Irrigation and Power Department
Government of Punjab Province
The Islamic Republic of Pakistan

Japan International Cooperation Agency
Japan

FEASIBILITY STUDY
ON
TAUNSA BARRAGE IRRIGATION SYSTEM REHABILITATION
IN
THE ISLAMIC REPUBLIC OF PAKISTAN

ANNEX

August 1998

Nippon Giken Inc.

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ANNEX

A. Gate Structure

B. Hydraulic Structures and Barrage Foundation

C. Hydrology

D. Irrigation System

E. Agriculture and Agro-economy

F. Construction Plan

G. Cost Estimates

H. Project Evaluation

I. Environment

Annex A

Gate Structure

ANNEX A GATE STRUCTURE

Table of Contents

List of Drawings

List of Tables

List of Figures

A.1 GATE STRUCTURE OF TAUNSA BARRAGE

The gate structure of the Taunsa barrage which was constructed on the Indus river during 1955-58, was fabricated in Bhalwal Workshop of IPD in accordance with the design made by Brawn & Rule Co., LTD. in U.S.A. General feature of the gates of the Taunsa Barrage is shown in Drawing-1 and 2.

A.2 GATE INSPECTION

Investigation of hoist, superstructure of every gates of the Taunsa barrage were investigated during the survey in collaboration with the Study Team and the counterpart personnel of IPD. Investigation of the gate structure was carried in turn from Bay No. 1 to Bay No. 65 of the barrage, then continued to the intake gates from right side bank to left side bank of the river. Procedures of the gate investigation are followings:

Removing of wooden plates on hoist deck
↓
Setting of scaffolding (8 set rotation par day)
↓
Opening cover (all caps and some side plates)
↓
Investigation of hoist, drum, and supper-structure
↓
Reattaching of cover
↓
Moving scaffolding to next bays
↓
Replacing removed wooden plates

Gate structure investigation during survey period was conducted applying an inventory with important items. Result of the investigation is summarized in Table A.2.1, in which magnitude of inadequacy or damage was quantified into five classes, namely, *0-Not Damaged, 1-Slightly Damaged, 2-Partly Damaged, 3-Severely Damaged, and 4-Uncontrollable,* respectively. And also the result by each gate is figured in Fig. A.2.1. Result of investigation by each subject is enumerated as follows:

1) Wire rope;

Wire ropes are under good condition remaining initially lubricated oil/grease, without any damage of element wire, corrosion or deformation. Results of measuring of the diameter of wire rope were sound as original. Almost one third of total number of wire ropes for roller trains were missing or damaged. As shown in Fig. A2.1, Distribution of damages in a line of gates is scattered.

2) Drum;

Drum bodies are under good condition without any damage or wear with only partial surface corrosion, excepting one bearing was damaged. No lubrication was almost practiced. As drum body was not designed so as to restrain the axis thrust, the drum and mount frame contacted and shaved each other. Distribution of damages in a line of gates is scattered. However, worst damages are inspected in undersluices.

3) Bering;

Bearings are almost under good condition, excluding undersluices in which some inconvenient are inspected.

4) Drum Gear;

All of drum gears are possible to be reconditioned without serious damages except some wearing of cogs, excluding undersluices. However, the cog fitting was considerably bad and position slipped out or shallow fitting were frequently observed.

5) Center Gear;

Some portion of the mount for center gears have serious corrosion and the strength are entirely lost due to large corrosion hole at the frame. The causes seemed to be brought from the design of frame and cover contacted with trend of rain water holding.

6) Frame;

Frames in Center block of all gates are deteriorated, while frames in right and left sides have no troubles at all.

7) Chain;

Chains are almost under good condition, some slight damages are found in weirs only.

8) Operating Force;

Hoist torque of weir gate under full poundage condition was 70 kgm in maximum, 15 kgm in minimum and 41 kgm in average. Some difficulties in operation are found in almost all gates. Especially, under-sluices are in severe condition in operation.

9) Reducer;
No damages were observed in all gates.

10) Chain sprocket;
No damages were observed in all gates.

11) Shaft;
No damages were observed in all gates.

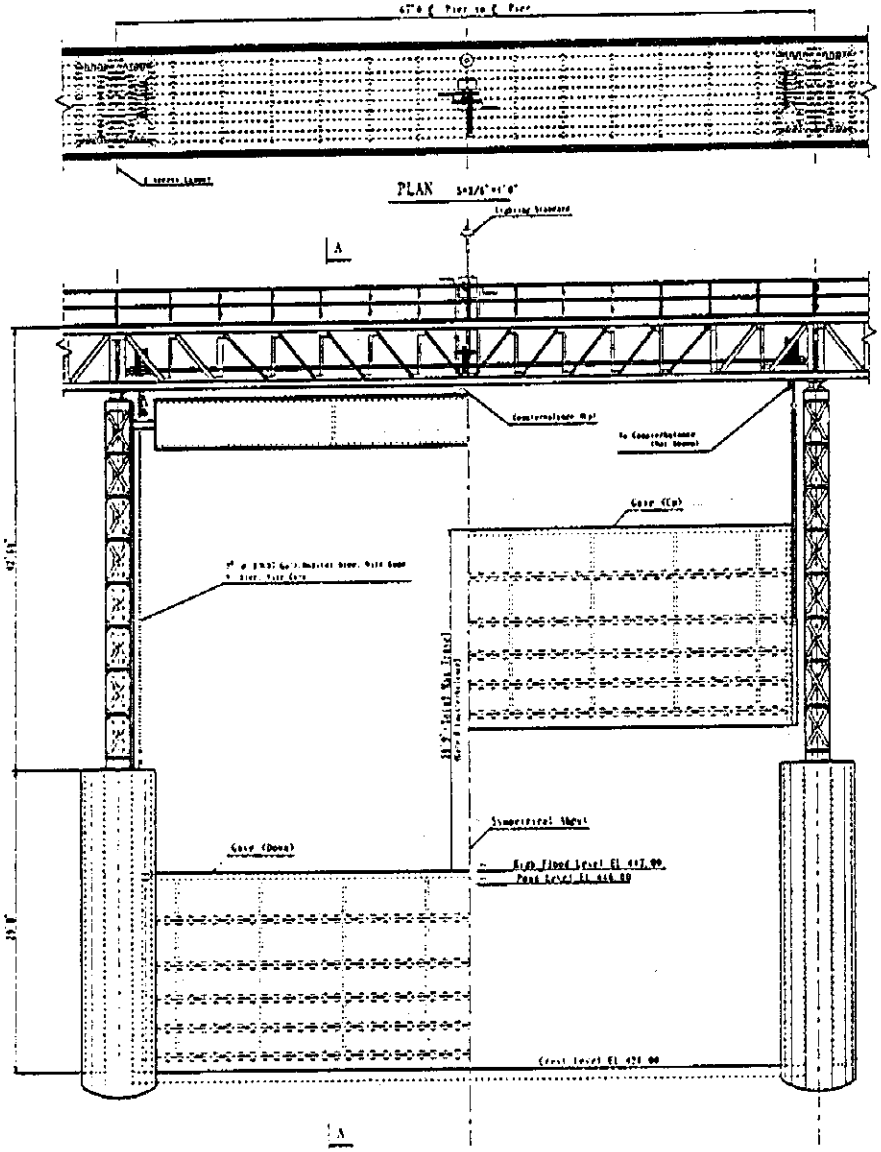
12) Counter Shaft;
No damage or deformation of counter shafts were observed, contact with drum mount frame were found in two of them.

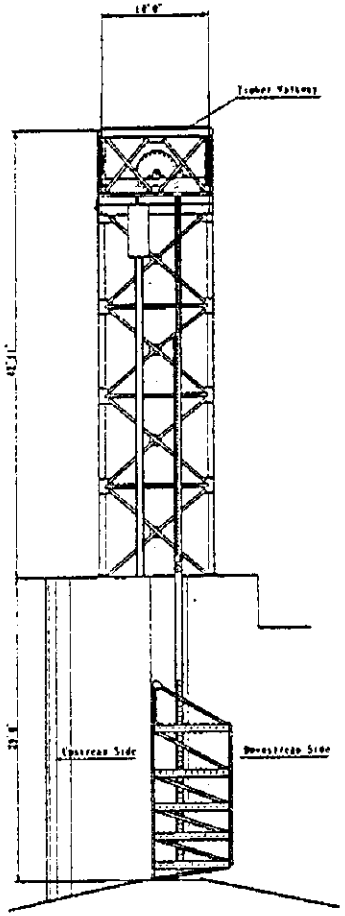
13) Counter Weight;
No damage or corrosion on counter weight were observed at the main body and hunger portion. Some corrosion was observed at the mount for drum, however such corrosion was not so deep and being no problem for practical operation.

14) Guide for Counter Weight;
No damages were observed in all gates.

15) Superstructure;
Partial small deformation of superstructure supposedly since the construction stage was observed. Corrosion of the superstructure was very rear and in good condition considering age from the construction. Declining measurement of superstructure for X-Y direction was conducted and no harmful decline was observed. Wooden deck was entirely deteriorated and many hazards were felt.

As a synthesis evaluation of gate investigation by each gate, undersluices have been deteriorated severely in comparison with weirs, and requiring immediate repairs. A few weir gates located in center portion seems to be deteriorated than others due to frequent operation. No severe damages in regulators of off-taking canals were observed Some repairable damages were found in the regulators of D.G. Khan canal.

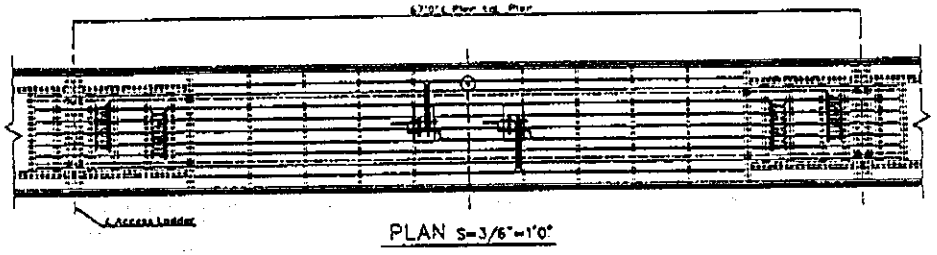




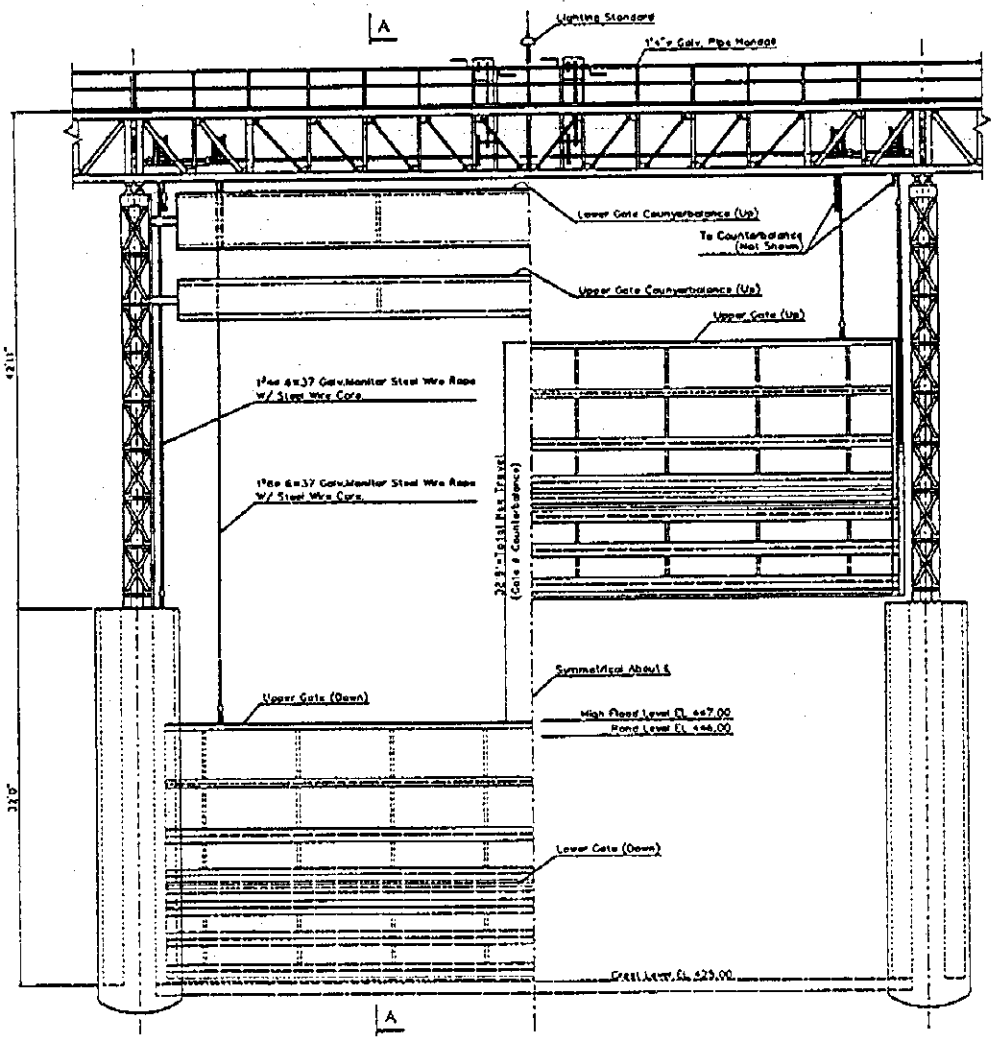
SECTION A-A

Drawing-1

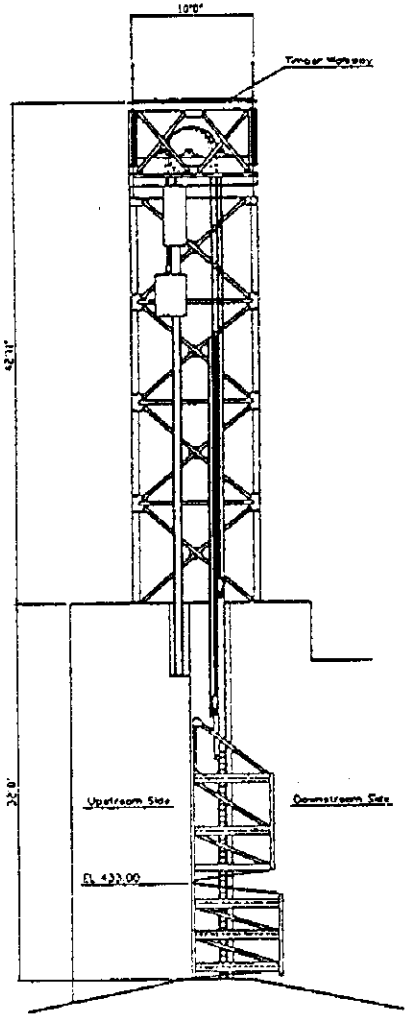
TALNSA BARRAGE IRRIGATION SYSTEM REHABILITATION PROJECT
MAIN WEIR GATES-GENERAL
ASSEMBLY-TALNSA BARRAGE
JAPAN INTERNATIONAL COOPERATION AGENCY



PLAN S=3/6"=1'0"



FRONT ELEVATION



SECTION A-A S=3/6"=1'0"

Drawing-2

TAUNSA BARRAGE IRRIGATION SYSTEM REHABILITATION PROJECT
UNDER SLUICE GATES-GENERL
ASSEMBLY-TAUNSA BARRAGE
JAPAN INTERNATIONAL COOPERATION AGENCY

Table A2.1 Summary of Investigation Result on Hoisting Devices (1/5)

	PARTS NAME	GATE NAME *	U1U	U1L	U2U	U2L	U3U	U3L	U4U	U4L	U5U	U5L	U6U	U6L	U7U	U7L	U8U	U8L	W9	W10	W11	W12
1	WIREROPE	MAIN(L)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		MAIN(R)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		ROLLER ASSEMBLY(L)	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	0	0	0	0
		ROLLER ASSEMBLY(R)	0	0	0	0	0	0	1	1	0	1	0	0	0	0	1	0	0	0	0	0
2	DRUM	LEFT SIDE	0	2	0	1	2	0	0	0	0	0	0	2	0	0	0	2	0	0	0	0
		RIGHT SIDE	0	0	2	2	0	2	1	0	0	1	0	0	1	2	0	2	0	0	0	0
3	BEARING	FOR DRUM	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		FOR COUNTER SHAFT	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0
		IN REDUCER	0	0	0	0	0	0	0	0	0	0	0	3	0	3	0	0	0	0	0	0
4	DRUM GEAR	GEAR(L)	0	2	0	0	2	0	0	0	0	0	0	1	0	2	0	2	0	0	0	0
		GEAR(R)	0	0	2	2	0	0	1	0	0	1	0	0	0	0	0	2	0	0	0	0
		PINION(L)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		PINION(R)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	CENTER GEAR	GEAR	1	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	3	1	1	1
		PINION	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	FRAME	LEFT SIDE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		RIGHT SIDE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		CENTER BLOCK	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	3	3	2	2
7	CHAIN		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	OPERATING FORCE(kgf·m)		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	42	53	46
	OPERATING CONDITION		2	2	3	3	2	2	2	2	2	2	2	2	2	2	2	2	2	1	2	1
9	REDUCER		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	CHAIN SPROCKET		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	SHAFT	FOR DRUM(L)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		FOR DRUM(R)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		IN REDUCER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
12	COUNTER SHAFT		0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0
13	COUNTER WEIGHT		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	GUIDE FOR COUNTER WEIGHT		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	SUPERSTRUCTURE		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	SUMMARY		5	11	9	11	8	6	8	7	4	10	4	11	5	11	6	13	8	5	5	4

Notes. 0: Not Damaged, 1: Slightly Damaged, 2: Partly Damaged, 3: Severely Damaged, 4: Uncontrolable, - : Not Inspected
* : U - Under-Sluice, W - Weir

Table A2.1 Summary of Investigation Result on Hoisting Devices (2/5)

	PARTS NAME	GATE NAME *	W13	W14	W15	W16	W17	W18	W19	W20	W21	W22	W23	W24	W25	W26	W27	W28	W29	W30	W31	W32
1	WIREROPE	MAIN(L)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		MAIN(R)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		ROLLER ASSEMBLY(L)	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		ROLLER ASSEMBLY(R)	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
2	DRUM	LEFT SIDE	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	0	1	0	0
		RIGHT SIDE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
3	BEARING	FOR DRUM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		FOR COUNTER SHAFT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		IN REDUCER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	DRUM GEAR	GEAR(L)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		GEAR(R)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		PINION(L)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		PINION(R)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	CENTER GEAR	GEAR	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
		PINION	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	FRAME	LEFT SIDE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		RIGHT SIDE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		CENTER BLOCK	1	1	1	1	1	1	2	1	2	1	2	1	1	1	1	1	1	1	1	2
7	CHAIN		0	0	0	0	1	0	1	0	0	0	0	0	0	0	1	0	1	1	1	0
8	OPERATING FORCE(kgf·m)		38	56	56	60	53	63	53	61	28	32	43	39	40	36	40	40	36	48	27	44
	OPERATING CONDITION		1	2	2	2	2	2	3	2	1	1	1	1	1	1	1	1	1	1	1	1
9	REDUCER		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	CHAIN SPROCKET		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	SHAFT	FOR DRUM(L)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		FOR DRUM(R)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		IN REDUCER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	COUNTER SHAFT		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	COUNTER WEIGHT		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	GUIDE FOR COUNTER WEIGHT		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	SUPERSTRUCTURE		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	SUMMARY		3	5	4	5	5	4	7	4	4	3	4	4	4	4	4	4	5	5	4	4

Notes. 0: Not Damaged, 1: Slightly Damaged, 2: Partly Damaged, 3: Severely Damaged, 4: Uncontrolable, - : Not Inspected
* : W - Weir

Table A2.1 Summary of Investigation Result on Hoisting Devices (3/5)

	PARTS NAME	GATE NAME *	W33	W34	W35	W36	W37	W38	W39	W40	W41	W42	W43	W44	W45	W46	W47	W48	W49	W50	W51	W52
1	WIREROPE	MAIN(L)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		MAIN(R)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		ROLLER ASSEMBLY(L)	1	1	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	1	0
		ROLLER ASSEMBLY(R)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
2	DRUM	LEFT SIDE	0	0	1	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1	1
		RIGHT SIDE	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0
3	BEARING	FOR DRUM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		FOR COUNTER SHAFT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		IN REDUCER	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0
4	DRUM GEAR	GEAR(L)	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		GEAR(R)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		PINION(L)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		PINION(R)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	CENTER GEAR	GEAR	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
		PINION	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	FRAME	LEFT SIDE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		RIGHT SIDE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		CENTER BLOCK	2	2	2	2	2	2	1	2	2	2	1	2	2	1	1	1	1	1	2	1
7	CHAIN		0	1	1	0	1	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0
8	OPERATING FORCE(kgf-m)		44	70	36	45	32	18	24	44	37	33	39	44	35	35	52	40	30	15	32	44
	OPERATING CONDITION		1	3	1	1	1	0	0	1	1	1	1	1	1	1	2	1	1	0	3	1
9	REDUCER		0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	CHAIN SPROCKET		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	SHAFT	FOR DRUM(L)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		FOR DRUM(R)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		IN REDUCER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	COUNTER SHAFT		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	COUNTER WEIGHT		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	GUIDE FOR COUNTER WEIGHT		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	SUPERSTRUCTURE		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	SUMMARY		6	9	7	4	5	3	5	4	5	5	3	6	6	3	4	3	5	2	9	4

Notes. 0: Not Damaged, 1: Slightly Damaged, 2: Partly Damaged, 3: Severely Damaged, 4: Uncontrolable, - : Not Inspected
*: W - Weir

Table A2.1 Summary of Investigation Result on Hoisting Devices (4/5)

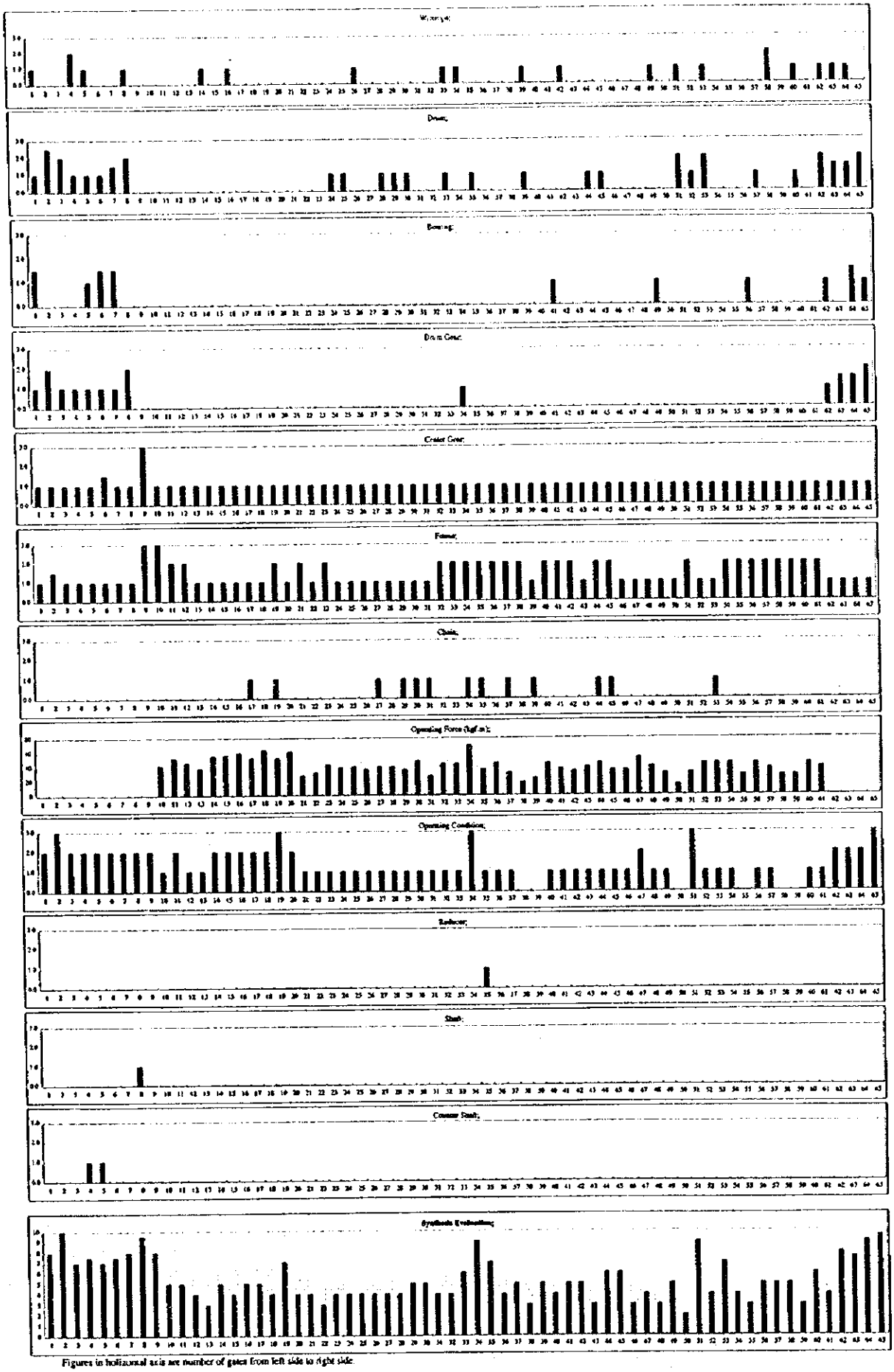
	PARTS NAME	GATE NAME *	W53	W54	W55	W56	W57	W58	W59	W60	W61	U62U	U62L	U63U	U63L	U64U	U64L	U65U	U65L
1	WIREROPE	MAIN(L)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		MAIN(R)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		ROLLER ASSEMBLY(L)	1	0	0	0	0	1	0	1	0	0	0	1	0	0	1	0	0
		ROLLER ASSEMBLY(R)	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0
2	DRUM	LEFT SIDE	1	0	0	0	1	0	0	1	0	1	2	0	2	0	1	0	2
		RIGHT SIDE	1	0	0	0	0	0	0	0	0	1	0	1	0	1	1	0	2
3	BEARING	FOR DRUM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		FOR COUNTER SHAFT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		IN REDUCER	0	0	0	1	0	0	0	0	0	1	1	0	0	3	0	0	1
4	DRUM GEAR	GEAR(L)	0	0	0	0	0	0	0	0	0	0	0	0	2	0	1	0	2
		GEAR(R)	0	0	0	0	0	0	0	0	0	1	0	1	0	1	1	0	2
		PINION(L)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		PINION(R)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	CENTER GEAR	GEAR	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
		PINION	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	FRAME	LEFT SIDE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		RIGHT SIDE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		CENTER BLOCK	1	2	2	2	2	2	2	2	2	1	1	1	1	1	1	1	1
7	CHAIN		1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	OPERATING FORCE(kgf·m)		44	44	28	44	37	28	28	44	39	-	-	-	-	-	-	-	-
	OPERATING CONDITION		1	1	0	1	1	0	0	1	1	2	2	2	2	2	2	3	3
9	REDUCER		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	CHAIN SPROCKET		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	SHAFT	FOR DRUM(L)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		FOR DRUM(R)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		IN REDUCER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	COUNTER SHAFT		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	COUNTER WEIGHT		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	GUIDE FOR COUNTER WEIGHT		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	SUPERSTRUCTURE		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	SUMMARY		7	4	3	5	5	5	3	6	4	8	8	7	8	9	9	5	14

Notes. 0: Not Damaged, 1: Slightly Damaged, 2: Partly Damaged, 3: Severely Damaged, 4: Uncontrolable, - : Not Inspected
*: U - Under-Sluice, W - Weir

Table A2.1 Summary of Investigation Result on Hoisting Devices (5/5)

	PARTS NAME	GATE NAME *	D1	D2	D3	D4	D5	D6	D7	M1	M2	M3	M4	M5	T1	T2	T3	T4	T5	T6	T7
1	WIREROPE	MAIN(L)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
		MAIN(R)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		ROLLER ASSEMBLY(L)	0	0	1	1	1	0	0	0	0	0	1	0	-	-	-	-	-	-	-
		ROLLER ASSEMBLY(R)	0	0	1	1	1	1	1	0	0	0	0	0	-	-	-	-	-	-	-
2	DRUM	LEFT SIDE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		RIGHT SIDE	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	BEARING	FOR DRUM	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
		FOR COUNTER SHAFT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		IN REDUCER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	DRUM GEAR	GEAR(L)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		GEAR(R)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		PINION(L)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		PINION(R)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	CENTER GEAR	GEAR	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		PINION	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6	FRAME	LEFT SIDE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		RIGHT SIDE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		CENTER BLOCK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	CHAIN		0	1	1	1	1	1	0	1	0	1	1	0	0	0	0	0	0	0	0
8	OPERATING FORCE(kgf•m)		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	OPERATING CONDITION		0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0
9	REDUCER		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
10	CHAIN SPROCKET		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	SHAFT	FOR DRUM(L)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		FOR DRUM(R)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		IN REDUCER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	COUNTER SHAFT		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	COUNTER WEIGHT		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	GUIDE FOR COUNTER WEIGHT		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	SUPERSTRUCTURE		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	SUMMARY		0	2	3	3	4	2	1	1	0	2	2	0	0	0	0	3	0	0	0

Notes. 0: Not Damaged, 1: Slightly Damaged, 2: Partly Damaged, 3: Severely Damaged, 4: Uncontrolable, - : Not Inspected
* : D - D.G.Khan Canal, M - Muzaffargh Cnal, T - T.P.Link Canal



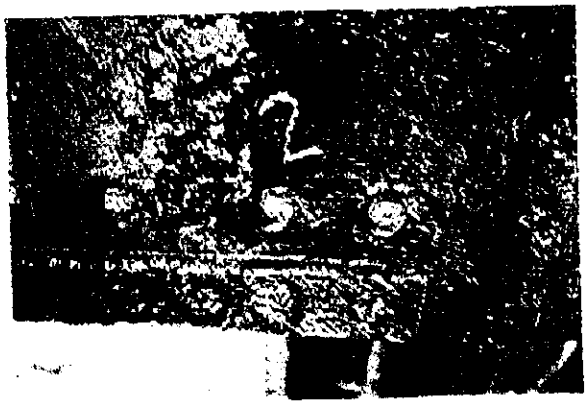
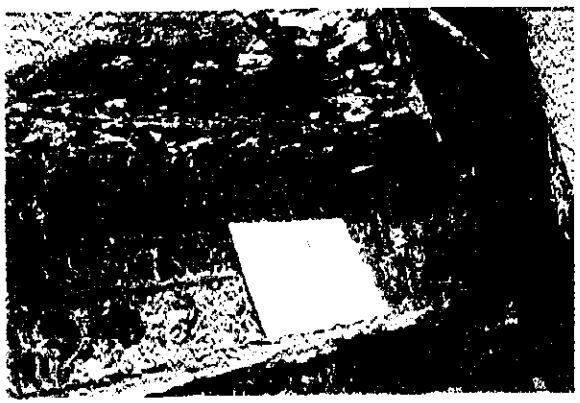
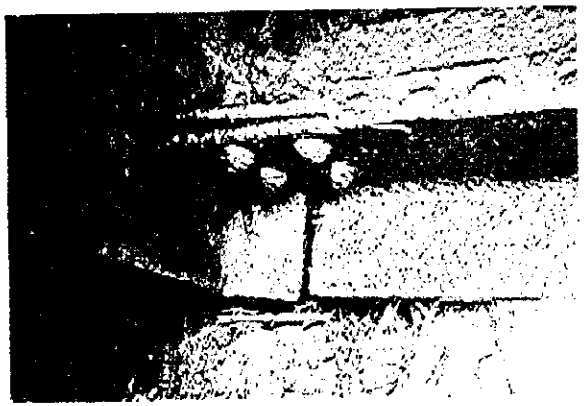
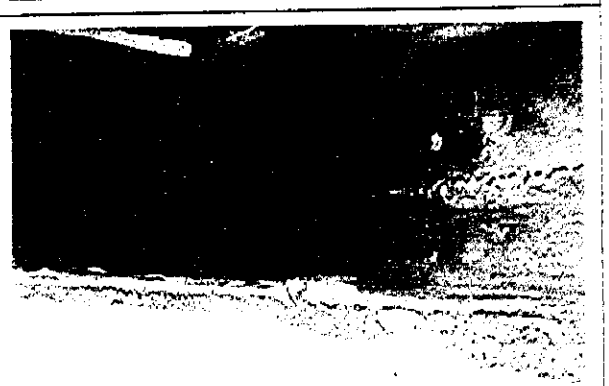
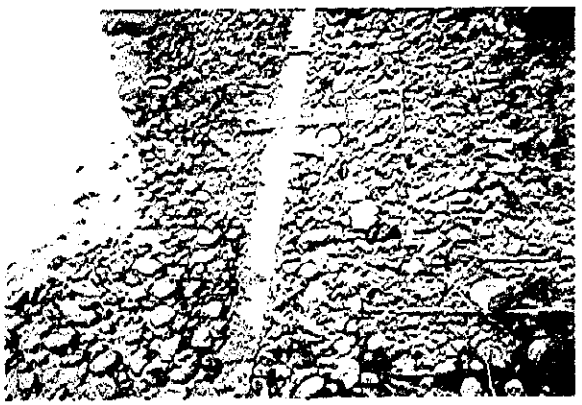
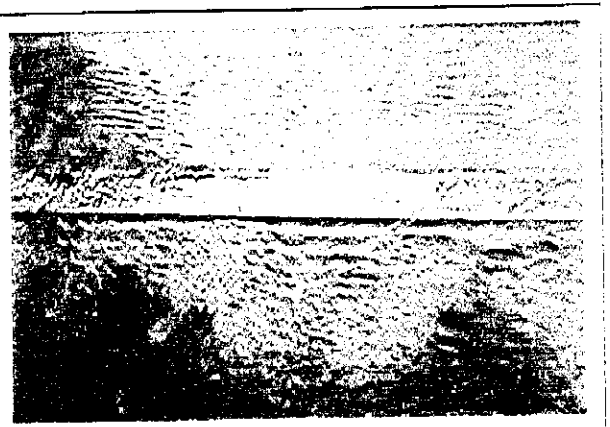
Figures in holizontal axis are number of gates from left side to right side.

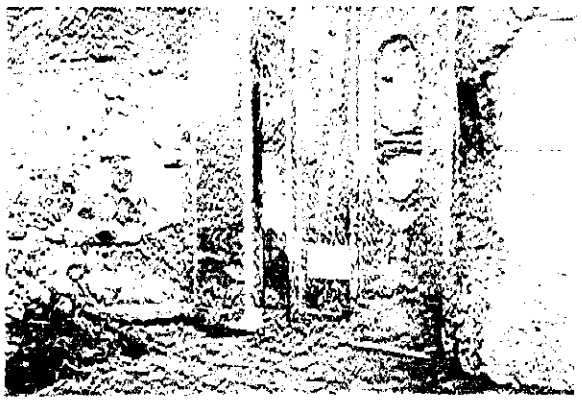
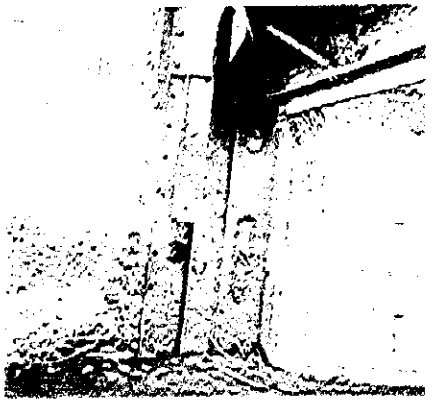
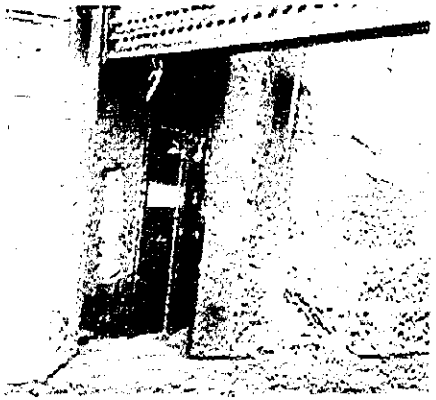
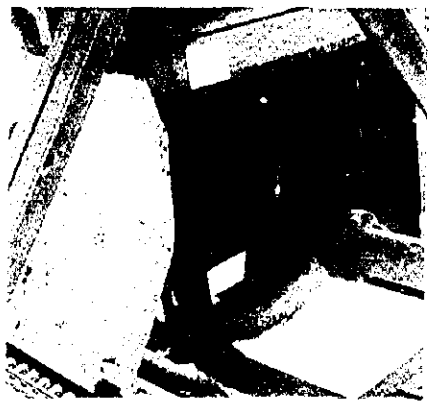
Fig.A2.1 Result of Inspection on Hoisting Devices

A.3 INSPECTION RECORD BY GATE

Through the Phase 1 and 2 survey, the damaged conditions of the gate structures were stood out by bay of the Taunsa barrage. The survey and inspection covered every elements of the gate structure, gate leaf, side seal, gate seal, hoist mechanism, superstructure and so on.

The record of the gate investigation was summarized in collaborated form consisting of every important figure and situation. The next 2 pages of photographs explain the definitions of deterioration. From the page A-15, the record sheets of all 96 bays inspected are attached.

Item	L	M	S
Skin Plate (U/S-Bottom) Corrosion			
Bottom Girder corrosion			
Sill Beam Abrasion			

Item	L	M	S
Concrete Damage (Side)			
Concrete Damage (Bottom)			
Basement Corrosion			

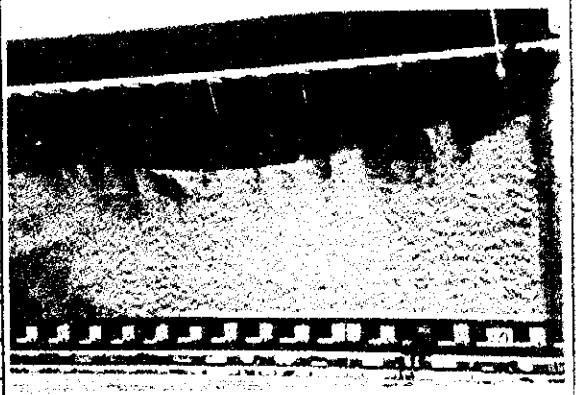
Survey Results of Gate Structure

Gate No. U1U **(Upper Undersluice Gate)**

Survey Item		Survey Result	Judge
Gate Leaf			
Skin Plate	Thickness-Avg	Top9.9 Mid9.9 Low10,1Btm 10.0 (9.5mm)	N
	Corrosion	U/S-Bottom L M (S)	↑
	Damage-Rivet	Corner-L – Corner-R –	
Truss	Thickness-Avg	Bottom Flange 18.5, Bottom Web 18.9 (19.1mm)	
	Distortion	25 mm (T3-R7)	
End Girder	Thickness-Avg	L-Bottom 12.7, R-Bottom 12.5 (12.7mm)	
	Remodeling	Left No Right No	
	Distortion	Left – Right –	
Bottom Girder	Thickness-Avg	Flange 11.5 mm (16.3), Web 9.5 mm (9.4)	
	Corrosion	(L) M S	
Rocker Assembly	Remodeling	Left No Right No	
	Distortion	Left – Right –	
	Others	No Function	
Roller Train	Missing	Left 0 Right 0	
	Diameter-Roller	Average 152.2 mm	
	Distortion	Left – Right –	
Seal	Left	2.0 m Broken	
	Bottom	Good	
	Right	1.5 m Broken	
Inclination		Top Level Difference – mm	↓
Leakage		L M (S)	N
Sill			
Side Seal	Abrasion-Max	Left: – mm, Right: – mm	RS
Roller Truck	Abrasion-Max	Left: 6 mm, Right: 6 mm	N
Roller Guard	Missing	Left 0 Right 0	N
	Defect	Left 0 Right 0	N
Sill Beam / Concrete	Abrasion	L M S	
	Damage-Left	L M S	
	Damage-Right	L M S	
	Damage-Bottom	L M S	

Survey Item		Survey Result	Judge
Hoisting Device			
Wire Rope	Main-Left	y: Distortion: – Corrosion: – Oil: –	G
	Main-Right	y: Distortion: – Corrosion: – Oil: –	G
	Roller Train-L	Broken	N
	Roller Train-R	y: Distortion: – Corrosion: – Oil: –	N
Drum	Left	Damage: miss Alignment Function:	RS
	Right	Damage: – Function:	↑
Bearing	Drum	Damage: – Oil: –	↓
	Counter Shaft	Damage: – Oil: –	RS
	Reduction Gear	Damage: – Oil: –	C
Gear	Drum Gear-L	Damage: – Fitting: – Backlash: – Oil: –	RS
	Drum Pinion-L	Damage: –	↑
	Drum Gear-R	Damage: – Fitting: – Backlash: – Oil: –	
	Drum Pinion-R	Damage: –	
	Gear-Middle	Damage: – Fitting: – Backlash: – Oil: –	
	Pinion-Middle	Damage: –	
Basement	Drum-L	Damage: – Corrosion: L M (S)	
	Drum-R	Damage: – Corrosion: L M (S)	↓
	Drive Device	Damage: – Corrosion: L (M) S	RS
Drive Chain		Damage: – Looseness: – Oil: –	C
Chain Sprocket		Damage: – Corrosion: L (M) S	↑
Reduction Gear		Damage: – Corrosion: L (M) S	
Cover	Drum-L	Damage: – Corrosion: L M (S)	
	Drum-R	Damage: – Corrosion: L M (S)	↓
	Gear-Middle	Damage: – Corrosion: L (M) S	C
Counter Shaft		Damage: – Corrosion: L M S	G
Counter Weight		Damage: – Corrosion: L M S	G
Hoisting Torque	Wet Condition	– kg-m	—
	Dry Condition	0.8 kg-m	G
Superstructure		Damage: – Corrosion: L M (S)	RS

Photograph



Remarks: Judgement • N: Totally Replace, C: Partly Replace, RL: Large Repair, RM: Medium Repair, RS: Small Repair, G: No Repair, -: No Data.

( ) shows design dimension.

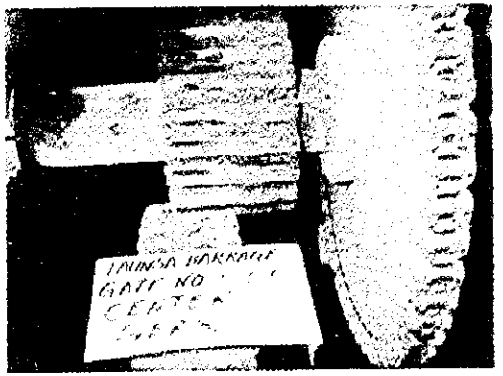
Survey Results of Gate Structure

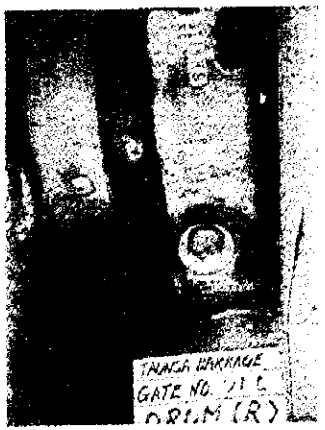
Gate No. U1L (Lower Undersluice Gate)

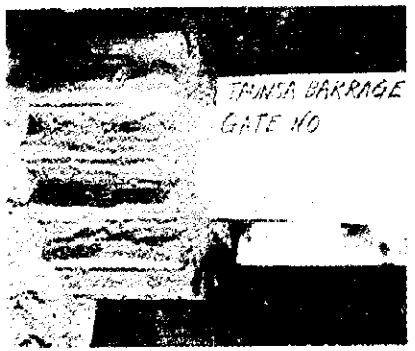
Survey Item		Survey Result	Judge
Gate Leaf			
Skin Plate	Thickness-Avg	Top9.7 Mid9.8 Low9.2 Btm9.2 (9.5mm)	N
	Corrosion	U/S-Bottom (L) M S	↑
	Damage-Rivet	Corner-L 2 mm Corner-R 7 mm	
Truss	Thickness-Avg	Bottom Flange 21.3, Bottom Web 19.8 (22.2mm)	
	Distortion		
End Girder	Thickness-Avg	L-Bottom 10.9, R-Bottom 10.7 (12.7mm)	
	Remodeling	Left No Right No	
	Distortion	Left – Right –	
Bottom Girder	Thickness-Avg	Flange 14.0 mm (16.0), Web 8.3 mm (9.7)	
	Corrosion	L (M) S	
Rocker Assembly	Remodeling	Left No Right No	
	Distortion	Left 2 m Ab. Right 2.5 m Ab.	
	Others	No Function	
Roller Train	Missing	Left 2 Right 2	
	Diameter-Roller	Average 150.2 mm	
	Distortion	Left – Right –	
Seal	Left	Lost	
	Bottom	Lost	
	Right	Lost	
Inclination		Top Level Difference – mm	↓
Leakage		(L) M S	N
Sill			
Side Seal	Abrasion-Max	Left: – mm, Right: – mm	RS
Roller Truck	Abrasion-Max	Left: 16 mm, Right: 14 mm	RL
Roller Guard	Missing	Left 0 Right 1	N
	Defect	Left 0 Right 0	N
Sill Beam	Abrasion	L M S	—
Concrete	Damage-Left	L M S	—
	Damage-Right	L M S	—
	Damage-Bottom	L M S	—

Survey Item		Survey Result	Judge
Hoisting Device			
Wire Rope	Main-Left	y: Distortion: – Corrosion: – Oil: –	G
	Main-Right	y: Distortion: – Corrosion: – Oil: –	G
	Roller Train-L	y: Distortion: – Corrosion: – Oil: –	N
	Roller Train-R	y: Distortion: – Corrosion: – Oil: –	N
Drum	Left	Damage: – Function:	RS
	Right	Damage: – Function:	RS
Bearing	Drum	Damage: Right side Broken Oil: –	C
	Counter Shaft	Damage: – Oil: –	RS
	Reduction Gear	Damage: – Oil: –	C
Gear	Drum Gear-L	Damage: – Fitting: 7.0 % Backlash: – Oil: –	RS
	Drum Pinion-L	Damage: L (Miss Alignment)	↑
	Drum Gear-R	Damage: – Fitting: – Backlash: – Oil: –	
	Drum Pinion-R	Damage: –	
	Gear-Middle	Damage: – Fitting: 7.0 % Backlash: – Oil: –	
	Pinion-Middle	Damage: L (Miss Alignment)	
Basement	Drum-L	Damage: – Corrosion: L M (S)	
	Drum-R	Damage: – Corrosion: L M (S)	↓
	Drive Device	Damage: – Corrosion: L (M) S	RS
Drive Chain		Damage: – Looseness: – Oil: –	C
Chain Sprocket		Damage: – Corrosion: L (M) S	↑
Reduction Gear		Damage: – Corrosion: L (M) S	
Cover	Drum-L	Damage: – Corrosion: L M (S)	
	Drum-R	Damage: – Corrosion: L M (S)	↓
	Gear-Middle	Damage: – Corrosion: L (M) S	C
Counter Shaft		Damage: – Corrosion: L M S	G
Counter Weight		Damage: – Corrosion: L M S	G
Hoisting Torque	Wet Condition	– kg·m	—
	Dry Condition	10.9 kg·m	RS
Superstructure		Damage: – Corrosion: L M (S)	RS

Photograph







Remarks: Judgement = N: Totally Replace, C: Partly Replace, RL: Large Repair, RM: Medium Repair, RS: Small Repair, G: No Repair, -: No Data.

( ) shows design dimension.

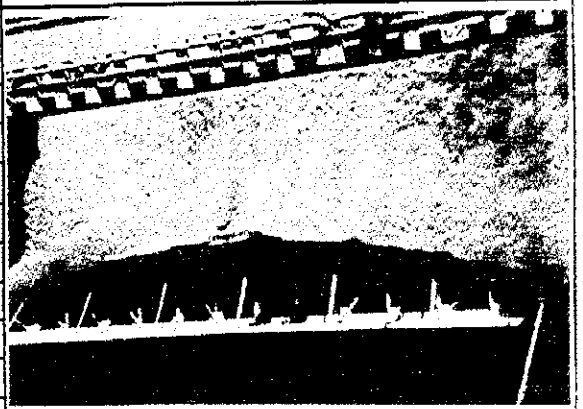
Survey Results of Gate Structure

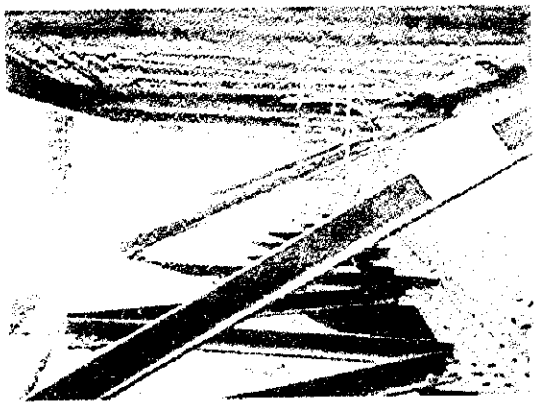
Gate No. U2U **(Upper Undersluice Gate)**

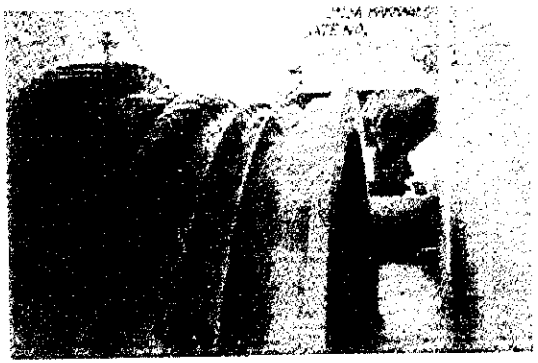
Survey Item		Survey Result	Judge
Gate Leaf			
Skin Plate	Thickness-Avg	Top10.1 Mid10.1 Low10.0 Btm9.7 (9.5mm)	N
	Corrosion	U/S-Bottom L M (S)	↑
	Damage-Rivet	Corner-L – Corner-R –	
Truss	Thickness-Avg	Bottom Flange 18.5, Bottom Web 18.9 (19.1mm)	
	Distortion	10 mm (T3-R10)	
End Girder	Thickness-Avg	L-Bottom 12.9, R-Bottom 12.8 (12.7mm)	
	Remodeling	Left No Right No	
	Distortion	Left No Right No	
Bottom Girder	Thickness-Avg	Flange 11.4 mm (16.3), Web 9.4 mm (9.4)	
	Corrosion	(L) M S	
Rocker Assembly	Remodeling	Left No Right No	
	Distortion	Left – Right –	
	Others	No Function	
Roller Train	Missing	Left 0 Right 0	
	Diameter-Roller	Average 151.5 mm	
	Distortion	Left – Right –	
Seal	Left	0.3 m Broken	
	Bottom	Good	
	Right	0.5 m Broken	
Inclination		Top Level Difference – mm	↓
Leakage		(L) M S	N
Sill			
Side Seal	Abrasion-Max	Left: – mm, Right: – mm	RS
Roller Truck	Abrasion-Max	Left: 7 mm, Right: 7 mm	N
Roller Guard	Missing	Left 0 Right 0	N
	Defect	Left 0 Right 0	N
Sill Beam	Abrasion	L M S	
Concrete	Damage-Left	L M S	
	Damage-Right	L M S	
	Damage-Bottom	L M S	

Survey Item		Survey Result	Judge
Hoisting Device			
Wire Rope	Main-Left	φ41.9 Distortion: – Corrosion: – Oil: –	G
	Main-Right	φ42.5 Distortion: – Corrosion: – Oil: –	G
	Roller Train-L	y: – Distortion: – Corrosion: – Oil: –	N
	Roller Train-R	y: – Distortion: – Corrosion: – Oil: –	N
Drum	Left	Damage: – Function: –	RS
	Right	Damage: – Function: Touching to Frame	↑
Bearing	Drum	Damage: – Oil: –	↓
	Counter Shaft	Damage: – Oil: –	RS
	Reduction Gear	Damage: – Oil: –	C
Gear	Drum Gear-L	Damage: – Fitting: – Backlash: – Oil: –	RS
	Drum Pinion-L	Damage: –	↑
	Drum Gear-R	Damage: – Fitting: – Backlash: – Oil: –	
	Drum Pinion-R	Damage: –	
	Gear-Middle	Damage: – Fitting: – Backlash: – Oil: –	
	Pinion-Middle	Damage: –	
Basement	Drum-L	Damage: – Corrosion: L M (S)	
	Drum-R	Damage: – Corrosion: L M (S)	↓
	Drive Device	Damage: – Corrosion: L (M) S	RS
Drive Chain		Damage: – Looseness: – Oil: –	C
Chain Sprocket		Damage: – Corrosion: L (M) S	↑
Reduction Gear		Damage: – Corrosion: L (M) S	
Cover	Drum-L	Damage: – Corrosion: L M (S)	
	Drum-R	Damage: – Corrosion: L M (S)	↓
	Gear-Middle	Damage: – Corrosion: L (M) S	C
Counter Shaft		Damage: – Corrosion: L M S	G
Counter Weight		Damage: – Corrosion: L M S	RS
Hoisting Torque	Wet Condition	– kg-m	—
	Dry Condition	3.1 kg-m	RS
Superstructure		Damage: – Corrosion: L M (S)	RS

Photograph







Remarks: Judgement = N: Totally Replace, C: Partly Replace, RL: Large Repair, RM: Medium Repair, RS: Small Repair, G: No Repair, -: No Data.

( ) shows design dimension.

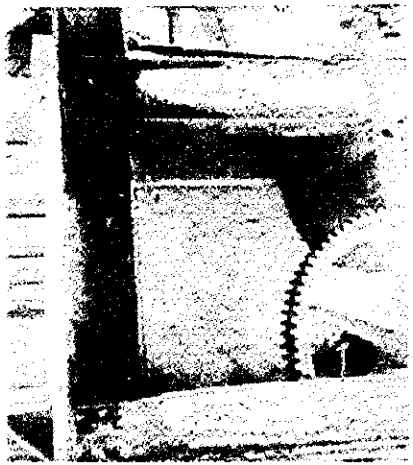
Survey Results of Gate Structure

Gate No. U2L (Lower Undersluice Gate)

Survey Item			Survey Result	Judge
Gate Leaf				
	Skin Plate	Thickness-Avg	Top9.9 Mid10.0 Low9.5 Btm8.1 (9.5mm)	N
		Corrosion	U/S-Bottom L (M) S	
		Damage-Rivet	Corner-L 4 Corner-R 4	
	Truss	Thickness-Avg	Bottom Flange 20.9, Bottom Web 20.6 (22.2mm)	
		Distortion	T1 End (L, R)	
	End Girder	Thickness-Avg	L-Bottom 11.3, R-Bottom 11.7 (12.7mm)	
		Remodeling	Left Re. Right Re.	
		Distortion	Left Crack Right Crack	
	Bottom Girder	Thickness-Avg	Flange 14.2 mm (16.0), Web8.1 mm (9.7)	
		Corrosion	L (M) S	
	Rocker Assembly	Remodeling	Left Re. Right Re.	
		Distortion	Left Broken Right Broken	
		Others		
	Roller Train	Missing	Left 2 Right 1	
		Diameter-Roller	Average – mm	
		Distortion	Left 20 mm Band Right –	
	Seal	Left	Lost	
		Bottom	Lost	
		Right	Lost	
	Inclination		Top Level Difference – mm	
Leakage			(L) M S	N
Sill				
	Side Seal	Abrasion-Max	Left: – mm, Right: – mm	RS
	Roller Truck	Abrasion-Max	Left: 15 mm, Right: 8 mm	RL
	Roller Guard	Missing	Left 1 Right 1	N
		Defect	Left 0 Right 0	N
	Sill Beam	Abrasion	L M S	—
	Concrete	Damage-Left	L M S	—
		Damage-Right	L M S	—
		Damage-Bottom	L M S	—

Survey Item			Survey Result	Judge
Hoisting Device				
	Wire Rope	Main-Left	φ44.6 Distortion: – Corrosion: – Oil: –	G
		Main-Right	y: – Distortion: – Corrosion: – Oil: –	G
		Roller Train-L	y: – Distortion: – Corrosion: – Oil: –	N
		Roller Train-R	y: – Distortion: – Corrosion: – Oil: –	N
	Drum	Left	Damage: – Function: Over Lapping	RS
		Right	Damage: – Function: Over Lapping	
	Bearing	Drum	Damage: – Oil: –	
		Counter Shaft	Damage: – Oil: –	RS
		Reduction Gear	Damage: – Oil: –	C
	Gear	Drum Gear-L	Damage: – Fitting: – Backlash: – Oil: –	RS
		Drum Pinion-L	Damage: –	
		Drum Gear-R	Damage: – Fitting: 10.0 % Backlash: 4.5 mm Oil: –	
		Drum Pinion-R	Damage: –	
		Gear-Middle	Damage: – Fitting: – Backlash: – Oil: –	
		Pinion-Middle	Damage: –	
	Basement	Drum-L	Damage: – Corrosion: L M (S)	
		Drum-R	Damage: – Corrosion: L M (S)	
		Drive Device	Damage: – Corrosion: L (M) S	RS
Drive Chain			Damage: – Looseness: – Oil: –	C
Chain Sprocket			Damage: – Corrosion: L (M) S	
Reduction Gear			Damage: – Corrosion: L (M) S	
	Cover	Drum-L	Damage: – Corrosion: L M (S)	
		Drum-R	Damage: – Corrosion: L M (S)	
		Gear-Middle	Damage: – Corrosion: L (M) S	C
Counter Shaft			Damage: – Corrosion: L M S	G
Counter Weight			Damage: – Corrosion: L M S	RS
	Hoisting Torque	Wet Condition	– kg·m	—
		Dry Condition	3.9 kg·m	RS
Superstructure			Damage: – Corrosion: L M (S)	RS

Photograph



Remarks: Judgement = N: Totally Replace, C: Partly Replace, RL: Large Repair, RM: Medium Repair, RS: Small Repair, G: No Repair, -: No Data.

( ) shows design dimension.

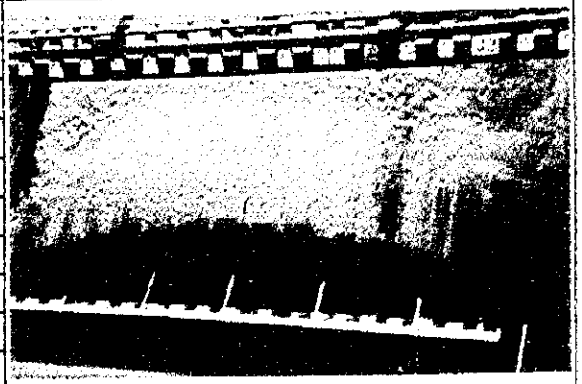
Survey Results of Gate Structure

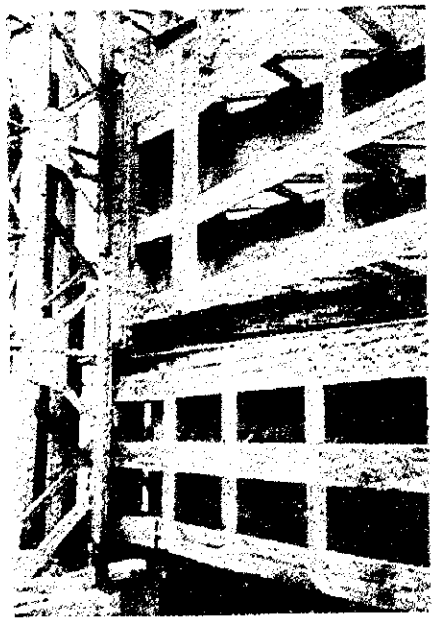
Gate No. U3U (Upper Undersluice Gate)

Survey Item		Survey Result	Judge
Gate Leaf			
Skin Plate	Thickness-Avg	Top10.1 Mid10.0 Low9.9 Btm9.9 (9.5mm)	N
	Corrosion	U/S-Bottom L M (S)	↑
	Damage-Rivet	Corner-L – Corner-R –	
Truss	Thickness-Avg	Bottom Flange 18.6, Bottom Web 18.6 (19.1mm)	
	Distortion		
End Girder	Thickness-Avg	L-Bottom 12.2, R-Bottom 12.1 (12.7mm)	
	Remodeling	Left No Right No	
	Distortion	Left – Right –	
Bottom Girder	Thickness-Avg	Flange 11.7 mm (16.3), Web 9.4 mm (9.4)	
	Corrosion	(L) M S	
Rocker Assembly	Remodeling	Left No Right No	
	Distortion	Left – Right –	
	Others	No Function	
Roller Train	Missing	Left 0 Right 0	
	Diameter-Roller	Average – mm	
	Distortion	Left – Right –	
Seal	Left	3 m Broken	
	Bottom	Good	
	Right	Good	↓
Inclination		Top Level Difference – mm	
Leakage		(L) M S	N
Sill			
Side Seal	Abrasion-Max	Left: – mm, Right: – mm	RS
Roller Truck	Abrasion-Max	Left: 8 mm, Right: 6 mm	N
Roller Guard	Missing	Left 0 Right 0	N
	Defect	Left 0 Right 0	N
Sill Beam	Abrasion	L M S	
Concrete	Damage-Left	L M S	
	Damage-Right	L M S	
	Damage-Bottom	L M S	

Survey Item		Survey Result	Judge
Hoisting Device			
Wire Rope	Main-Left	y: – Distortion: – Corrosion: – Oil: –	G
	Main-Right	y: – Distortion: – Corrosion: – Oil: –	G
	Roller Train-L	y: – Distortion: – Corrosion: – Oil: –	N
	Roller Train-R	y: – Distortion: – Corrosion: – Oil: –	N
Drum	Left	Damage: – Function: Touching to Frame	RS
	Right	Damage: – Function: –	↑
Bearing	Drum	Damage: – Oil: –	↓
	Counter Shaft	Damage: – Oil: –	RS
	Reduction Gear	Damage: – Oil: –	C
Gear	Drum Gear-L	Damage: – Fitting: 90% Backlash: – Oil: –	RS
	Drum Pinion-L	Damage: – Miss Alignment	↑
	Drum Gear-R	Damage: – Fitting: – Backlash: – Oil: –	
	Drum Pinion-R	Damage: –	
	Gear-Middle	Damage: – Fitting: – Backlash: – Oil: –	
	Pinion-Middle	Damage: –	
Basement	Drum-L	Damage: – Corrosion: L M (S)	
	Drum-R	Damage: – Corrosion: L M (S)	↓
	Drive Device	Damage: – Corrosion: L (M) S	RS
Drive Chain		Damage: – Looseness: – Oil: –	C
Chain Sprocket		Damage: – Corrosion: L (M) S	↑
Reduction Gear		Damage: – Corrosion: L (M) S	
Cover	Drum-L	Damage: – Corrosion: L M (S)	
	Drum-R	Damage: – Corrosion: L M (S)	↓
	Gear-Middle	Damage: – Corrosion: L (M) S	C
Counter Shaft		Damage: – Corrosion: L M S	G
Counter Weight		Damage: – Corrosion: L M S	G
Hoisting Torque	Wet Condition	– kg-m	—
	Dry Condition	0 kg-m	C
Superstructure		Damage: – Corrosion: L M (S)	RS

Photograph





Remarks: Judgement = N: Totally Replace, C: Partly Replace, RL: Large Repair, RM: Medium Repair, RS: Small Repair, G: No Repair, -: No Data.

( ) shows design dimension.

Survey Results of Gate Structure

Gate No. U3L (Lower Undersluice Gate)

Survey Item			Survey Result	Judge
Gate Leaf				
	Skin Plate	Thickness-Avg	Top9.9 Mid9.8 Low9.4 Btm8.6 (9.5mm)	N
		Corrosion	U/S-Bottom (L) M S	↑
		Damage-Rivet	Corner-L 4 Corner-R 11	
	Truss	Thickness-Avg	Bottom Flange 20.8, Bottom Web 21.0 (22.2mm)	
		Distortion		
	End Girder	Thickness-Avg	L-Bottom 10.4, R-Bottom 11.6 (12.7mm)	
		Remodeling	Left No Right No	
		Distortion	Left No Right Bend	
	Bottom Girder	Thickness-Avg	Flange14.7 mm (16.0), Web 8.2 mm (9.7)	
		Corrosion	L (M) S	
	Rocker Assembly	Remodeling	Left No Right No	
		Distortion	Left 2 m Ab. Right Heavy Ab.	
		Others	No Function	
	Roller Train	Missing	Left 2 Right 1	
		Diameter-Roller	Average 147.6 mm	
		Distortion	Left - Right -	
	Seal	Left	Lost	
		Bottom	Lost	
		Right	Lost	
	Inclination		Top Level Difference - mm	↓
Leakage			(L) M S	N
Sill				
	Side Seal	Abrasion-Max	Left: - mm, Right: - mm	RS
	Roller Truck	Abrasion-Max	Left: 9 mm, Right: 7 mm	RL
	Roller Guard	Missing	Left 0 Right 0	N
		Defect	Left 0 Right 1	N
	Sill Beam	Abrasion	L M S	—
	Concrete	Damage-Left	L M S	—
		Damage-Right	L M S	—
		Damage-Bottom	L M S	—

Survey Item			Survey Result	Judge
Hoisting Device				
	Wire Rope	Main-Left	y: - Distortion: - Corrosion: - Oil: -	G
		Main-Right	y: - Distortion: - Corrosion: - Oil: -	G
		Roller Train-L	y: - Distortion: - Corrosion: - Oil: -	N
		Roller Train-R	y: - Distortion: - Corrosion: - Oil: -	N
	Drum	Left	Damage: - Function: Over Lapping	RS
		Right	Damage: - Function: Touching Frame	↑
	Bearing	Drum	Damage: - Oil: -	↓
		Counter Shaft	Damage: - Oil: -	RS
		Reduction Gear	Damage: - Oil: -	C
	Gear	Drum Gear-L	Damage: - Fitting: - Backlash: - Oil: -	RS
		Drum Pinion-L	Damage: -	↑
		Drum Gear-R	Damage: - Fitting: - Backlash: - Oil: -	
		Drum Pinion-R	Damage: -	
		Gear-Middle	Damage: - Fitting: - Backlash: - Oil: -	
		Pinion-Middle	Damage: -	
	Basement	Drum-L	Damage: - Corrosion: L M (S)	
		Drum-R	Damage: - Corrosion: L M (S)	↓
		Drive Device	Damage: - Corrosion: L (M) S	RS
	Drive Chain		Damage: - Looseness: - Oil: -	C
	Chain Sprocket		Damage: - Corrosion: L (M) S	↑
	Reduction Gear		Damage: - Corrosion: L (M) S	
	Cover	Drum-L	Damage: - Corrosion: L M (S)	
		Drum-R	Damage: - Corrosion: L M (S)	↓
		Gear-Middle	Damage: - Corrosion: L (M) S	C
	Counter Shaft		Damage: - Corrosion: L M S	G
	Counter Weight		Damage: - Corrosion: L M S	RS
	Hoisting Torque	Wet Condition	- kg-m	—
		Dry Condition	4.3 kg-m	RS
Superstructure			Damage: - Corrosion: L M (S)	RS

Photograph

Remarks: Judgement = N: Totally Replace, C: Partly Replace, RL: Large Repair, RM: Medium Repair, RS: Small Repair, G: No Repair, -: No Data.

( ) shows design dimension.

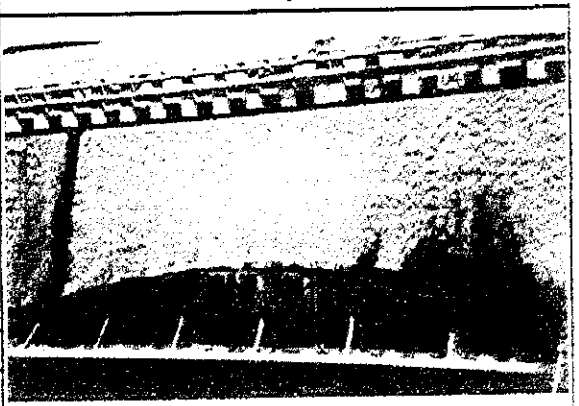
Survey Results of Gate Structure

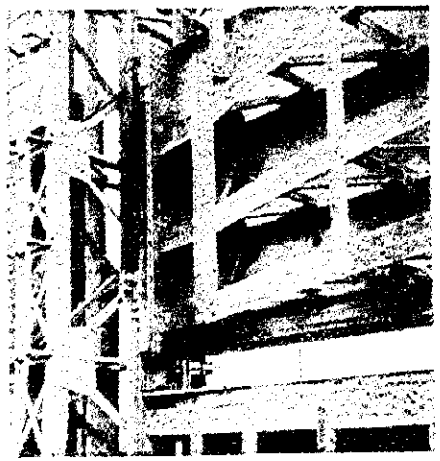
Gate No. U4U (Upper Undersluice Gate)

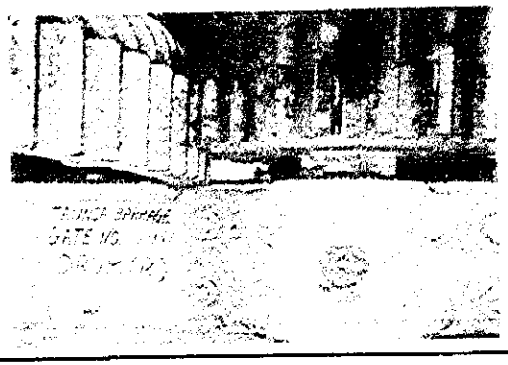
Survey Item		Survey Result	Judge
Gate Leaf			
Skin Plate	Thickness-Avg	Top10.0 Mid9.9 Low10.0 Btm10.1 (9.5mm)	N
	Corrosion	U/S-Bottom L M (S)	↑
	Damage-Rivet	Corner-L – Corner-R –,	
Truss	Thickness-Avg	Bottom Flange 19.2, Bottom Web 18.7 (19.1mm)	
	Distortion		
End Girder	Thickness-Avg	L-Bottom 12.5, R-Bottom 12.3 (12.7mm)	
	Remodeling	Left No Right No	
	Distortion	Left – Right –	
Bottom Girder	Thickness-Avg	Flange 11.6 mm (16.9), Web 9.0 mm (9.4)	
	Corrosion	(L) M S	
Rocker Assembly	Remodeling	Left No Right No	
	Distortion	Left – Right –	
	Others	No Function	
Roller Train	Missing	Left 0 Right 0	
	Diameter-Roller	Average 152.4 mm	
	Distortion	Left – Right –	
Seal	Left	1.5 m Broken	
	Bottom	Good	
	Right	2.0 m Broken	↓
Inclination		Top Level Difference – mm	
Leakage		L M (S)	N
Sill			
Side Seal	Abrasion-Max	Left: – mm, Right: – mm	RS
Roller Truck	Abrasion-Max	Left: 10 mm, Right: 6 mm	N
Roller Guard	Missing	Left 0 Right 0	N
	Defect	Left 0 Right 0	N
Sill Beam	Abrasion	L M S	
Concrete	Damage-Left	L M S	
	Damage-Right	L M S	
	Damage-Bottom	L M S	

Survey Item		Survey Result	Judge
Hoisting Device			
Wire Rope	Main-Left	y: – Distortion: – Corrosion: – Oil: –	G
	Main-Right	y: – Distortion: – Corrosion: – Oil: –	G
	Roller Train-L	Broken	N
	Roller Train-R	y: – Distortion: – Corrosion: – Oil: –	N
Drum	Left	Damage: – Function: –	RS
	Right	Damage: – Function: –	↑
Bearing	Drum	Damage: – Oil: –	↓
	Counter Shaft	Damage: – Oil: –	RS
	Reduction Gear	Damage: – Oil: –	C
Gear	Drum Gear-L	Damage: – Fitting: 90% Backlash: – Oil: –	RS
	Drum Pinion-L	Damage: – Miss Alignment	↑
	Drum Gear-R	Damage: – Fitting: 90% Backlash: – Oil: – Touching Frame	
	Drum Pinion-R	Damage: – Miss Alignment	
	Gear-Middle	Damage: – Fitting: – Backlash: – Oil: –	
	Pinion-Middle	Damage: –	
Basement	Drum-L	Damage: – Corrosion: L M (S)	
	Drum-R	Damage: – Corrosion: L M (S)	↓
	Drive Device	Damage: – Corrosion: L (M) S	RS
Drive Chain		Damage: – Looseness: – Oil: –	C
Chain Sprocket		Damage: – Corrosion: L (M) S	↑
Reduction Gear		Damage: – Corrosion: L (M) S	
Cover	Drum-L	Damage: – Corrosion: L M (S)	
	Drum-R	Damage: – Corrosion: L M (S)	↓
	Gear-Middle	Damage: – Corrosion: L (M) S	C
Counter Shaft		Damage: – Corrosion: L M S	G
Counter Weight		Damage: – Corrosion: L M S	RS
Hoisting Torque	Wet Condition	– kg-m	—
	Dry Condition	2.0 kg-m	RS
Superstructure		Damage: – Corrosion: L M (S)	RS

Photograph







Remarks: Judgement = N: Totally Replace, C: Partly Replace, RL: Large Repair, RM: Medium Repair, RS: Small Repair, G: No Repair, -: No Data.

( ) shows design dimension.

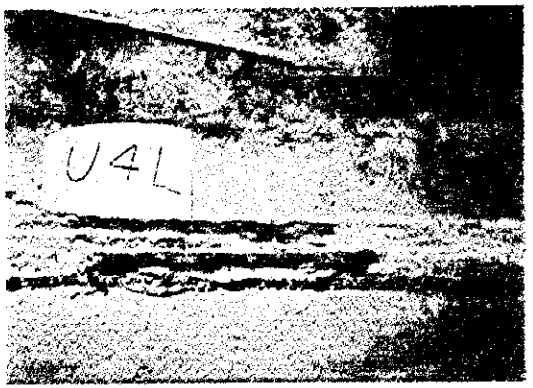
Survey Results of Gate Structure

Gate No. U4L (Lower Undersluice Gate)

Survey Item			Survey Result	Judge
Gate Leaf				
	Skin Plate	Thickness-Avg	Top9.7 Mid9.8 Low9.2 Btm8.8 (9.5mm)	N
		Corrosion	U/S-Bottom (L) M S	
		Damage-Rivet	Corner-L 5 Corner-R 9	
	Truss	Thickness-Avg	Bottom Flange 20.8, Bottom Web 20.8 (22.2mm)	
		Distortion		
	End Girder	Thickness-Avg	L-Bottom 12.1, R-Bottom 11.0 (12.7mm)	
		Remodeling	Left No Right No	
		Distortion	Left – Right –	
	Bottom Girder	Thickness-Avg	Flange 14.6 mm (16.0), Web 8.2 mm (9.7)	
		Corrosion	L (M) S	
	Rocker Assembly	Remodeling	Left No Right No	
		Distortion	Left Heavy Ab. Right Heavy Ab.	
		Others	No Function	
	Roller Train	Missing	Left 0 Right 1	
		Diameter-Roller	Average 151.8 mm	
		Distortion	Left – Right –	
	Seal	Left	Lost	
		Bottom	Lost	
		Right	Lost	
	Inclination		Top Level Difference – mm	
Leakage			(L) M S	N
Sill				
	Side Seal	Abrasion-Max	Left: – mm, Right: – mm	RS
	Roller Truck	Abrasion-Max	Left: 14 mm, Right: 12 mm	RL
	Roller Guard	Missing	Left 0 Right 0	N
		Defect	Left 0 Right 0	N
	Sill Beam	Abrasion	L M S	–
	Concrete	Damage-Left	L M S	–
		Damage-Right	L M S	–
		Damage-Bottom	L M S	–

Survey Item			Survey Result	Judge
Hoisting Device				
	Wire Rope	Main-Left	γ: – Distortion: – Corrosion: – Oil: –	G
		Main-Right	γ: – Distortion: – Corrosion: – Oil: –	G
		Roller Train-L	Broken	N
		Roller Train-R	Broken	N
	Drum	Left	Damage: – Function: –	RS
		Right	Damage: – Function: –	
	Bearing	Drum	Damage: – Oil: –	
		Counter Shaft	Damage: – Oil: –	RS
		Reduction Gear	Damage: – Oil: –	C
	Gear	Drum Gear-L	Damage: – Fitting: – Backlash: – Oil: –	RS
		Drum Pinion-L	Damage: –	
		Drum Gear-R	Damage: – Fitting: – Backlash: – Oil: –	
		Drum Pinion-R	Damage: –	
		Gear-Middle	Damage: – Fitting: – Backlash: – Oil: –	
		Pinion-Middle	Damage: –	
	Basement	Drum-L	Damage: – Corrosion: L M (S)	
		Drum-R	Damage: – Corrosion: L M (S)	
		Drive Device	Damage: – Corrosion: L (M) S	RS
	Drive Chain		Damage: – Looseness: – Oil: –	C
	Chain Sprocket		Damage: – Corrosion: L (M) S	
	Reduction Gear		Damage: – Corrosion: L (M) S	
	Cover	Drum-L	Damage: – Corrosion: L M (S)	
		Drum-R	Damage: – Corrosion: L M (S)	
		Gear-Middle	Damage: – Corrosion: L (M) S	C
	Counter Shaft		Damage: Touching Corrosion: L M (S)	RS
	Counter Weight		Damage: – Corrosion: L M S	RS
	Hoisting Torque	Wet Condition	– kg-m	–
		Dry Condition	3.9 kg-m	RS
Superstructure			Damage: – Corrosion: L M (S)	RS

Photograph



Remarks: Judgement = N: Totally Replace, C: Partly Replace, RL: Large Repair, RM: Medium Repair, RS: Small Repair, G: No Repair, -: No Data.

( ) shows design dimension.

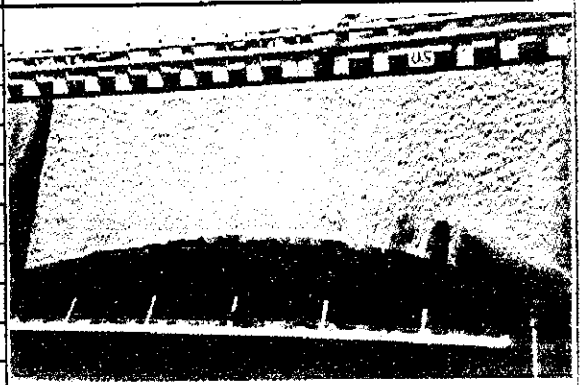
Survey Results of Gate Structure

Gate No. U5U (Upper Undersluice Gate)

Survey Item		Survey Result	Judge
Gate Leaf			
Skin Plate	Thickness-Avg	Top – Mid – Low – Btm9.9 (9.5mm)	N
	Corrosion	U/S-Bottom L M (S)	
	Damage-Rivet	Corner-L – Corner-R –	
Truss	Thickness-Avg	Bottom Flange 19.0, Bottom Web 19.0 (19.1mm)	
	Distorion		
End Girder	Thickness-Avg	L-Bottom 12.5, R-Bottom 12.3 (12.7mm)	
	Remodeling	Left No Right No	
	Distortion	Left – Right –	
Bottom Girder	Thickness-Avg	Flange 11.7 mm (16.3), Web 9.2 mm (9.4)	
	Corrosion	(L) M S	
Rocker Assembly	Remodeling	Left No Right No	
	Distortion	Left – Right –	
	Others	No Function	
Roller Train	Missing	Left 0 Right 0	
	Diameter-Roller	Average 152.2 mm	
	Distortion	Left – Right –	
Seal	Left	2 m Broken	
	Bottom	Good	
	Right	4 m Broken	
Inclination		Top Level Difference – mm	
Leakage		L M (S)	N
Sill			
Side Seal	Abrasion-Max	Left: – mm, Right: – mm	RS
Roller Truck	Abrasion-Max	Left: – mm, Right: – mm	N
Roller Guard	Missing	Left 0 Right 0	N
	Defect	Left 0 Right 0	N
Sill Beam	Abrasion	L M S	
Concrete	Damage-Left	L M S	
	Damage-Right	L M S	
	Damage-Bottom	L M S	

Survey Item		Survey Result	Judge
Hoisting Device			
Wire Rope	Main-Left	y: – Distortion: – Corrosion: – Oil: –	G
	Main-Right	y: – Distortion: – Corrosion: – Oil: –	G
	Roller Train-L	y: – Distortion: – Corrosion: – Oil: –	N
	Roller Train-R	y: – Distortion: – Corrosion: – Oil: –	N
Drum	Left	Damage: – Function: –	RS
	Right	Damage: – Function: –	
Bearing	Drum	Damage: – Oil: –	
	Counter Shaft	Damage: – Oil: –	RS
	Reduction Gear	Damage: – Oil: –	C
Gear	Drum Gear-L	Damage: – Fitting: – Backlash: – Oil: –	RS
	Drum Pinion-L	Damage: –	
	Drum Gear-R	Damage: – Fitting: – Backlash: – Oil: –	
	Drum Pinion-R	Damage: –	
	Gear-Middle	Damage: – Fitting: – Backlash: – Oil: –	
	Pinion-Middle	Damage: –	
Basement	Drum-L	Damage: – Corrosion: L M (S)	
	Drum-R	Damage: – Corrosion: L M (S)	
	Drive Device	Damage: – Corrosion: L (M) S	RS
Drive Chain		Damage: – Looseness: – Oil: –	C
Chain Sprocket		Damage: – Corrosion: L (M) S	
Reduction Gear		Damage: – Corrosion: L (M) S	
Cover	Drum-L	Damage: – Corrosion: L M (S)	
	Drum-R	Damage: – Corrosion: L M (S)	
	Gear-Middle	Damage: – Corrosion: L (M) S	C
Counter Shaft		Damage: – Corrosion: L M S	G
Counter Weight		Damage: – Corrosion: L M S	G
Hoisting Torque	Wet Condition	– kg-m	—
	Dry Condition	-0.4 kg-m	G
Superstructure		Damage: – Corrosion: L M (S)	RS

Photograph



Remarks: Judgement = N: Totally Replace, C: Partly Replace, RL: Large Repair, RM: Medium Repair, RS: Small Repair, G: No Repair, -: No Data.

( ) shows design dimension.

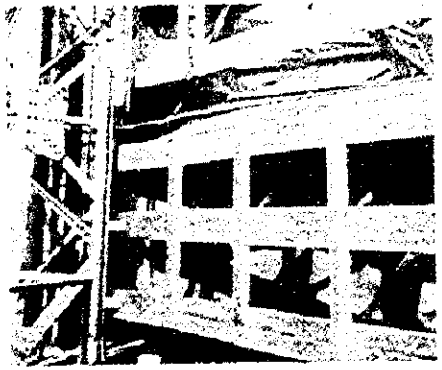
Survey Results of Gate Structure

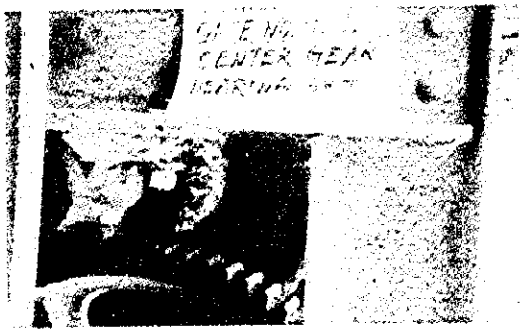
Gate No. U5L (Lower Undersluice Gate)

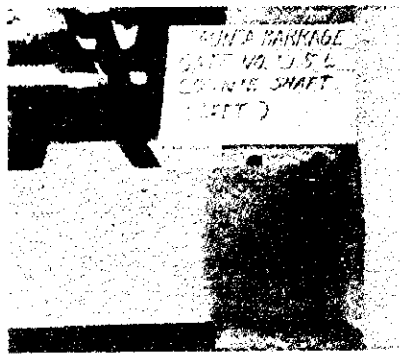
Survey Item		Survey Result	Judge
Gate Leaf			
Skin Plate	Thickness-Avg	Top – Mid – Low – Btm 8.3 (9.5mm)	N
	Corrosion	U/S-Bottom (L) M S	↑
	Damage-Rivet	Corner-L 4 Corner-R 8	
Truss	Thickness-Avg	Bottom Flange 21.9, Bottom Web 21.0 (22.2mm)	
	Distortion		
End Girder	Thickness-Avg	L-Bottom 11.4, R-Bottom 10.8 (12.7mm)	
	Remodeling	Left No Right No	
	Distortion	Left Small Bend Right –	
Bottom Girder	Thickness-Avg	Flange14.5 mm (16.0), Web 9.2 mm (9.7)	
	Corrosion	L (M) S	
Rocker Assembly	Remodeling	Left No Right No	
	Distortion	Left Heavy Ab. Right Heavy Ab.	
	Others	No Function	
Roller Train	Missing	Left 0 Right 0	
	Diameter-Roller	Average 152.2 mm	
	Distortion	Left – Right –	
Seal	Left	Lost	
	Bottom	Lost	
	Right	Lost	
Inclination		Top Level Difference – mm	↓
Leakage		(L) M S	N
Sill			
Side Seal	Abrasion-Max	Left: – mm, Right: – mm	RS
Roller Truck	Abrasion-Max	Left: – mm, Right: – mm	RL
Roller Guard	Missing	Left 0 Right 0	N
	Defect	Left 0 Right 0	N
Sill Beam	Abrasion	L M S	—
Concrete	Damage-Left	L M S	—
	Damage-Right	L M S	—
	Damage-Bottom	L M S	—

Survey Item		Survey Result	Judge
Hoisting Device			
Wire Rope	Main-Left	y: – Distortion: – Corrosion: – Oil: –	G
	Main-Right	y: – Distortion: – Corrosion: – Oil: –	G
	Roller Train-L	Broken	N
	Roller Train-R	Broken	N
Drum	Left	Damage: – Function: –	RS
	Right	Damage: – Function: –	RS
Bearing	Drum	Damage: – Oil: –	RS
	Counter Shaft	Damage: – Oil: Center Gear Bearing Sleeve Broken	C
	Reduction Gear	Damage: – Oil: –	RS
Gear	Drum Gear-L	Damage: – Fitting: – Backlash: – Oil: –	↑
	Drum Pinion-L	Damage: –	
	Drum Gear-R	Damage: – Fitting: – Backlash: – Oil: –	
	Drum Pinion-R	Damage: –	
	Gear-Middle	Damage: – Fitting: – Backlash: – Oil: –	
	Pinion-Middle	Damage: –	
Basement	Drum-L	Damage: – Corrosion: L M (S)	
	Drum-R	Damage: – Corrosion: L M (S)	↓
	Drive Device	Damage: – Corrosion: L (M) S	RS
Drive Chain		Damage: – Looseness: – Oil: –	C
Chain Sprocket		Damage: – Corrosion: L (M) S	↑
Reduction Gear		Damage: – Corrosion: L (M) S	
Cover	Drum-L	Damage: – Corrosion: L M (S)	
	Drum-R	Damage: – Corrosion: L M (S)	↓
	Gear-Middle	Damage: – Corrosion: L (M) S	C
Counter Shaft		Damage: Touching Corrosion: L M (S)	RS
Counter Weight		Damage: – Corrosion: L M S	RS
Hoisting Torque	Wet Condition	– kg·m	—
	Dry Condition	2.0 kg·m	RS
Superstructure		Damage: – Corrosion: L M (S)	RS

Photograph







Remarks: Judgement = N: Totally Replace, C: Partly Replace, RL: Large Repair, RM: Medium Repair, RS: Small Repair, G: No Repair, -: No Data.

( ) shows design dimension.

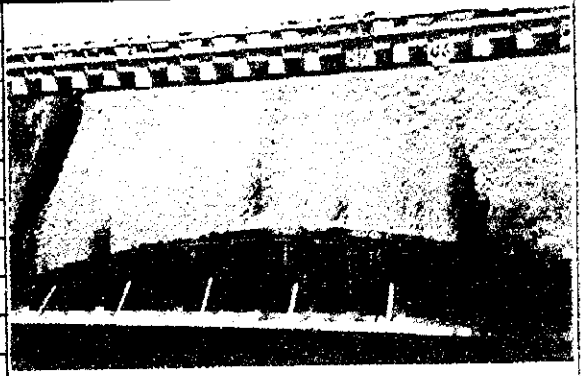
Survey Results of Gate Structure

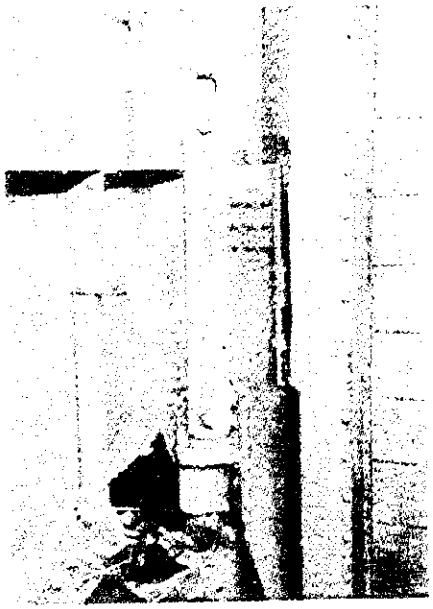
Gate No. U6U (Upper Undersluice Gate)

Survey Item		Survey Result	Judge
Gate Leaf			
Skin Plate	Thickness-Avg	Top – Mid – Low – Btm9.8 (9.5mm)	N
	Corrosion	U/S-Bottom L M (S)	↑
	Damage-Rivet	Corner-L – Corner-R –	
Truss	Thickness-Avg	Bottom Flange 18.5 , Bottom Web 18.6 (19.1mm)	
	Distortion		
End Girder	Thickness-Avg	L-Bottom 12.0 , R-Bottom 11.9 (12.7mm)	
	Remodeling	Left No Right No	
	Distortion	Left – Right –	
Bottom Girder	Thickness-Avg	Flange 11.7 mm (16.3), Web 9.3 mm (9.4)	
	Corrosion	(L) M S	
Rocker Assembly	Remodeling	Left No Right No	
	Distortion	Left – Right –	
	Others	No Function	
Roller Train	Missing	Left 0 Right 1	
	Diameter-Roller	Average – mm	
	Distortion	Left – Right –	
Seal	Left	2 m Broken	
	Bottom	Good	
	Right	3 m Broken	
Inclination		Top Level Difference – mm	↓
Leakage		L M (S)	N
Sill			
Side Seal	Abrasion-Max	Left: – mm, Right: – mm	RS
Roller Truck	Abrasion-Max	Left: – mm, Right: – mm	N
Roller Guard	Missing	Left 0 Right 0	N
	Defect	Left 0 Right 0	N
Sill Beam	Abrasion	L M S	
Concrete	Damage-Left	L M S	
	Damage-Right	L M S	
	Damage-Bottom	L M S	

Survey Item		Survey Result	Judge
Hoisting Device			
Wire Rope	Main-Left	y: – Distortion: – Corrosion: – Oil: –	G
	Main-Right	y: – Distortion: – Corrosion: – Oil: –	G
	Roller Train-L	y: – Distortion: – Corrosion: – Oil: –	N
	Roller Train-R	Broken	N
Drum	Left	Damage: – Function: –	RS
	Right	Damage: – Function: –	↑
Bearing	Drum	Damage: – Oil: –	↓
	Counter Shaft	Damage: – Oil: –	RS
	Reduction Gear	Damage: – Oil: –	C
Gear	Drum Gear-L	Damage: – Fitting: – Backlash: – Oil: –	RS
	Drum Pinion-L	Damage: –	↑
	Drum Gear-R	Damage: – Fitting: – Backlash: – Oil: –	
	Drum Pinion-R	Damage: –	
	Gear-Middle	Damage: – Fitting: – Backlash: – Oil: –	
	Pinion-Middle	Damage: –	
Basement	Drum-L	Damage: – Corrosion: L M (S)	
	Drum-R	Damage: – Corrosion: L M (S)	↓
	Drive Device	Damage: – Corrosion: L (M) S	RS
Drive Chain		Damage: – Looseness: – Oil: –	C
Chain Sprocket		Damage: – Corrosion: L (M) S	↑
Reduction Gear		Damage: – Corrosion: L (M) S	
Cover	Drum-L	Damage: – Corrosion: L M (S)	
	Drum-R	Damage: – Corrosion: L M (S)	↓
	Gear-Middle	Damage: – Corrosion: L (M) S	C
Counter Shaft		Damage: – Corrosion: L M S	G
Counter Weight		Damage: – Corrosion: L M S	C
Hoisting Torque	Wet Condition	– kg·m	—
	Dry Condition	0 kg·m	G
Superstructure		Damage: – Corrosion: L M (S)	RS

Photograph





Remarks Judgement = N: Totally Replace, C: Partly Replace, RL: Large Repair, RM: Medium Repair, RS: Small Repair, G: No Repair, -: No Data.

( ) shows design dimension.

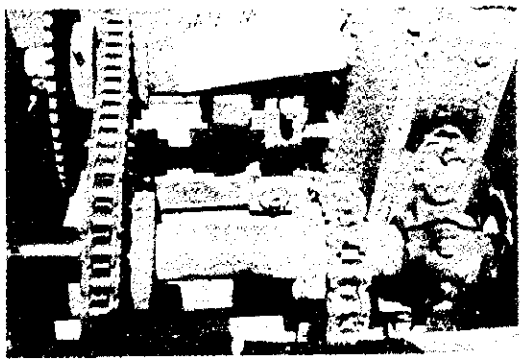
Survey Results of Gate Structure

Gate No. U6L (Lower Undersluice Gate)

Survey Item			Survey Result	Judge
Gate Leaf				
	Skin Plate	Thickness-Avg	Top – Mid – Low – Btm 8.5 (9.5mm)	N
		Corrosion	U/S-Bottom L (M) S	
		Damage-Rivet	Corner-L 7 Corner-R 7	
	Truss	Thickness-Avg	Bottom Flange 20.8, Bottom Web 21.3 (22.2mm)	
		Distortion		
	End Girder	Thickness-Avg	L-Bottom 12.1, R-Bottom 11.9 (12.7mm)	
		Remodeling	Left No Right Re.	
		Distortion	Left Bend Right Bend	
	Bottom Girder	Thickness-Avg	Flange14.5 mm (16.0), Web 9.0 mm (9.7)	
		Corrosion	L (M) S	
	Rocker Assembly	Remodeling	Left No Right Re.	
		Distortion	Left – Right Broken	
		Others		
	Roller Train	Missing	Left 2 Right 1	
		Diameter-Roller	Average – mm	
		Distortion	Left – Right –	
	Seal	Left	Lost	
		Bottom	Lost	
		Right	Lost	
	Inclination		Top Level Difference – mm	
Leakage			(L) M S	N
Sill				
	Side Seal	Abrasion-Max	Left: – mm, Right: – mm	RS
	Roller Truck	Abrasion-Max	Left: – mm, Right: – mm	RL
	Roller Guard	Missing	Left 1 Right 1	N
		Defect	Left 0 Right 0	N
	Sill Beam	Abrasion	L M S	—
	Concrete	Damage-Left	L M S	—
		Damage-Right	L M S	—
		Damage-Bottom	L M S	—

Survey Item			Survey Result	Judge
Hoisting Device				
	Wire Rope	Main-Left	y: – Distortion: – Corrosion: – Oil: –	G
		Main-Right	y: – Distortion: – Corrosion: – Oil: –	G
		Roller Train-L	y: – Distortion: – Corrosion: – Oil: –	N
		Roller Train-R	y: – Distortion: – Corrosion: – Oil: –	N
	Drum	Left	Damage: – Function: Touching Frame	RS
		Right	Damage: – Function: –	
	Bearing	Drum	Damage: – Oil: –	
		Counter Shaft	Damage: – Oil: –	RS
		Reduction Gear	Damage: Broken Oil: –	C
	Gear	Drum Gear-L	Damage: – Fitting: 9.0 % Backlash: 3 mm Oil: –	RS
		Drum Pinion-L	Damage: Miss Alignment	
		Drum Gear-R	Damage: – Fitting: – Backlash: – Oil: –	
		Drum Pinion-R	Damage: –	
		Gear-Middle	Damage: – Fitting: – Backlash: – Oil: –	
		Pinion-Middle	Damage: Miss Alignment	
	Basement	Drum-L	Damage: – Corrosion: L M (S)	
		Drum-R	Damage: – Corrosion: L M (S)	
		Drive Device	Damage: – Corrosion: L (M) S	RS
Drive Chain			Damage: – Looseness: – Oil: –	C
Chain Sprocket			Damage: – Corrosion: L (M) S	
Reduction Gear			Damage: – Corrosion: L (M) S	
	Cover	Drum-L	Damage: – Corrosion: L M (S)	
		Drum-R	Damage: – Corrosion: L M (S)	
		Gear-Middle	Damage: – Corrosion: L (M) S	C
Counter Shaft			Damage: – Corrosion: L M S	G
Counter Weight			Damage: – Corrosion: L M S	RS
	Hoisting Torque	Wet Condition	– kg-m	—
		Dry Condition	7.4 kg-m	RS
Superstructure			Damage: – Corrosion: L M (S)	RS

Photograph



Remarks: Judgement ▪ N: Totally Replace, C: Partly Replace, RL: Large Repair, RM: Medium Repair, RS: Small Repair, G: No Repair, -: No Data.

( ) shows design dimension.

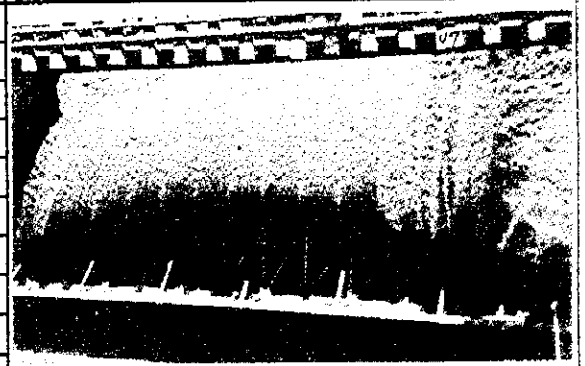
Survey Results of Gate Structure

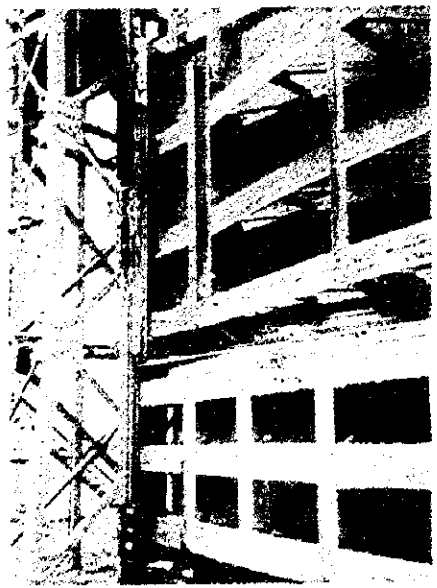
Gate No. U7U (Upper Undersluice Gate)

Survey Item		Survey Result	Judge
Gate Leaf			
Skin Plate	Thickness-Avg	Top – Mid – Low – Btm10.0 (9.5mm)	N
	Corrosion	U/S-Bottom L M (S)	
	Damage-Rivet	Corner-L – Corner-R –	
Truss	Thickness-Avg	Bottom Flange 19.1, Bottom Web 18.7 (19.1mm)	
	Distortion		
End Girder	Thickness-Avg	L-Bottom 12.7, R-Bottom 12.6 (12.7mm)	
	Remodeling	Left No Right No	
	Distortion	Left – Right –	
Bottom Girder	Thickness-Avg	Flange 11.4 mm (16.3), Web 9.2 mm (9.4)	
	Corrosion	(L) M S	
Rocker Assembly	Remodeling	Left No Right No	
	Distortion	Left – Right –	
	Others	No Function	
Roller Train	Missing	Left 0 Right 0	
	Diameter-Roller	Average – mm	
	Distortion	Left – Right –	
Seal	Left	4 m Broken	
	Bottom	Good	
	Right	3 m Broken	
Inclination		Top Level Difference – mm	
Leakage		(L) M S	N
Sill			
Side Seal	Abrasion-Max	Left: – mm, Right: – mm	RS
Roller Truck	Abrasion-Max	Left: – mm, Right: – mm	N
Roller Guard	Missing	Left 0 Right 0	N
	Defect	Left 0 Right 0	N
Sill Beam	Abrasion	L M S	
Concrete	Damage-Left	L M S	
	Damage-Right	L M S	
	Damage-Bottom	L M S	

Survey Item		Survey Result	Judge
Hoisting Device			
Wire Rope	Main-Left	y: – Distortion: – Corrosion: – Oil: –	G
	Main-Right	y: – Distortion: – Corrosion: – Oil: –	G
	Roller Train-L	y: – Distortion: – Corrosion: – Oil: –	N
	Roller Train-R	y: – Distortion: – Corrosion: – Oil: –	N
Drum	Left	Damage: – Function: Miss Alignment	RS
	Right	Damage: – Function: –	
Bearing	Drum	Damage: – Oil: –	
	Counter Shaft	Damage: – Oil: –	RS
	Reduction Gear	Damage: – Oil: –	C
Gear	Drum Gear-L	Damage: – Fitting: – Backlash: – Oil: –	RS
	Drum Pinion-L	Damage: –	
	Drum Gear-R	Damage: – Fitting: – Backlash: – Oil: –	
	Drum Pinion-R	Damage: –	
	Gear-Middle	Damage: – Fitting: – Backlash: – Oil: –	
	Pinion-Middle	Damage: –	
Basement	Drum-L	Damage: – Corrosion: L M (S)	
	Drum-R	Damage: – Corrosion: L M (S)	
	Drive Device	Damage: – Corrosion: L (M) S	RS
Drive Chain		Damage: – Looseness: – Oil: –	C
Chain Sprocket		Damage: – Corrosion: L (M) S	
Reduction Gear		Damage: – Corrosion: L (M) S	
Cover	Drum-L	Damage: – Corrosion: L M (S)	
	Drum-R	Damage: – Corrosion: L M (S)	
	Gear-Middle	Damage: – Corrosion: L (M) S	C
Counter Shaft		Damage: – Corrosion: L M S	G
Counter Weight		Damage: – Corrosion: L M S	RS
Hoisting Torque	Wet Condition	– kg·m	–
	Dry Condition	2.0 kg·m	RS
Superstructure		Damage: – Corrosion: L M (S)	RS

Photograph





Remarks: Judgement = N: Totally Replace, C: Partly Replace, RL: Large Repair, RM: Medium Repair, RS: Small Repair, G: No Repair, -: No Data.

( ) shows design dimension.

Survey Results of Gate Structure

Gate No. U7L (Lower Undersluice Gate)

Survey Item		Survey Result	Judge
Gate Leaf			
Skin Plate	Thickness-Avg	Top – Mid – Low – Btm 8.7 (9.5mm)	N
	Corrosion	U/S-Bottom (L) M S	
	Damage-Rivet	Corner-L 12 Corner-R 11	
Truss	Thickness-Avg	Bottom Flange 21.6, Bottom Web 20.2 (22.2mm)	
	Distortion		
End Girder	Thickness-Avg	L-Bottom 10.1, R-Bottom 11.3 (12.7mm)	
	Remodeling	Left Re. Right No	
	Distortion	Left Small Bend Right –	
Bottom Girder	Thickness-Avg	Flange 13.6 mm (16.0), Web 7.8 mm (9.7)	
	Corrosion	L (M) S	
Rocker Assembly	Remodeling	Left Re Right No	
	Distortion	Left – Right Heavy Ab.	
	Others		
Roller Train	Missing	Left 0 Right 0	
	Diameter-Roller	Average – mm	
	Distortion	Left – Right –	
Seal	Left	Lost	
	Bottom	Lost	
	Right	Lost	
Inclination		Top Level Difference – mm	
Leakage		(L) M S	N
Sill			
Side Seal	Abrasion-Max	Left: – mm, Right: – mm	RS
Roller Truck	Abrasion-Max	Left: – mm, Right: – mm	RL
Roller Guard	Missing	Left 1 Right 1	N
	Defect	Left 0 Right 0	N
Sill Beam	Abrasion	L M S	—
Concrete	Damage-Left	L M S	—
	Damage-Right	L M S	—
	Damage-Bottom	L M S	—

Survey Item		Survey Result	Judge
Hoisting Device			
Wire Rope	Main-Left	y: – Distortion: – Corrosion: – Oil: –	G
	Main-Right	y: – Distortion: – Corrosion: – Oil: –	G
	Roller Train-L	Broken	N
	Roller Train-R	y: – Distortion: – Corrosion: – Oil: –	N
Drum	Left	Damage: – Function: –	RS
	Right	Damage: – Function: Miss Alignment	
Bearing	Drum	Damage: – Oil: –	
	Counter Shaft	Damage: – Oil: –	RS
	Reduction Gear	Damage: Broken Oil: –	C
Gear	Drum Gear-L	Damage: – Fitting: – Backlash: – Oil: –	RS
	Drum Pinion-L	Damage: –	
	Drum Gear-R	Damage: – Fitting: – Backlash: – Oil: –	
	Drum Pinion-R	Damage: –	
	Gear-Middle	Damage: – Fitting: – Backlash: – Oil: –	
	Pinion-Middle	Damage: –	
Basement	Drum-L	Damage: – Corrosion: L M (S)	
	Drum-R	Damage: – Corrosion: L M (S)	
	Drive Device	Damage: – Corrosion: L (M) S	RS
Drive Chain		Damage: – Looseness: – Oil: –	C
Chain Sprocket		Damage: – Corrosion: L (M) S	
Reduction Gear		Damage: – Corrosion: L (M) S	
Cover	Drum-L	Damage: – Corrosion: L M (S)	
	Drum-R	Damage: – Corrosion: L M (S)	
	Gear-Middle	Damage: – Corrosion: L (M) S	C
Counter Shaft		Damage: – Corrosion: L M S	G
Counter Weight		Damage: – Corrosion: L M S	RS
Hoisting Torque	Wet Condition	– kg·m	—
	Dry Condition	5.9 kg·m	RS
Superstructure		Damage: – Corrosion: L M (S)	RS

Photograph

Remarks: Judgement = N: Totally Replace, C: Partly Replace, RL: Large Repair, RM: Medium Repair, RS: Small Repair, G: No Repair, -: No Data.

( ) shows design dimension.

Survey Results of Gate Structure

Gate No. N8U (Upstream Lock Gate)

Survey Item			Survey Result	Judge
Gate Leaf				
	Skin Plate	Thickness-Avg	Top 9.8 Mid 9.9 Low 9.3 Btm – (9.5mm)	G
		Corrosion	U/S-Bottom L (M) S	RS
		Damage-Rivet	Corner-L – Corner-R –	–
	Truss	Thickness-Avg	Bottom Flange 9.7, Bottom Web 9.6 (11.1mm)	G
		Distortion		G
	End Girder	Thickness-Avg	L-Bottom 10.6, R-Bottom 10.6 (11.1mm)	C
		Remodeling	Left No Right No	↑
		Distortion	Left – Right –	
	Bottom Girder	Thickness-Avg	Flange – mm (16.3), Web – mm (9.4)	
		Corrosion	L M S	
	Rocker Assembly	Remodeling	Left No Right No	
		Distortion	Left M.Ab. Right M.Ab.	
		Others	No Function	
	Roller Train	Missing	Left 0 Right 0	
		Diameter-Roller	Average 152.3 mm	
		Distortion	Left – Right –	
	Seal	Left	6 m Broken	
		Bottom	Lost	
		Right	6 m Broken	
	Inclination		Top Level Difference – mm	↓
Leakage			(L) M S	C
Sill				
	Side Seal	Abrasion-Max	Left: – mm, Right: – mm	RS
	Roller Truck	Abrasion-Max	Left: – mm, Right: – mm	RL
	Roller Guard	Missing	Left 0 Right 0	N
		Defect	Left 0 Right 0	N
	Sill Beam	Abrasion	L M S	–
	Concrete	Damage-Left	L M S	–
		Damage-Right	L M S	–
		Damage-Bottom	L M S	–

Survey Item			Survey Result	Judge
Hoisting Device				
	Wire Rope	Main-Left	y: – Distortion: – Corrosion: – Oil: –	G
		Main-Right	y: – Distortion: – Corrosion: – Oil: –	G
		Roller Train-L	y: – Distortion: – Corrosion: – Oil: –	N
		Roller Train-R	y: – Distortion: – Corrosion: – Oil: –	N
	Drum	Left	Damage: – Function: –	RS
		Right	Damage: – Function: –	↑
	Bearing	Drum	Damage: – Oil: –	↓
		Counter Shaft	Damage: – Oil: –	RS
		Reduction Gear	Damage: – Oil: –	C
	Gear	Drum Gear-L	Damage: – Fitting: – Backlash: – Oil: –	RS
		Drum Pinion-L	Damage: –	↑
		Drum Gear-R	Damage: – Fitting: – Backlash: – Oil: –	
		Drum Pinion-R	Damage: –	
		Gear-Middle	Damage: – Fitting: – Backlash: – Oil: –	
		Pinion-Middle	Damage: –	
	Basement	Drum-L	Damage: – Corrosion: L M (S)	↓
		Drum-R	Damage: – Corrosion: L M (S)	
		Drive Device	Damage: – Corrosion: L (M) S	RS
	Drive Chain		Damage: – Looseness: – Oil: –	C
	Chain Sprocket		Damage: – Corrosion: L (M) S	↑
	Reduction Gear		Damage: – Corrosion: L (M) S	
	Cover	Drum-L	Damage: – Corrosion: L M (S)	
		Drum-R	Damage: – Corrosion: L M (S)	↓
		Gear-Middle	Damage: – Corrosion: L (M) S	C
	Counter Shaft		Damage: Touching Corrosion: L M S	G
	Counter Weight		Damage: – Corrosion: L M S	RS
	Hoisting Torque	Wet Condition	– kg-m	
		Dry Condition	3.5 kg-m	RS
Superstructure			Damage: – Corrosion: L M (S)	RS

Photograph

Remarks: Judgement = N: Totally Replace, C: Partly Replace, RL: Large Repair, RM: Medium Repair, RS: Small Repair, G: No Repair, -: No Data

( ) shows design dimension.

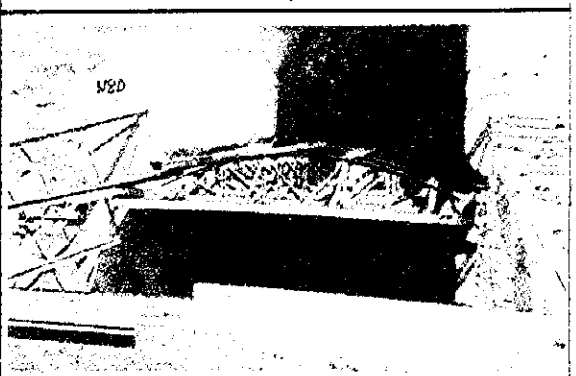
Survey Results of Gate Structure

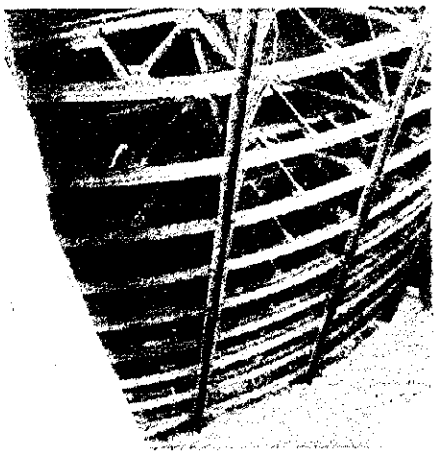
Gate No. N8D (Downstream Lock Gate)

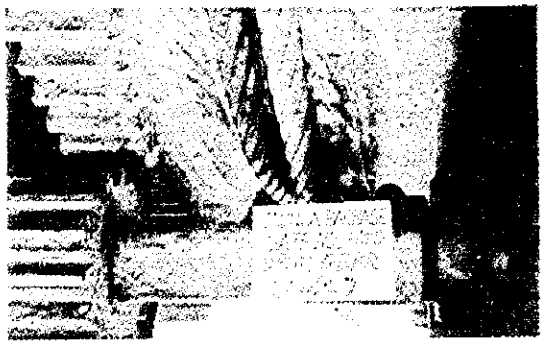
Survey Item			Survey Result	Judge
Gate Leaf				
	Skin Plate	Thickness-Avg	Top10.2 Mid10.2 Low10.1 Btm – (9.5mm)	G
		Corrosion	U/S-Bottom L M (S)	G
		Damage-Rivet	Corner-L – Corner-R –	—
	Truss	Thickness-Avg	Bottom Flange –, Bottom Web – (11.1mm)	—
		Distortion	–	—
	End Girder	Thickness-Avg	L-Bottom No, R-Bottom No (11.1mm)	—
		Remodeling	Left No Right No	—
		Distortion	Left – Right –	—
	Bottom Girder	Thickness-Avg	Flange – mm (16.3), Web – mm (9.4)	—
		Corrosion	L M S	—
	Rocker Assembly	Remodeling	Left No Right No	—
		Distortion	Left – Right –	—
		Others	–	—
	Roller Train	Missing	Left 0 Right 0	—
		Diameter-Roller	Average – mm	—
		Distortion	Left – Right –	—
	Seal	Left	–	—
		Bottom	–	—
		Right	–	—
	Inclination		Top Level Difference – mm	—
Leakage			L M S	—
Sill				
	Side Seal	Abrasion-Max	Left: – mm, Right: – mm	—
	Roller Truck	Abrasion-Max	Left: – mm, Right: – mm	—
	Roller Guard	Missing	Left 0 Right 0	—
		Defect	Left 0 Right 0	—
	Sill Beam	Abrasion	L M S	—
	Concrete	Damage-Left	L M S	—
		Damage-Right	L M S	—
		Damage-Bottom	L M S	—

Survey Item			Survey Result	Judge
Hoisting Device				
	Wire Rope	Main-Left	y: – Distortion: – Corrosion: – Oil: –	G
		Main-Right	y: – Distortion: – Corrosion: – Oil: –	G
		Roller Train-L	y: – Distortion: – Corrosion: – Oil: –	G
		Roller Train-R	y: – Distortion: – Corrosion: – Oil: –	G
	Drum	Left	Damage: – Function: Touching Frame	RS
		Right	Damage: – Function: Touching Frame	↑
	Bearing	Drum	Damage: – Oil: –	↓
		Counter Shaft	Damage: – Oil: –	RS
		Reduction Gear	Damage: Little Oil: –	C
	Gear	Drum Gear-L	Damage: – Fitting: 75% Backlash: – Oil: –	RS
		Drum Pinion-L	Damage: Miss Alignment	↑
		Drum Gear-R	Damage: – Fitting: – Backlash: – Oil: –	
		Drum Pinion-R	Damage: –	
		Gear-Middle	Damage: – Fitting: – Backlash: – Oil: –	
		Pinion-Middle	Damage: –	
	Basement	Drum-L	Damage: – Corrosion: L M (S)	
		Drum-R	Damage: – Corrosion: L M (S)	↓
		Drive Device	Damage: – Corrosion: L (M) S	RS
	Drive Chain		Damage: – Looseness: L Oil: –	C
	Chain Sprocket		Damage: – Corrosion: L (M) S	↑
	Reduction Gear		Damage: – Corrosion: L (M) S	
	Cover	Drum-L	Damage: – Corrosion: L M (S)	
		Drum-R	Damage: – Corrosion: L M (S)	↓
		Gear-Middle	Damage: – Corrosion: L (M) S	C
	Counter Shaft		Damage: Touching Corrosion: L M S	G
	Counter Weight		Damage: – Corrosion: L M S	RS
	Hoisting Torque	Wet Condition	– kg-m	—
		Dry Condition	1.8 kg-m	RS
Superstructure			Damage: – Corrosion: L M (S)	RS

Photograph







Remarks: Judgement = N: Totally Replace, C: Partly Replace, RL: Large Repair, RM: Medium Repair, RS: Small Repair, G: No Repair, -: No Data.

( ) shows design dimension.

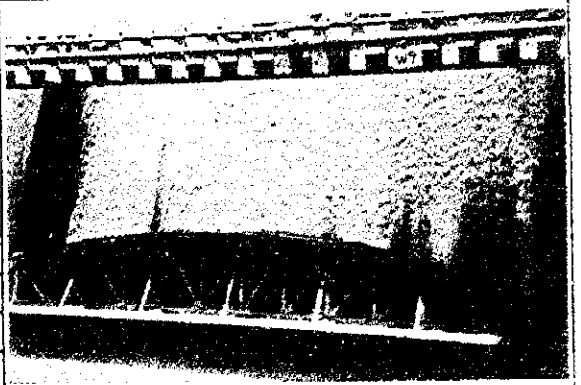
Survey Results of Gate Structure

Gate No. W9 (Main Weir Gate)

Survey Item			Survey Result	Judge
Gate Leaf				
	Skin Plate	Thickness-Avg	Top 10.2 Mid 9.9 Low 9.9 Btm – (9.5mm)	G
		Corrosion	U/S–Bottom L M S	—
		Damage-Rivet	Corner–L – Corner–R –	—
	Truss	Thickness-Avg	Bottom Flange –, Bottom Web – (19.1mm)	—
		Distortion		G
	End Girder	Thickness-Avg	L–Bottom –, R–Bottom – (11.1mm)	C
		Remodeling	Left No Right No	↑
		Distortion	Left – Right –	
	Bottom Girder	Thickness-Avg	Flange – mm (16.3), Web – mm (9.4)	
		Corrosion	L M S	
	Rocker Assembly	Remodeling	Left No Right No	
		Distortion	Left – Right –	
		Others	No Function	
	Roller Train	Missing	Left – Right –	
		Diameter-Roller	Average – mm	
		Distortion	Left – Right –	
	Seal	Left	–	
		Bottom	–	
		Right	–	
	Inclination		Top Level Difference 140 mm	↓
Leakage			L (M) S	C
Sill				
	Side Seal	Abrasion-Max	Left: mm, Right: mm	RS
	Roller Truck	Abrasion-Max	Left: mm, Right: mm	RL
	Roller Guard	Missing	Left 0 Right 0	N
		Defect	Left 0 Right 0	N
	Sill Beam	Abrasion	L M S	—
	Concrete	Damage-Left	L M (S)	RS
		Damage-Right	L (M) S	RS
		Damage-Bottom	L M S	—

Survey Item			Survey Result	Judge
Hoisting Device				
	Wire Rope	Main-Left	y: – Distortion: – Corrosion: – Oil: –	G
		Main-Right	y: – Distortion: – Corrosion: – Oil: –	G
		Roller Train-L	y: – Distortion: – Corrosion: – Oil: –	C
		Roller Train-R	y: – Distortion: – Corrosion: – Oil: –	C
	Drum	Left	Damage: – Function: –	RS
		Right	Damage: – Function: –	↑
	Bearing	Drum	Damage: – Oil: –	
		Counter Shaft	Damage: – Oil: –	
		Reduction Gear	Damage: – Oil: –	
	Gear	Drum Gear-L	Damage: – Fitting: – Backlash: – Oil: –	
		Drum Pinion-L	Damage: –	
		Drum Gear-R	Damage: – Fitting: – Backlash: – Oil: –	
		Drum Pinion-R	Damage: –	
		Gear-Middle	Damage: – Fitting: – Backlash: 10 mm Oil: –	
		Pinion-Middle	Damage: Dangerous to Operation	
	Basement	Drum-L	Damage: – Corrosion: L M (S)	↓
		Drum-R	Damage: – Corrosion: L M (S)	RS
		Drive Device	Damage: – Corrosion: (L) M S	C
	Drive Chain		Damage: – Looseness: – Oil: –	↑
	Chain Sprocket		Damage: – Corrosion: L (M) S	
	Reduction Gear		Damage: – Corrosion: L (M) S	
	Cover	Drum-L	Damage: – Corrosion: L M (S)	
		Drum-R	Damage: – Corrosion: L M (S)	↓
		Gear-Middle	Damage: – Corrosion: L (M) S	C
	Counter Shaft		Damage: – Corrosion: L M S	G
	Counter Weight		Damage: – Corrosion: L M S	RS
	Hoisting Torque	Wet Condition	kg·m	—
		Dry Condition	kg·m	—
Superstructure			Damage: – Corrosion: L M (S)	RS

Photograph



Remarks. Judgement = N: Totally Replace, C: Partly Replace, RL: Large Repair, RM: Medium Repair, RS: Small Repair, G: No Repair, -: No Data.

( ) shows design dimension.

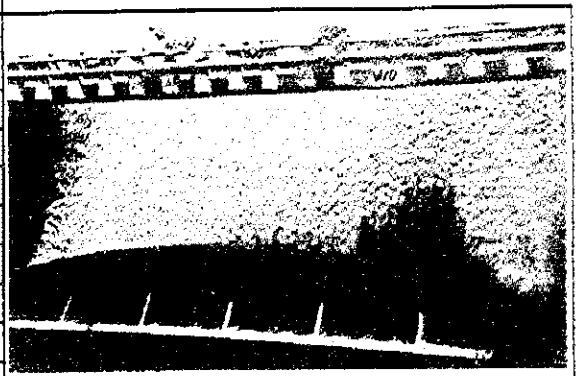
Survey Results of Gate Structure

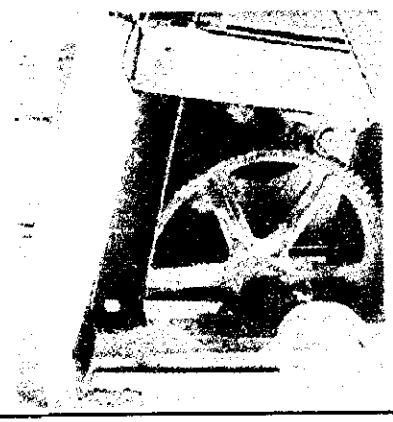
Gate No. W10 (Main Weir Gate)

Survey Item		Survey Result	Judge
Gate Leaf			
Skin Plate	Thickness-Avg	Top10.0 Mid9.9 Low10.0 Btm9.2 (9.5mm)	G
	Corrosion	U/S-Bottom L M S	—
	Damage-Rivet	Corner-L – Corner-R –	—
Truss	Thickness-Avg	Bottom Flange 18.7, Bottom Web 18.6 (19.1mm)	G
	Distortion		—
End Girder	Thickness-Avg	L-Bottom 10.4, R-Bottom 9.5 (11.1mm)	C
	Remodeling	Left No Right No	↑
	Distortion	Left – Right –	
Bottom Girder	Thickness-Avg	Flange 14.8 mm (16.3), Web 8.4 mm (9.4)	
	Corrosion	L (M) S	
Rocker Assembly	Remodeling	Left No Right No	
	Distortion	Left – Right –	
	Others	No Function	
Roller Train	Missing	Left – Right –	
	Diameter-Roller	Average – mm	
	Distortion	Left – Right –	
Seal	Left	–	
	Bottom	–	
	Right	–	
Inclination		Top Level Difference 140 mm	↓
Leakage		(L) M S	C
Sill			
Side Seal	Abrasion-Max	Left: – mm, Right: – mm	RS
Roller Truck	Abrasion-Max	Left: – mm, Right: – mm	RL
Roller Guard	Missing	Left 0 Right 0	N
	Defect	Left 0 Right 0	N
Sill Beam	Abrasion	L M S	—
Concrete	Damage-Left	L M (S)	RS
	Damage-Right	L (M) S	RS
	Damage-Bottom	L M S	—

Survey Item		Survey Result	Judge
Hoisting Device			
Wire Rope	Main-Left	y: – Distortion: – Corrosion: – Oil: –	C
	Main-Right	y: – Distortion: – Corrosion: – Oil: –	C
	Roller Train-L	y: – Distortion: – Corrosion: – Oil: –	C
	Roller Train-R	y: – Distortion: – Corrosion: – Oil: –	C
Drum	Left	Damage: – Function: Miss Alignment	RS
	Right	Damage: – Function: –	↑
Bearing	Drum	Damage: – Oil: –	↓
	Counter Shaft	Damage: – Oil: –	RS
	Reduction Gear	Damage: – Oil: –	C
Gear	Drum Gear-L	Damage: – Fitting: – Backlash: – Oil: –	RS
	Drum Pinion-L	Damage: –	↑
	Drum Gear-R	Damage: – Fitting: – Backlash: – Oil: –	
	Drum Pinion-R	Damage: –	
	Gear-Middle	Damage: – Fitting: – Backlash: – Oil: –	
	Pinion-Middle	Damage: –	
Basement	Drum-L	Damage: – Corrosion: L M (S)	↓
	Drum-R	Damage: – Corrosion: L M (S)	RS
	Drive Device	Damage: – Corrosion: (L) M S	C
Drive Chain		Damage: – Looseness: – Oil: –	↑
Chain Sprocket		Damage: – Corrosion: L (M) S	
Reduction Gear		Damage: – Corrosion: L (M) S	
Cover	Drum-L	Damage: – Corrosion: L M (S)	
	Drum-R	Damage: – Corrosion: L M (S)	↓
	Gear-Middle	Damage: – Corrosion: L (M) S	C
Counter Shaft		Damage: – Corrosion: L M S	G
Counter Weight		Damage: – Corrosion: L M S	RS
Hoisting Torque	Wet Condition	4.2 kg·m	RL
	Dry Condition	5.9 kg·m	RS
Superstructure		Damage: – Corrosion: L M (S)	RS

Photograph





Remarks: Judgement = N: Totally Replace, C: Partly Replace, RL: Large Repair, RM: Medium Repair, RS: Small Repair, G: No Repair, -: No Data.

( ) shows design dimension.

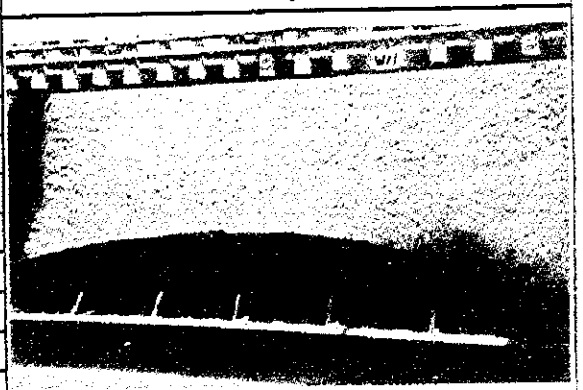
Survey Results of Gate Structure

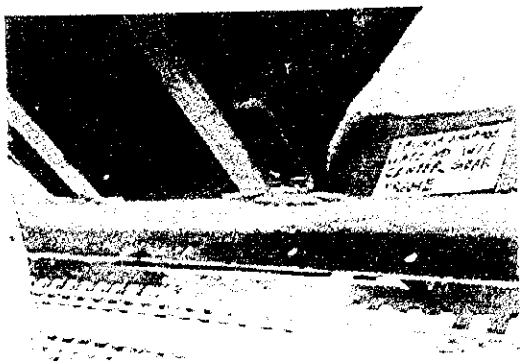
Gate No. W11 (Main Weir Gate)

Survey Item		Survey Result	Judge
Gate Leaf			
Skin Plate	Thickness-Avg	Top10.2 Mid10.0 Low9.9 Btm9.1 (9.5mm)	G
	Corrosion	U/S-Bottom L M S	—
	Damage-Rivet	Corner-L — Corner-R —	—
Truss	Thickness-Avg	Bottom Flange 18.4, Bottom Web 18.5 (19.1mm)	G
	Distortion		—
End Girder	Thickness-Avg	L-Bottom 9.6, R-Bottom 9.7 (11.1mm)	C
	Remodeling	Left No Right No	↑
	Distortion	Left — Right —	
Bottom Girder	Thickness-Avg	Flange 15.0 mm (16.3), Web 8.3 mm (9.4)	
	Corrosion	L M S	
Rocker Assembly	Remodeling	Left No Right No	
	Distortion	Left — Right —	
	Others	No Function	
Roller Train	Missing	Left — Right —	
	Diameter-Roller	Average — mm	
	Distortion	Left — Right —	
Seal	Left	—	
	Bottom	—	
	Right	—	
Inclination		Top Level Difference 30 mm	↓
Leakage		(L) M S	C
Sill			
Side Seal	Abrasion-Max	Left: — mm, Right: — mm	RS
Roller Truck	Abrasion-Max	Left: — mm, Right: — mm	RL
Roller Guard	Missing	Left 0 Right 0	N
	Defect	Left 0 Right 0	N
Sill Beam	Abrasion	L M (S)	RS
Concrete	Damage-Left	L (M) S	RS
	Damage-Right	L (M) S	RS
	Damage-Bottom	L M S	—

Survey Item		Survey Result	Judge
Hoisting Device			
Wire Rope	Main-Left	y: — Distortion: — Corrosion: — Oil: —	G
	Main-Right	y: — Distortion: — Corrosion: — Oil: —	G
	Roller Train-L	y: — Distortion: — Corrosion: — Oil: —	C
	Roller Train-R	y: — Distortion: — Corrosion: — Oil: —	C
Drum	Left	Damage: — Function: —	RS
	Right	Damage: — Function: —	↑
Bearing	Drum	Damage: — Oil: —	↓
	Counter Shaft	Damage: — Oil: —	RS
	Reduction Gear	Damage: — Oil: —	C
Gear	Drum Gear-L	Damage: — Fitting: — Backlash: — Oil: —	RS
	Drum Pinion-L	Damage: —	↑
	Drum Gear-R	Damage: — Fitting: — Backlash: — Oil: —	
	Drum Pinion-R	Damage: —	
	Gear-Middle	Damage: — Fitting: — Backlash: 10 mm Oil: —	
	Pinion-Middle	Damage: —	↓
Basement	Drum-L	Damage: — Corrosion: L M (S)	RS
	Drum-R	Damage: — Corrosion: L M (S)	C
	Drive Device	Damage: — Corrosion: L (M) S	↑
Drive Chain		Damage: — Looseness: — Oil: —	
Chain Sprocket		Damage: — Corrosion: L (M) S	
Reduction Gear		Damage: — Corrosion: L (M) S	
Cover	Drum-L	Damage: — Corrosion: L M (S)	↓
	Drum-R	Damage: — Corrosion: L M (S)	C
	Gear-Middle	Damage: — Corrosion: L (M) S	G
Counter Shaft		Damage: — Corrosion: L M S	RS
Counter Weight		Damage: — Corrosion: L M S	RL
Hoisting Torque	Wet Condition	52.5 kg-m	RS
	Dry Condition	8.2 kg-m	
Superstructure		Damage: — Corrosion: L M (S)	RS

Photograph





Remarks. Judgement = N: Totally Replace, C: Partly Replace, RL: Large Repair, RM: Medium Repair, RS: Small Repair, G: No Repair, -: No Data.

( ) shows design dimension.

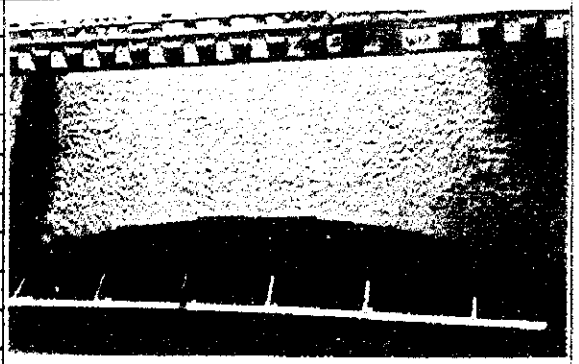
Survey Results of Gate Structure

Gate No. W12 (Main Weir Gate)

Survey Item		Survey Result	Judge
Gate Leaf			
Skin Plate	Thickness-Avg	Top10.1 Mid10.0 Low10.0 Btm9.2 (9.5mm)	G
	Corrosion	U/S-Bottom L M S	—
	Damage-Rivet	Corner-L – Corner-R –	—
Truss	Thickness-Avg	Bottom Flange 18.6 , Bottom Web 18.6 (19.1mm)	G
	Distortion		—
End Girder	Thickness-Avg	L-Bottom 9.2, R-Bottom 9.8 (11.1mm)	C
	Remodeling	Left No Right No	↑
	Distortion	Left – Right –	
Bottom Girder	Thickness-Avg	Flange 15.1 mm (16.3), Web 9.5 mm (9.4)	
	Corrosion	L (M) S	
Rocker Assembly	Remodeling	Left No Right No	
	Distortion	Left – Right –	
	Others	No Function	
Roller Train	Missing	Left – Right –	
	Diameter-Roller	Average – mm	
	Distortion	Left – Right –	
Seal	Left	–	
	Bottom	–	
	Right	–	
Inclination		Top Level Difference 5 mm	↓
Leakage		(L) M S	C
Sill			
Side Seal	Abrasion-Max	Left: – mm, Right: – mm	RS
Roller Truck	Abrasion-Max	Left: – mm, Right: – mm	RL
Roller Guard	Missing	Left 0 Right 0	N
	Defect	Left 0 Right 0	N
Sill Beam	Abrasion	L M S	—
Concrete	Damage-Left	L M (S)	RS
	Damage-Right	L (M) S	RS
	Damage-Bottom	(L) M S	RS

Survey Item		Survey Result	Judge
Hoisting Device			
Wire Rope	Main-Left	y: – Distortion: – Corrosion: – Oil: –	G
	Main-Right	y: – Distortion: – Corrosion: – Oil: –	G
	Roller Train-L	y: – Distortion: – Corrosion: – Oil: –	C
	Roller Train-R	y: – Distortion: – Corrosion: – Oil: –	C
Drum	Left	Damage: – Function: –	RS
	Right	Damage: – Function: –	↑
Bearing	Drum	Damage: – Oil: –	↓
	Counter Shaft	Damage: – Oil: –	RS
	Reduction Gear	Damage: – Oil: –	C
Gear	Drum Gear-L	Damage: – Fitting: – Backlash: – Oil: –	RS
	Drum Pinion-L	Damage: –	↑
	Drum Gear-R	Damage: – Fitting: – Backlash: – Oil: –	
	Drum Pinion-R	Damage: –	
	Gear-Middle	Damage: – Fitting: – Backlash: – Oil: –	
	Pinion-Middle	Damage: –	
Basement	Drum-L	Damage: – Corrosion: L M (S)	
	Drum-R	Damage: – Corrosion: L M (S)	↓
	Drive Device	Damage: – Corrosion: L (M) S	RS
Drive Chain		Damage: – Looseness: – Oil: –	C
Chain Sprocket		Damage: – Corrosion: L (M) S	↑
Reduction Gear		Damage: – Corrosion: L (M) S	
Cover	Drum-L	Damage: – Corrosion: L M (S)	
	Drum-R	Damage: – Corrosion: L M (S)	↓
	Gear-Middle	Damage: – Corrosion: L (M) S	C
Counter Shaft		Damage: – Corrosion: L M S	G
Counter Weight		Damage: – Corrosion: L M S	RS
Hoisting Torque	Wet Condition	45.5 kg·m	RL
	Dry Condition	6.2 kg·m	RS
Superstructure		Damage: – Corrosion: L M (S)	RS

Photograph



Remarks: Judgement ∗ N: Totally Replace, C: Partly Replace, RL: Large Repair, RM: Medium Repair, RS: Small Repair, G: No Repair, -: No Data.

( ) snows design dimension.

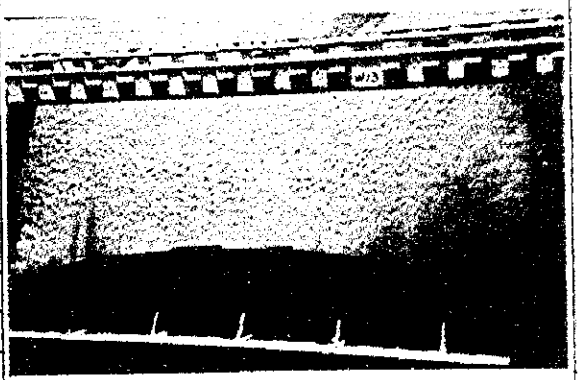
Survey Results of Gate Structure

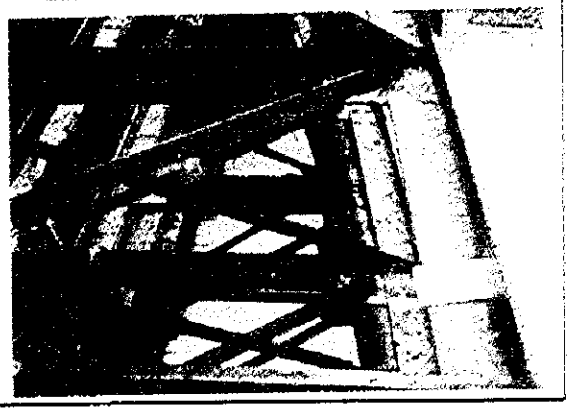
Gate No. W13 (Main Weir Gate)

Survey Item		Survey Result	Judge
Gate Leaf			
Skin Plate	Thickness-Avg	Top10.0 Mid10.1 Low 9.9 Btm9.0 (9.5mm)	G
	Corrosion	U/S-Bottom L M S	—
	Damage-Rivet	Corner-L – Corner-R –	—
Truss	Thickness-Avg	Bottom Flange 18.5 , Bottom Web 18.5 (19.1mm)	G
	Distortion		—
End Girder	Thickness-Avg	L-Bottom 9.8, R-Bottom 10.1 (11.1mm)	C
	Remodeling	Left No Right No	↑
	Distortion	Left – Right –	
Bottom Girder	Thickness-Avg	Flange 14.7 mm (16.3), Web 9.1 mm (9.4)	
	Corrosion	L (M) S	
Rocker Assembly	Remodeling	Left No Right No	
	Distortion	Left – Right –	
	Others	No Function	
Roller Train	Missing	Left – Right –	
	Diameter-Roller	Average – mm	
	Distortion	Left – Right –	
Seal	Left	–	
	Bottom	–	
	Right	–	
Inclination		Top Level Difference 30 mm	↓
Leakage		(L) M S	C
Sill			
Side Seal	Abrasion-Max	Left: – mm, Right: – mm	RS
Roller Truck	Abrasion-Max	Left: – mm, Right: – mm	RL
Roller Guard	Missing	Left 0 Right 0	N
	Defect	Left 0 Right 0	N
Sill Beam	Abrasion	L M S	—
Concrete	Damage-Left	L (M) S	RS
	Damage-Right	L (M) S	RS
	Damage-Bottom	L M S	—

Survey Item		Survey Result	Judge
Hoisting Device			
Wire Rope	Main-Left	y: – Distortion: – Corrosion: – Oil: –	G
	Main-Right	y: – Distortion: – Corrosion: – Oil: –	G
	Roller Train-L	y: – Distortion: – Corrosion: – Oil: –	C
	Roller Train-R	y: – Distortion: – Corrosion: – Oil: –	C
Drum	Left	Damage: – Function: –	RS
	Right	Damage: – Function: –	↑
Bearing	Drum	Damage: – Oil: –	↓
	Counter Shaft	Damage: – Oil: –	RS
	Reduction Gear	Damage: – Oil: –	C
Gear	Drum Gear-L	Damage: – Fitting: – Backlash: – Oil: –	RS
	Drum Pinion-L	Damage: –	↑
	Drum Gear-R	Damage: – Fitting: – Backlash: – Oil: –	
	Drum Pinion-R	Damage: –	
	Gear-Middle	Damage: – Fitting: – Backlash: – Oil: –	
	Pinion-Middle	Damage: –	
Basement	Drum-L	Damage: – Corrosion: L M (S)	↓
	Drum-R	Damage: – Corrosion: L M (S)	
	Drive Device	Damage: – Corrosion: L (M) S	RS
Drive Chain		Damage: – Looseness: – Oil: –	C
Chain Sprocket		Damage: – Corrosion: L (M) S	↑
Reduction Gear		Damage: – Corrosion: L (M) S	
Cover	Drum-L	Damage: – Corrosion: L M (S)	
	Drum-R	Damage: – Corrosion: L M (S)	↓
	Gear-Middle	Damage: – Corrosion: L (M) S	C
Counter Shaft		Damage: – Corrosion: L M S	G
Counter Weight		Damage: – Corrosion: L M S	RS
Hoisting Torque	Wet Condition	37.5 kg-m	RL
	Dry Condition	5.1 kg-m	RS
Superstructure		Damage: – Corrosion: L M (S)	RS

Photograph





Remarks: Judgement = N: Totally Replace, C: Partly Replace, RL: Large Repair, RM: Medium Repair, RS: Small Repair, G: No Repair, -: No Data.

( ) shows design dimension.

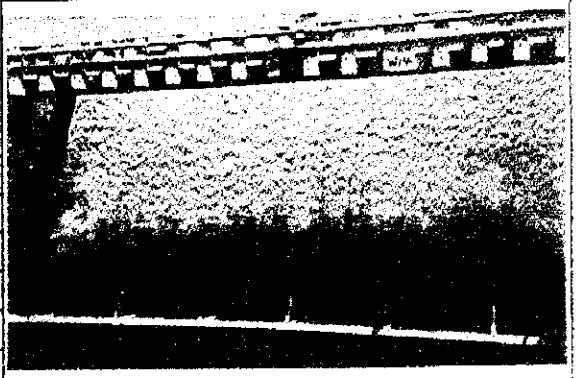
Survey Results of Gate Structure

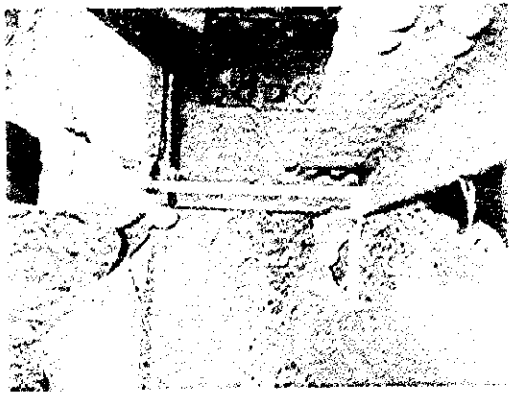
Gate No. W14 (Main Weir Gate)

Survey Item		Survey Result	Judge
Gate Leaf			
Skin Plate	Thickness-Avg	Top – Mid – Low – Btm 8.8 (9.5mm)	G
	Corrosion	U/S-Bottom L M S	—
	Damage-Rivet	Corner-L – Corner-R –	—
Truss	Thickness-Avg	Bottom Flange 18.3, Bottom Web 18.5 (19.1mm)	G
	Distortion	15 mm (T5, Center)	RS
End Girder	Thickness-Avg	L-Bottom 9.9, R-Bottom 9.9 (11.1mm)	C
	Remodeling	Left No Right No	↑
	Distortion	Left – Right –	
Bottom Girder	Thickness-Avg	Flange 14.1 mm (16.3), Web 9.1 mm (9.4)	
	Corrosion	L (M) S	
Rocker Assembly	Remodeling	Left No Right No	
	Distortion	Left – Right –	
	Others	No Function	
Roller Train	Missing	Left – Right –	
	Diameter-Roller	Average – mm	
	Distortion	Left – Right –	
Seal	Left	–	
	Bottom	–	
	Right	–	
Inclination		Top Level Difference 10 mm	↓
Leakage		(L) M S	C
Sill			
Side Seal	Abrasion-Max	Left: – mm, Right: – mm	RS
Roller Truck	Abrasion-Max	Left: – mm, Right: – mm	RL
Roller Guard	Missing	Left 0 Right 1	N
	Defect	Left 1 Right 0	N
Sill Beam	Abrasion	L M (S)	RS
Concrete	Damage-Left	L (M) S	RS
	Damage-Right	L (M) S	RS
	Damage-Bottom	L (M) S	RS

Survey Item		Survey Result	Judge
Hoisting Device			
Wire Rope	Main-Left	y: – Distortion: – Corrosion: – Oil: –	C
	Main-Right	y: – Distortion: – Corrosion: – Oil: –	G
	Roller Train-L	Broken	C
	Roller Train-R	y: – Distortion: – Corrosion: – Oil: –	C
Drum	Left	Damage: – Function: –	RS
	Right	Damage: – Function: –	↑
Bearing	Drum	Damage: – Oil: –	↓
	Counter Shaft	Damage: – Oil: –	RS
	Reduction Gear	Damage: – Oil: –	C
Gear	Drum Gear-L	Damage: – Fitting: – Backlash: – Oil: –	RS
	Drum Pinion-L	Damage: –	↑
	Drum Gear-R	Damage: – Fitting: – Backlash: – Oil: –	
	Drum Pinion-R	Damage: –	
	Gear-Middle	Damage: – Fitting: – Backlash: – Oil: –	
	Pinion-Middle	Damage: –	
Basement	Drum-L	Damage: – Corrosion: L M (S)	
	Drum-R	Damage: – Corrosion: L M (S)	↓
	Drive Device	Damage: – Corrosion: L (M) S	RS
Drive Chain		Damage: – Looseness: – Oil: –	C
Chain Sprocket		Damage: – Corrosion: L (M) S	↑
Reduction Gear		Damage: – Corrosion: L (M) S	
Cover	Drum-L	Damage: – Corrosion: L M (S)	
	Drum-R	Damage: – Corrosion: L M (S)	↓
	Gear-Middle	Damage: – Corrosion: L (M) S	C
Counter Shaft		Damage: – Corrosion: L M S	G
Counter Weight		Damage: – Corrosion: L M S	RS
Hoisting Torque	Wet Condition	66.6 kg-m	RL
	Dry Condition	11.7 kg-m	RS
Superstructure		Damage: – Corrosion: L M (S)	RS

Photograph





Remarks: Judgement = N: Totally Replace, C: Partly Replace, RL: Large Repair, RM: Medium Repair, RS: Small Repair, G: No Repair, -: No Data.

( ) shows design dimension.

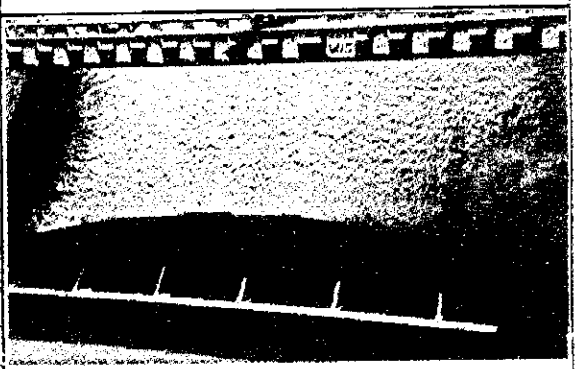
Survey Results of Gate Structure

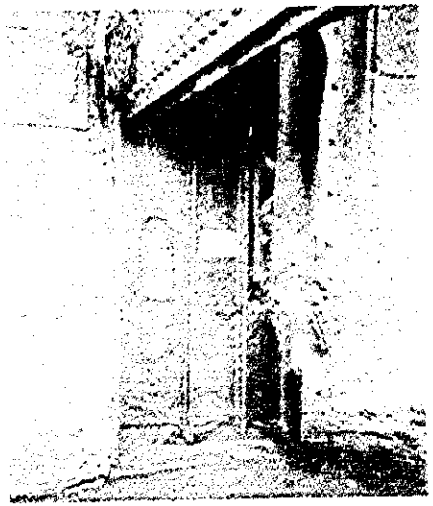
Gate No. W15 (Main Weir Gate)

Survey Item		Survey Result	Judge
Gate Leaf			
Skin Plate	Thickness-Avg	Top – Mid – Low – Btm 9.5 (9.5mm)	G
	Corrosion	U/S-Bottom L M S	–
	Damage-Rivet	Corner-L – Corner-R –	–
Truss	Thickness-Avg	Bottom Flange 18.7, Bottom Web 18.5 (19.1mm)	G
	Distortion		–
End Girder	Thickness-Avg	L-Bottom 10.2, R-Bottom 10.2 (11.1mm)	C
	Remodeling	Left No Right No	↑
	Distortion	Left – Right –	
Bottom Girder	Thickness-Avg	Flange 14.6 mm (16.3), Web 8.9 mm (9.4)	
	Corrosion	L (M) S	
Rocker Assembly	Remodeling	Left No Right No	
	Distortion	Left – Right –	
	Others	No Function	
Roller Train	Missing	Left – Right –	
	Diameter-Roller	Average – mm	
	Distortion	Left – Right –	
Seal	Left	–	
	Bottom	–	
	Right	–	
Inclination		Top Level Difference 40 mm	↓
Leakage		(L) M S	C
Sill			
Side Seal	Abrasion-Max	Left: – mm, Right: – mm	RS
Roller Truck	Abrasion-Max	Left: – mm, Right: – mm	RL
Roller Guard	Missing	Left 0 Right 0	N
	Defect	Left 1 Right 0	N
Sill Beam	Abrasion	L M S	–
Concrete	Damage-Left	L M (S)	RS
	Damage-Right	L (M) S	RS
	Damage-Bottom	L (M) S	RS

Survey Item		Survey Result	Judge
Hoisting Device			
Wire Rope	Main-Left	y: – Distortion: – Corrosion: – Oil: –	G
	Main-Right	y: – Distortion: – Corrosion: – Oil: –	G
	Roller Train-L	y: – Distortion: – Corrosion: – Oil: –	C
	Roller Train-R	y: – Distortion: – Corrosion: – Oil: –	C
Drum	Left	Damage: – Function: –	RS
	Right	Damage: – Function: –	↑
Bearing	Drum	Damage: – Oil: –	↓
	Counter Shaft	Damage: – Oil: –	RS
	Reduction Gear	Damage: – Oil: –	C
Gear	Drum Gear-L	Damage: – Fitting: – Backlash: – Oil: –	RS
	Drum Pinion-L	Damage: –	↑
	Drum Gear-R	Damage: – Fitting: – Backlash: – Oil: –	
	Drum Pinion-R	Damage: –	
	Gear-Middle	Damage: – Fitting: – Backlash: – Oil: –	
	Pinion-Middle	Damage: –	
Basement	Drum-L	Damage: – Corrosion: L M (S)	
	Drum-R	Damage: – Corrosion: L M (S)	↓
	Drive Device	Damage: – Corrosion: L (M) S	RS
Drive Chain		Damage: – Looseness: – Oil: –	C
Chain Sprocket		Damage: – Corrosion: L (M) S	↑
Reduction Gear		Damage: – Corrosion: L (M) S	
Cover	Drum-L	Damage: – Corrosion: L M (S)	
	Drum-R	Damage: – Corrosion: L M (S)	↓
	Gear-Middle	Damage: – Corrosion: L (M) S	C
Counter Shaft		Damage: – Corrosion: L M S	G
Counter Weight		Damage: – Corrosion: L M S	RS
Hoisting Torque	Wet Condition	54.4 kg-m	RL
	Dry Condition	5.9 kg-m	RS
Superstructure		Damage: – Corrosion: L M (S)	RS

Photograph





Remarks: Judgement = N: Totally Replace, C: Partly Replace, RL: Large Repair, RM: Medium Repair, RS: Small Repair, G: No Repair, -: No Data.

( ) shows design dimension.

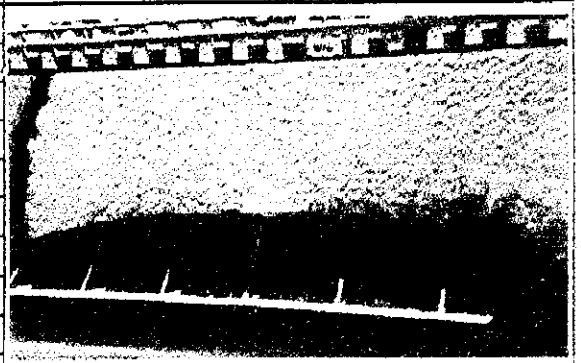
Survey Results of Gate Structure

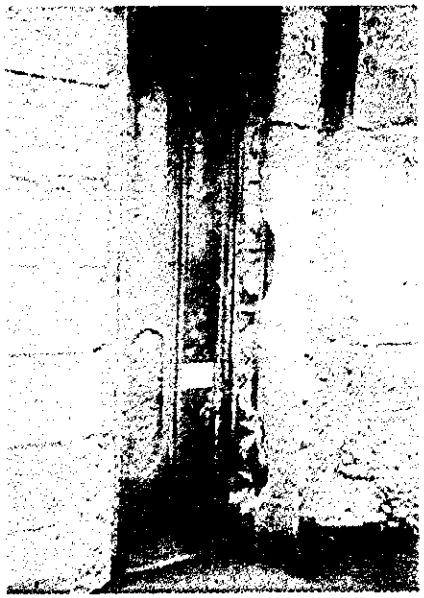
Gate No. W16 (Main Weir Gate)

Survey Item			Survey Result	Judge
Gate Leaf				
	Skin Plate	Thickness-Avg	Top – Mid – Low – Btm 8.8 (9.5mm)	G
		Corrosion	U/S-Bottom L M S	—
		Damage-Rivet	Corner-L – Corner-R –	—
	Truss	Thickness-Avg	Bottom Flange 18.8 , Bottom Web 18.5 (19.1mm)	G
		Distortion		—
	End Girder	Thickness-Avg	L-Bottom 10.2, R-Bottom 10.3 (11.1mm)	C
		Remodeling	Left No Right No	↑
		Distortion	Left – Right –	
	Bottom Girder	Thickness-Avg	Flange 14.4 mm (16.3), Web 8.6 mm (9.4)	
		Corrosion	L (M) S	
	Rocker Assembly	Remodeling	Left No Right No	
		Distortion	Left 0.5 m Broken Right 1.5 m Heavy Ab.	
		Others	No Function	
	Roller Train	Missing	Left 1 Right 2	
		Diameter-Roller	Average – mm	
		Distorion	Left – Right –	
	Seal	Left	–	
		Bottom	–	
		Right	–	
	Inclination		Top Level Difference 10 mm	↓
Leakage			(L) M S	C
Sill				
	Side Seal	Abrasion-Max	Left: – mm, Right: – mm	RS
	Roller Truck	Abrasion-Max	Left: – mm, Right: – mm	RL
	Roller Guard	Missing	Left 0 Right 0	N
		Defect	Left 2 Right 0	N
	Sill Beam	Abrasion	L M S	—
	Concrete	Damage-Left	L M (S)	RS
		Damage-Right	L (M) S	RS
		Damage-Bottom	(L) M S	RS

Survey Item			Survey Result	Judge
Hoisting Device				
	Wire Rope	Main-Left	y: – Distortion: – Corrosion: – Oil: –	G
		Main-Right	y: – Distortion: – Corrosion: – Oil: –	G
		Roller Train-L	Broken	C
		Roller Train-R	y: – Distortion: – Corrosion: – Oil: –	C
	Drum	Left	Damage: – Function: –	RS
		Right	Damage: – Function: –	↑
	Bearing	Drum	Damage: – Oil: –	↓
		Counter Shaft	Damage: – Oil: –	RS
		Reduction Gear	Damage: – Oil: –	C
	Gear	Drum Gear-L	Damage: – Fitting: 100% Backlash: 1.0 mm	RS
		Drum Pinion-L	Damage: –	↑
		Drum Gear-R	Damage: – Fitting: – Backlash: – Oil: –	
		Drum Pinion-R	Damage: –	
		Gear-Middle	Damage: – Fitting: – Backlash: – Oil: –	
		Pinion-Middle	Damage: –	
	Basement	Drum-L	Damage: – Corrosion: L M (S)	
		Drum-R	Damage: – Corrosion: L M (S)	↓
		Drive Device	Damage: – Corrosion: L (M) S	RS
Drive Chain			Damage: – Looseness: – Oil: –	C
Chain Sprocket			Damage: – Corrosion: L (M) S	↑
Reduction Gear			Damage: – Corrosion: L (M) S	
	Cover	Drum-L	Damage: – Corrosion: L M (S)	
		Drum-R	Damage: – Corrosion: L M (S)	↓
		Gear-Middle	Damage: – Corrosion: L (M) S	C
Counter Shaft			Damage: – Corrosion: L M S	G
Counter Weight			Damage: – Corrosion: L M S	RS
	Hoisting Torque	Wet Condition	59.5 kg·m	RL
		Dry Condition	7.8 kg·m	RS
Superstructure			Damage: – Corrosion: L M (S)	RS

Photograph





Remarks: Judgement = N: Totally Replace, C: Partly Replace, RL: Large Repair, RM: Medium Repair, RS: Small Repair, G: No Repair, -: No Data.

( ) shows design dimension.

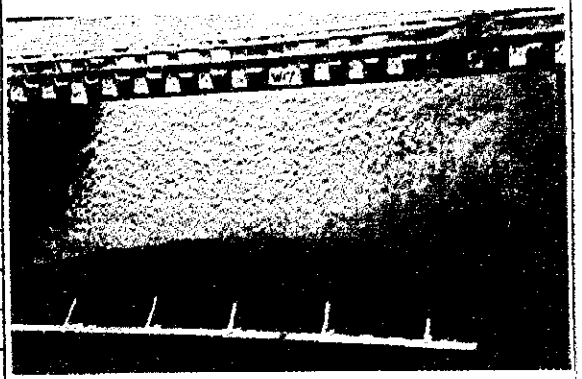
Survey Results of Gate Structure

Gate No. W17 (Main Weir Gate)

Survey Item		Survey Result	Judge
Gate Leaf			
Skin Plate	Thickness-Avg	Top – Mid – Low – Btm 8.5 (9.5mm)	G
	Corrosion	U/S–Bottom L M S	—
	Damage-Rivet	Corner-L – Corner-R –	—
Truss	Thickness-Avg	Bottom Flange 18.4, Bottom Web 18.4 (19.1mm)	G
	Distortion	Vertical Truss 20 mm (L4,Top)	RS
End Girder	Thickness-Avg	L–Bottom 9.6, R–Bottom 9.6 (11.1mm)	—
	Remodeling	Left No Right No	C
	Distortion	Left – Right –	↑
Bottom Girder	Thickness-Avg	Flange 14.6 mm (16.3), Web 8.7 mm (9.4)	
	Corrosion	L (M) S	
Rocker Assembly	Remodeling	Left No Right No	
	Distortion	Left – Right –	
	Others	No Function	
Roller Train	Missing	Left 3 Right 1	
	Diameter-Roller	Average – mm	
	Distortion	Left – Right –	
Seal	Left	–	
	Bottom	–	
	Right	–	
Inclination		Top Level Difference 30 mm	↓
Leakage		(L) M S	C
Sill			
Side Seal	Abrasion-Max	Left: – mm, Right: – mm	RS
Roller Truck	Abrasion-Max	Left: – mm, Right: – mm	RL
Roller Guard	Missing	Left 1 Right 0	N
	Defect	Left 0 Right 0	N
Sill Beam	Abrasion	L M S	—
Concrete	Damage-Left	L (M) S	RS
	Damage-Right	L (M) S	RS
	Damage-Bottom	(L) M S	RS

Survey Item		Survey Result	Judge
Hoisting Device			
Wire Rope	Main-Left	y: – Distortion: – Corrosion: – Oil: –	G
	Main-Right	y: – Distortion: – Corrosion: – Oil: –	G
	Roller Train-L	y: – Distortion: – Corrosion: – Oil: –	C
	Roller Train-R	y: – Distortion: – Corrosion: – Oil: –	C
Drum	Left	Damage: – Function: –	RS
	Right	Damage: – Function: Miss Alignment	↑
Bearing	Drum	Damage: – Oil: –	↓
	Counter Shaft	Damage: – Oil: –	RS
	Reduction Gear	Damage: – Oil: –	C
Gear	Drum Gear-L	Damage: – Fitting: – Backlash: – Oil: –	RS
	Drum Pinion-L	Damage: –	↑
	Drum Gear-R	Damage: – Fitting: – Backlash: – Oil: –	
	Drum Pinion-R	Damage: –	
	Gear-Middle	Damage: – Fitting: – Backlash: – Oil: –	
	Pinion-Middle	Damage: –	
Basement	Drum-L	Damage: – Corrosion: L M (S)	
	Drum-R	Damage: – Corrosion: L M (S)	↓
	Drive Device	Damage: – Corrosion: L (M) S	RS
Drive Chain		Damage: – Looseness: L Oil: –	C
Chain Sprocket		Damage: – Corrosion: L (M) S	↑
Reduction Gear		Damage: – Corrosion: L (M) S	
Cover	Drum-L	Damage: – Corrosion: L M (S)	
	Drum-R	Damage: – Corrosion: L M (S)	↓
	Gear-Middle	Damage: – Corrosion: L (M) S	C
Counter Shaft		Damage: – Corrosion: L M S	G
Counter Weight		Damage: – Corrosion: L M S	RS
Hoisting Torque	Wet Condition	52.5 kg·m	RL
	Dry Condition	5.9 kg·m	RS
Superstructure		Damage: – Corrosion: L M (S)	RS

Photograph



Remarks: Judgement = N: Totally Replace, C: Partly Replace, RL: Large Repair, RM: Medium Repair, RS: Small Repair, G: No Repair, -: No Data.

( ) shows design dimension.

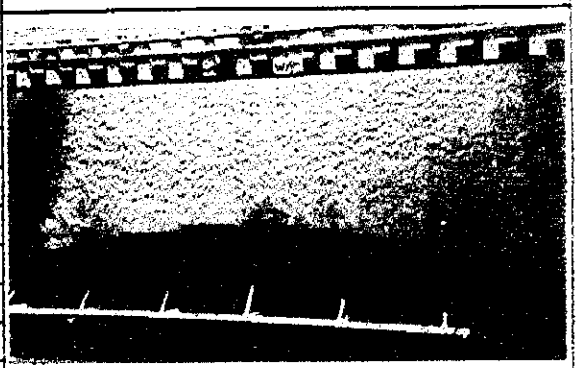
Survey Results of Gate Structure

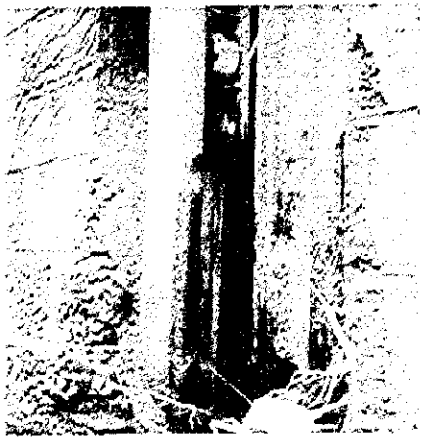
Gate No. W18 (Main Weir Gate)

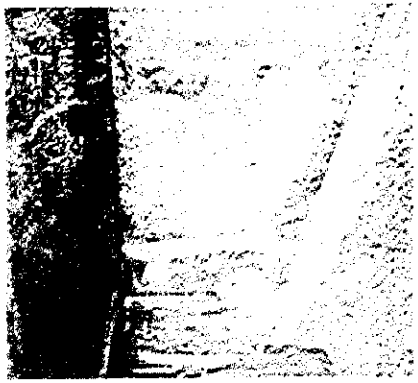
Survey Item		Survey Result	Judge
Gate Leaf			
Skin Plate	Thickness-Avg	Top – Mid – Low – Btm 8.9 (9.5mm)	G
	Corrosion	U/S-Bottom L M S	—
	Damage-Rivet	Corner-L – Corner-R –	—
Truss	Thickness-Avg	Bottom Flange 18.9, Bottom Web 18.4 (19.1mm)	G
	Distortion		—
End Girder	Thickness-Avg	L-Bottom 9.2, R-Bottom 10.1 (11.1mm)	C
	Remodeling	Left No Right No	↑
	Distortion	Left – Right –	
Bottom Girder	Thickness-Avg	Flange15.0 mm (16.3), Web 8.8 mm (9.4)	
	Corrosion	L (M) S	
Rocker Assembly	Remodeling	Left No Right No	
	Distortion	Left – Right –	
	Others	No Function	
Roller Train	Missing	Left 1 Right 2	
	Diameter-Roller	Average – mm	
	Distortion	Left – Right –	
Seal	Left	–	
	Bottom	–	
	Right	–	
Inclination		Top Level Difference 15 mm	↓
Leakage		(L) M S	C
Sill			
Side Seal	Abrasion-Max	Left: – mm, Right: – mm	RS
Roller Truck	Abrasion-Max	Left: – mm, Right: – mm	RL
Roller Guard	Missing	Left 0 Right 0	N
	Defect	Left 0 Right 0	N
Sill Beam	Abrasion	L M S	—
Concrete	Damage-Left	(L) M S	RS
	Damage-Right	(L) M S	RS
	Damage-Bottom	(L) M S	RS

Survey Item		Survey Result	Judge
Hoisting Device			
Wire Rope	Main-Left	y: – Distortion: – Corrosion: – Oil: –	G
	Main-Right	y: – Distortion: – Corrosion: – Oil: –	G
	Roller Train-L	y: – Distortion: – Corrosion: – Oil: –	C
	Roller Train-R	y: – Distortion: – Corrosion: – Oil: –	C
Drum	Left	Damage: – Function: –	RS
	Right	Damage: – Function: –	↑
Bearing	Drum	Damage: – Oil: –	↓
	Counter Shaft	Damage: – Oil: –	RS
	Reduction Gear	Damage: – Oil: –	C
Gear	Drum Gear-L	Damage: – Fitting: – Backlash: – Oil: –	RS
	Drum Pinion-L	Damage: –	↑
	Drum Gear-R	Damage: – Fitting: – Backlash: – Oil: –	
	Drum Pinion-R	Damage: –	
	Gear-Middle	Damage: – Fitting: – Backlash: – Oil: –	
	Pinion-Middle	Damage: –	
Basement	Drum-L	Damage: – Corrosion: L M (S)	
	Drum-R	Damage: – Corrosion: L M (S)	↓
	Drive Device	Damage: – Corrosion: L (M) S	RS
Drive Chain		Damage: – Looseness: – Oil: –	C
Chain Sprocket		Damage: – Corrosion: L (M) S	↑
Reduction Gear		Damage: – Corrosion: L (M) S	
Cover	Drum-L	Damage: – Corrosion: L M (S)	
	Drum-R	Damage: – Corrosion: L M (S)	↓
	Gear-Middle	Damage: – Corrosion: L (M) S	C
Counter Shaft		Damage: – Corrosion: L M S	G
Counter Weight		Damage: – Corrosion: L M S	RS
Hoisting Torque	Wet Condition	63 kg-m	RL
	Dry Condition	5.9 kg-m	RS
Superstructure		Damage: – Corrosion: L M (S)	RS

Photograph







Remarks: Judgement = N: Totally Replace, C: Partly Replace, RL: Large Repair, RM: Medium Repair, RS: Small Repair, G: No Repair, -: No Data.

( ) shows design dimension.