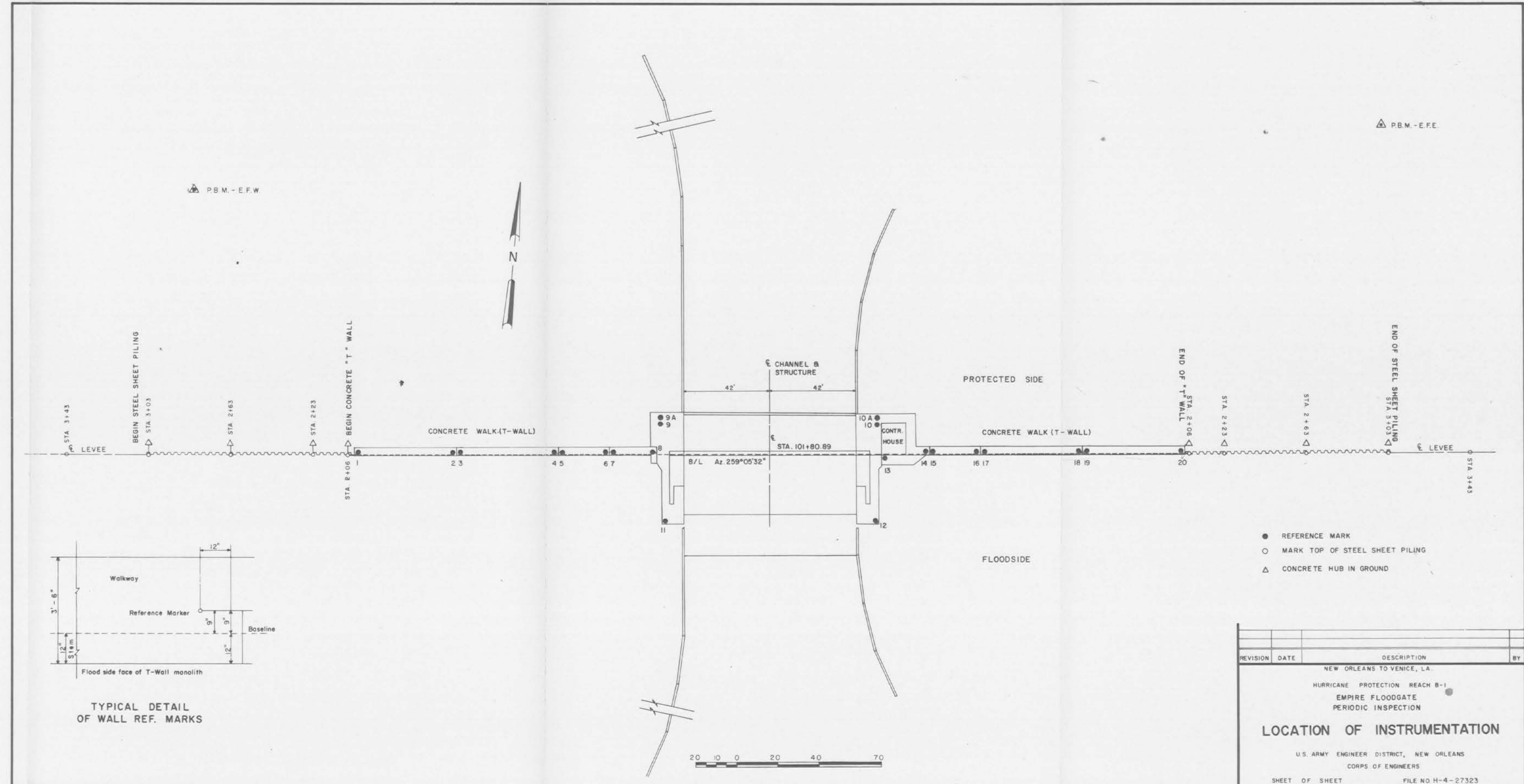
~~b. Scour Survey. Recent scour surveys indicate no appreciable scouring has occurred since the last inspection.~~

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

d. Settlement. The eastern side of the structure, RM-19 to station 3+03E, has settled approximately 0.5 ft. more than on the western side at stations 3+03W to RM-2, for the worst case. The overall settlement on the eastern side of the structure is in excess of 1 foot since construction.

Instrumentation Plates.

<u>Plate No.</u>	<u>Title</u>	<u>File No.</u>
1	Location Map	H-4-26081
2	Location of Instrumentation	H-4-27323
3	Settlement Reference Marks Tabulation	H-4-27323
4	Settlement and Reference Marks Differential Movement	H-4-27323
5	Settlement and Reference Marks Differential Movement	H-4-27323
6	Reference Marks Differential Chart	H-4-27323
7	Settlement and Reference Marks Differential Movement	



TYPICAL DETAIL OF WALL REF. MARKS

- REFERENCE MARK
- MARK TOP OF STEEL SHEET PILING
- △ CONCRETE HUB IN GROUND

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	

Stability is a Part of Your Contract

SETTLEMENT REFERENCE MARK - SHEET PILING and LEVEE																			
REFERENCE MARK EAST OF WEST	2+066	2+068	2+231	2+232	2+453	2+454	3+031	3+032	3+432	E-W	2+046	2+067	2+233	2+234	2+637	2+638	3+033	3+034	3+433
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	12.2.75
ORIGINAL READINGS (FT)	14.13	7.65	13.89	8.13	13.78	7.96	13.76	14.43	14.11		13.87	7.11	13.38	7.56	13.03	7.80	12.65	13.91	11.69
9 NOVEMBER 1984	13.21	6.29	12.75	②	12.32	5.22	12.07	11.98	12.03		13.37	②	12.78	②	12.26	②	11.71	12.71	10.11
24 JULY 1986	13.11	6.17	12.62	②	12.16	5.96	11.92	11.61	11.86		13.35	②	12.75	②	12.22	②	11.64	12.15	②
DATE OF OBSERVATION																			

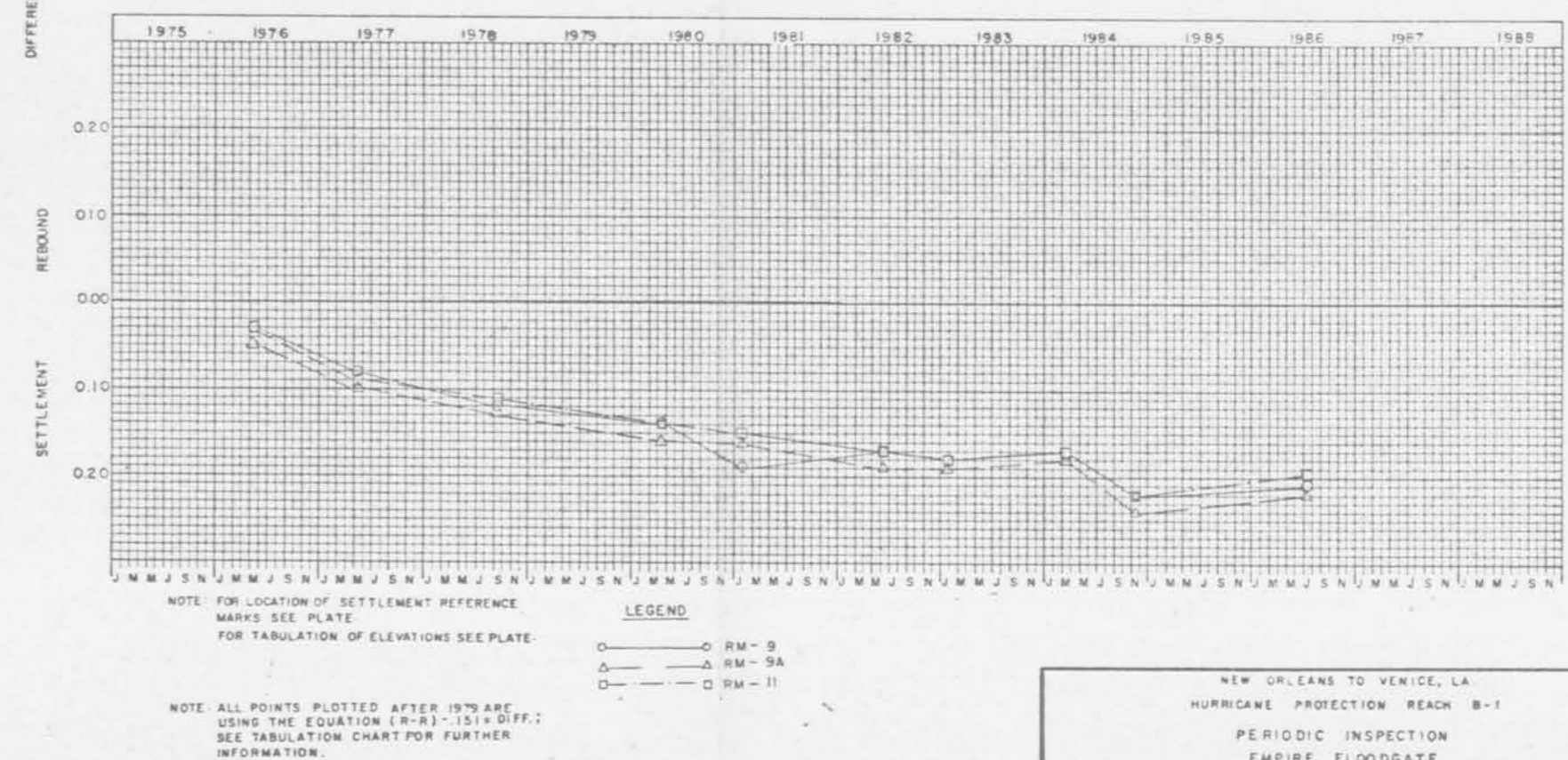
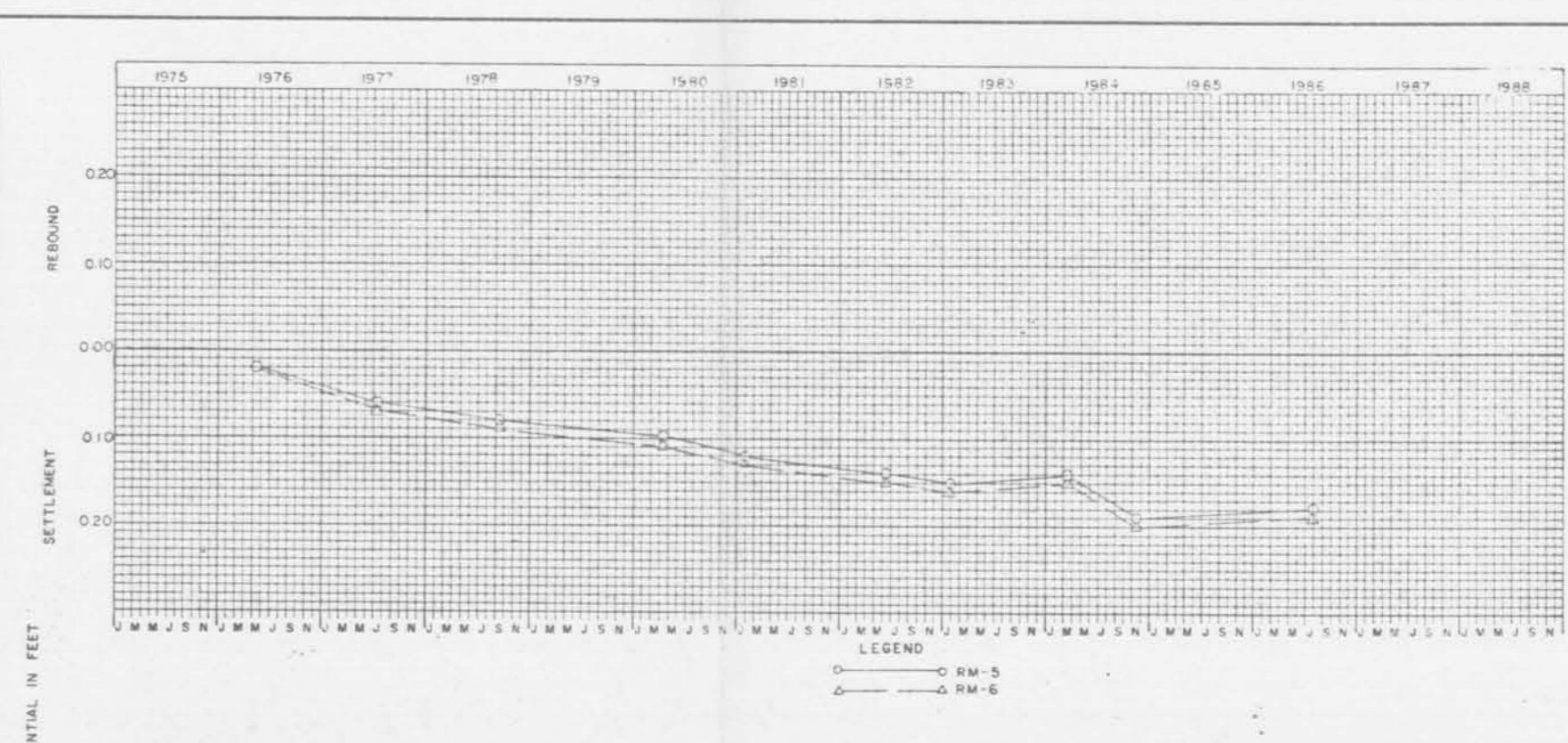
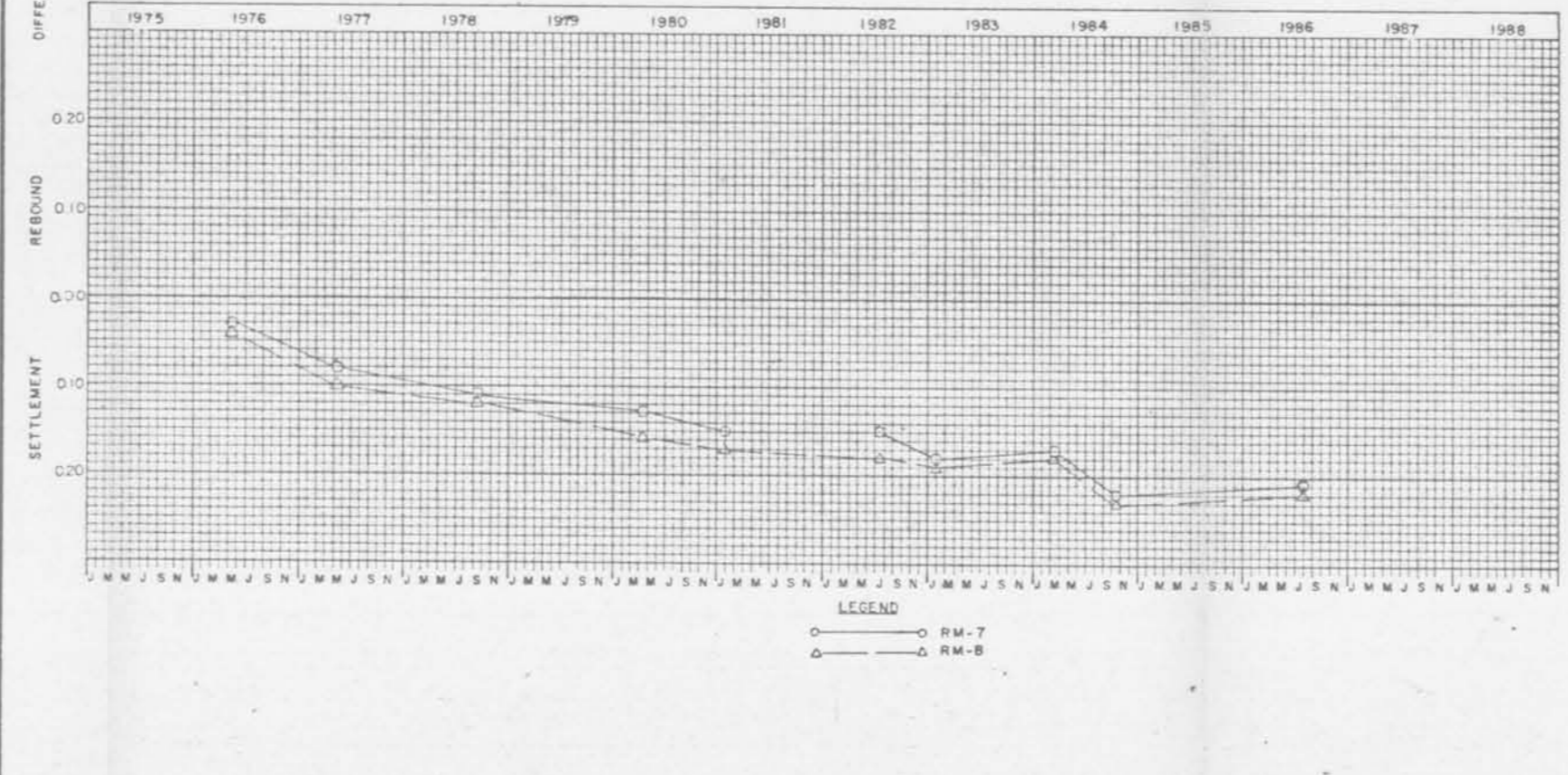
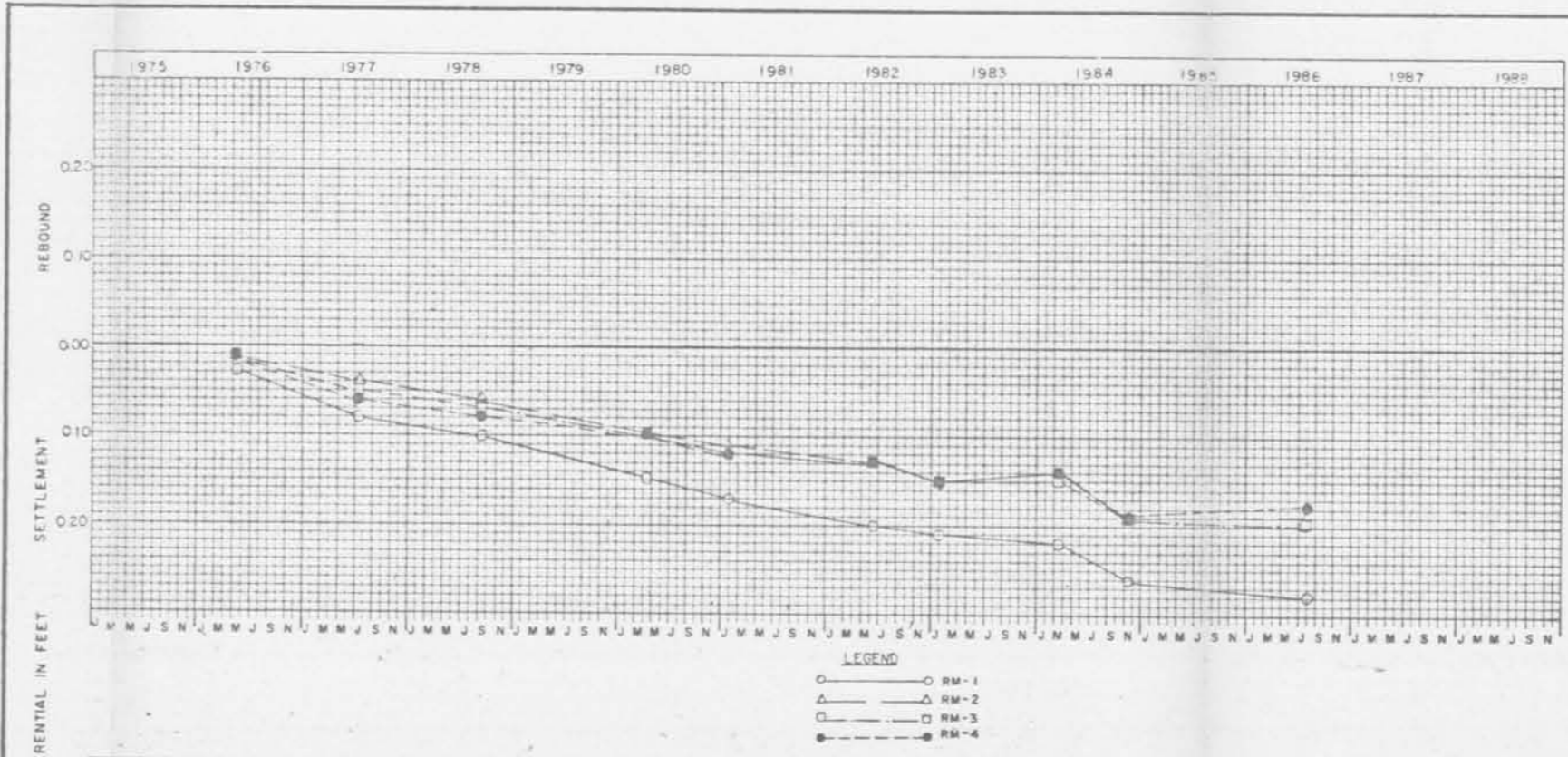
NOTE: FIRST STATIONINGS LISTED ARE ON STEEL SHEET PILING. ELEVATIONS FOR 3+432 & W ARE ON CONCRETE MONUMENTS

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		
9 NOVEMBER 1984	24.750	24.750	23.813	-	-	24.000	24.375	24.813	70°	
24 JULY 1986	24.843	24.750	23.718	-	-	24.000	24.406	25.000	63°	
DATE OF OBSERVATION										

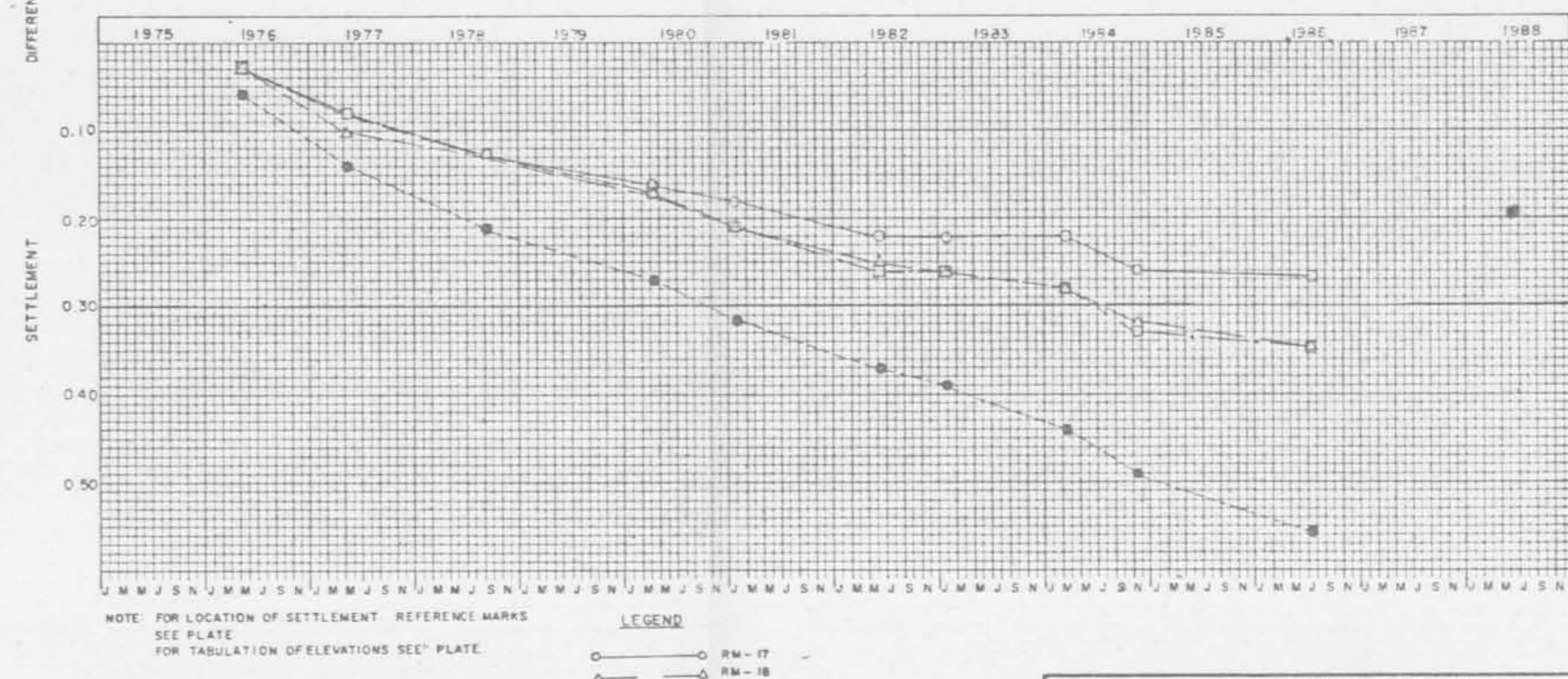
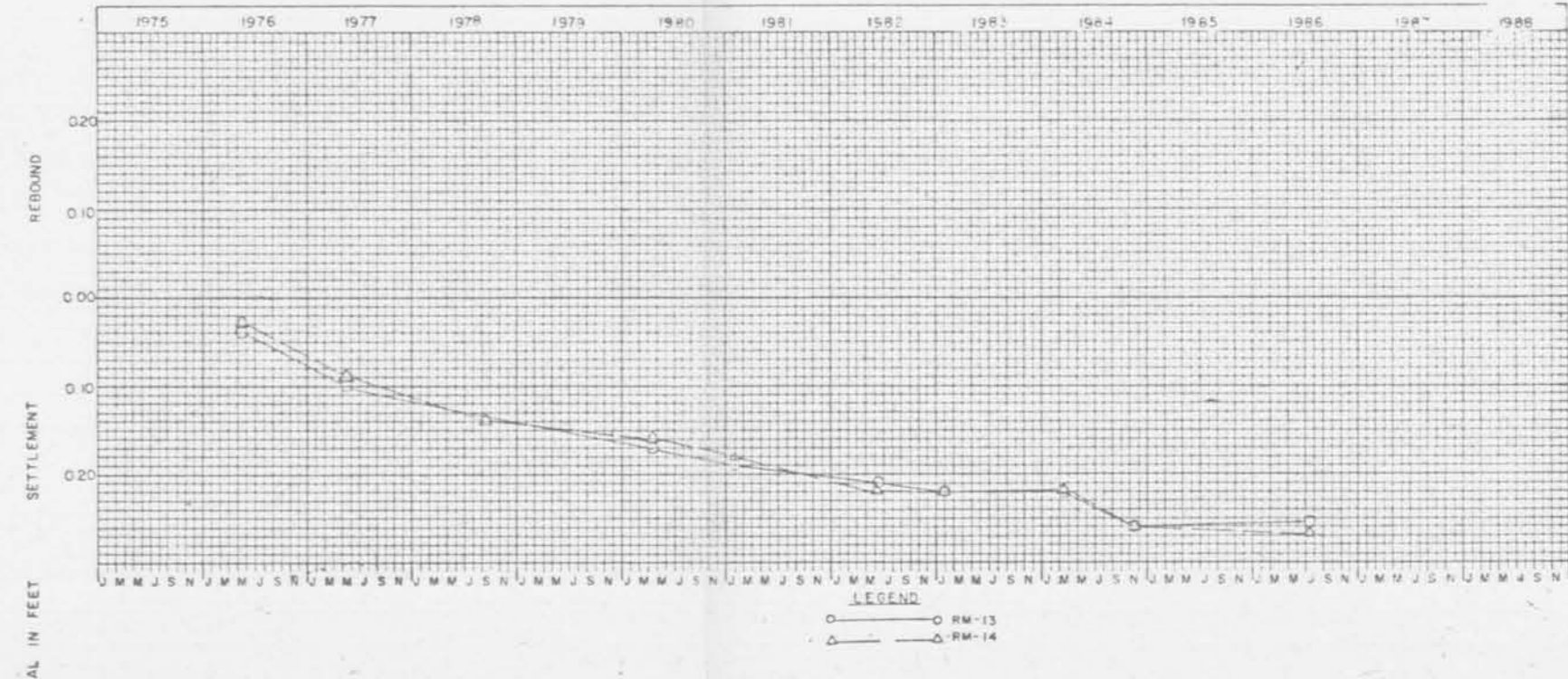
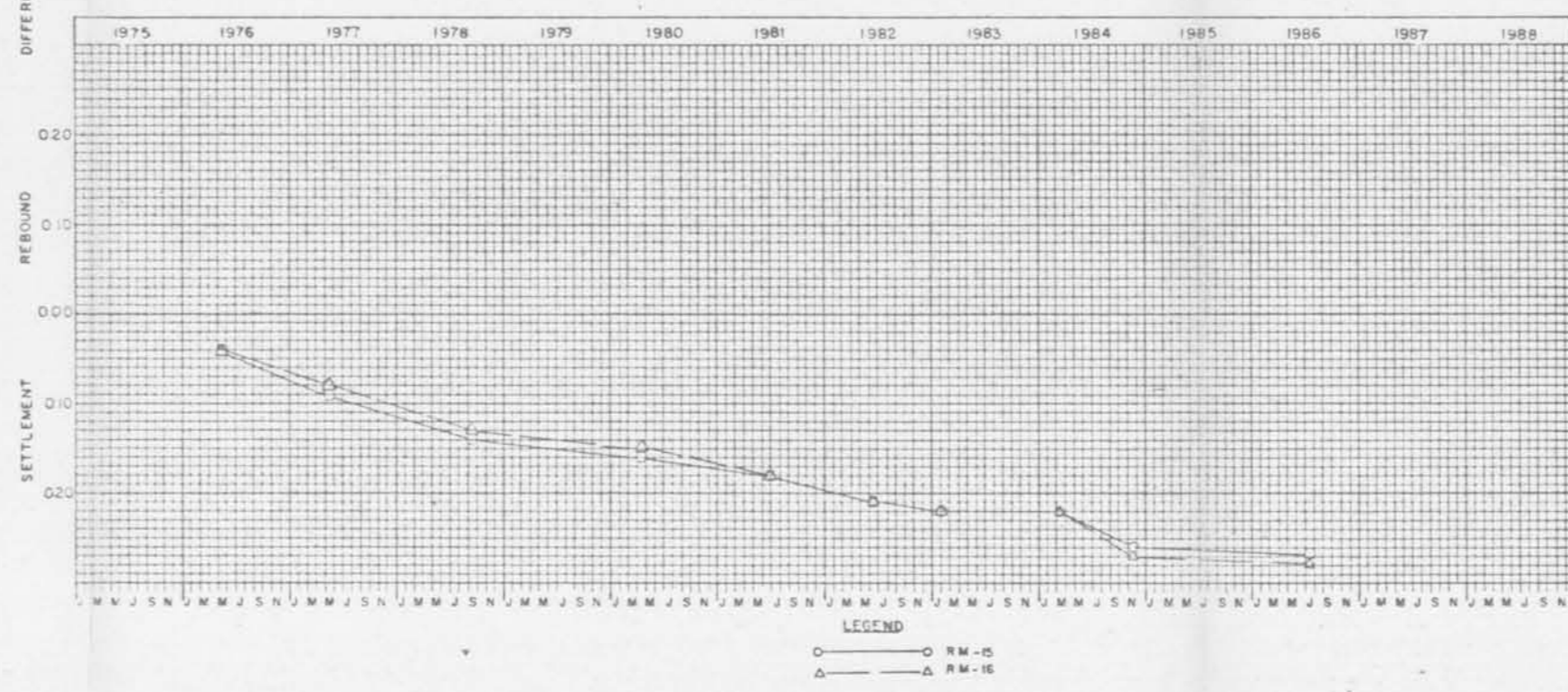
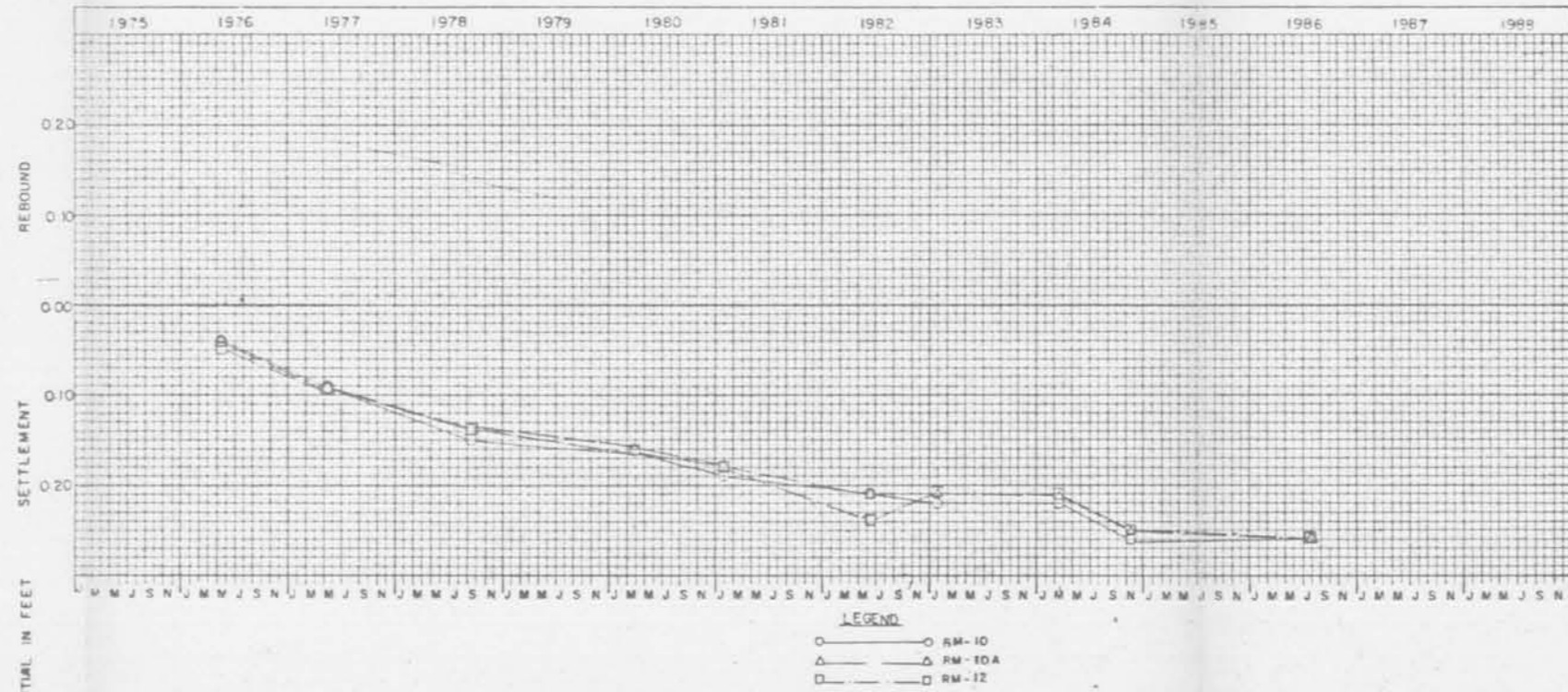
SETTLEMENT REFERENCE MARKS - STRUCTURE and T-WALL																													
NO OF REFERENCE MARKS	RM 1	RM 2	RM 3	RM 4	RM 5	RM 6	RM 7	RM 8	RM 9	RM9A	RM10	RM10A	RM11	RM12	RM13	RM14	RM15	RM16	RM17	RM18	RM19	RM20	Temp	Gage 1	Gage 2	Pressure	E.F.E.	E.F.W.	
INITIAL DATE	12.2.75	12.2.75	12.2.75	12.2.75	12.2.75	12.2.75	12.2.75	12.2.75	12.2.75	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	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		
9 NOVEMBER 1984	14.18	14.38	14.39	14.44	14.42	14.42	14.42	14.36	14.38	14.38	14.30	14.30	14.37	14.33	14.34	14.27	14.26	14.24	14.14	14.13	13.93	17°	0.30	0.30			2.97	-	
24 JULY 1986	14.16	14.38	14.38	14.45	14.43	14.43	14.43	14.37	14.30	14.40	14.30	14.39	14.32	14.34	14.26	14.25	14.24	14.24	14.11	14.11	13.86	83°	1.20	1.20			2.97	4.70	
DATE OF OBSERVATION																													

NOTES:
 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.) CORRECTIONS, PBM E.F.E. (1975-76) ELEV. 3.122' - (1978) ELEV. 2.971' = 0.151'.
 Ⓢ APPEARS TO BE SURVEY ERROR.
 Ⓣ CAP DESTROYED, SHOT NATURAL GROUND

NEW ORLEANS TO VENICE, LA
 HURRICANE PROTECTION REACH B-1
 PERIODIC INSPECTION
 EMPIRE FLOODGATE
 SETTLEMENT REFERENCE MARKS TABULATIONS
 U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
 CORPS OF ENGINEERS
 SHEET OF SHEET FILE NO



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

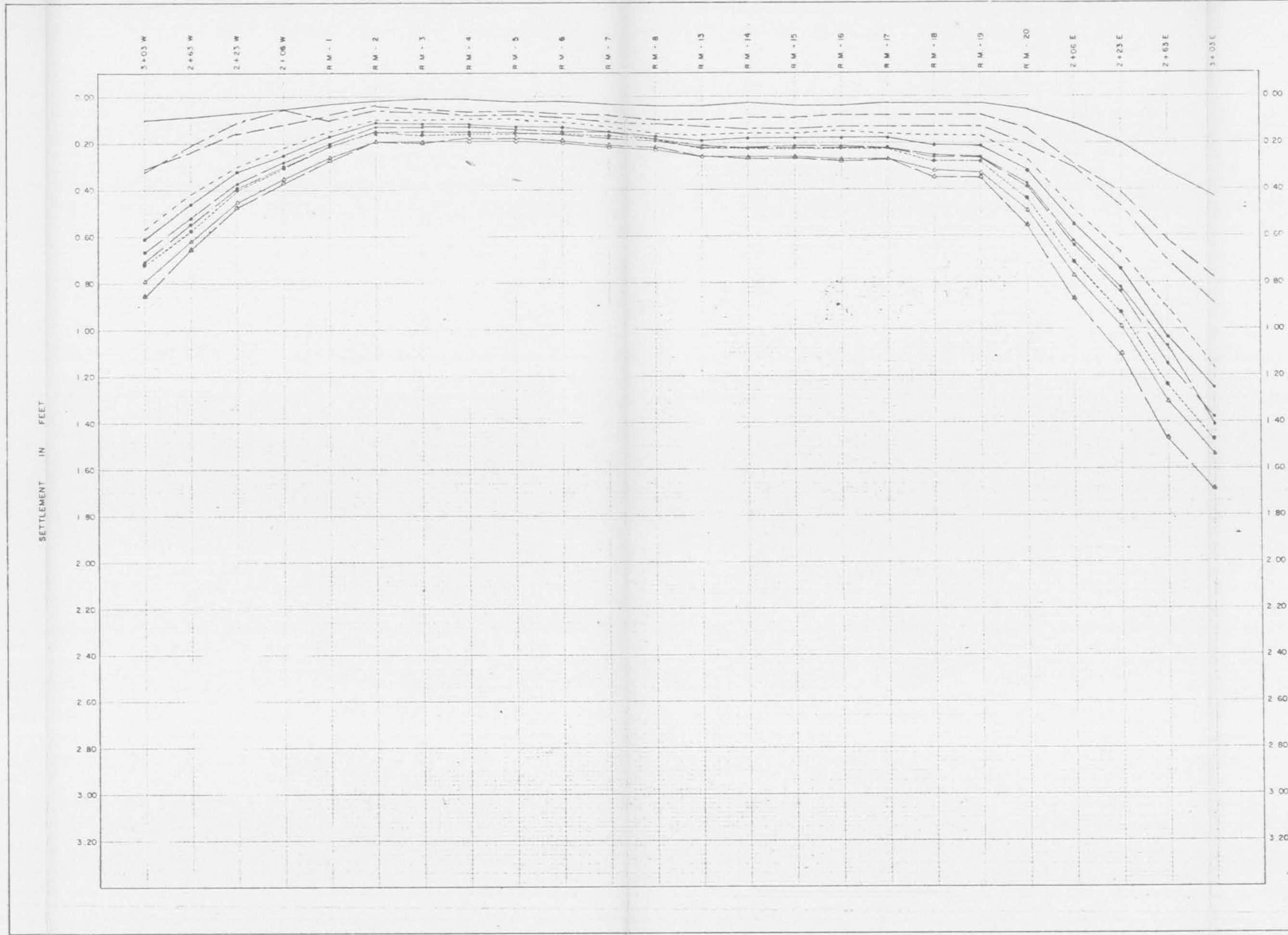


NEW ORLEANS TO VENICE, LA
HURRICANE PROTECTION REACH B-1
PERIODIC INSPECTION
EMPIRE FLOODGATE

SETTLEMENT AND REFERENCE MARKS
DIFFERENTIAL'S MOVEMENT

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

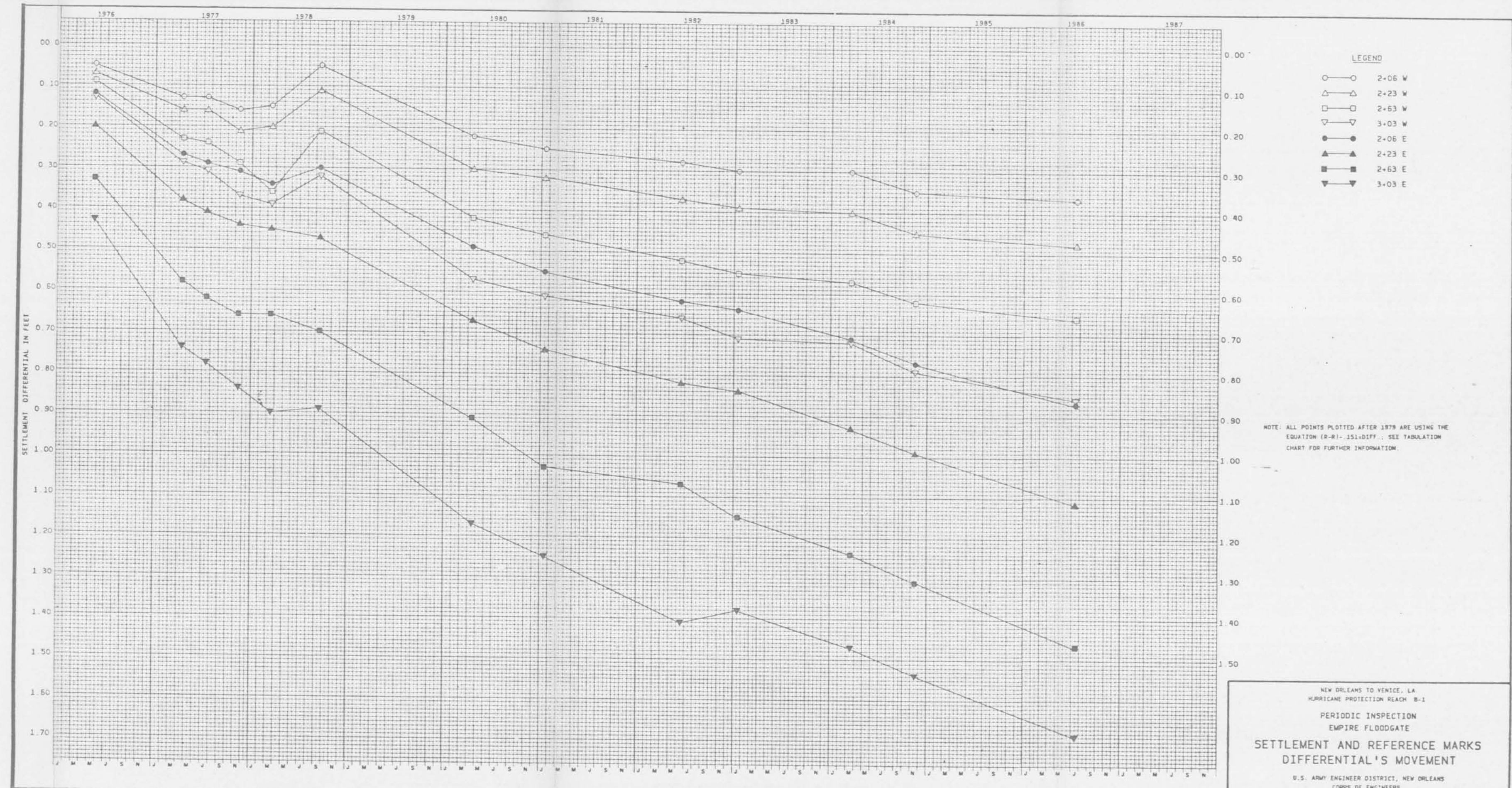
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LEGEND

- May 1976 ———
- July 1977 - - - - -
- Sept 1978 - · - · -
- Apr 1980 ·····
- Jan 1981 ▲
- June 1982 ■
- Jan 1983 ●
- Mar 1984 ◆
- Nov 1984 ×
- July 1986 ○

NEW ORLEANS TO VENICE, LA
 HURRICANE PROTECTION REACH B-1
 PERIODIC INSPECTION
 EMPIRE FLOODGATE
 REFERENCE MARKS
 DIFFERENTIAL CHART
 U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
 CORPS OF ENGINEERS



SECTION V - INSPECTION

5-01 Inspection Team. The inspection of the structure was conducted on 29 January 1987 by the following personnel:

N O D

Johnny B. Drummond	Gen Engr Sec
Richard L. Tillman	Struc Des Sec
Jose A. Lizarribar	F&M Br (Materials)
Lawrence S. Dressler	F&M Br (Struc Foundations)
Deborah F. Garrett	H&H Br
Gerard P. Jesclard	Gen Engr Sec (Elec)
Dennis C. Strecker	Gen Engr Sec (Mech)
Richard F. Baldini, Jr.	Operations Div

PLAQUEMINES PARISH GOVERNMENT

Henry Urban	Maintenance Foreman
Carol Martin	Superintendent of Heavy Equipment
Luke Petrovich	President of Council

STATE OF LOUISIANA

Geneva Grille	Dept. of Public Works
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5-02 Orientation. Prior to the inspection, the team members were given a brief orientation of the following features of the structure: structural, hydraulic and hydrology, foundations and materials, electrical, mechanical and operations.

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

I. STRUCTURAL.

a. Floodwall. The condition of the floodwall concrete was very good. There was some longitudinal separation of monolith ends between instrumentation reference marks RM2-RM3 and RM4-RM5. This was also noted in the last periodic inspection report. However, there has been no further separation of the monoliths occurring since then. The waterstops between these monoliths were still intact and appeared to be in good condition.

b. Gatebay Monolith. The condition of the concrete in the gatebay monolith was also in very good condition. No significant cracks, spalled concrete areas nor exposed reinforcing steel was observed. A small hole through the North wall of the counterweight recess shaft on the East side of the structure with water flowing through it was observed (See Photo No. 1). The location of the hole was approximately 6" below the chamfered joint elevation. A large amount of corrosion was evident on the protective wall armour and also on the ladders on each side of the channel walls (See Photo No. 2).

c. Flap Gate. The flap gate was raised to the closed position (See Photo No. 3). The operation of the gate was satisfactory. The paint on both sides of the gate appeared to be in fairly good condition. Extremely large amounts of soil deposits had collected on the gate while in the open position. After the gate was in the fully closed position, there was still a substantial amount of soil remaining on the walkway with smaller deposits remaining on the skin plate of the gate. Adjacent to and on the North side of the gate in its closed position the soil deposits sloped down and away from the water surface into the channel. Moderate damage to the skin plate and channel beam across the top of the gate was observed on the three central interior spans (See Photo No. 4). A portion of this damage occurred prior to Periodic Inspection No. 4 and has not yet been repaired. However, the majority of the damage has taken place since the previous periodic inspection. The damage to the flap gate does not in any way adversely affect the operation of the floodgate. The damage to the gate occurred as a result of its failure to properly seat when in the fully opened position due to a silt build-up underneath it. With the gate in this "partially open" position, the gate is susceptible to being hit by some of the larger vessels that pass through the floodgate.

d. Handrails. Overall, the handrails were in excellent condition. However, there was an area of the handrail that was not properly anchored. This area is located adjacent to and on the north side of the ladder recess at the corner of the structure on the West side of the channel.

e. Approach Channel. In general, the overall condition of the timber guidewalls, fenders and dolphins was excellent. There is no pile cap protection on a large percentage of the timber piles.

II. HYDRAULIC & HYDROLOGY.

a. The breakwater on the southwest bank has lost a considerable amount of riprap. In some locations, the shell is exposed. In the remaining locations, the riprap appears to be at elevations of about 1.0 to 1.5 ft NGVD. The design elevation of the breakwater protection was 3.0 ft NGVD. Since the breakwater is an integral part of the design for the reduction of wave forces on the structure, we recommend that the breakwater be raised to its design elevation.

b. The riprap protection of the east side of the north and south approach channels was barely visible about the water surface line. The staff gage on the guide wall had a reading of 0.0 ft NGVD. The design top elevation for placement of the Riprap at the bankline was at +1.0 ft NGVD. The stone may have settled, but looking at the remaining stone, it appears more likely to have been washed away toward the wingwalls. This situation should be monitored to determine if there will be any adverse effects on the levee.

III. Foundation & Materials.

a. The gate accumulates a lot of sediment on top, which when lifted periodically, is deposited in the gate's recess and outer sill. This process, plus normal sedimentation has developed significant quantities of material to cause the gate to seat a couple of feet above its normal resting elevation. On the day of the inspection, the top of the gate was resting at elevation -10.5 feet and normally it should rest at -14.00 feet. The water elevation was at 0.0 feet and there are vessels using the structure with a draft of 12 feet. This explains why the gate has been hit in the open position. It should be noted that the design gate recess bottom elevation is -20.75 feet, the sill elevation (top) is -14.0 feet and the adjacent authorized channel depth is -9.0 feet. Therefore, the gate recess acts as a sump in the channel in which silt easily accumulates each time the gate is closed.

b. Riprap is deficient all around the structure (See Photo No. 5). According to the plans there are areas near the T-Walls, sheet pile, levees and shoreline that require riprap up to elevation +8.00 feet and that seems not to be the case.

IV. Mechanical & Electrical.

- a. The cathodic protection anodes need to be replaced.
- b. All of the electrical and mechanical equipment was in very good condition.

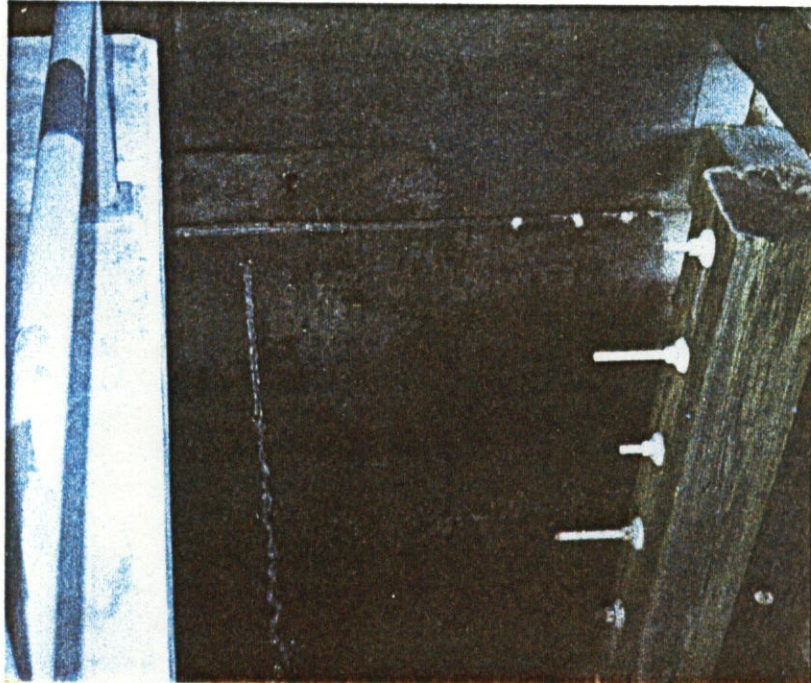


Photo No. 1: Small Hole in counter weight recess shaft

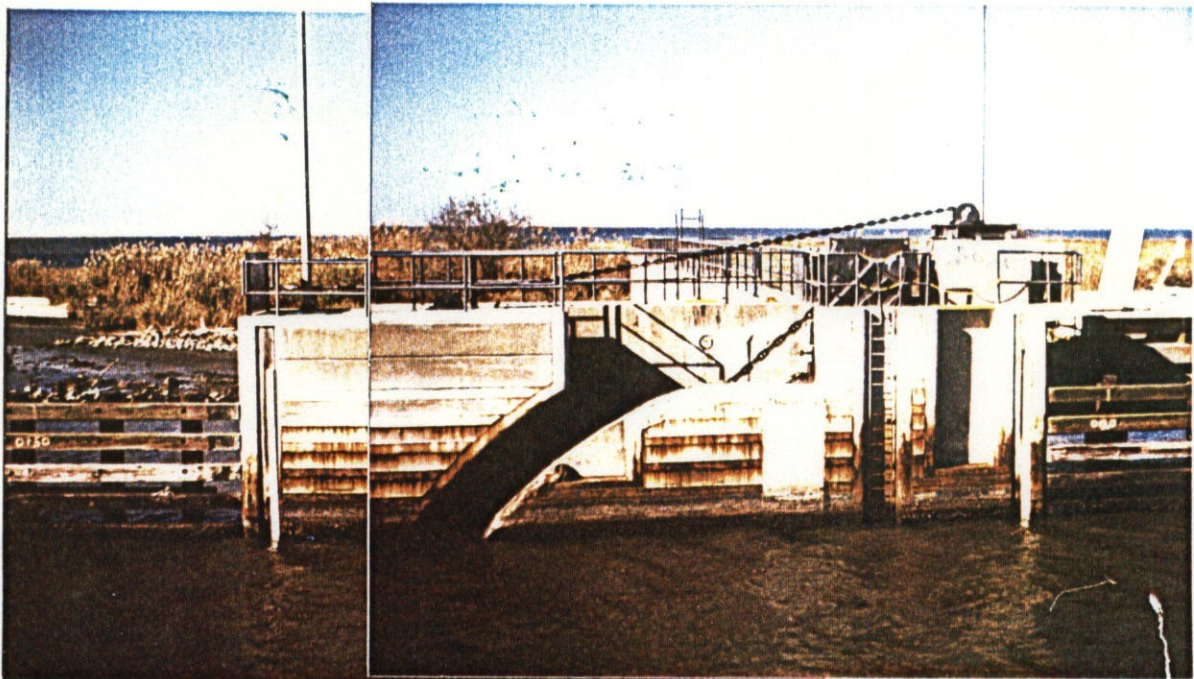


Photo No. 2: Corrosion on protective wall armour and ladder (Typical)

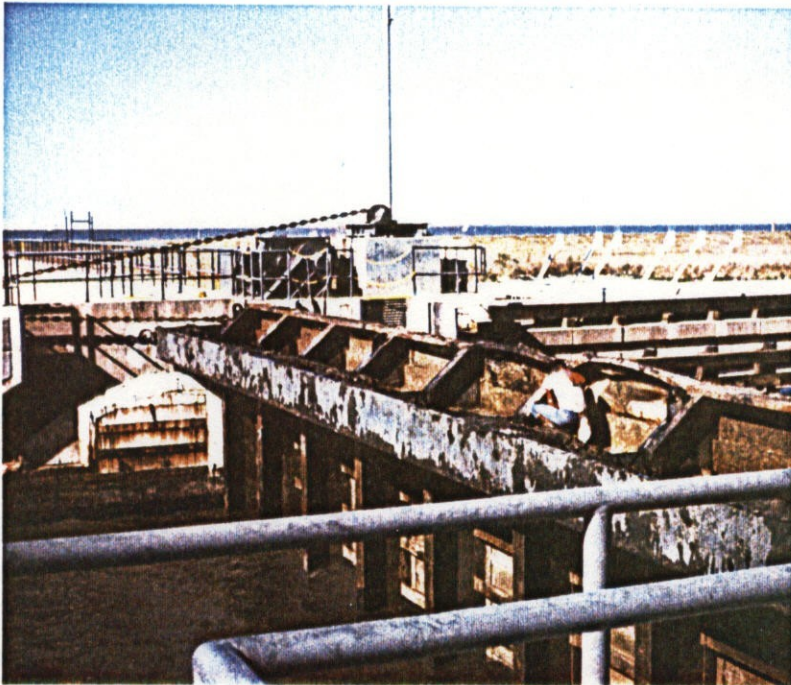


Photo No. 3: Flap gate in closed position



Photo No. 4: Damaged flap gate

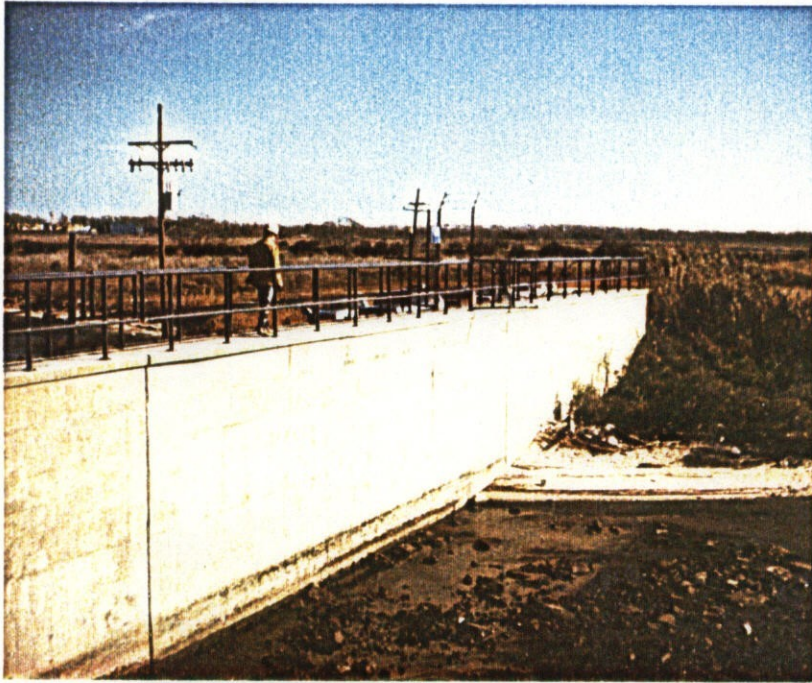


Photo No. 5: Deficient riprap (Typical)

SECTION VI - CONCLUSIONS AND REMEDIAL ACTIONS

6-01 Conclusions. It is concluded that the Empire Floodgate is safe, stable and in satisfactory operating condition.

6-02 Remedial Actions. The following remedial actions will be accomplished by the local interest (Plaquemines Government) during the scheduled dewatering of the structure in March 1988.

a. The damaged gate skin plate and channel beam will be repaired.

*b. A 24-inch layer of No. 2 riprap stone will be replaced at the breakwater dike on the southwest bank and the east side of the north and south approach channels.

c. The corroded protective wall armours and ladders, will be cleaned and painted.

d. The cathodic protection anodes will be replaced.

e. The parish is considering dredging the approaches to the structure to elevation -12.0 ft NGVD during the same period as the dewatering operation in order to remove large silt deposits which prevent the gate from laying flat in the recess.

f. The small hole in the counter weight recess shaft will be repaired.

The following remedial actions will be accomplished by the Plaquemines Parish Commission Council during regular scheduled maintenance periods in FY 87.

g. The handrail on the north side of the ladder recess at the corner of the structure will be properly anchored.

h. The government will recommend to the Plaquemines Parish Government that pilecap protection be provided for all timber piles.

The excessive settlement of the uncapped sheetpiling on the eastern side of the structure, as noted in paragraph 4-02d, is being evaluated and resolved by the New Orleans District. Any proposed remedial action deemed necessary, upon completion of the investigation, will be included as an appendix in the next periodic inspection report.

6-03 Next Inspection. The next inspection of Empire Floodgate is scheduled for March 1988. The structure will be dewatered at that time.