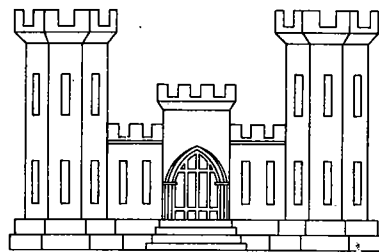


**OPERATION AND MAINTENANCE MANUAL
FOR**

**BAYOU BIENVENUE
CONTROL STRUCTURE**



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

JUNE 1974

OPERATION AND MAINTENANCE MANUAL
FOR
BAYOU BIENVENUE CONTROL STRUCTURE

TABLE OF CONTENTS

<u>Chapter</u>	<u>Title</u>	<u>Page</u>
<u>PART I - GENERAL</u>		
1	Introduction	1
2	Project Description	2
<u>PART II - OPERATION AND MAINTENANCE</u>		
1	General	5
2	Control Structure	8
3	Sector Gate Operation	10
<u>PART III - EMERGENCY OPERATIONS</u>		
1	Hurricane Procedure	12
2	Procedures in Emergencies Created by CBR Fallout Conditions	15
<u>PART IV - MAINTENANCE GUIDE</u>		
1	Inspection Guide and Maintenance Standards	16
2	Maintenance Control System	22
3	Lubricants and Lubrication	23
<u>APPENDIX I</u>		
Exhibit No. 1	Title 33 Federal Regulation	
Exhibit No. 2	Semiannual Inspection Report	
Exhibit No. 3	Maintenance Inspection Report (Not Scheduled)	
Exhibit No. 4	Lubrication and Oil Record	

OPERATION AND MAINTENANCE MANUAL

FOR

BAYOU BIENVENUE CONTROL STRUCTURE

PART I GENERAL

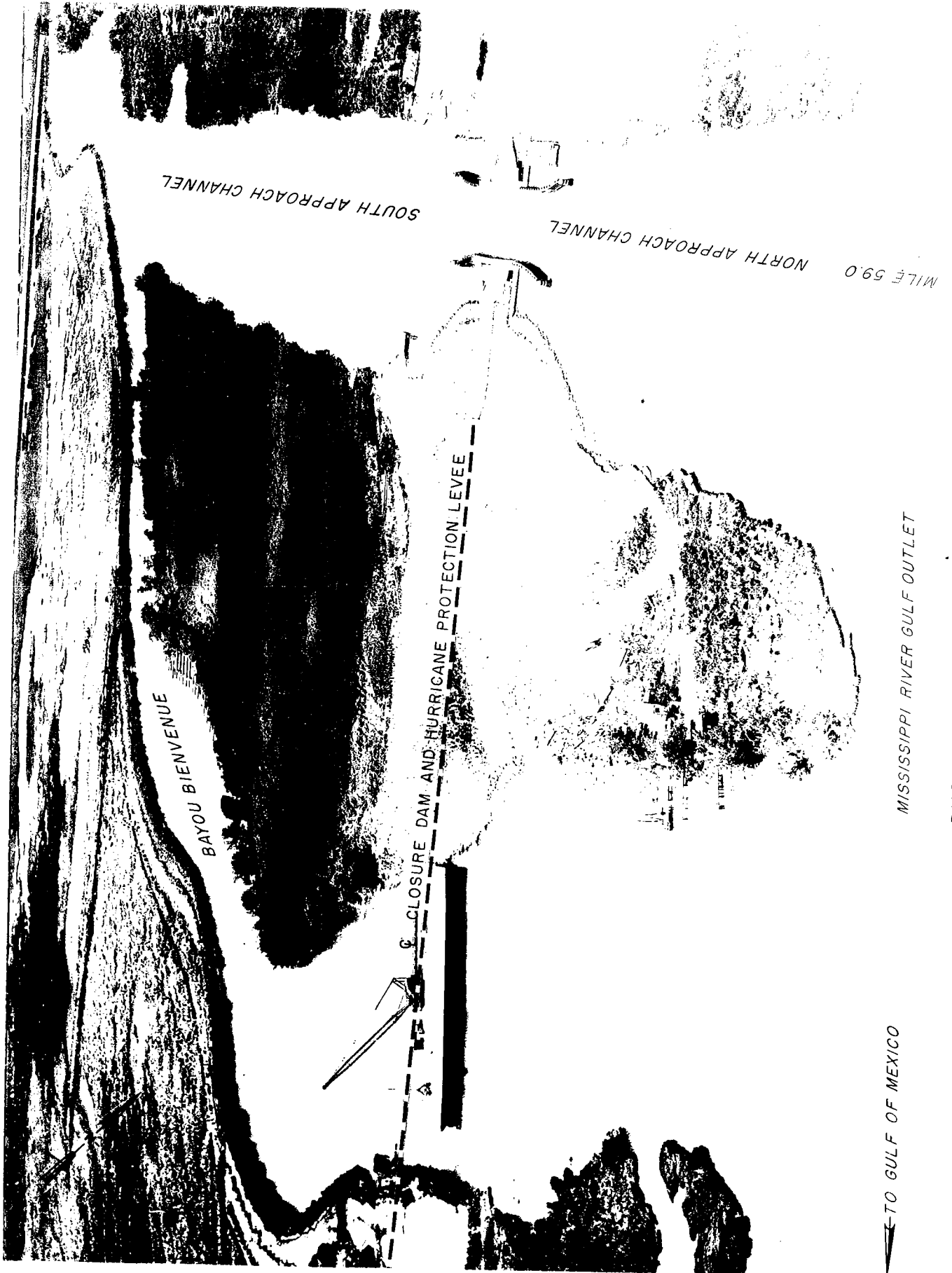
Chapter 1 - Introduction

a. Authority. Authority for this manual is contained in ER 1150-2-301 dated 1 September 1967, Local Cooperation, Policies and Procedures, and ER 1130-2-304, Project Operations, dated 25 March 1966. These regulations direct the preparation and prescribe the coverage of operation and maintenance manuals for completed civil works projects constructed by Corps of Engineers and operated by local interests.

b. Purpose. The purpose of the manual is to provide guidance and instructions to project personnel for proper operation and maintenance of Bayou Bienvenue Control Structure.

c. Parts of Manual. This manual is divided into four parts, namely: General, Operation & Maintenance, Emergency Operating Conditions & Maintenance Guide.

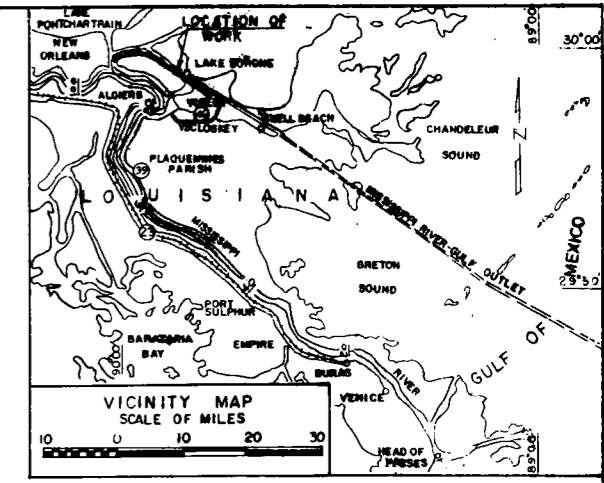
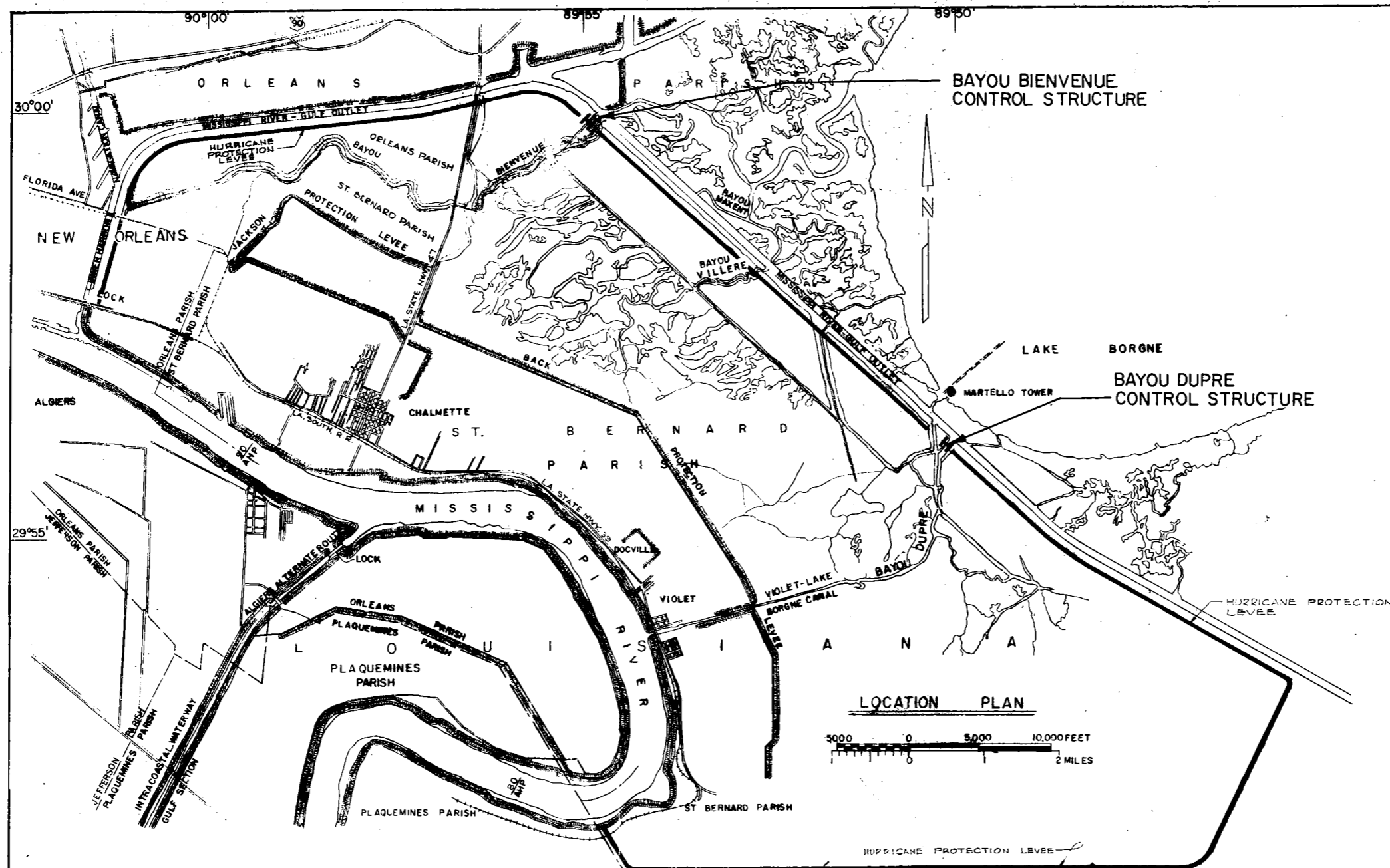
d. Scope. The scope of the manual is limited to essential operation and maintenance instructions for trained project personnel. The manual does not cover material presented in other general or detailed manuals, manufacturer's instruction books, regulations, or other such publications; however, reference has been made to them where applicable.



MISSISSIPPI RIVER GULF OUTLET

PHOTO TAKEN 23 MAY 1974

TO GULF OF MEXICO



LAKE PONTCHARTRAIN, LA. AND VICINITY
CHALMETTE AREA PLAN

BAYOU BIENVENUE CONTROL STRUCTURE
OPERATION & MAINTENANCE MANUAL

LOCATION PLAN

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

FILE NO. H-2-26327

Chapter 2 - Project Description

a. Authorization and Location. The Bayou Bienvenue control structure is a portion of the hurricane protection system that will protect the Chalmette area from hurricane flooding. The structure allows water traffic to proceed normally to and from the MR-GO via Bayou Bienvenue except during a hurricane. This structure, together with the Bayou Dupre control structure, will provide a drainage outlet for the area inclosed by the hurricane protection system. In addition to handling all the runoff from within the area, the Bayou Bienvenue control structure will allow drainage to flow from the city of New Orleans via the siphon below the IHNC.

The structure is located at the eastern edge of Orleans parish, Louisiana, approximately 400 feet west of the original intersection of Bayou Bienvenue and the MR-GO. See plate 1.

b. Description. The Bayou Bienvenue control structure, in addition to the access channel to the structure, consists of welded steel 60° sector gates in a reinforced concrete sector gate bay supported on untreated timber piles, treated timber guide walls at each end of the structure, pile supported inverted "tee" type floodwall. "I" type floodwalls will tie the "tee" type floodwalls to the earthen levees on each side of the structure in the future when the earth settlement ceases. The sector gates are operated by electric motors with provisions for manual operation. A general view of the structure is shown in photo. no. 1.

The gate bay is a reinforced concrete "U" frame, 76 feet in length with a channel clearance width of 56 feet. The top of the gates, the gate bay walls and the inverted "tee" floodwalls are at elevation 17.5 and the sill is at elevation -10.78 feet.(1) The "I" type floodwalls will be built to elevation 18.5 to allow for settlement. Needle girders and needles have been provided so that the gate bay can be dewatered for repair or painting of the gates. At the ends of the gate bay there are concrete sheet pile wingwalls installed with tie backs to retain the adjacent backfill. Two reinforced concrete control houses are located above the machinery space on each side of the gate bay. Control House No. 1 contains the engine driven generator and the electrical switch-gear. Both control houses contain the machinery for manual operation and control panels to start the generator and to operate the gates from either side. Pertinent data are as follows:

(1) All elevations herein are in feet and refer to mean sea level datum.

<u>Dimensions</u>	<u>Feet</u>
Width Structure	134
Channel Clearance	56
Length "tee" floodwalls	95 each
Length "I" floodwall (future)	92 each
Length structure	76
Length of guide walls	96 each
Length of timber fenders	72 each

<u>Elevations</u>	<u>Feet, m.s.l.</u>
Top of gate bay walls	17.5
Top of gates	17.5
Guide wall	10.0
Sill	-10.78(-10.0 m.l.g.)
Operating floor of control house	17.5

Hydraulic design criteria

Maximum, differential head, MR-GO to landside	11.0
Maximum reverse head, landside to MR-GO	5.0
Maximum differential head for safe navigation thru structure	0.5

c. Floodwalls. There are two types of floodwalls constructed between the gate bay and the adjacent levees. The inverted "tee" type floodwall commences at the gate bay wall and extends approximately 95 feet toward the levee on each side of the structure. The inverted "tee" type of floodwall consists of a pile-supported concrete base slab and stem, with a sheet pile cutoff wall. The "tee" wall is supported against settlement and overturning by battered, prestressed concrete piles with tip elevations at approximately -67.0. A 4-foot wide concrete access walkway forms the top of the inverted "tee" floodwall.

An "I" type floodwall will be constructed from the end of the "tee" type floodwall approximately 92 feet to the levee on each side of the structure. The "I" wall will consist of prestressed concrete sheet pile with full length tongue and groove plastic interlocks. The "I" type floodwall and 4-foot wide concrete access walkway on top of the wall will be constructed when settlement in this area ceases.

d. Concrete sheet pile wingwalls. Concrete sheet pile wingwalls were constructed on each end of the gate bay to retain the earthfill at the entrance and exit of the gate chamber.

e. Dewatering. Dewatering of the gate bay will be accomplished only at low water periods with adequate provisions made to terminate dewatering should water stages reach elevation 5.0 or above. Dewatering of the gate bay will be accomplished by placing reinforced concrete needles and wood strips between the needles on each side of the structure. The concrete needles are supported at the top and secured to a steel girder. At the bottom, the concrete needles fit into recesses in the base slab. Before placing the needles, it will be necessary to secure the services of a diver to clean out the needle dam recesses. At this time, it may be advantageous to partially close the gates. After the needles are set in place, the gate bay should be dewatered by lowering the water level at a rate not to exceed one half foot per hour. Prior to dewatering, four temporary monitoring points should be installed on the gate bay walls (two each side). Elevation and measurements of the distance across the gate bay should be taken every four hours during the dewatering and refilling periods. Settlement readings should be taken on the chamber walls and across the gate bay floor after the chamber is dewatered as follows: (1) immediately after dewatering; (2) twice daily for the first three days; (3) daily for the next five days, and (4) weekly thereafter. The MR-GO and land side stages should be recorded daily. All of the above data should be filed for future reference. Placing of the needle dam should be accomplished as follows:

1. Assemble girder and supports and place in needle girder recess.
2. Place and secure to girder eleven (11) needles at each end of the structure. Needles should be placed six on one side and five on the other with wood strips between the joints. This will leave a gap in the middle.
3. Drive a wooden wedge in the gap to make needles fit snug.
4. Pump water from structure and caulk joints where necessary.

PART II - OPERATION AND MAINTENANCE

Chapter 1 - General

a. As constructed drawings. The original tracings of the "as constructed" drawings, file no. H-4-24362 in 65 sheets, are maintained in the files of the U. S. Army Engineer District, New Orleans. Prints of pertinent drawings will be maintained in the office of Orleans Levee District.

b. Local cooperation. An act of assurance for the portion of the Chalmette Area Plan located in Orleans Parish, supported by a resolution of the Board of Levee Commissioners of the Orleans Levee District, dated 28 July 1966, was approved and accepted on behalf of the United States on 10 October 1966.

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

"(6) 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.

"(7) 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;"

c. Approved regulations. The general regulations approved by the Secretary of the Army for the operation and maintenance of flood control works constructed by the Federal Government were published in the Federal Register of 1 January 1970. A copy of these regulations is attached hereto as exhibit no. 1. The specific requirements for control structures are contained in subparagraphs (a) "General" and (h) "Miscellaneous facilities" of Section 208.10. Subparagraphs (b) "Levees" and (c) "Floodwalls" are of interest since both will have some effect on the structure.

d. Duties of the superintendent. Local interests shall appoint a permanent committee consisting of or headed by an official to be known as the "Superintendent." He shall be responsible for the development and maintenance, and is directly in charge of an organization responsible for the efficient operation and maintenance of all structures and facilities during flood periods, and for continuous inspection and maintenance of the project works during periods of low water, all without cost to the United States Government. It shall be the duty of the Superintendent to make all inspections and conduct all tests required herein. He shall make certain that the required maintenance measures are being operated in such a manner as to obtain maximum benefits. The Superintendent shall submit to the District Engineer, P. O. Box 60267, New Orleans, Louisiana, a semiannual report as required in paragraph g covering inspection, operation, and maintenance of the protective works. He shall keep on file with the District Engineer his name, home and business addresses, home and business telephone numbers, and any changes thereto. Suggested form for the semiannual reports is shown herein as exhibit no. 2.

e. General rules. General rules for the maintenance and operation of the project are included in the Flood Control Regulations, exhibit no. 1. Specific instructions are included in the following pages which supplement the instructions contained in the regulations.

f. Safe Navigation. No vessel should navigate through the structure when a differential head of 0.5 foot is present. A differential head of this amount would make navigation hazardous.

g. Semiannual reports. The Flood Control Regulations specify that semiannual reports, covering inspection, maintenance, and operation of the protection works, be submitted to the District Engineer. These reports should be submitted on 30 June and 31 December of each year and should include inspection check lists similar to the sample form contained herein as exhibit no. 2 of this manual, supplemented by accounts of maintenance or operation activities during the period covered. The report should also include all logs of operation and copies of all inspection check lists made during the period covered by the report. (See exhibit no. 3). The report should further include detail plans for necessary remedial work which has been revealed by the inspections. The nature, date of any construction, and removal of all temporary repairs should be included. Other items of interest or suggestions resulting from the operation of the protection system should also be made for the files of the local agency involved.

Chapter 2 - Control Structures

EQUIPMENT

1. General. In this section, the major items of equipment are identified by manufacturer and type or model numbers when applicable.
2. Sector gate machinery. All sector gate machinery components were manufactured in accordance with the detailed contract drawings. The following is a list of commercially available components.
 - a. Parallel shaft speed reducer. The parallel shaft speed reducer was manufactured by Philadelphia Gear Corporation, King of Prussia, Pennsylvania, and is identified as size 13 HP4. The ratio is 657:1.
 - b. Concentric shaft speed reducer. The concentric shaft speed reducer was manufactured by Philadelphia Gear Corporation, King of Prussia, Pennsylvania, and is identified as size 2HS2. The ratio is 7.59:1.
 - c. Electric motor. The electric motor was manufactured by Marathon Electric, P. O. Box 1407, Wausau, Wisconsin. The motors are rated at 2HP, 1,800 RPM, 3 ϕ , 60 Hz, 460-volt, and are identified as squirrel cage induction motors in a 184T frame. The motors have a rear shaft extension for the electric brake.
 - d. Electric brake. The electric brake was manufactured by Square "D" Company, Cleveland, Ohio and is identified as 8-inch, type "WB" DC magnetic brakes with a manual release. The brake is rated at 100 foot-pounds with a 480-volt, 60Hz, power supply.
2. Engine Generator. The engine generator was furnished by Onan, 1400 73rd Avenue N.E., Minneapolis, Minnesota and is identified as model number 15.ORDJC-4XR. The generator is rated at 480-volt, 60 Hz, 3 ϕ , 15 KW, 18.75 KVA @ .8 pf, and is a single bearing unit with a direct connection to the diesel engine. The power plant for the generator is a 4-cylinder, 4-stroke-cycle, 120-cubic-inch radiator-cooled diesel engine, and is rated at 30.4 HP @ 1,800 RPM.
3. Fuel. Fuel for the engine generator is diesel fuel. The fuel is stored in a 25-gallon storage tank adjacent to control house 1 on the structure.

4. Lighting system. The structure is provided with red guard navigation lights on both sides and at each end of the structure. Red guard lights are also on each sector leaf, and are limit switch actuated when the gates are closed. All navigation lights are battery powered and sun switch actuated. Lighting is provided inside the control house, and is powered by the engine generator.

e. Cathodic Protection System. The Cathodic protection system should be checked for proper operation, and potential measurements should be taken periodically (annually) by experienced personnel. The potential measurements shall be taken with a Copper-Copper Sulfate reference half cell and a high resistance voltmeter. Readings should be taken at 2-foot intervals of water depth at each of 17 locations on each gate leaf. The 17 locations are as follows:

(1) Five on the skin plate side (one at each end of the gate leaf and three centered between the anode strings.

(2) Twelve on the backside of the gate centered between the anode strings.

The step by step procedure is as follows:

(1) Determine structure to water potential by placing reference cell in water at desired depth and between 6 and 12 inches from steel structure.

(2) Adjust variable resistor, if used, to obtain a structure to water potential of -0.85 volts to reference half cell.

(3) Record date, gate leaf no., depth of cell, voltage, sketch of station location, and number for future reference.

(4) Inspect all anodes, resistors, wiring and components, and connections for deterioration; repair as necessary.

(5) Forward a copy of all readings and inspection results to Engineering Division, New Orleans District.

Chapter 3 - Sector Gate Operation

a. Gate control unit. One gate control unit is located in each control house. Each unit has switches for operating both gate leaves. Also mounted on the control unit is the start-stop controls for the engine generator unit.

b. Control switches. The gate control switches have pistol grip handles and are the momentary contact type with a spring that returns the switch to the neutral position when the handle is released. The handle is turned, and held, to the position as indicated on the control unit to open or close either one or both of the gates. The two push-buttons on the control unit are for engine generator controls. The black pushbutton is for starting the unit, the red for stopping.

c. Gate operation. The following sequence should be followed to assure proper operation:

(1) Open doors or windows on the control house which houses the engine generator, to assure proper ventilation of the room.

(2) Check oil, fuel, and cooling fluid levels on the engine generator. The start, stop, and remote switch should be in the remote position. The fuel "shut off" valve should be open.

(3) Check the emergency handwheel to assure that the control knobs and levers are in the "Clutch Disengaged (Motor)" and "In Motor" positions. If these knobs and levers are not in these positions, limit switches in the handwheel unit will prevent gate operation.

(4) Start the engine generator by depressing the "start" button on the control unit. The unit is designed for a delayed start; therefore, the button need only to be depressed and released.

(5) The engine generator is designed for immediate loads following engine start, therefore, the structure is ready to be operated.

(6) Before gate operation, no vessel should be anchored within 1,000 feet on either side of the structure during gate operation.

(7) To close the gates, turn and hold the pistol grip switches in the close position. The gates will close as long as the pistol grips are held; gate movement will stop if the switches are released. Limit switches stop the gates when they are fully closed.

(8) When gate operations are finished, stop the engine generator by depressing the stop button on the control panel.

(9) Secure all doors and windows on the control houses.

(10) To operate the structure in the event of power failure, the emergency handwheel must be used. To use the hand crank, place the control knob in the "Out Hand" position. Place the control levers in the "Clutch Engaged (Hand)" and "Ratchet Off" position. Descend into machinery pit, connect turnbuckle to brake release rod. Return to control house and raise brake release rod to first notch. Now operate the handwheels to effect gate opening or closing.

WARNING: THE OPERATOR SHOULD BE IN CONTROL OF THE HANDWHEEL AT THE TIME HE IS DISENGAGING THE BRAKE.

d. Limit switches. There are heavy duty lever type limit switches which stop the gate leaves in the fully open or fully closed position. A red light on the panel will light momentarily indicating the gate is closed. A green light indicates the gates are fully open.

PART III - EMERGENCY OPERATING CONDITION

Chapter 1 - Hurricane Procedure

a. General. Test operations prior to commencement of the hurricane season each year should be standard operating procedure.

b. National Weather Service Definition.

(1) Advises for Small Craft: If a hurricane moves within a few hundred miles of the coast, small craft are usually warned to stay in port; that is, not to venture into the open ocean.

(2) Hurricane Watch: Should the hurricane continue to approach the coast so as to constitute an appreciable threat to coastal areas, a "Hurricane Watch" is announced for the vulnerable areas. The "Hurricane Watch" does not constitute a warning that the hurricane conditions are eminent, rather it indicates that the hurricane is close enough that every one in the area covered by the "Watch" should listen for further advisories and be ready to take precautionary action quickly in case warnings are issued. When a "Watch" is issued, small craft operating in the applicable area are advised to seek safe shelter.

(3) Hurricane Warning: When hurricane conditions are expected within 24 hours, a hurricane warning is added to the advisory. Hurricane warnings identify coastal areas where winds of at least 74 miles per hour are expected to occur. A warning may also describe coastal areas where dangerously high water or exceptionally high waves are forecast, even though winds may be less than hurricane force.

When the hurricane warning is issued, all precautions should be taken immediately. Hurricane warnings are seldom issued more than 24 hours in advance. If the hurricane's path is unusual or erratic, the warnings may be issued only a few hours before the beginning of hurricane conditions. Precautionary actions should begin as soon as a hurricane warning is announced.

c. Gate Closing Criteria.

(1) When Advises for Small Craft are issued by the National Weather Service which are applicable to the northern Gulf of Mexico and are associated with a tropical storm or hurricane in the Gulf of

Mexico, the structure should be fully manned and test operated to insure free gate movement and proper seating of the sector gates. Any interfering obstructions should be cleared from the gated structure immediately. The structure should be manned continuously thereafter and should be closed at the time the stage reaches 2.0 feet on the staff gage. However, if stages are above elevation 2.0 or small craft warnings associated with a tropical storm or hurricane are issued, the structure should be closed immediately.

(2) Once the structure has been closed because a landside stage of 2 feet has been reached, the structure should not be reopened except to allow vessels seeking passage to safe harbor in Bayou Bienvenue, and then only if the MR-GO stage is less than 0.5-foot higher than the landside stage. The gates should be reclosed immediately. Under no circumstances should the gates be reopened to allow traffic to exit the safe harbor in Bayou Bienvenue once small craft warnings have been issued.

(3) When a Hurricane Warning is issued which is applicable to the northern Gulf of Mexico, the structure should be closed, if not already closed due to the criteria in (1) and (2) above, and should be maintained in a closed position. At no time should the structure be reopened for whatever reason, once a Hurricane Warning has been issued. In the event of an emergency in which stalled or otherwise threatened vessels are located outside the protected area, the situation should be called to the attention of the U. S. Coast Guard.

d. Gate Opening Criteria. The gates should not be opened following a hurricane until four criteria listed below have been fulfilled.

(1) Advices to Small Craft have been lifted by the National Weather Service.

(2) The MR-GO stage has fallen below the landside stage.

(3) The differential between the landside stage and the MR-GO stage is equal to or less than the differential of 0.5 feet.

(4) No vessel is anchored within 1,000 feet of the structure.

e. Shutdown operation. The superintendent in charge will insure completion of the following actions in the order listed:

(1) Check to see that all vessels and tows are clear of structure and gates.

(2) Close all gates as stated in c above.

(3) Secure storm shutters, and all loose equipment and materials, and take all necessary precautions to minimize possible damage or loss.

(4) Check emergency electrical power units.

(5) Effect complete shutdown of all plant and equipment machinery except those that are absolutely necessary and feasible to leave "on" for the shutdown period.

(6) Log and report by the fastest electrical means available to the Orleans Levee District office, the degree of shutdown. The report shall be as brief as possible giving at least the following information:

(a) Position of gates.

(b) Elevation of water landside of structure and on MR-GO side.

(c) Percent of installation and shutdown.

(7) The Orleans Levee District will report the information in paragraph (6) above to the New Orleans District office as soon as possible.

Chapter 2 - Procedures in Emergencies Created by CBR Fallout Conditions

a. General. This project has no shelter or convertible area suitable for protection against fallout radiation at the present time. Therefore, in the event of a chemical, biological or radiological fallout condition, employees and their families living in the immediate vicinity of this installation are instructed to follow directions as outlined by Civil Defense authorities in the area.

b. Shutdown operation. The superintendent in charge will insure completion of the items listed on page 13, paragraph e, time permitting.

PART IV - MAINTENANCE GUIDE

Chapter 1 - Inspection Guide and Maintenance Standards

- a. Inspection guide. Listed herein are those items that are considered to be of primary importance to the proper functioning of the structure. The list includes suggested abnormal conditions to be inspected. The list is grouped by inspection frequencies and should be revised as experience in project maintenance dictates.
- b. Maintenance standards. The quality of maintenance must be high. The level of maintenance should be such that the structure functions most efficiently at a minimum cost.
- c. Employees' responsibility. Every employee concerned with the operation and maintenance of the structure is encouraged to search for improved measures and means that will lead to development of more efficient and more economical methods of accomplishing the required work.
- d. Spare parts. Parts such as limit switches, navigation lights and fixtures, control switches, etc. should be kept on hand so that operation would not be prevented due to breakdown.
- e. Frequency of inspection. The items to be inspected have been grouped as follows: Not scheduled - those items requiring special attention following high water, storms, or at beginning of a season; Operational - those items which shall be inspected by operating personnel during performance of normal duties (see exhibit no. 3); Monthly - those items which consist of a general type inspection for condition and wear of equipment; Semiannual - those items which consist of a general type inspection for condition, appearance, and housekeeping; and Annually - those items which consist of a detailed inspection of all equipment. (See exhibit 3 for samples of inspection report).

Inspection Frequencies for Project Components

Not Scheduled

1. Erosion. After extended periods of high tides and/or heavy rains, inspect for erosion at the structure and the closure dam.

2. Channels. Inspect after high tides or heavy rains for silting, snags, and scoured or caving banks. Further, soundings should be made in the derrick stone and riprap areas.
3. Circuit breakers. Inspect after short circuit interruption; repair or replace if required.
4. Tools and spare parts. Inspect before using; repair or replace as necessary.
5. One-half inch water proof cement mortar on roof. Inspect after storms, or high winds; repair damage.
6. Grounds, general. Inspect after storms or heavy rains for any damage.
7. Navigation sign. Repair and repaint as necessary.

Operational

8. Hinge and Pintle. Prior to starting operating machinery, check for lubrication.
9. Operating machinery. Inspect machinery for loose parts, mis-alinement, wear and broken parts. Adjust or aline as required. Repair or replace worn or damaged parts.
10. Shafts and couplings. Check for vibration, alinement and satisfactory operation.
11. Internal combustion engines. Check to determine that electrical, fuel, lubrication and cooling systems operate properly. Check exhaust for leaks and observe for unusual vibration. Check speed governing.
12. Panel board. Inspect for cleanliness, condition and finish.
13. Meters and instruments. Observe for proper operation and condition.
14. Control switches and push buttons. Observe condition at each operation.
15. Wire rope, drum, and sheaves. Observe for condition and proper reeling and reeving during operation.

16. Electric motor and brake. Observe during operation for unusual noise or vibration.

Weekly

17. Gate Operation. a. Operate the gates through a complete closing and opening cycle. Inspect the operation to assure that the gates and the controls are functioning properly.

b. A fully charged battery should be taken to the structure to be used in case the installed battery is unable to start the generator.

Monthly

18. Engine. Check all fluid levels, replenishing if necessary. Check exhaust for leaks. Check speed governing.

19. Switchgear panels and inclosures. Visually inspect for cleanliness and condition.

20. Panel wiring and terminal blocks. Visually inspect for condition, check connections for tightness.

21. Storage batteries. Check for leaks, test, and record specific gravity of all cells. Add distilled water as required. Clean corrosion from connections, tighten, and coat with terminal grease.

22. Navigation lights. Visually inspect for cleanliness and condition.

23. Operating machinery. Inspect machinery for loose parts, mis-alinement, wear, and broken parts. Adjust or aline as required, repair or replace worn or damaged parts. Check fluid levels. Check wire rope for proper lubrication. Adequate precautions should be taken to insure that there is no interference with navigation.

24. Shafts and couplings. Check for vibration, alinement and satisfactory operation.

Semiannually

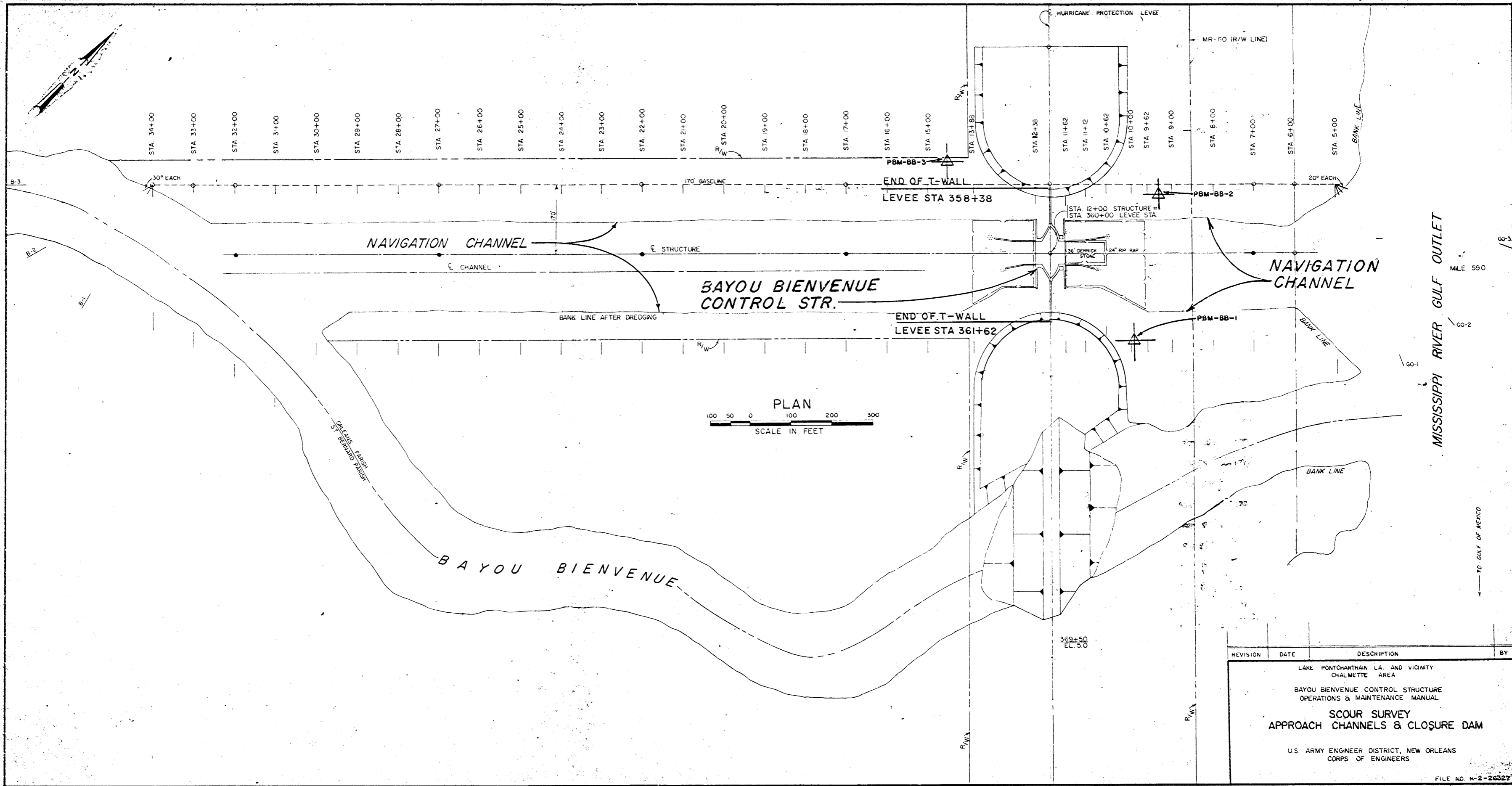
25. Inlet and outlet channels. Inspect for silting, snags and scoured or caving banks.

26. Riprap. Inspect for settlement and displaced or missing stone.
27. Concrete. Close visual inspection to detect cracks, leaks, spalling and deterioration of structure and concrete floodwalls.
28. Roof. Close inspection to detect leaks and damages to roofing.
29. Drainage. Inspect for adequacy of drainage. Check for ponding and gullyng.
30. Operating machinery. Dismantle as necessary, and inspect for wear, misalignment, or loose parts.
31. Railings and miscellaneous metal work. Examine supports, treads, railing, gratings, anchors, and bolts for rust, deterioration, and rigidity. Tighten loose bolts, repair broken welds, replace defective members, keep walkways clear and free from obstruction, oil, grease, or debris. Keep railings rigid and secure to base.
32. Building exterior. Inspect for cracks and check around openings for cracks or leaks.
33. Floors. Examine concrete floors for cracks, settlement, or deterioration.

Annually

34. Motor and generator bearings. Check bearing clearances and end play. Adjust, repair or replace as necessary.
35. Generator and motor windings. Inspect exposed parts of windings for damage. Measure and record insulation resistance of all windings.
36. Circuit breaker panels. Inspect panel for cleanliness or damage. Check hinges, latches, and finish. Clean and repair as required.
37. Switchgear panels and inclosures. Inspect for cleanliness and condition. Tighten loose bolts and connections, repair or replace damaged parts.
38. Piping and valves. Inspect exposed piping and valves for leakage and corrosion. Repair or replace piping as required. Repack, reseal, or replace damaged valves.

39. Tools, shop equipment, and spare parts. Inspect equipment for condition, clean and repair as required, replace missing parts.
40. Electrical cables. Examine exposed portions of cables for signs of overheating, damage to insulation or sheath. Check and record insulation resistance of critical cables.
41. Control boards and panel. Examine for overall condition. Tighten, repair, and clean to restore in good condition.
42. Panel wiring and terminal blocks. Examine closely. Tighten connections and observe for damaged insulation. Clean and repair or replace damaged parts.
43. Control switches and pushbuttons. Examine for condition. Replace contacts as needed to maintain in good condition.
44. Meters and instruments. Check meters and instruments against standard instruments. Repair or replace if defective. Keep clean.
45. Operating machinery. Check for corrosion and take necessary action to prevent suspected corrosion. Check cable drum for fit on reducer shaft. Repair or replace any damaged or worn parts.
46. Wire rope. Visually inspect entire length for broken strands or worn, or damaged parts. Clean, lubricate and replace if necessary.
47. Bearings. Visually inspect for wear or damage. Replace if necessary.
48. Surveys. Settlement reference marks, alinement of floodwalls, closure dam elevations, and scour survey observations will be made quarterly for the first two years after completion of the structure and annually thereafter. Elevations for closure dam and channel scour survey should be taken as indicated on plate no. 2. A copy of all surveys should be furnished the Engineering Division, New Orleans District.
49. Cathodic protection system. When inspecting gates, see that the system is in good condition, and providing desired protection. Check anodes; replace as necessary.
50. Windows, louvers, and doors. Check weatherstripping, calking around frames, door stops, locks, latches, screens, glazing, and hinges.



PLAN
SCALE IN FEET

REVISION	DATE	DESCRIPTION	BY
		LAKE PONTCHARTRAIN LA. AND VICINITY CHALMETTE AREA	
		BAYOU BIENVENUE CONTROL STRUCTURE OPERATIONS & MAINTENANCE MANUAL	
		SCOUR SURVEY APPROACH CHANNELS & CLOSURE DAM	
		U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS CORPS OF ENGINEERS	

MISSISSIPPI RIVER GULF OUTLET

TO GULF OF MEXICO

Three Years

51. Periodic Inspection. New Orleans District Engineering personnel, along with Orleans Levee District personnel, will inspect the structure at three year intervals.

Ten Years

52. Structure general. The gate bay structure shall be unwatered, at approximately 10-year intervals, for thorough inspection of gates and gate bay, hinge and pintle, rubber seals, broken lubrication lines, cathodic protection anodes, broken underwater timbers and performing other underwater work that may be necessary. Reference point elevations should be taken while the structure is unwatered.

Chapter 2 - Maintenance Control System

a. Inspection. Maintenance inspections are an essential part of good maintenance; however, overemphasis should be avoided. There is no need to inspect everything in detail. Greater emphasis should be placed on the operational inspections and trouble reports in an effort to reduce the number of maintenance inspections.

b. Records. Records must be maintained on items inspected in order to accumulate sufficient data to determine the optimum inspection interval, the extent of repairs, and the desirability of replacement. An inspection and maintenance record system shall be maintained in the office of the Orleans Levee District involved, on forms similar to exhibits no. 2 and 4. These records shall be made available to Government personnel at all times. The inspection and maintenance records should be reviewed and used to analyze the effectiveness of the maintenance program. Where a particular piece of equipment has repeatedly been found to require no work, thought should be given to extending the period of inspections.

Chapter 3 - Lubricants and Lubrication

a. General. Proper lubrication is an important part of a good maintenance program. Dependable operation and the life expectancy of equipment requiring lubrication are almost entirely dependent on the use of proper lubricants at the right time intervals and in the proper quantities. Experience gained by project personnel as to the best lubricants for specific applications and the proper time intervals for adding lubricant or relubricating various items of equipment becomes more important as a project ages. A lubrication and oil record shall be maintained on a form similar to sheet 1 of exhibit no. 4. Lubricating programs should be thoroughly reviewed at least once each year to insure continuous improvement and economy in project maintenance.

b. Selection of lubricants. The selection of lubricants is a very important part of the lubrication program. First, the equipment manufacturers' recommendations as the lubricant or lubricants to be used must be taken into consideration, especially when the equipment requires special lubricants. Some manufacturers' recommendations specify only the viscosity of the lubricants to be used; some recommend lubricants by trade name only, while others may specify lubricants by either SAE (Society of Automotive Engineers) or AGMA (American Gear Mfrgs. Assn.) numbers. These various methods of specifying lubricants should, where possible, be reduced to a common base in order that the number of different types, or lubricants of different characteristics, can be reviewed and analyzed. This information is necessary to keep the number of lubricants stocked to the minimum required for proper lubrication.

c. Recommended lubricants. (1) Oils. All crankcase oils shall be rated for SAE Service MS with viscosities as follows:

Main engines. SAE 30 or 40 - Change after 100-hours.

Flexible couplings: Multipurpose-type gear lubricant (API Service GL 4) - SAE 80.

(2) Greases.

Ball and roller bearings: No. 2 sodium soap base grease.

Hinge and pintle bearings: Lithium base, moly disulfide and extreme pressure additives highly water repellent, high load capacity with a National Lubricating Institute Classification of no. 2 consistency.

d. Precautions for personnel. Several precautions should be emphasized for lubricating project equipment. First, good housekeeping is one of the most important. Care should be exercised to prevent excessive oiling or greasing and leaking oil in the area around the equipment. Over-lubrication of equipment should be avoided, not only from the standpoint of good housekeeping, but because in some cases, such as grease-lubricated ball or roller bearings, excessive grease increases friction within the bearing and results in higher bearing temperatures, which may be dangerous. Do not add lubricant to oil-lubricated bearings while the equipment is operating. Be sure to fill such bearings to the point recommended by the manufacturer. Adding grease to grease-lubricated bearings is usually done while the equipment is operating. If a relief plug is provided, remove the plug before adding grease. This will permit the new grease to force out some of the old grease so that the employee can observe its condition. Allow the equipment to operate for a few minutes before replacing the relief plug so that excess grease will be forced out. Always clean up around equipment after lubricating. Precautions should be taken to prevent the entrance of moisture of condensation into oil or grease reservoirs.

§ 208.10 Local flood protection works; maintenance and operation of structures and facilities.

(a) *General.* (1) The structures and facilities constructed by the United States for local flood protection shall be continuously maintained in such a manner and operated at such times and for such periods as may be necessary to obtain the maximum benefits.

(2) The State, political subdivision thereof, or other responsible local agency, which furnished assurance that it will maintain and operate flood control works in accordance with regulations prescribed by the Secretary of the Army, as required by law, shall appoint a permanent committee consisting of or headed by an official hereinafter called the "Superintendent," who shall be responsible for the development and maintenance of, and directly in charge of, an organization responsible for the efficient operation and maintenance of all of the structures and facilities during flood periods and for continuous inspection and maintenance of the project works during periods of low water, all without cost to the United States.

(3) A reserve supply of materials needed during a flood emergency shall be kept on hand at all times.

(4) No encroachment or trespass which will adversely affect the efficient operation or maintenance of the project works shall be permitted upon the right-of-way for the protective facilities.

(5) No improvement shall be passed over, under, or through the walls, levees, improved channels or floodways, nor shall any excavation or construction be permitted within the limits of the project right-of-way, nor shall any change be made in any feature of the works without prior determination by the District Engineer of the Department of the Army or his authorized representative that such improvement, excavation, construction, or alteration will not adversely

affect the functioning of the protective facilities. Such improvements or alterations as may be found to be desirable and permissible under the above determination shall be constructed in accordance with standard engineering practice. Advice regarding the effect of proposed improvements or alterations on the functioning of the project and information concerning methods of construction acceptable under standard engineering practice shall be obtained from the District Engineer or, if otherwise obtained, shall be submitted for his approval. Drawings or prints showing such improvements or alterations as finally constructed shall be furnished the District Engineer after completion of the work.

(6) It shall be the duty of the superintendent to submit a semiannual report to the District Engineer covering inspection, maintenance, and operation of the protective works.

(7) The District Engineer or his authorized representatives shall have access at all times to all portions of the protective works.

(8) Maintenance measures or repairs which the District Engineer deems necessary shall be promptly taken or made.

(9) Appropriate measures shall be taken by local authorities to insure that the activities of all local organizations operating public or private facilities connected with the protective works are coordinated with those of the Superintendent's organization during flood periods.

(10) The Department of the Army will furnish local interests with an Operation and Maintenance Manual for each completed project, or separate useful part thereof, to assist them in carrying out their obligations under this part.

(b) *Levees—(1) Maintenance.* The Superintendent shall provide at all times such maintenance as may be required to insure serviceability of the structures in time of flood. Measures shall be taken to promote the growth of sod, exterminate burrowing animals, and to provide for routine mowing of the grass and weeds, removal of wild growth and drift deposits, and repair of damage caused by erosion or other forces. Where practicable, measures shall be taken to retard bank erosion by planting of willows or other suitable growth on areas riverward of the levees. Periodic inspections shall be made by the Superintendent to insure that the above maintenance measures

are being effectively carried out and, further, to be certain that:

(i) No unusual settlement, sloughing, or material loss of grade or levee cross section has taken place;

(ii) No caving has occurred on either the land side or the river side of the levee which might affect the stability of the levee section;

(iii) No seepage, saturated areas, or sand boils are occurring;

(iv) Toe drainage systems and pressure relief wells are in good working condition, and that such facilities are not becoming clogged;

(v) Drains through the levees and gates on said drains are in good working condition;

(vi) No revetment work or riprap has been displaced, washed out, or removed;

(vii) No action is being taken, such as burning grass and weeds during inappropriate seasons, which will retard or destroy the growth of sod;

(viii) Access roads to and on the levee are being properly maintained;

(ix) Cattle guards and gates are in good condition;

(x) Crown of levee is shaped so as to drain readily, and roadway thereon, if any, is well shaped and maintained;

(xi) There is no unauthorized grazing or vehicular traffic on the levees;

(xii) Encroachments are not being made on the levee right-of-way which might endanger the structure or hinder its proper and efficient functioning during times of emergency.

Such inspections shall be made immediately prior to the beginning of the flood season; immediately following each major high water period, and otherwise at intervals not exceeding 90 days, and such intermediate times as may be necessary to insure the best possible care of the levee. Immediate steps will be taken to correct dangerous conditions disclosed by such inspections. Regular maintenance repair measures shall be accomplished during the appropriate season as scheduled by the Superintendent.

(2) *Operation.* During flood periods the levee shall be patrolled continuously to locate possible sand boils or unusual wetness of the landward slope and to be certain that:

(i) There are no indications of slides or sloughs developing;

(ii) Wave wash or scouring action is not occurring;

(iii) No low reaches of levee exist which may be overtopped;

(iv) No other conditions exist which might endanger the structure.

Appropriate advance measures will be taken to insure the availability of adequate labor and materials to meet all contingencies. Immediate steps will be taken to control any condition which endangers the levee and to repair the damaged section.

(c) *Flood walls—(1) Maintenance.* Periodic inspections shall be made by the Superintendent to be certain that:

(i) No seepage, saturated areas, or sand boils are occurring;

(ii) No undue settlement has occurred which affects the stability of the wall or its water tightness;

(iii) No trees exist, the roots of which might extend under the wall and offer accelerated seepage paths;

(iv) The concrete has not undergone cracking, chipping, or breaking to an extent which might affect the stability of the wall or its water tightness;

(v) There are no encroachments upon the right-of-way which might endanger the structure or hinder its functioning in time of flood;

(vi) Care is being exercised to prevent accumulation of trash and debris adjacent to walls, and to insure that no fires are being built near them;

(vii) No bank caving conditions exist riverward of the wall which might endanger its stability;

(viii) Toe drainage systems and pressure relief wells are in good working condition, and that such facilities are not becoming clogged.

Such inspections shall be made immediately prior to the beginning of the flood season, immediately following each major high water period, and otherwise at intervals not exceeding 90 days. Measures to eliminate encroachments and effect repairs found necessary by such inspections shall be undertaken immediately. All repairs shall be accomplished by methods acceptable in standard engineering practice.

(2) *Operation.* Continuous patrol of the wall shall be maintained during flood periods to locate possible leakage at monolith joints or seepage underneath the wall. Floating plant or boats will not be allowed to lie against or tie up to the wall. Should it become necessary during a flood emergency to pass anchor cables over the wall, adequate measures shall be taken to protect the concrete and construction joints. Immediate steps shall

be taken to correct any condition which endangers the stability of the wall.

(d) *Drainage structures—(1) Maintenance.* Adequate measures shall be taken to insure that inlet and outlet channels are kept open and that trash, drift, or debris is not allowed to accumulate near drainage structures. Flap gates and manually operated gates and valves on drainage structures shall be examined, oiled, and trial operated at least once every 90 days. Where drainage structures are provided with stop log or other emergency closures, the condition of the equipment and its housing shall be inspected regularly and a trial installation of the emergency closure shall be made at least once each year. Periodic inspections shall be made by the Superintendent to be certain that:

(i) Pipes, gates, operating mechanism, riprap, and headwalls are in good condition;

(ii) Inlet and outlet channels are open;

(iii) Care is being exercised to prevent the accumulation of trash and debris near the structures and that no fires are being built near bituminous coated pipes;

(iv) Erosion is not occurring adjacent to the structure which might endanger its water tightness or stability.

Immediate steps will be taken to repair damage, replace missing or broken parts, or remedy adverse conditions disclosed by such inspections.

(2) *Operation.* Whenever high water conditions imperd, all gates will be inspected a short time before water reaches the invert of the pipe and any object which might prevent closure of the gate shall be removed. Automatic gates shall be closely observed until it has been ascertained that they are securely closed. Manually operated gates and valves shall be closed as necessary to prevent inflow of flood water. All drainage structures in levees shall be inspected frequently during floods to ascertain whether seepage is taking place along the lines of their contact with the embankment. Immediate steps shall be taken to correct any adverse condition.

(v) Riprap sections and deflection dikes and walls are in good condition;

(vi) Approach and egress channels adjacent to the improved channel or floodway are sufficiently clear of obstructions and debris to permit proper functioning of the project works.

Such inspections shall be made prior to the beginning of the flood season and otherwise at intervals not to exceed 90 days. Immediate steps will be taken to remedy any adverse conditions disclosed by such inspections. Measures will be taken by the Superintendent to promote the growth of grass on bank slopes and earth deflection dikes. The Superintendent shall provide for periodic repair and cleaning of debris basins, check dams, and related structures as may be necessary.

(2) *Operation.* Both banks of the channel shall be patrolled during periods of high water, and measures shall be taken to protect those reaches being attacked by the current or by wave wash. Appropriate measures shall be taken to prevent the formation of jams of ice or debris. Large objects which become lodged against the bank shall be removed. The improved channel or floodway shall be thoroughly inspected immediately following each major high water period. As soon as practicable thereafter, all snags and other debris shall be removed and all damage to banks, riprap, deflection dikes and walls, drainage outlets, or other flood control structures repaired.

(h) *Miscellaneous facilities* — (1) *Maintenance.* Miscellaneous structures and facilities constructed as a part of the protective works and other structures and facilities which function as a part of, or affect the efficient functioning of the protective works, shall be periodically inspected by the Superintendent and appropriate maintenance measures taken. Damaged or unserviceable parts shall be repaired or replaced without delay. Areas used for ponding in connection with pumping plants or for temporary storage of interior run-off during flood

periods shall not be allowed to become filled with silt, debris, or dumped material. The Superintendent shall take proper steps to prevent restriction of bridge openings and, where practicable, shall provide for temporary raising during floods of bridges which restrict channel capacities during high flows.

(2) *Operation.* Miscellaneous facilities shall be operated to prevent or reduce flooding during periods of high water. Those facilities constructed as a part of the protective works shall not be used for purposes other than flood protection without approval of the District Engineer unless designed therefor.

SEMIANNUAL INSPECTION
OPERATION AND MAINTENANCE REPORT
 FOR
 BAYOU BIENVENUE CONTROL STRUCTURE
HURRICANE PROTECTION

(Semiannual reports to be submitted 30 June and 31 December to the District Engineer, Corps of Engineers, U.S. Army Engineer District, New Orleans, New Orleans, Louisiana.)

INSPECTION AND MAINTENANCE

Date of Inspection _____

<u>a. Feature inspected</u>	<u>Condition of feature</u>
1. Inlet and outlet channels	_____
2. Riprap	_____
3. Concrete	_____
4. Roofing and flashing	_____
5. Drainage	_____
6. Operating machinery	_____
7. Railings and miscellaneous metal work	_____
8. Tools and spare parts	_____
9. Building exterior	_____
10. Floors	_____
11. Fire hazards	_____
12. Safe working conditions	_____

b. Action taken to correct adverse conditions reported above: _____

 Date submitted

 Superintendent
 EXHIBIT NO. 2

MAINTENANCE INSPECTION
(Not Scheduled)
FOR
BAYOU BIENVENUE CONTROL STRUCTURE

Date of Inspection _____

<u>a. Feature inspection</u>	<u>Condition of feature</u>
1. Erosion	_____
2. Channels	_____
3. Control panels	_____
4. Tools and spare parts	_____
5. Roofing and flashing	_____
6. Grounds, general	_____

b. Action taken to correct adverse conditions reported above: _____

Date submitted

Superintendent

MAINTENANCE INSPECTION
(Operational)

BAYOU BIENVENUE CONTROL STRUCTURE

Date of Inspection _____

a. <u>Feature inspected</u>	<u>Condition of feature</u>
1. Operating machinery	_____
2. Shafts and couplings	_____
3. Internal combustion engines	_____
4. Lighting panel board	_____
5. Meter and instruments	_____
6. Control switches and pushbuttons	_____
7. Wire rope, drum and sheaves	_____
8. Electric motor and brake	_____

b. Action taken to correct adverse conditions reported above: _____

Date submitted

Superintendent

MAINTENANCE INSPECTION
(Monthly)

BAYOU BIENVENUE CONTROL STRUCTURE

Date of inspection _____

<u>a. Feature inspected</u>	<u>Condition of feature</u>
1. Engine	_____
2. Switchgear panels and inclosures	_____
3. Panel wiring and terminal blocks	_____
4. Storage batteries	_____
5. Operating machinery	_____
6. Shafts and couplings	_____

b. Action taken to correct adverse conditions reported above: _____

Date submitted

Superintendent

MAINTENANCE INSPECTION
(Annually)

BAYOU BIENVENUE CONTROL STRUCTURE

Date of inspection _____

<u>a. Feature inspection</u>	<u>Condition of feature</u>
1. Motor and generator bearings	_____
2. Generator and motor windings	_____
3. Circuit breaker panels	_____
4. Switchgear panels and inclosures	_____
5. Piping and valves	_____
6. Tools, shop equipment, and spare parts	_____
7. Cables	_____
8. Control boards and panels	_____
9. Panel wiring and terminal block	_____
10. Control switches and pushbuttons	_____
11. Meters and instruments	_____
12. Operating machinery	_____
13. Wire rope	_____
14. Bearings	_____

b. Action taken to correct adverse conditions reported above: _____

Date submitted

Superintendent

Lubrication and Oil Record

Date:	Engine Generator:	Remarks:

Indicate date of lubrication, Oil change, or oil added.

Date
Date submitted

Superintendent