Republika ng Pilipinas
PAMBANSANG PANGASIWAAN NG PATUBIG
(National Irrigation Administration)
Lungsod ng Quezon

MC No. 10, s. 1992

MEMORANDUM CIRCULAR

T O : ALL REGIONAL IRRIGATION MANAGERS, PROJECT MANAGERS, OPERATION MANAGERS, DISTRICT CHIEFS, IRRIGATION SUPERINTENDENTS, PROVINCIAL IRRIGATION ENGINEERS AND ALL OTHERS CONCERNED
This Agency

SUBJECT : INSTRUCTION MANUAL/GUIDELINES IN THE INSPECTION OF GATES AND HOISTS

Gates and hoists are important components of diversion structures to provide adequate and efficient distribution of irrigation water supply. In order to prolong the life and maintain the quality of the performance of these components, there is a need for their proper handling, operation and maintenance. For this purpose, an instruction manual/guidelines and procedures in the proper inspection of these gates and hoists is hereby furnished for the proper guidance of field personnel involved in the operation and maintenance of the aforementioned components of diversion structures.

The Regional Irrigation Manager is responsible for the enforcement of this Memorandum. He is required to submit to the Administrator, copy furnished the Assistant Administrator for Systems Operation and Equipment Management (AA-SOEM), monthly summary report of inspection and exercise operation of gates and hoists using the attached Format (Form GH-01). This report should be submitted not later than fifteen (15) days after the end of month to which it relates.

This Memorandum is supplemented to all existing guidelines and procedures in regards to the O & M of Gates and Hoists and shall take effect starting February 1, 1992.

(SGD.) JOSE B. DEL ROSARIO, JR.
Administrator

January 29, 1992

INSTRUCTION MANUALS AND INSPECTION OF GATES AND HOISTS

Introduction

Gates are very high precision mechanisms with very close working tolerances. As such, it is very essential to maintain these tolerances after installation and during operation by scheduling regular inspection and follow up measures. In any irrigation system, the smooth functioning of these gates depends upon proper operation and timely maintenance. The timely maintenance can only be done if regular and periodic inspections and actual exercise operations are carried out. This method will not only improve the performance but likewise increase the life span of the mechanism.

Vertical Lift Gates

In order to detect normal wear and tear and other defects that have developed in the mechanism, periodic actual operation and inspection should be carried out. **This should be done at least once a month during the dry season and twice a month during the wet season or whenever it is deemed necessary.**

Inspection work should involve not only the gate components that are exposed and readily visible with the human eye but also its embedded parts. Unlike the gate which can be easily inspected by just raising it above the water level, there is however a difficulty in the inspection of the embedded parts, especially on the upstream lower reaches, as this can be done only when there is no water flowing on the sluices.

Inspection of Embedded Parts

All parts rigidly embedded and fixed in concrete and partially exposed should be inspected, i.e.sill beam, track paths, guide paths, etc. All debris and scaling over these parts should be thoroughly cleaned and any peculiar deformation should be carefully noted and whenever necessary, photographs should be taken as a basis of comparison during subsequent inspection. This is required especially when there is pitting or corrosion where a comparison with previous record is very useful to ascertain the rate of such phenomenom and to determine if it is seriously affecting the stability of the gate.

Aside from the above defects, there may also be normal wear and tear and the seal seat and track surfaces may become uneven or may have developed indentations like roller marks. In view of this and inasmuch that embedded parts are required to be in true alignment, it is required that readings for alignment should be

taken every half meter relative to some fixed points. These assigned points should be kept permanent and to be used at every subsequent inspection.

The following critical dimensions should also be checked at an interval of at least thirty centimeters (30 cm), whenever applicable:

a. Center to center distance between track plates;

b. Center to center distance between side seals;

c. Face to face distance between guides;

The trueness of these observations should be in consonance with the corresponding observation on the gate leaf.

All nuts, bolts, screws, etc. should likewise be checked for wear, tear and tightness every exercise period.

The entire gate slot should also be thoroughly checked and cleaned of obstructions for the free and smooth travel of the gate.

In sliding gate, the sealing metallic surface should be carefully inspected since no rubber sealing is provided and a slight misalignment may cause considerable leakage.

Inspection of Gate and its Components

All debris and scaling formed on any part of the gate should be removed from the gate leaf. Any peculiar deformation on the leaf should be carefully observed and photographic records should be kept, if necessary. The skin plate and other components should be tapped lightly by hammer (or any equivalent material) to ensure soundness.

The skin plate should also be observed for pitting, scaling and corrosion. If ever pitting and corrosion developed on the skin plate, this should be checked to ascertain that its thickness is still within the tolerable/acceptable limits. Aside from the skin plates, thread of the main wheels, guide wheels and other accessories fitted on the gates should also be checked for pittings, corrosions and scoring marks.

Back side (downstream side) of the skin plate should also be checked. All welding joints of horizontal and vertical members (stiffeners) should be checked and drain holes, if any, should be cleaned.

Hoisting connection on the gate should likewise be checked for normal wear and tear and shearing and punching effect.

Alignment of seals should be checked by means of thread and feeler gauge. Corner joints should be checked and cracks should be observed. In case of musical note rubber seals, twists, overlapping bulb flatness, deformation, etc. should also be checked. Any undesirable material on the rubber seal and in between the rubber seal and skin plate should be cleaned. Retractable seals should be checked for their effectiveness and use of oil or grease over ruber seals should be avoided. Cladded rubber seals should be inspected for proper adhesion and all nuts and bolts fixing rubber seals to the gate should be checked. In case of metallic seals, thickness and camber, if any, including the position of countersunk screws should be checked.

The following critical dimensions should also be checked whenever possible:

a. Center to center distance between rollers of fixed wheel gate,

b. Center to center distance between side wheels,

c. Face to face distance between faces of guide shoes or guide rollers,

The trueness of these observations should be in consonance with corresponding observations in embedded parts.

All nuts, bolts and screws should be checked for wear, tear and tightness and countersunk screws should also be checked for their proper positioning. All welds should checked for cracks and other possible defects.

Testing of the Gate

The gates should be raised and lowered to check that it moves freely and smoothly without excessive sway and friction.

There should not be any undue pressure or extra effort when the gate is operated under no load condition and that the operation should be trouble free and no unusual sound should be heard.

On load (when there is water) there should be no undue vibrations in the gate as well as in the structure. In case vibrations are noticed during the operation of the gate, this should be properly investigated.

The gate should also be tested for leakage when in fully closed position.

RADIAL GATES

As in the case of vertical lift gates, scheduled inspection of radial gates should also be done at least **once a month during the dry season and twice a month during the wet season or whenever it is deemed necessary**Inspection of embedded parts involved the same work as in the case of vertical lift gates since the basic things to be checked are practically the same. One basic part that needs to be checked in radial gates for possible defect is the welding joint of the anchor bolts for the trunnion side.

Inspection of Radial Gates

The other inspections to be carried out should be as follows:

Inspection of gate installation should be carried out to detect normal wear and tear and other possible defects. The gates should be operated up and down to make sure that everything is in order.

Inspection work should involve visual inspection of exposed surfaces, such as gate leaf, arms, trunnions, etc., and checking of important dimensions.

The visual inspection of components covers checking the following:

a. Trunnion girder connections;

b. Tightness of nuts fitted to anchor rods passing through trunnion girder in installation where anchors consist of rods with nuts;

c. Soundness of welding of tie plate to trunnion girders where tie plate are used;

d. Filling between trunnion bracket and trunnion girder/bracket;

e. The skin plate and other components should be slightly tapped by hammer to check soundness. The skin plate should be observed for pitting, scaling and corrosion and if some corrosion and pitting developed on the skin plate, it should be checked to ascertain that it is still within the acceptable limits of 1.5 mm;

f. Leakage in the gates past the seals, alignment of seals and corner joints should be checked and cracks should be observed;

g. Soundness of welds in the components of gate leaf and connection should also be checked;

h. Lubrication, wherever required, of trunnion bearing and pin, lock plate fixing bolts, etc. should be checked;

i. Setting of guide rollers and lubrication of guide rollers;

j. Rope connections on the gate leaf should be checked for shearing and normal wear and tear;

k. Wire ropes and sockets should be examined for rusting, broken strands, reduction in diameter, etc. Conditions of sockets and turnbuckles should be checked for cracks and other possible damages;

l. Paints on various parts, including exposed surfaces of embedded parts, gate components, hoist, hoist supporting structures, etc.;

m. Anchorages and concrete around the anchorages should be checked for any cracks or for any slackness in the rods;

n. Bulging, if any, of wall plates; and,

o. Seating of gate bottom of sill beam.

The gate should be tested for its travel up and down to see that it moves smoothly without excessive sway thorughout the travel.

The operation should be trouble-free and there should not be any unusual sound produced. There should be no undue pressure or extra efforts when the gate is operated under no load condition.

On load (i.e. when there is water) there should be no undue vibrations in the gate and structure during operation. In case vibrations are noticed, the positions of gate openings and water levels should be noted and the causes thereof should be investigated.

Hoist

The inspection and testing of hoist that are required to be carried out are the following:

a. Visual inspection of the various hoist parts is to be carried out to detect any wear and tear and any increase in clearances of the various meshing parts;

b. The hoists should be operated especially for inspection and testing, once with water at or lower than the crest and a second time with water at maximum flood level. In both these conditions, the hoisting components should run trouble-free and there should not be any undue noise, vibration or chatter. The current being taken by the motor in case of electrically operated hoist should be read from the ampere meter and this should be in line with the rating

characterestics of the motor. In case of manually operated hoist there should not be any undue extra pressure or effort for operating the gates;

c. The gear covers should be removed and the lubrication checked. Any replenishment of the lubricant required should be carried out. In case the lubricant becomes dirty the same should be drained and the parts cleaned with proper solvent before refilling is done;

d. The oil level in the worm reducer should also be checked and replenished/replaced when necessary;

e. The greasing of various bush/roller bearing needs to be done. This includes such lubrication as maybe required for the motor, clutch, plummer blocks, etc.;

f. All the hoist moving parts including gears, etc. should be checked for wear, proper lubrication, cracks, etc.;

g. The brake should be checked for damage, if any, and to ensure it works properly. Any excess wear of brake lining should be taken note of and suitable recommendations for changing this brake lining can be made;

h. Adjustment of all couplings, especially the flexible coupling should be checked;

i. All nuts and bolts are to be checked for tightness and where any nuts are found to be loose, suitable lock nuts or washers should be added;

j. The rope connections at the drum end should be checked for tightness and for any wear, rusting, broken strands, reduction in diameter, etc.;

k. The condition of electrical wiring, switches, relays, control, etc. should be examined. Any voltage drop in the system should be measured to indicate if any parts have become defective and need replacement;

l. The proper functioning of the control panel including indicating lamps, etc. should be ascertained;

m. The limit switches should be checked for proper functioning and may be reset, if necessary;

n. The paint on various surfaces of the hoisting components and hoist supporting structure may be chacked and any peeled paint should be cleaned and repainted;

o. The carbon brushes and terminals of the motor should be checked for proper operation. Worn out carbon brushes should be changed and loose terminal connections should be tightened;

REGION : _____
SYSTEM : _____
LOCATION : _____
DATE OF EXERCISE OF GATE/HOIST: _____
INSPECTED BY: _____

CHECKLIST OF GATES' AND HOISTS' PARTS INSPECTED

FORM GH-01 Sheet 1 of 2

PARTICULAR TO BE INSPECTED	ACTUAL CONDITION: BEFORE OPER'N	ACTUAL CONDITION: AFTER OPER'N	REMARKS
A. Steel Gate Embedded Parts			
a. Sill beam			
b. Seal seats			
c. Track paths			
d. Guide paths			
e. Lintel beam			
B. Gate Leaves			
a. Paint coatings			
b. Welds of horizontal and vertical stiffeners			
c. Drain holes of horizontal stiffeners			
d. Alignment of wheels or rollers. (It should be rotated a number of times to ensure its free rotation.			
e. Lubrication system of wheel pin bushing (For Fixed-Wheel Gates)			
f. Rubber Seal condition and alignment (use feeler gauge)			
g. Thickness and Camber (For metallic seals)			
h. Trunnion pin bushing lubrication (For Radial Gates)			
i. Hanger connecting the hoist to the gate			

NOTE : Indicate whether the actual condition of the parts inspected before and after operation are in order or not in order by writing o.k. or not o.k. on the space provided for.

REGION : _____
SYSTEM : _____
LOCATION : _____
DATE OF EXERCISE OF GATE/HOIST: _____
INSPECTED BY : _____

CHECKLIST OF GATES' AND HOISTS' PARTS INSPECTED

FORM GH-01 Sheet 2 of 2

PARTICULAR TO BE INSPECTED	ACTUAL CONDITION: BEFORE OPER'N	ACTUAL CONDITION: AFTER OPER'N	REMARKS
C. Hoist			
a. Rope drum hoisting mechanism			
1. Wire rope lubrication			
2. Winding of rope on drum			
3. Pillow block grease fittings			
4. Lubrication of gears			
5. Clearance/s of gear tooth and alignment			
6. Tension on wire rope			
b. Crank Pedestal Type Hoist Mechanism			
1. Lubrication of the bearing housing and reduction of gears			
2. Lubrication of stem threads			
3. Alignment of line shaft (If tandem type lifting mechanism is installed)			
4. Tension of stem (For Tandem type mechanism)			
5. Anchor bolts of pedestal			

NOTE : Indicate whether the actual condition of the parts inspected before and after operation are in order or not in order by writing o.k. or not o.k. on the space provided for.