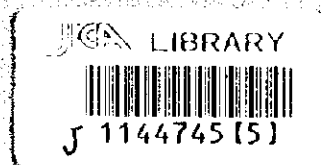


**FEASIBILITY STUDY  
ON  
TAUNSA BARRAGE IRRIGATION SYSTEM REHABILITATION  
IN  
THE ISLAMIC REPUBLIC OF PAKISTAN**

**ANNEX**

**August 1988**



**Nippon Giken Inc.**

A F A
J R
88-56







1144745 (5)

**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.**

# ***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

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A.2	GATE INSPECTION .....	A - 1
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## **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

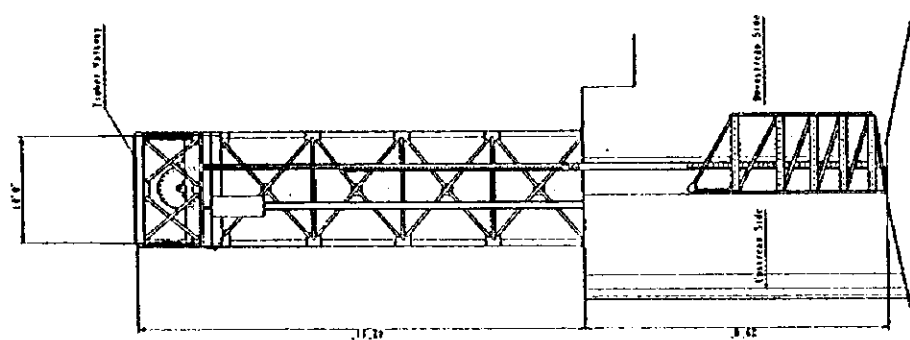
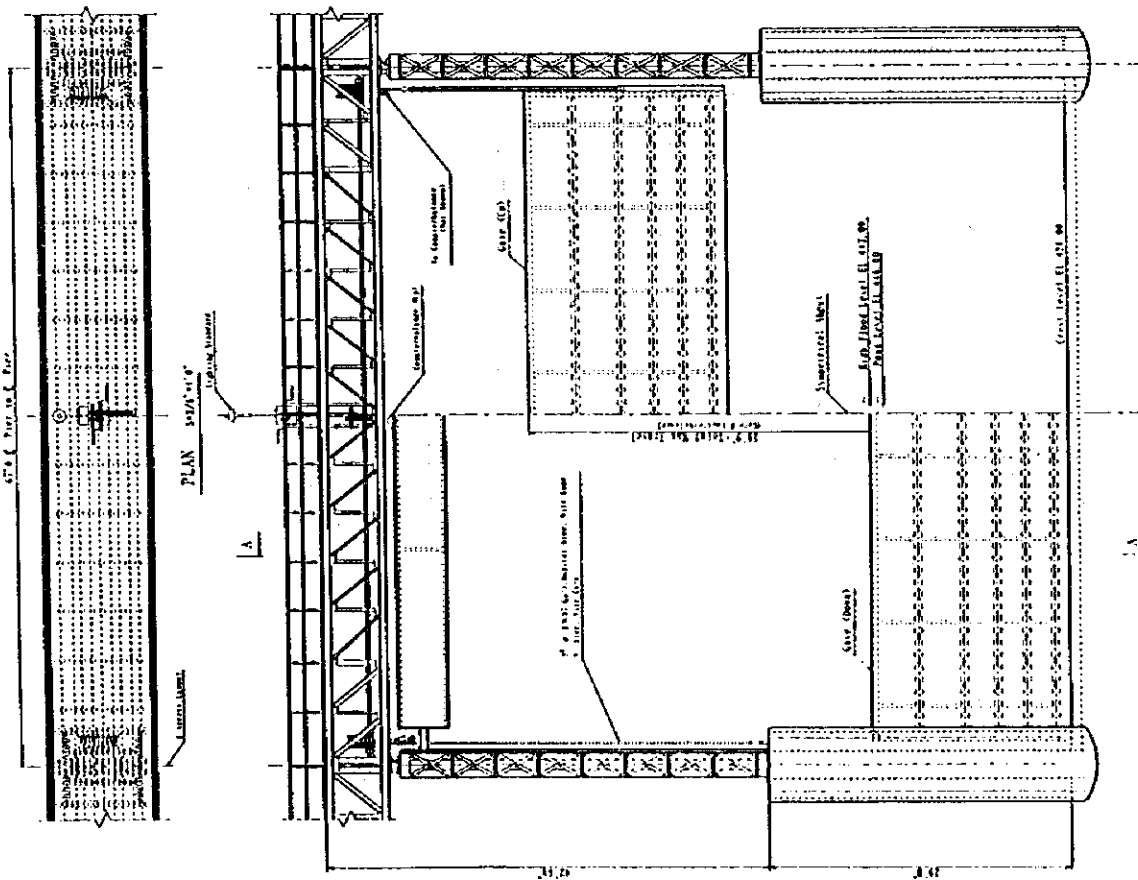
Gate structure investigation during survey period was conducted applying an inventory with important items. Result of the investigation is summarized in Table A.2.1, in which magnitude of inadequacy or damage was quantified into five classes, namely, *0-Not Damaged*, *1-Slightly Damaged*, *2-Partly Damaged*, *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.

67.8 (1) Part 10 C Part



# Drawing-1

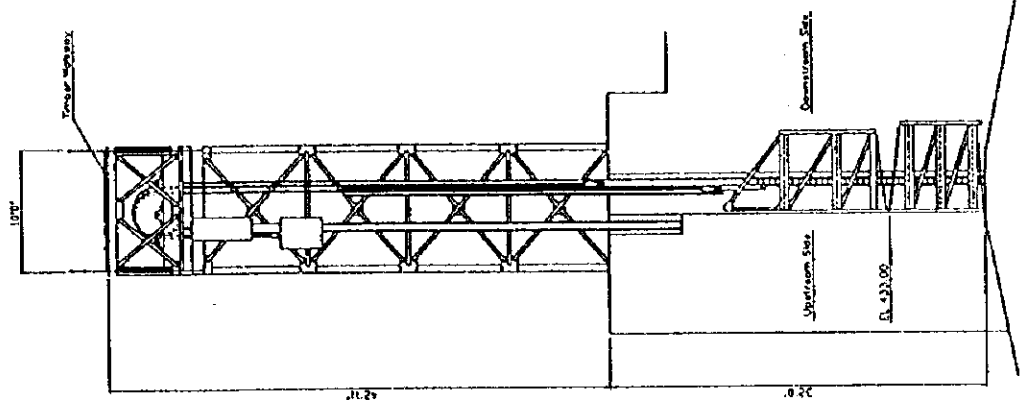
TAJNSA BARRAGE IRRIGATION SYSTEM REHABILITATION PROJECT
MAIN WEIR GATES-GENERAL
ASSEMBLY-TAJNSA BARRAGE
JAPAN INTERNATIONAL COOPERATION (JICA)

SECTION A-A 1/400

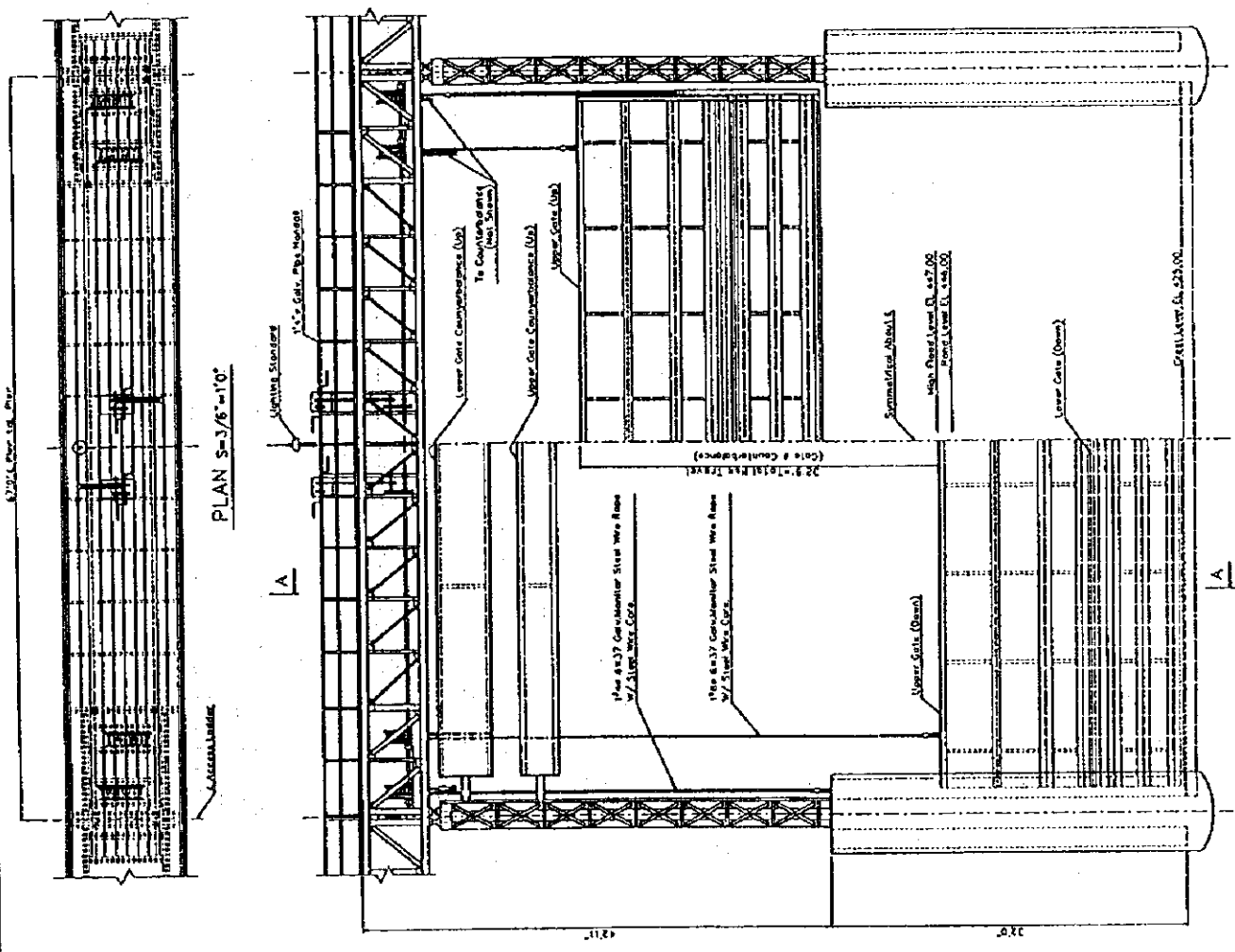
FRONT ELEVATION 1/400

Drawing-2

TAUNSA BARRAGE ARRIGATION SYSTEM  
 REHABILITATION PROJECT  
 UNDER SLUICE GATES—GENERAL  
 ASSEMBLY—TAUNSA BARRAGE  
 JAPAN INTERNATIONAL COOPERATION AGENCY



SECTION A - A, S=3/8"=1'0"



FRONT ELEVATION

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	0
		ROLLER ASSEMBLY(L)	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	0	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	0
2	DRUM	LEFT SIDE	0	2	0	1	2	0	0	0	0	0	2	0	0	0	2	0	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	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	0
		IN REDUCER	0	0	0	0	0	0	0	0	0	0	0	3	0	3	0	0	0	0	0	0	0
4	DRUM GEAR	GEAR(L)	0	2	0	0	2	0	0	0	0	0	1	0	2	0	2	0	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	0
		PINION(L)	0	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	0
5	CENTER GEAR	GEAR	1	1	1	1	1	1	1	1	1	1	2	1	1	1	1	3	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	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	0
		RIGHT SIDE	0	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	2
7	CHAIN	0	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	0	
10	CHAIN SPROCKET	0	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	0
		IN REDUCER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	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	0	
13	COUNTER WEIGHT	0	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	0	
15	SUPERSTRUCTURE	0	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: Uncontrollable, -: 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	MADN(L)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
		MADN(R)	0	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	0
		ROLLER ASSEMBLY(R)	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
2	DRUM	LEFT SIDE	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	0	1	0	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	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: Uncontrollable, -: 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	
		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	1	1	0	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	
		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: Uncontrollable, -: Not Inspected  
 \*: W - Weir



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

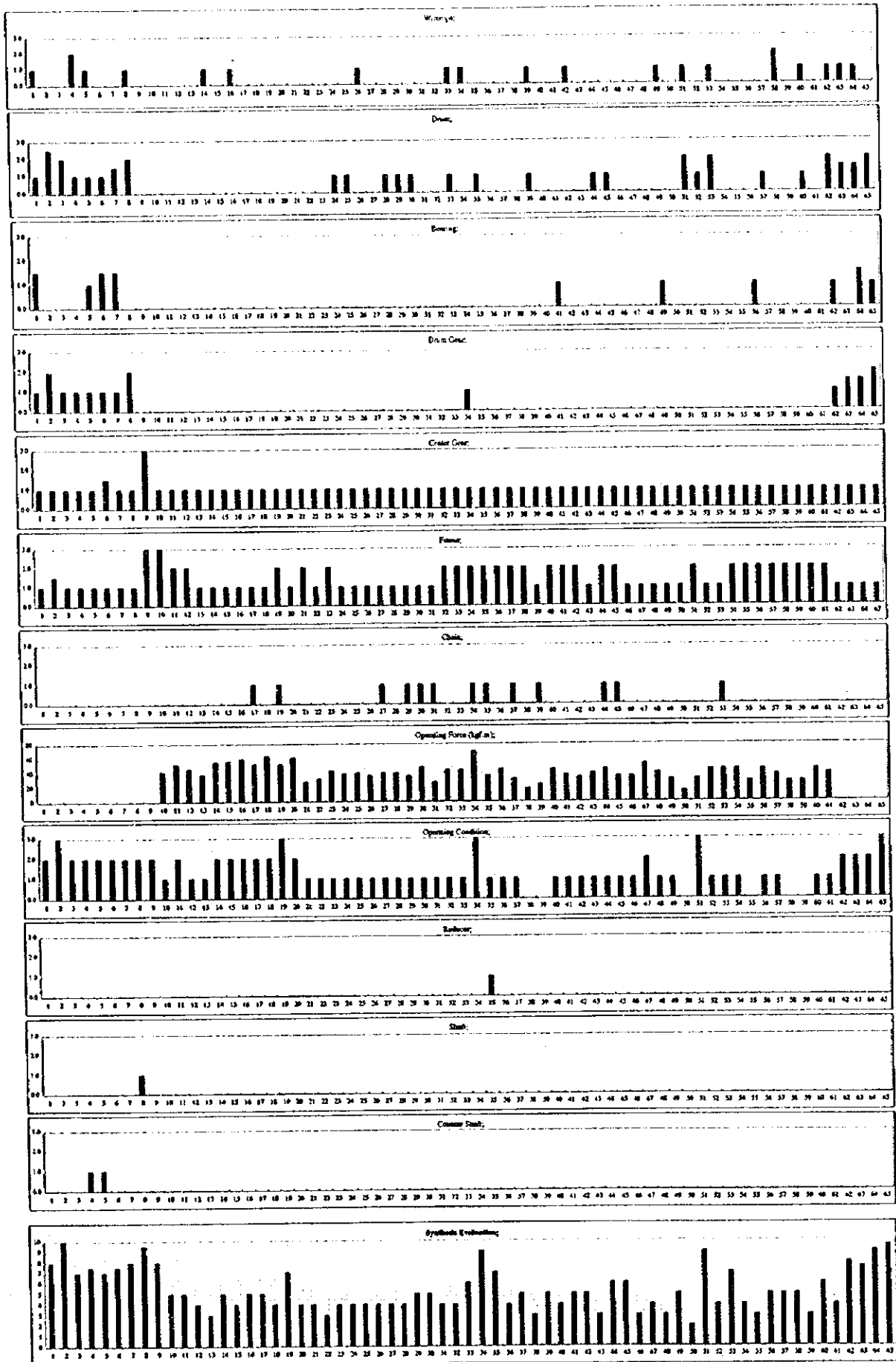
PARTS NAME		GATE NAME *	W53	W54	W55	W56	W57	W58	W59	W60	W61	U62U	U62L	U63U	U63L	U64U	U64L	U65U	U65L	
1	WIRE ROPE	MAIN(L)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		MAIN(R)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		ROLLER ASSEMBLY(L)	1	0	0	0	0	1	0	1	0	0	0	0	1	0	0	1	0	0
		ROLLER ASSEMBLY(R)	0	0	0	0	0	1	0	0	0	0	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	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(kg·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		
		FOR DRUM(R)	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		
12	COUNTER SHAFT	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			
14	GUIDE FOR COUNTER WEIGHT	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			
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: Uncontrollable, -: Not Inspected  
 \*: U - Under-Stuice, 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	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	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	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	
		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	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
		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	0
		CENTER BLOCK	0	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	0	
8	OPERATING FORCE(kgf-m)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	OPERATING CONDITION	0	0	0	0	1	0	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	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	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	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	0	2	3	3	4	2	1	1	0	2	2	0	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 Canal, T - T.P.Link Canal



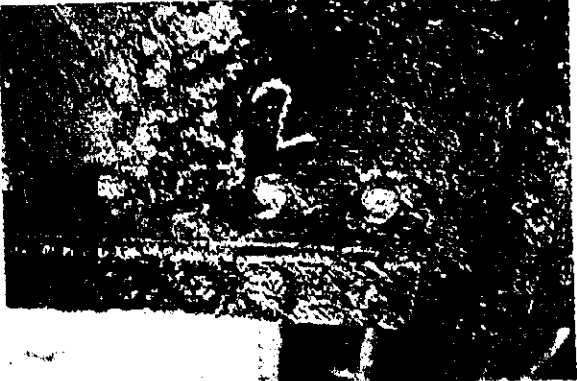





Figures in horizontal axis are number of gates from left side to right side.

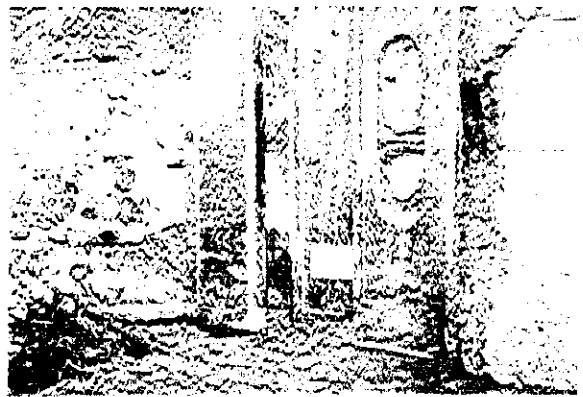
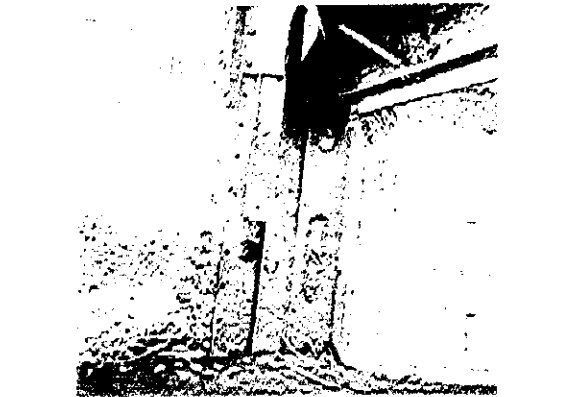



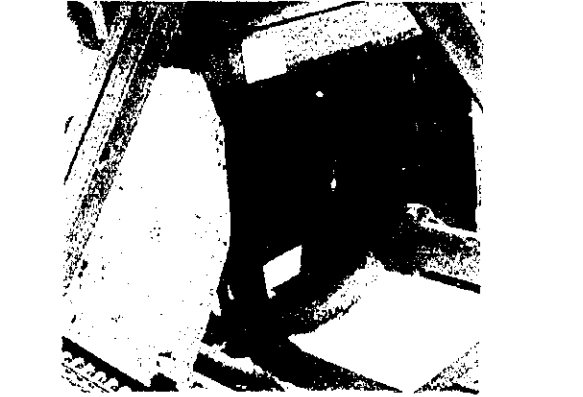


Fig A2.1 Result of Inspection on Hoisting Devices

### ***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	 A black and white photograph showing a person standing on a horizontal metal skin plate. The surface of the plate is heavily corroded and pitted. The background is dark and indistinct.	 A black and white photograph showing a close-up of a metal skin plate with significant surface corrosion and pitting. The texture is rough and uneven.	 A black and white photograph showing a metal skin plate with corrosion. A vertical structural member is visible on the right side of the frame.
Bottom Girder corrosion	 A black and white photograph showing a bottom girder with a white rectangular marker placed on its surface to indicate the location of corrosion. The girder is surrounded by a dark, possibly wet, environment.	 A black and white photograph showing a close-up of a bottom girder with visible corrosion and a white marker.	 A black and white photograph showing a bottom girder with corrosion. A horizontal structural member is visible above the girder.
Sill Beam Abrasion	 A black and white photograph showing a close-up of a sill beam with significant surface abrasion and a rough, textured appearance.	 A black and white photograph showing a close-up of a sill beam with abrasion. A vertical structural member is visible on the right side.	 A black and white photograph showing a close-up of a sill beam with abrasion. A horizontal structural member is visible above the beam.

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

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GATE NO. 12  
CENTRAL  
CORROSION

TAINCA DAMPING  
GATE NO 12  
CENTER BEAR  
FRAME

Survey Results of Gate Structure

Gate No. U1U (Upper Undersluice Gate)

Survey Item		Survey Result	Judge	Survey Item	Survey Result	Judge	Photograph	
<b>Gate Leaf</b>				<b>Hoisting Device</b>				
Skin Plate	Thickness-Avg	Top 9.9 Mid 9.9 Low 10.1 Btm 10.0 (9.5mm)	N	Wire Rope	Main-Left	∅: Distortion: - Corrosion: - Oil: -		G
	Corrosion	U/S-Bottom L M ⊙	↑		Main-Right	∅: Distortion: - Corrosion: - Oil: -		G
Damage-Rivet	Corner-L	-		Roller Train-L	Broken	N		
	Corner-R	-		Roller Train-R	∅: Distortion: - Corrosion: - Oil: -	N		
Truss	Thickness-Avg	Bottom Flange 18.5, Bottom Web 18.9 (19.1mm)		Drum	Left	Damage: miss Alignment Function:		RS
	Distortion	25 mm (T3-R7)			Right	Damage: - Function:		↑
End Girder	Thickness-Avg	L-Bottom 12.7, R-Bottom 12.5 (12.7mm)		Bearing	Drum	Damage: - Oil: -		↓
	Remodeling	Left No Right No			Counter Shaft	Damage: - Oil: -		RS
	Distortion	Left - Right -			Reduction Gear	Damage: - Oil: -		C
Bottom	Thickness-Avg	Flange 11.5 mm (16.3), Web 9.5 mm (9.4)		Gear	Drum Gear-L	Damage: - Fitting: - Backlash: - Oil: -		RS
	Corrosion	⊙ M S			Drum Pinion-L	Damage: -		↑
Rocker	Remodeling	Left No Right No			Drum Gear-R	Damage: - Fitting: - Backlash: - Oil: -		
	Distortion	Left - Right -			Drum Pinion-R	Damage: -		
Assembly	Others	No Function			Gear-Middle	Damage: - Fitting: - Backlash: - Oil: -		
	Roller Train	Missing Left 0 Right 0			Pinion-Middle	Damage: -		
Seal	Diameter-Roller	Average 152.2 mm		Basement	Drum-L	Damage: - Corrosion: L M ⊙		
	Distortion	Left - Right -			Drum-R	Damage: - Corrosion: L M ⊙		↓
	Left	2.0 m Broken			Drive Device	Damage: - Corrosion: L ⊙ S		RS
Inclination	Bottom	Good		Drive Chain	Damage: - Looseness: - Oil: -	C		
	Right	1.5 m Broken		Chain Sprocket	Damage: - Corrosion: L ⊙ S	↑		
Leakage	Top Level Difference - mm		↓	Reduction Gear	Damage: - Corrosion: L ⊙ S			
Sill	Cover	L M ⊙	N	Cover	Drum-L	Damage: - Corrosion: L M ⊙		↓
	Side Seal	Abrasion-Max Left: - mm, Right: - mm	RS		Drum-R	Damage: - Corrosion: L M ⊙		
	Roller Truck	Abrasion-Max Left: 6 mm, Right: 6 mm	N		Gear-Middle	Damage: - Corrosion: L ⊙ S		C
Roller Guard	Counter Shaft	Missing Left 0 Right 0	N	Counter Shaft	Damage: - Corrosion: L M S	G		
	Defect	Left 0 Right 0	N	Counter Weight	Damage: - Corrosion: L M S	G		
Sill Beam	Hoisting	Abrasion L M S		Hoisting	Wet Condition - kg-m	-		
	Concrete	Damage-Left L M S		Torque	Dry Condition 0.8 kg-m	G		
	Damage-Right	L M S		Superstructure	Damage: - Corrosion: L M ⊙	RS		
Damage-Bottom	L M S							

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

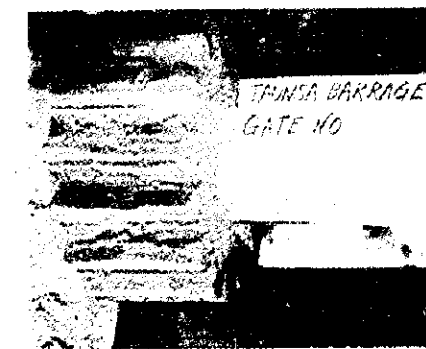
( ) shows design dimension.

Survey Results of Gate Structure

(2/96)

Gate No. U1L (Lower Undersluice Gate)

Survey Item		Survey Result	Judge	Survey Item	Survey Result	Judge	Photograph	
<b>Gate Leaf</b>				<b>Hoisting Device</b>				
Skin Plate	Thickness-Avg	Top 9.7 Mid 9.8 Low 9.2 Bim 9.2 (9.5mm)	N	Wire Rope	Main-Left	y: Distortion: - Corrosion: - Oil: -		G
	Corrosion	U/S-Bottom (L) M S	↑		Main-Right	y: Distortion: - Corrosion: - Oil: -		G
	Damage-Rivet	Corner-L 2 mm Corner-R 7 mm			Roller Train-L	y: Distortion: - Corrosion: - Oil: -	N	
Truss	Thickness-Avg	Bottom Flange 21.3, Bottom Web 19.8 (22.2mm)			Roller Train-R	y: Distortion: - Corrosion: - Oil: -	N	
	Distortion			Drum	Left	Damage: - Function:	RS	
End Girder	Thickness-Avg	L-Bottom 10.9, R-Bottom 10.7 (12.7mm)			Right	Damage: - Function:	RS	
	Remodeling	Left No Right No		Bearing	Drum	Damage: Right gide Broken Oil: -	C	
	Distortion	Left - Right -			Counter Shaft	Damage: - Oil: -	RS	
Bottom	Thickness-Avg	Flange 14.0 mm (16.0), Web 8.3 mm (9.7)			Reduction Gear	Damage: - Oil: -	C	
	Corrosion	L (M) S		Gear	Drum Gear-L	Damage: - Fitting: 7 0 % Backlash: - Oil: -	RS	
Rocker	Remodeling	Left No Right No			Drum Pinion-L	Damage: L (Miss Alignment)	↑	
	Assembly	Distortion	Left 2 m Ab. Right 2.5 m Ab.			Drum Gear-R	Damage: - Fitting: - Backlash: - Oil: -	
Others		No Function			Drum Pinion-R	Damage: -		
Roller Train	Missing	Left 2 Right 2			Gear-Middle	Damage: - Fitting: 7 0 % Backlash: - Oil: -		
	Diameter-Roller	Average 150.2 mm		Pinion-Middle	Damage: L (Miss Alignment)			
	Distortion	Left - Right -		Basement	Drum-L	Damage: - Corrosion: L M (S)		
Seal	Left	Lost			Drum-R	Damage: - Corrosion: L M (S)	↓	
	Bottom	Lost			Drive Device	Damage: - Corrosion: L (M) S	RS	
	Right	Lost		Drive Chain		Damage: - Looseness: - Oil: -	C	
Inclination	Top Level Difference - mm	↓	Chain Sprocket		Damage: - Corrosion: L (M) S	↑		
Leakage		(L) M S	N	Reduction Gear	Damage: - Corrosion: L (M) S			
<b>Sill</b>				Cover	Drum-L	Damage: - Corrosion: L M (S)	↓	
Side Seal	Abrasion-Max	Left: - mm, Right: - mm	RS		Drum-R	Damage: - Corrosion: L M (S)	↓	
	Roller Truck	Abrasion-Max	Left: 16 mm, Right: 14 mm		RL	Gear-Middle	Damage: - Corrosion: L (M) S	C
Roller Guard	Missing	Left 0 Right 1	N	Counter Shaft	Damage: - Corrosion: L M S	G		
	Defect	Left 0 Right 0	N	Counter Weight	Damage: - Corrosion: L M S	G		
Sill Beam	Abrasion	L M S	-	Hoisting	Wet Condition	- kg-m	-	
Concrete	Damage-Left	L M S	-		Dry Condition	10.9 kg-m	RS	
	Damage-Right	L M S	-	Superstructure		Damage: - Corrosion: L M (S)	RS	
	Damage-Bottom	L M S	-					



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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	Survey Item	Survey Result	Judge	Photograph		
<b>Gate Leaf</b>				<b>Hoisting Device</b>					
Skin Plate	Thickness-Avg	Top 10.1 Mid 10.1 Low 10.0 Bim 9.7 (9.5mm)	N	Wire Rope	Main-Left	φ 41.9 Distortion: - Corrosion: - Oil: -		G	
	Corrosion	U/S-Bottom L M S	↑		Main-Right	φ 42.5 Distortion: - Corrosion: - Oil: -		G	
Damage-Rivet	Corner-L - Corner-R -		Roller Train-L		γ: - Distortion: - Corrosion: - Oil: -	N			
Truss	Thickness-Avg	Bottom Flange 18.5, Bottom Web 18.9 (19.1mm)			Roller Train-R	γ: - Distortion: - Corrosion: - Oil: -		N	
	Distortion	10 mm (T3-R10)		Drum	Left	Damage: - Function: -		RS	
End Girder	Thickness-Avg	L-Bottom 12.9, R-Bottom 12.8 (12.7mm)			Right	Damage: - Function: Touching to Frame		↑	
	Remodeling	Left No Right No		Bearing	Drum	Damage: - Oil: -		↓	
	Distortion	Left No Right No			Counter Shaft	Damage: - Oil: -		RS	
Bottom	Thickness-Avg	Flange 11.4 mm (16.3), Web 9.4 mm (9.4)			Reduction Gear	Damage: - Oil: -		C	
	Corrosion	L M S		Gear	Drum Gear-L	Damage: - Fitting: - Backlash: - Oil: -		RS	
Rocker	Remodeling	Left No Right No			Drum Pinion-L	Damage: -		↑	
	Assembly	Distortion	Left - Right -			Drum Gear-R		Damage: - Fitting: - Backlash: - Oil: -	
Roller Train		Others	No Function			Drum Pinion-R		Damage: -	
	Missing	Left 0 Right 0			Gear-Middle	Damage: - Fitting: - Backlash: - Oil: -			
	Diameter-Roller	Average 151.5 mm		Pinion-Middle	Damage: -				
Seal	Distortion	Left - Right -		Basement	Drum-L	Damage: - Corrosion: L M S		↓	
	Left	0.3 m Broken			Drum-R	Damage: - Corrosion: L M S		↓	
	Bottom	Good			Drive Device	Damage: - Corrosion: L M S		RS	
Inclination	Right	0.5 m Broken		Drive Chain	Damage: - Looseness: - Oil: -	C			
	Top Level Difference - mm		↓	Chain Sprocket	Damage: - Corrosion: L M S	↑			
Leakage		L M S	N	Reduction Gear	Damage: - Corrosion: L M S				
Sill	Side Seal	Abrasion-Max	Left: - mm, Right: - mm	RS	Cover	Drum-L		Damage: - Corrosion: L M S	↓
		Roller Truck	Abrasion-Max	Left: 7 mm, Right: 7 mm		N		Drum-R	Damage: - Corrosion: L M S
	Roller Guard	Missing	Left 0 Right 0	N		Gear-Middle		Damage: - Corrosion: L M S	C
		Defect	Left 0 Right 0	N	Counter Shaft	Damage: - Corrosion: L M S		G	
Concrete	Abrasion	L M S		Counter Weight	Damage: - Corrosion: L M S	RS			
	Damage-Left	L M S		Hoisting	Wet Condition	- Kg-m		-	
	Damage-Right	L M S			Dry Condition	3.1 Kg-m	RS		
Damage-Bottom	L M S		Superstructure	Damage: - Corrosion: L M S	RS				

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	Survey Item		Survey Result		Judge	Photograph
Gate Leaf					Hoisting Device					
Skin Plate	Thickness-Avg	Top 9.9 Mid 10.0 Low 9.5 Btm 8.1 (9.5mm)		N	Wire Rope	Main-Left	ø 44.6 Distortion: - Corrosion: - Oil: -		G	
	Corrosion	U/S-Bottom L (M) S		↑		Main-Right	γ: - Distortion: - Corrosion: - Oil: -		G	
	Damage-Rivet	Corner-L 4 Corner-R 4				Roller Train-L	γ: - Distortion: - Corrosion: - Oil: -		N	
				Roller Train-R		γ: - Distortion: - Corrosion: - Oil: -		N		
Truss	Thickness-Avg	Bottom Flange 20.9, Bottom Web 20.6 (22.3mm)			Drum	Left	Damage: - Function: Over Lapping		RS	
	Distortion	T1 End (L, R)				Right	Damage: - Function: Over Lapping		↑	
End Girder	Thickness-Avg	L-Bottom 11.3, R-Bottom 11.7 (12.7mm)			Bearing	Drum	Damage: - Oil: -		↓	
	Remodeling	Left Re. Right Re.				Counter Shaft	Damage: - Oil: -		RS	
	Distortion	Left Crack Right Crack				Reduction Gear	Damage: - Oil: -		C	
Bottom Girder	Thickness-Avg	Flange 14.2 mm (16.0), Web 8.1 mm (9.7)			Gear	Drum Gear-L	Damage: - Fitting: - Backlash: - Oil: -		RS	
	Corrosion	L (M) S				Drum Pinion-L	Damage: -		↑	
Rocker Assembly	Remodeling	Left Re. Right Re.				Drum Gear-R	Damage: - Fitting: 100% Backlash: 4.5 mm Oil: -		↑	
	Distortion	Left Broken Right Broken				Drum Pinion-R	Damage: -		↑	
Others				Gear-Middle		Damage: - Fitting: - Backlash: - Oil: -		↑		
Roller Train	Missing	Left 2 Right 1			Pinion-Middle	Damage: -		↑		
	Diameter-Roller	Average - mm			Basement	Drum-L	Damage: - Corrosion: L M (M)		↓	
	Distortion	Left 20 mm Band Right -				Drum-R	Damage: - Corrosion: L M (S)		↓	
				Drive Device		Damage: - Corrosion: L (M) S		RS		
Seal	Left	Lost			Drive Chain	Damage: - Looseness: - Oil: -		C		
	Bottom	Lost			Chain Sprocket	Damage: - Corrosion: L (M) S		↑		
	Right	Lost			Reduction Gear	Damage: - Corrosion: L (M) S		↑		
Inclination	Top Level Difference - mm		↓	Cover	Drum-L	Damage: - Corrosion: L M (S)		↓		
Leakage	(L) M S		N		Drum-R	Damage: - Corrosion: L M (S)		↓		
					Gear-Middle	Damage: - Corrosion: L (M) S		C		
Sill	Side Seal	Abrasion-Max	Left: - mm, Right: - mm		RS	Counter Shaft	Damage: - Corrosion: L M S		G	
		Roller Truck	Abrasion-Max Left: 15 mm, Right: 8 mm		RL		Counter Weigh	Damage: - Corrosion: L M S		
	Roller Guard	Missing	Left 1 Right 1		N			Hoisting	Wet Condition	
Defect		Left 0 Right 0		N	Torque	Dry Condition	3.9 kg-m		RS	
Sill Beam	Abrasion	L M S		-	Superstructure	Damage: - Corrosion: L M (S)		RS		
Concrete	Damage-Left	L M S		-						
	Damage-Right	L M S		-						
	Damage-Bottom	L M S		-						

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	Survey Item		Survey Result	Judge	Photograph
<b>Gate Leaf</b>				<b>Hoisting Device</b>				
Skin Plate	Thickness-Avg	Top 10.1 Mid 10.0 Low 9.9 Blm 9.9 (9.5mm)	N	Wire Rope	Main-Left	γ: - Distortion: - Corrosion: - Oil: -	G	
	Corrosion	U/S-Bottom L M (S)	↑		Main-Right	γ: - Distortion: - Corrosion: - Oil: -	G	
	Damage-Rivet	Corner-L - Corner-R -			Roller Train-L	γ: - Distortion: - Corrosion: - Oil: -	N	
			Roller Train-R		γ: - Distortion: - Corrosion: - Oil: -	N		
Truss	Thickness-Avg	Bottom Flange 18.6, Bottom Web 18.6 (19.1mm)		Drum	Left	Damage: - Function: Touching to Frame	RS	
	Distortion				Right	Damage: - Function: -	↑	
End Girder	Thickness-Avg	L-Bottom 12.2, R-Bottom 12.1 (12.7mm)		Bearing	Drum	Damage: - Oil: -	↓	
	Remodeling	Left No Right No			Counter Shaft	Damage: - Oil: -	RS	
	Distortion	Left - Right -			Reduction Gear	Damage: - Oil: -	C	
Bottom Girder	Thickness-Avg	Flange 11.7 mm (16.3), Web 9.4 mm (9.4)		Gear	Drum Gear-L	Damage: - Fitting: 90% Backlash: - Oil: -	RS	
	Corrosion	(L) M S			Drum Pinion-L	Damage: - Miss Alignment	↑	
Rocker Assembly	Remodeling	Left No Right No			Drum Gear-R	Damage: - Fitting: - Backlash: - Oil: -		
	Distortion	Left - Right -			Drum Pinion-R	Damage: -		
Roller Train	Others	No Function			Gear-Middle	Damage: - Fitting: - Backlash: - Oil: -		
	Missing	Left 0 Right 0			Pinion-Middle	Damage: -		
	Diameter-Roller	Average - mm		Basement	Drum-L	Damage: - Corrosion: L M (S)		
Distortion	Left - Right -		Drum-R		Damage: - Corrosion: L M (S)	↓		
Seal	Left	3 m Broken			Drive Device	Damage: - Corrosion: L (M) S	RS	
Seal	Bottom	Good		Drive Chain	Damage: - Looseness: - Oil: -	C		
	Right	Good		Chain Sprocket	Damage: - Corrosion: L (M) S	↑		
	Inclination	Top Level Difference - mm	↓	Reduction Gear	Damage: - Corrosion: L (M) S			
Leakage	(L) M S	N	Cover	Drum-L	Damage: - Corrosion: L M (S)			
Sill	Side Seal	Abrasion-Max		Left: - mm, Right: - mm	RS	Drum-R	Damage: - Corrosion: L M (S)	↓
		Roller Truck		Abrasion-Max	Left: 8 mm, Right: 6 mm	N	Gear-Middle	Damage: - Corrosion: L (M) S
		Roller Guard	Missing	Left 0 Right 0	N	Counter Shaft	Damage: - Corrosion: L M S	G
Sill Beam	Concrete	Defect	Left 0 Right 0	N	Counter Weight	Damage: - Corrosion: L M S	G	
		Abrasion	L M S		Hoisting	Wet Condition	- kg-m	-
		Damage-Left	L M S		Torque	Dry Condition	0 kg-m	C
	Damage-Right	L M S		Superstructure	Damage: - Corrosion: L M (S)	RS		
	Damage-Bottom	L M S						

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	Survey Item		Survey Result		Judge	Photograph
<b>Gate Leaf</b>					<b>Hoisting Device</b>					  
Skin Plate	Thickness-Avg	Top 9.9 Mid 9.8 Low 9.4 Btm 8.6 (9.5mm)		N	Wire Rope	Main-Left	Y: - Distortion: - Corrosion: - Oil: -		G	
	Corrosion	U/S-Bottom (L) M S		↑		Main-Right	Y: - Distortion: - Corrosion: - Oil: -		G	
	Damage-Rivet	Corner-L 4 Corner-R 11				Roller Train-L	Y: - Distortion: - Corrosion: - Oil: -		N	
Truss	Thickness-Avg	Bottom Flange 20.8, Bottom Web 21.0 (22.2mm)				Roller Train-R	Y: - Distortion: - Corrosion: - Oil: -		N	
	Distortion				Drum	Left	Damage: - Function: Over Lapping		RS	
End Girder	Thickness-Avg	L-Bottom 10.4, R-Bottom 11.6 (12.7mm)				Right	Damage: - Function: Touching Frame		↑	
	Remodeling	Left No Right No			Bearing	Drum	Damage: - Oil: -		↓	
	Distortion	Left No Right Bend				Counter Shaft	Damage: - Oil: -		RS	
Bottom	Thickness-Avg	Flange 14.7 mm (16.0), Web 8.2 mm (9.7)				Reduction Gear	Damage: - Oil: -		C	
Girder	Corrosion	L (M) S			Gear	Drum Gear-L	Damage: - Fitting: - Backlash: - Oil: -		RS	
Rocker	Remodeling	Left No Right No				Drum Pinion-L	Damage: -		↑	
Assembly	Distortion	Left 2 m Ab. Right Heavy Ab.				Drum Gear-R	Damage: - Fitting: - Backlash: - Oil: -			
	Others	No Function				Drum Pinion-R	Damage: -			
Roller Train	Missing	Left 2 Right 1				Gear-Middle	Damage: - Fitting: - Backlash: - Oil: -			
	Diameter-Roller	Average 147.6 mm				Pinion-Middle	Damage: -			
	Distortion	Left - Right -			Basement	Drum-L	Damage: - Corrosion: L M (S)		↓	
Seal	Left	Lost				Drum-R	Damage: - Corrosion: L M (S)		↓	
	Bottom	Lost				Drive Device	Damage: - Corrosion: L (M) S		RS	
	Right	Lost			Drive Chain	Damage: - Looseness: - Oil: -		C		
Inclination	Top Level Difference - mm		↓	Chain Sprocket	Damage: - Corrosion: L (M) S		↑			
Leakage	(L) M S		N	Reduction Gear	Damage: - Corrosion: L (M) S					
<b>Sill</b>					Cover	Drum-L	Damage: - Corrosion: L M (S)		↓	
Side Seal	Abrasion-Max	Left: - mm, Right: - mm		RS		Drum-R	Damage: - Corrosion: L M (S)		↓	
Roller Truck	Abrasion-Max	Left: 9 mm, Right: 7 mm		RL		Gear-Middle	Damage: - Corrosion: L (M) S		C	
Roller Guard	Missing	Left 0 Right 0		N	Counter Shaft	Damage: - Corrosion: L M S		G		
	Defect	Left 0 Right 1		N	Counter Weight	Damage: - Corrosion: L M S		RS		
Sill Beam	Abrasion	L M S		-	Hoisting	Wet Condition	- kg-m		-	
Concrete	Damage-Left	L M S		-	Torque	Dry Condition	4.3 kg-m		RS	
	Damage-Right	L M S		-	Superstructure	Damage: - Corrosion: L M (S)		RS		
	Damage-Bottom	L M S		-						

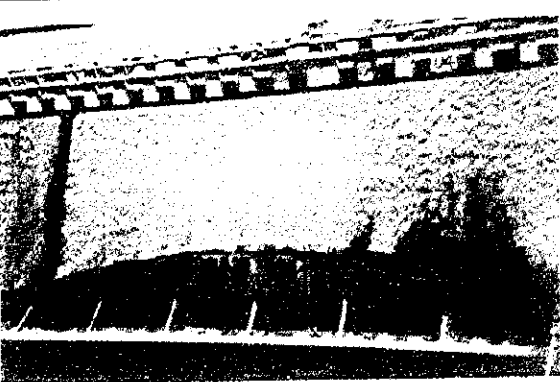
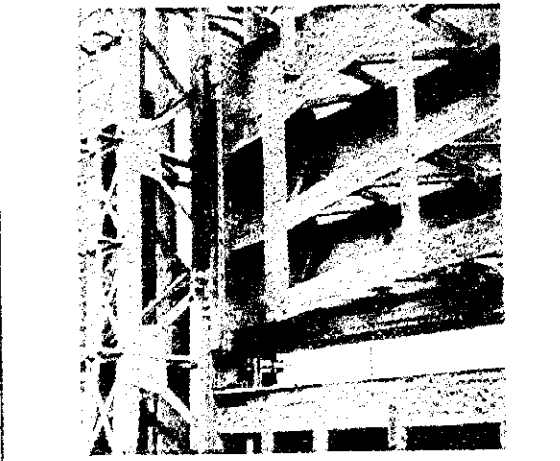

Remarks: Judgement = N: Totally Replace, C: Partly Replace, RL: Large Repair, RM: Medium Repair, RS: Small Repair, G: No Repair, -: No Data.

( ) shows design dimension.

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Survey Results of Gate Structure

Gate No. U4U (Upper Undersluice Gate)

Survey Item			Survey Result	Judge	Survey Item			Survey Result	Judge	Photograph
Gate Leaf					Hoisting Device					  
Skin Plate	Thickness-Avg	Top 10.0 Mid 9.9 Low 10.0 Btm 10.1 (9.5mm)	N	↑	Wire Rope	Main-Left	γ: - Distortion: - Corrosion: - Oil: -	G		
	Corrosion	U/S-Bottom L M (S)				Main-Right	γ: - Distortion: - Corrosion: - Oil: -	G		
Truss	Thickness-Avg	Bottom Flange 19.2, Bottom Web 18.7 (19.1mm)			Roller Train-L	Broken	N			
	Distortion			Roller Train-R	γ: - Distortion: - Corrosion: - Oil: -	N				
End Girder	Thickness-Avg	L-Bottom 12.5, R-Bottom 12.3 (12.7mm)			Drum	Left	Damage: - Function: -	RS		
	Remodeling	Left No Right No		Right		Damage: - Function: -	↑			
	Distortion	Left - Right -		Bearing	Drum	Damage: - Oil: -	↓			
Bottom	Thickness-Avg	Flange 11.6 mm (16.3), Web 9.0 mm (9.4)			Counter Shaft	Damage: - Oil: -	RS			
	Corrosion	(L) M S			Reduction Gear	Damage: - Oil: -	C			
Rocker	Remodeling	Left No Right No		Gear	Drum Gear-L	Damage: - Fitting: 90% Backlash: - Oil: -	RS			
Assembly	Distortion	Left - Right -			Drum Pinion-L	Damage: - Miss Alignment	↑			
	Others	No Function			Drum Gear-R	Damage: - Fitting: 90% Backlash: - Oil: - Touching Frame				
Roller Train	Missing	Left 0 Right 0			Drum Pinion-R	Damage: - Miss Alignment				
	Diameter-Roller	Average 152.4 mm			Gear-Middle	Damage: - Fitting: - Backlash: - Oil: -				
	Distortion	Left - Right -		Pinion-Middle	Damage: -					
Seal	Left	1.5 m Broken		Basement	Drum-L	Damage: - Corrosion: L M (S)	↓			
	Bottom	Good			Drum-R	Damage: - Corrosion: L M (S)				
	Right	2.0 m Broken			Drive Device	Damage: - Corrosion: L (M) S	RS			
Inclination	Top Level Difference - mm		↓	Drive Chain	Damage: - Looseness: - Oil: -	C				
Leakage	L M (S)		N	Chain Sprocket	Damage: - Corrosion: L (M) S	↑				
Sill					Reduction Gear	Damage: - Corrosion: L (M) S				
Side Seal	Abrasion-Max	Left: - mm, Right: - mm	RS	Cover	Drum-L	Damage: - Corrosion: L M (S)				
	Roller Truck	Abrasion-Max Left: 10 mm, Right: 6 mm	N		Drum-R	Damage: - Corrosion: L M (S)	↓			
Roller Guard	Missing	Left 0 Right 0	N		Gear-Middle	Damage: - Corrosion: L (M) S	C			
	Defect	Left 0 Right 0	N	Counter Shaft	Damage: - Corrosion: L M S	G				
Concrete	Abrasion	L M S		Counter Weight	Damage: - Corrosion: L M S	RS				
	Damage-Left	L M S		Hoisting	Wet Condition	- kg-m	-			
	Damage-Right	L M S			Dry Condition	2.0 kg-m	RS			
Damage-Bottom	L M S		Superstructure	Damage: - Corrosion: L M (S)	RS					

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.

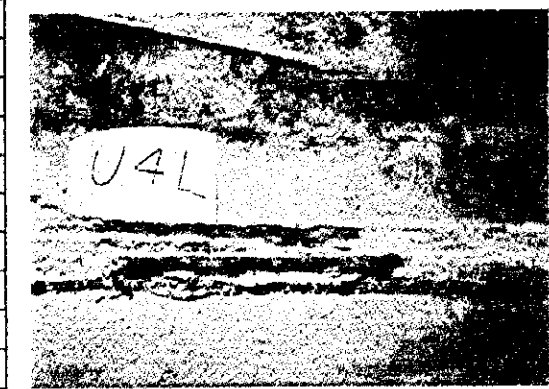
A-21

Survey Results of Gate Structure

(8/96)

Gate No. U4L (Lower Undersluice Gate)

Survey Item		Survey Result	Judge	Survey Item	Survey Result	Judge	Photograph		
<b>Gate Leaf</b>				<b>Hoisting Device</b>					
Skin Plate	Thickness-Avg	Top 9.7 Mid 9.8 Low 9.2 Btm 8.8 (9.5mm)	N	Wire Rope	Main-Left	γ - Distortion: - Corrosion: - Oil: -		G	
	Corrosion	U/S-Bottom (L) M S	▲		Main-Right	γ - Distortion: - Corrosion: - Oil: -		G	
	Damage-Rivet	Corner-L 5 Corner-R 9			Roller Train-L	Broken	N		
			Roller Train-R		Broken	N			
Truss	Thickness-Avg	Bottom Flange 20.8, Bottom Web 20.8 (22.2mm)		Drum	Left	Damage: - Function: -	RS		
	Distortion				Right	Damage: - Function: -	↑		
End Girder	Thickness-Avg	L-Bottom 12.1, R-Bottom 11.0 (12.7mm)		Bearng	Drum	Damage: - Oil: -	↓		
	Remodeling	Left No Right No			Counter Shaft	Damage: - Oil: -	RS		
	Distortion	Left - Right -			Reduction Gear	Damage: - Oil: -	C		
Bottom	Thickness-Avg	Flange 14.6 mm (16.0), Web 8.2 mm (9.7)		Gear	Drum Gear-L	Damage: - Fitting: - Backlash: - Oil: -	RS		
	Corrosion	L (M) S			Drum Pinion-L	Damage: -	↑		
Rocker	Remodeling	Left No Right No			Drum Gear-R	Damage: - Fitting: - Backlash: - Oil: -			
	Distortion	Left Heavy Ab. Right Heavy Ab.			Drum Pinion-R	Damage: -			
Assembly	Others	No Function			Gear-Middle	Damage: - Fitting: - Backlash: - Oil: -			
				Pinion-Middle	Damage: -				
Roller Train	Missing	Left 0 Right 1		Basement	Drum-L	Damage: - Corrosion: L M (S)	↓		
	Diameter-Roller	Average 151.8 mm			Drum-R	Damage: - Corrosion: L M (S)			
	Distortion	Left - Right -			Drive Device	Damage: - Corrosion: L (M) S	RS		
Seal	Left	Lost		Drive Chain		Damage: - Looseness: - Oil: -	C		
	Bottom	Lost			Chain Sprocket	Damage: - Corrosion: L (M) S	↑		
	Right	Lost		Reduction Gear	Damage: - Corrosion: L (M) S	↓			
Inclination	Top Level Difference - mm		↓	Cover	Drum-L	Damage: - Corrosion: L M (S)	↓		
Leakage	(L) M S	N	Drum-R		Damage: - Corrosion: L M (S)				
			Gear-Middle		Damage: - Corrosion: L (M) S	C			
Sill	Side Seal	Abrasion-Max	Left: - mm, Right: - mm	RS	Counter Shaft		Damage: Touching Corrosion: L M (S)	RS	
		Roller Truck	Abrasion-Max	Left: 14 mm, Right: 12 mm		RL	Counter Weight		Damage: - Corrosion: L M S
	Roller Guard	Missing	Left 0 Right 0	N		Hoisting		Wet Condition	- kg-m
		Defect	Left 0 Right 0	N	Torque		Dry Condition	3.9 kg-m	RS
	Sill Beam	Abrasion	L M S	-	Superstructure		Damage: - Corrosion: L M (S)	RS	
Concrete	Damage-Left	L M S	-						
	Damage-Right	L M S	-						
	Damage-Bottom	L M S	-						



A-22

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. USU (Upper Undersluice Gate)

Survey Item		Survey Result	Judge	Survey Item	Survey Result	Judge	Photograph	
<b>Gate Leaf</b>				<b>Hoisting Device</b>				
Skin Plate	Thickness-Avg	Top - Mid - Low - Btm 9.9 (9.5mm)	N	Wire Rope	Main-Left	y: - Distortion: - Corrosion: - Oil: -		G
	Corrosion	U/S-Bottom L M (S)	↑		Main-Right	y: - Distortion: - Corrosion: - Oil: -		G
	Damage-Rivet	Corner-L - Corner-R -			Roller Train-L	y: - Distortion: - Corrosion: - Oil: -		N
			Roller Train-R		y: - Distortion: - Corrosion: - Oil: -	N		
Truss	Thickness-Avg	Bottom Flange 19.0, Bottom Web 19.0 (19.1mm)		Drum	Left	Damage: - Function: -		RS
	Distortion				Right	Damage: - Function: -		↑
End Girder	Thickness-Avg	L-Bottom 12.5, R-Bottom 12.3 (12.7mm)		Bearing	Drum	Damage: - Oil: -		↓
	Remodeling	Left No Right No			Counter Shaft	Damage: - Oil: -		RS
	Distortion	Left - Right -			Reduction Gear	Damage: - Oil: -		C
Bottom Girder	Thickness-Avg	Flange 11.7 mm (16.3), Web 9.2 mm (9.4)		Gear	Drum Gear-L	Damage: - Fitting: - Backlash: - Oil: -		RS
	Corrosion	(L) M S			Drum Pinion-L	Damage: -		↑
Rocker Assembly	Remodeling	Left No Right No			Drum Gear-R	Damage: - Fitting: - Backlash: - Oil: -		
	Distortion	Left - Right -			Drum Pinion-R	Damage: -		
Roller Train	Missing	Left 0 Right 0			Gear-Middle	Damage: - Fitting: - Backlash: - Oil: -		
	Diameter-Roller	Average 152.2 mm			Pinion-Middle	Damage: -		
	Distortion	Left - Right -		Basement	Drum-L	Damage: - Corrosion: L M (S)		
Seal	Left	2 m Broken			Drum-R	Damage: - Corrosion: L M (S)		↓
	Bottom	Good			Drive Device	Damage: - Corrosion: L (M) S		RS
	Right	4 m Broken		Drive Chain	Damage: - Looseness: - Oil: -	C		
Inclination	Top Level Difference - mm		Chain Sprocket	Damage: - Corrosion: L (M) S	↑			
<b>Leakage</b>		L M (S)	N	Reduction Gear	Damage: - Corrosion: L (M) S			
<b>Sill</b>				Cover	Drum-L	Damage: - Corrosion: L M (S)	↓	
Side Seal	Abrasion-Max	Left: - mm, Right: - mm	RS		Drum-R	Damage: - Corrosion: L M (S)		
Roller Truck	Abrasion-Max	Left: - mm, Right: - mm	N		Gear-Middle	Damage: - Corrosion: L (M) S	C	
Roller Guard	Missing	Left 0 Right 0	N	Counter Shaft	Damage: - Corrosion: L M S	G		
	Defect	Left 0 Right 0	N	Counter Weight	Damage: - Corrosion: L M S	G		
Sill Beam	Abrasion	L M S		Hoisting Torque	Wet Condition	- kg-m	-	
Concrete	Damage-Left	L M S			Dry Condition	-0.4 kg-m	G	
	Damage-Right	L M S		<b>Superstructure</b>	Damage: - Corrosion: L M (S)	RS		
	Damage-Bottom	L M S						

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

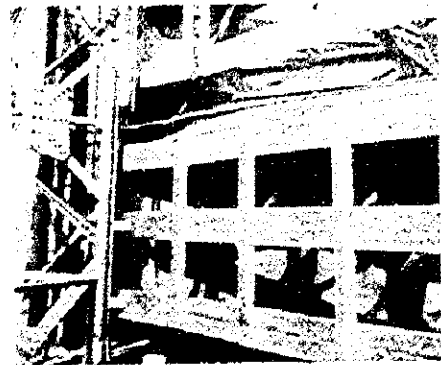
( ) shows design dimension.

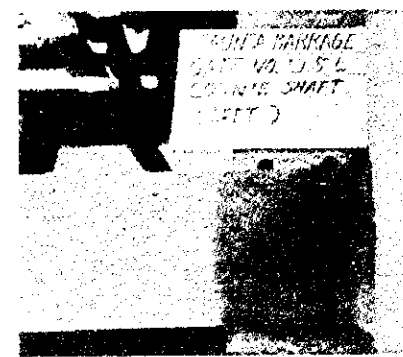
A-23

Survey Results of Gate Structure

(10/96)

Gate No. USL (Lower Undersluice Gate)

Survey Item		Survey Result		Judge	Survey Item		Survey Result		Judge	Photograph
<b>Gate Leaf</b>					<b>Hoisting Device</b>					
Skin Plate	Thickness-Avg	Top - Mid - Low - Btm 8.3 (9.5mm)		N	Wire Rope	Main-Left	y: - Distortion: - Corrosion: - Oil: -		G	
	Corrosion	UIS-Bottom (L) M S		↑		Main-Right	y: - Distortion: - Corrosion: - Oil: -		G	
	Damage-Rivet	Corner-L 4 Corner-R 8				Roller Train-L	Broken		N	
				Roller Train-R		Broken		N		
Truss	Thickness-Avg	Bottom Flange 21.9, Bottom Web 21.0 (22.2mm)			Drum	Left	Damage: - Function: -		RS	
	Distortion					Right	Damage: - Function: -		RS	
End Girder	Thickness-Avg	L-Bottom 11.4, R-Bottom 10.8 (12.7mm)			Bearing	Drum	Damage: - Oil: -		RS	
	Remodeling	Left No Right No				Counter Shaft	Damage: - Oil: Center Gear Bearing Elbow Broken		C	
	Distortion	Left Small Bend Right -				Reduction Gear	Damage: - Oil: -		RS	
Bottom	Thickness-Avg	Flange 14.5 mm (16.0), Web 9.2 mm (9.7)			Gear	Drum Gear-L	Damage: - Fitting: - Backlash: - Oil: -		↑	
	Girder	Corrosion	L (M) S				Drum Pinion-L	Damage: -		
Rocker	Remodeling	Left No Right No				Drum Gear-R	Damage: - Fitting: - Backlash: - Oil: -			
	Assembly	Distortion	Left Heavy Ab. Right Heavy Ab.				Drum Pinion-R	Damage: -		
		Others	No Function				Gear-Middle	Damage: - Fitting: - Backlash: - Oil: -		
Roller Train	Missing	Left 0 Right 0				Pinion-Middle	Damage: -			
	Diameter-Roller	Average 152.2 mm			Basement	Drum-L	Damage: - Corrosion: L M (S)			
	Distortion	Left - Right -				Drum-R	Damage: - Corrosion: L M (S)		↓	
Seal	Left	Lost				Drive Device	Damage: - Corrosion: L (M) S		RS	
Seal	Bottom	Lost			Drive Chain	Damage: - Looseness: - Oil: -		C		
	Right	Lost				Chain Sprocket	Damage: - Corrosion: L (M) S		↑	
	Inclination	Top Level Difference - mm		↓	Reduction Gear	Damage: - Corrosion: L (M) S		↑		
Leakage	(L) M S		N	Cover	Drum-L	Damage: - Corrosion: L M (S)				
Sill	Side Seal	Abrasion-Max	Left: - mm, Right: - mm		RS	Drum-R	Damage: - Corrosion: L M (S)		↓	
		Roller Truck	Abrasion-Max		Left: - mm, Right: - mm		RL	Gear-Middle	Damage: - Corrosion: L (M) S	
	Roller Guard	Missing	Left 0 Right 0		N	Counter Shaft	Damage: Touching Corrosion: L M (S)		RS	
		Defect	Left 0 Right 0		N	Counter Weight	Damage: - Corrosion: L M S		RS	
	Sill Beam	Abrasion	L M S		-	Hoisting	Wet Condition	- kg·m		-
Concrete	Damage-Left	L M S		-	Torque		Dry Condition	2.0 kg·m		RS
	Damage-Right	L M S		-	Superstructure	Damage: - Corrosion: L M (S)		RS		
	Damage-Bottom	L M S		-						



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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	Survey Item	Survey Result	Judge	Photograph		
Gate Leaf				Hoisting Device					
Skin Plate	Thickness-Avg	Top - Mid - Low - Btm 9.8 (9.5mm)	N	Wire Rope	Main-Left	y: - Distortion: - Corrosion: - Oil: -		G	
	Corrosion	U/S-Bottom L M (S)	↑		Main-Right	y: - Distortion: - Corrosion: - Oil: -		G	
	Damage-Rivet	Corner-L - Corner-R -			Roller Train-L	y: - Distortion: - Corrosion: - Oil: -		N	
			Roller Train-R		Broken	N			
Truss	Thickness-Avg	Bottom Flange 18.3, Bottom Web 18.6 (19.1mm)		Drum	Left	Damage: - Function: -		RS	
	Distortion				Right	Damage: - Function: -		↑	
End Girder	Thickness-Avg	L-Bottom 12.0, R-Bottom 11.9 (12.7mm)		Bearng	Drum	Damage: - Oil: -		↓	
	Remodeling	Left No Right No			Counter Shaft	Damage: - Oil: -		RS	
	Distortion	Left - Right -			Reduction Gear	Damage: - Oil: -		C	
Bottom	Thickness-Avg	Flange 11.7 mm (16.3), Web 9.3 mm (9.4)		Gear	Drum Gear-L	Damage: - Fitting: - Backlash: - Oil: -		RS	
	Corrosion	(L) M S			Drum Pinion-L	Damage: -		↑	
Rocker	Remodeling	Left No Right No			Drum Gear-R	Damage: - Fitting: - Backlash: - Oil: -		↑	
	Distortion	Left - Right -			Drum Pinion-R	Damage: -			
Assembly	Others	No Function			Gear-Middle	Damage: - Fitting: - Backlash: - Oil: -			
				Pinion-Middle	Damage: -				
Roller Train	Missing	Left 0 Right 1		Basement	Drum-L	Damage: - Corrosion: L M (S)			
	Diameter-Roller	Average - mm			Drum-R	Damage: - Corrosion: L M (S)		↓	
	Distortion	Left - Right -			Drive Device	Damage: - Corrosion: L (M) S		RS	
Seal	Left	2 m Broken		Drive Chain	Damage: - Looseness: - Oil: -	C			
	Bottom	Good		Chain Sprocket	Damage: - Corrosion: L (M) S	↑			
	Right	3 m Broken		Reduction Gear	Damage: - Corrosion: L (M) S				
Inclination	Top Level Difference - mm		↓	Cover	Drum-L	Damage: - Corrosion: L M (S)		↓	
Leakage	L M (S)	N	Drum-R		Damage: - Corrosion: L M (S)	↓			
			Gear-Middle		Damage: - Corrosion: L (M) S	C			
Sill	Side Seal	Abrasion-Max	Left: - mm, Right: - mm	RS	Counter Shaft	Damage: - Corrosion: L M S		G	
		Roller Truck	Abrasion-Max	Left: - mm, Right: - mm	N	Counter Weight		Damage: - Corrosion: L M S	C
		Roller Guard	Missing	Left 0 Right 0	N	Hoisting		Wet Condition	- kg-m
	Defect	Left 0 Right 0	N	Torque	Dry Condition	0 kg-m		G	
Concrete	Sill Beam	Abrasion	L M S		Superstructure	Damage: - Corrosion: L M (S)		RS	
		Damage-Left	L M S						
		Damage-Right	L M S						
	Damage-Bottom	L M S							

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


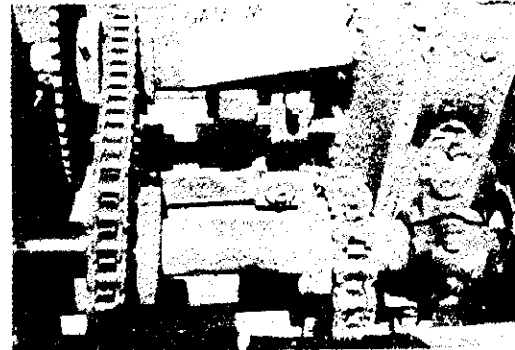
( ) shows design dimension.

A-25

Survey Results of Gate Structure

( 12 / 96 )

Gate No. U6L (Lower Undersluice Gate)

Survey Item			Survey Result			Judge	Survey Item			Survey Result			Judge	Photograph
Gate Leaf							Hoisting Device							 
Skin Plate	Thickness-Avg	Top - Mid - Low - Btm 8.5 (9.5mm)			N	Wire Rope	Main-Left	Y: - Distortion: - Corrosion: - Oil: -			G			
	Corrosion	UIS-Bottom L (M) S			↑		Main-Right	Y: - Distortion: - Corrosion: - Oil: -			G			
Truss	Damage-Rivet	Corner-L 7 Corner-R 7					Roller Train-L	Y: - Distortion: - Corrosion: - Oil: -			N			
	Thickness-Avg	Bottom Flange 20.8, Bottom Web 21.3 (22.2mm)					Roller Train-R	Y: - Distortion: - Corrosion: - Oil: -			N			
End Girder	Distortion					Drum	Left	Damage: - Function: Touching Frame			RS			
	Thickness-Avg	L-Bottom 12.1, R-Bottom 11.9 (12.7mm)					Right	Damage: - Function: -			↑			
	Remodeling	Left No Right Re				Bearing	Drum	Damage: - Oil: -			↓			
Distortion	Left Bend Right Band				Counter Shaft		Damage: - Oil: -			RS				
Bottom Girder	Thickness-Avg	Flange 14.5 mm (16.0), Web 9.0 mm (9.7)				Reduction Gear	Damage: Broken Oil: -			C				
	Corrosion	L (M) S				Gear	Drum Gear-L	Damage: - Fitting: 90% Backlash: 3mm Oil: -			RS			
Rocker Assembly	Remodeling	Left No Right Re.					Drum Pinion-L	Damage: Miss Alignment			↑			
	Distortion	Left - Right Broken					Drum Gear-R	Damage: - Fitting: - Backlash: - Oil: -			↑			
Roller Train	Others						Drum Pinion-R	Damage: -			↑			
	Missing	Left 2 Right 1					Gear-Middle	Damage: - Fitting: - Backlash: - Oil: -			↑			
	Diameter-Roller	Average - mm				Pinion-Middle	Damage: Miss Alignment			↑				
Seal	Distortion	Left - Right -				Basement	Drum-L	Damage: - Corrosion: L M (S)			↑			
	Left	Lost					Drum-R	Damage: - Corrosion: L M (S)			↓			
	Bottom	Lost					Drive Device	Damage: - Corrosion: L (M) S			RS			
Inclination	Right	Lost				Drive Chain	Damage: - Looseness: - Oil: -			C				
	Top Level Difference	- mm			↓	Chain Sprocket	Damage: - Corrosion: L (M) S			↑				
Leakage						(L) M S	N	Reduction Gear	Damage: - Corrosion: L (M) S			↑		
Sill							Cover	Drum-L	Damage: - Corrosion: L M (S)			↑		
Side Seal	Abrasion-Max	Left: - mm, Right: - mm			RS	Drum-R		Damage: - Corrosion: L M (S)			↓			
	Roller Truck	Abrasion-Max Left: - mm, Right: - mm			RL	Gear-Middle		Damage: - Corrosion: L (M) S			C			
Roller Guard	Missing	Left 1 Right 1			N	Counter Shaft	Damage: - Corrosion: L M S			G				
	Defect	Left 0 Right 0			N	Counter Weight	Damage: - Corrosion: L M S			RS				
Sill Beam	Abrasion	L M S			-	Hoisting	Wet Condition	- kg-m			-			
Concrete	Damage-Left	L M S			-	Torque	Dry Condition	7.4 kg-m			RS			
	Damage-Right	L M S			-	Superstructure	Damage: - Corrosion: L M (S)			RS				
	Damage-Bottom	L M S			-									

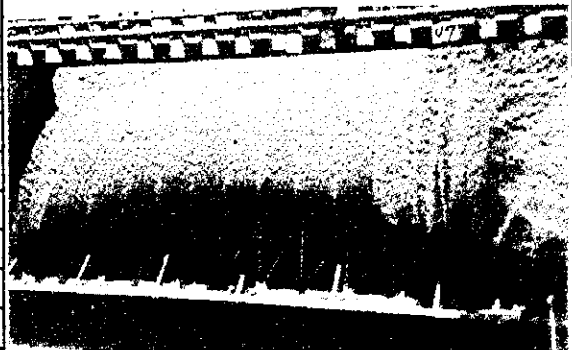
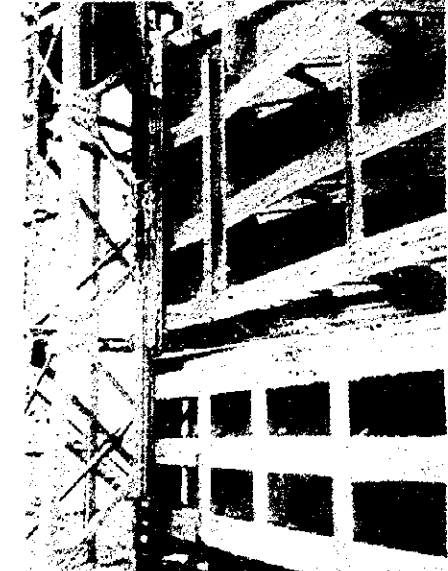
Remarks: Judgement: N: Totally Replace, C: Partly Replace, RL: Large Repair, RM: Medium Repair, RS: Small Repair, G: No Repair, -: No Data.

( ) shows design dimension.

A-26

Survey Results of Gate Structure

Gate No. U7U (Upper Undersluice Gate)

Survey Item		Survey Result	Judge	Survey Item		Survey Result	Judge	Photograph
Gate Leaf				Hoisting Device				  
Skin Plate	Thickness-Avg	Top - Mid - Low - Blm 10.0 (9.5mm)	N	Wire Rope	Main-Left	y: - Distortion: - Corrosion: - Oil: -	G	
	Corrosion	U/S-Bottom L M (S)	↑		Main-Right	y: - Distortion: - Corrosion: - Oil: -	G	
	Damage-Rivet	Corner-L - Corner-R -			Roller Train-L	y: - Distortion: - Corrosion: - Oil: -	N	
			Roller Train-R		y: - Distortion: - Corrosion: - Oil: -	N		
Truss	Thickness-Avg	Bottom Flange 19.1, Bottom Web 18.7 (19.1mm)		Drum	Left	Damage: - Function: Miss Alignment	RS	
	Distortion				Right	Damage: - Function: -	↑	
End Girder	Thickness-Avg	L-Bottom 12.7, R-Bottom 12.6 (12.7mm)		Bearing	Drum	Damage: - Oil: -	↓	
	Remodeling	Left No Right No			Counter Shaft	Damage: - Oil: -	RS	
	Distortion	Left - Right -			Reduction Gear	Damage: - Oil: -	C	
Bottom	Thickness-Avg	Flange 11.4 mm (16.3), Web 9.2 mm (9.4)		Gear	Drum Gear-L	Damage: - Fitting: - Backlash: - Oil: -	RS	
	Corrosion	(L) M S			Drum Pinion-L	Damage: -	↑	
Rocker	Remodeling	Left No Right No			Drum Gear-R	Damage: - Fitting: - Backlash: - Oil: -		
	Distortion	Left - Right -			Drum Pinion-R	Damage: -		
Assembly	Others	No Function			Gear-Middle	Damage: - Fitting: - Backlash: - Oil: -		
	Roller Train	Missing Left 0 Right 0			Pinion-Middle	Damage: -		
	Diameter-Roller	Average - mm		Basement	Drum-L	Damage: - Corrosion: L M (S)		
Distortion	Left - Right -		Drum-R		Damage: - Corrosion: L M (S)	↓		
Seal	Left 4 m Broken		Drive Device		Damage: - Corrosion: L (M) S	RS		
Seal	Bottom	Good		Drive Chain	Damage: - Looseness: - Oil: -	C		
	Right 3 m Broken			Chain Sprocket	Damage: - Corrosion: L (M) S	↑		
Inclination	Top Level Difference - mm		Reduction Gear	Damage: - Corrosion: L (M) S	↑			
Leakage	(L) M S		Cover	Drum-L	Damage: - Corrosion: L M (S)			
Sill	Side Seal	Abrasion-Max Left: - mm, Right: - mm		RS	Drum-R	Damage: - Corrosion: L M (S)	↓	
	Roller Truck	Abrasion-Max Left: - mm, Right: - mm		N	Gear-Middle	Damage: - Corrosion: L (M) S	C	
	Roller Guard	Missing	Left 0 Right 0	N	Counter Shaft	Damage: - Corrosion: L M S	G	
Defect		Left 0 Right 0	N	Counter Weight	Damage: - Corrosion: L M S	RS		
Sill Beam	Abrasion	L M S		Hoisting	Wet Condition	- kg-m	-	
	Concrete	Damage-Left L M S			Torque	Dry Condition	2.0 kg-m	RS
		Damage-Right L M S		Superstructure	Damage: - Corrosion: L M (S)	RS		
	Damage-Bottom L M S							



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

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Gate No. U7L (Lower Undersluice Gate)



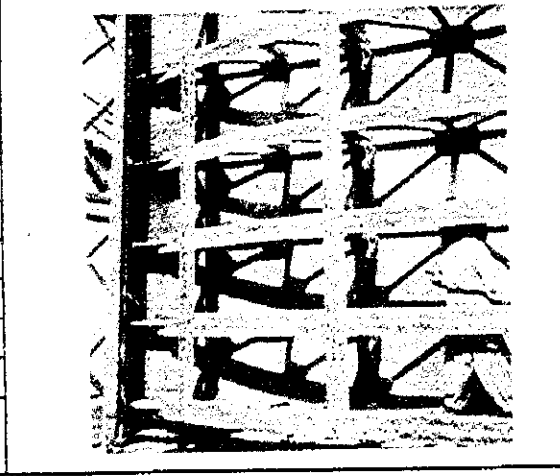
Survey Item		Survey Result	Judge	Survey Item		Survey Result	Judge	Photograph
Gate Leaf				Hoisting Device				 
Skin Plate	Thickness-Avg	Top - Mid - Low - Dim 8.7 (9.5mm)	N	Wire Rope	Main-Left	y - Distortion: - Corrosion: - Oil: -	G	
	Corrosion	U/S-Bottom (L) M S	↑		Main-Right	y - Distortion: - Corrosion: - Oil: -	G	
	Damage-Rivet	Corner-L 12 Corner-R 11			Roller Train-L	Broken	N	
Truss	Thickness-Avg	Bottom Flange 21.0, Bottom Web 20.2 (22.2mm)			Roller Train-R	y - Distortion: - Corrosion: - Oil: -	N	
	Distortion			Drum	Left	Damage: - Function: -	RS	
End Girder	Thickness-Avg	L-Bottom 10.1, R-Bottom 11.3 (12.7mm)			Right	Damage: - Function: Miss Alignment	↑	
	Remodeling	Left Re. Right No		Bearing	Drum	Damage: - Oil: -	↓	
	Distortion	Left Small Bend Right -			Counter Shaft	Damage: - Oil: -	RS	
Bottom	Thickness-Avg	Flange 13.6 mm (16.0), Web 7.8 mm (9.7)			Reduction Gear	Damage: Broken Oil: -	C	
	Girder	Corrosion	L (M) S	Gear	Drum Gear-L	Damage: - Fitting: - Backlash: - Oil: -	RS	
		Rocker	Remodeling Left Re Right No			Drum Pinion-L	Damage: -	
Assembly	Distortion	Left - Right Heavy Ab.			Drum Gear-R	Damage: - Fitting: - Backlash: - Oil: -	↑	
	Others				Drum Pinion-R	Damage: -	↑	
Roller Train	Missing	Left 0 Right 0			Gear-Middle	Damage: - Fitting: - Backlash: - Oil: -	↑	
	Diameter-Roller	Average - mm			Pinion-Middle	Damage: -	↑	
	Distortion	Left - Right -		Basement	Drum-L	Damage: - Corrosion: L M (S)	↓	
Seal	Left	Lost			Drum-R	Damage: - Corrosion: L M (S)	↓	
	Bottom	Lost			Drive Device	Damage: - Corrosion: L (M) S	RS	
	Right	Lost		Drive Chain	Damage: - Looseness: - Oil: -	C		
Leakage	Top Level Difference - mm		↓	Chain Sprocket	Damage: - Corrosion: L (M) S	↑		
	(L) M S		N	Reduction Gear	Damage: - Corrosion: L (M) S	↑		
Sill				Cover	Drum-L	Damage: - Corrosion: L M (S)	↓	
Side Seal	Abrasion-Max	Left: - mm, Right: - mm	RS		Drum-R	Damage: - Corrosion: L M (S)	↓	
	Roller Truck	Abrasion-Max	Left: - mm, Right: - mm		RL	Gear-Middle	Damage: - Corrosion: L (M) S	C
Roller Guard	Missing	Left 1 Right 1	N	Counter Shaft	Damage: - Corrosion: L M S	G		
	Defect	Left 0 Right 0	N	Counter Weight	Damage: - Corrosion: L M S	RS		
Sill Beam	Abrasion	L M S	-	Hoisting	Wet Condition	- kg-m	-	
	Concrete	Damage-Left	L M S		-	Torque	Dry Condition	5.9 kg-m
Damage-Right		L M S	-	Superstructure	Damage: - Corrosion: L M (S)		RS	
Damage-Bottom		L M S	-					

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.

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Gate No. N8U (Upstream Lock Gate)

Survey Item		Survey Result		Judge	Survey Item		Survey Result		Judge	Photograph
Gate Leaf										
Skin Plate	Thickness-Avg	Top 9.8 Mid 9.9 Low 9.3 Btm - (9.5mm)		G	Wire Rope	Main-Left	y: - Distortion: - Corrosion: - Oil: -		G	
	Corrosion	U/S-Bottom L (M) S		RS		Main-Right	y: - Distortion: - Corrosion: - Oil: -		G	
	Damage-Rivet	Corner-L - Corner-R -		-		Roller Train-L	y: - Distortion: - Corrosion: - Oil: -		N	
				Roller Train-R		y: - Distortion: - Corrosion: - Oil: -		N		
Truss	Thickness-Avg	Bottom Flange 9.7, Bottom Web 9.6 (11.1mm)		G	Drum	Left	Damage: - Function: -		RS	
	Distortion			G		Right	Damage: - Function: -		↑	
End Girder	Thickness-Avg	L-Bottom 10.6, R-Bottom 10.6 (11.1mm)		C	Bearing	Drum	Damage: - Oil: -		↓	
	Remodeling	Left No Right No		↑		Counter Shaft	Damage: - Oil: -		RS	
	Distortion	Left - Right -				Reduction Gear	Damage: - Oil: -		C	
Bottom Girder	Thickness-Avg	Flange - mm (16.3), Web - mm (9.4)			Gear	Drum Gear-L	Damage: - Fitting: - Backlash: - Oil: -		RS	
	Corrosion	L M S				Drum Pinion-L	Damage: -		↑	
Rocker Assembly	Remodeling	Left No Right No				Drum Gear-R	Damage: - Fitting: - Backlash: - Oil: -			
	Distortion	Left M.Ab. Right M.Ab.				Drum Pinion-R	Damage: -			
Roller Train	Missing	Left 0 Right 0				Gear-Middle	Damage: - Fitting: - Backlash: - Oil: -			
	Diameter-Roller	Average 152.3 mm				Pinion-Middle	Damage: -			
	Distortion	Left - Right -			Basement	Drum-L	Damage: - Corrosion: L M (S)		↓	
Seal	Left	6 m Broken				Drum-R	Damage: - Corrosion: L M (S)			
	Bottom	Lost				Drive Device	Damage: - Corrosion: L (M) S		RS	
	Right	6 m Broken			Drive Chain	Damage: - Looseness: - Oil: -		C		
Inclination	Top Level Difference - mm		↓	Chain Sprocket	Damage: - Corrosion: L (M) S		↑			
Leakage	(L) M S		C	Reduction Gear	Damage: - Corrosion: L (M) S					
Sill										
Side Seal	Abrasion-Max	Left: - mm, Right: - mm		RS	Cover	Drum-L	Damage: - Corrosion: L M (S)		↓	
	Roller Truck	Abrasion-Max Left: - mm, Right: - mm		RL		Drum-R	Damage: - Corrosion: L M (S)			
Roller Guard	Missing	Left 0 Right 0		N		Gear-Middle	Damage: - Corrosion: L (M) S		C	
	Defect	Left 0 Right 0		N	Counter Shaft	Damage: Touching Corrosion: L M S		G		
Sill Beam	Abrasion	L M S		-	Counter Weight	Damage: - Corrosion: L M S		RS		
Concrete	Damage-Left	L M S		-	Hoisting	Wet Condition	- kg-m			
	Damage-Right	L M S		-		Torque	Dry Condition 3.5 kg-m		RS	
	Damage-Bottom	L M S		-	Superstructure	Damage: - Corrosion: L M (S)		RS		
										
										

Remarks: Judgment = 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	Survey Item			Survey Result			Judge	Photograph
Gate Leaf							Hoisting Device							
Skin Plate	Thickness-Avg	Top 10.2 Mid 10.2 Low 10.1 Blm - (9.5mm)			G	Wire Rope	Main-Left	y: - Distortion: - Corrosion: - Oil: -			G			
	Corrosion	U/S-Bottom L M (S)			G		Main-Right	y: - Distortion: - Corrosion: - Oil: -			G			
	Damage-Rivet	Corner-L - Corner-R -			-		Roller Train-L	y: - Distortion: - Corrosion: - Oil: -			G			
Truss	Thickness-Avg	Bottom Flange - Bottom Web - (11.1mm)			-		Roller Train-R	y: - Distortion: - Corrosion: - Oil: -			G			
	Distortion	-			-	Drum	Left	Damage: - Function: Touching Frame			RS			
End Girder	Thickness-Avg	L-Bottom No. R-Bottom No (11.1mm)			-		Right	Damage: - Function: Touching Frame			↑			
	Remodeling	Left No Right No			-	Bearing	Drum	Damage: - Oil: -			↓			
	Distortion	Left - Right -			-		Counter Shaft	Damage: - Oil: -			RS			
Bottom	Thickness-Avg	Flange - mm (15.3), Web - mm (9.4)			-		Reduction Gear	Damage: Little Oil: -			C			
	Girder	Corrosion	L M S			-	Gear	Drum Gear-L	Damage: - Fitting: 75% Backlash: - Oil: -			RS		
Rocker	Remodeling	Left No Right No			-	Drum Pinion-L		Damage: Miss Alignment			↑			
Assembly	Distortion	Left - Right -			-	Drum Gear-R		Damage: - Fitting: - Backlash: - Oil: -						
	Others	-			-	Drum Pinion-R		Damage: -						
Roller Train	Missing	Left 0 Right 0			-	Gear-Middle		Damage: - Fitting: - Backlash: - Oil: -						
	Diameter-Roller	Average - mm			-	Pinion-Middle		Damage: -						
	Distortion	Left - Right -			-	Basement	Drum-L	Damage: - Corrosion: L M (S)						
Seal	Left	-			-		Drum-R	Damage: - Corrosion: L M (S)			↓			
	Bottom	-			-		Drive Device	Damage: - Corrosion: L (M) S			RS			
	Right	-			-	Drive Chain	Damage: - Looseness: L Oil: -			C				
Inclination	Top Level Difference - mm			-	Chain Sprocket	Damage: - Corrosion: L (M) S			↑					
Leakage	L M S			-	Reduction Gear	Damage: - Corrosion: L (M) S								
Sill							Cover	Drum-L	Damage: - Corrosion: L M (S)					
Side Seal	Abrasion-Max	Left: - mm, Right: - mm			-	Drum-R		Damage: - Corrosion: L M (S)			↓			
Roller Truck	Abrasion-Max	Left: - mm, Right: - mm			-	Gear-Middle		Damage: - Corrosion: L (M) S			C			
Roller Guard	Missing	Left 0 Right 0			-	Counter Shaft	Damage: Touching Corrosion: L M S			G				
	Defect	Left 0 Right 0			-	Counter Weight	Damage: - Corrosion: L M S			RS				
Sill Beam	Abrasion	L M S			-	Hoisting	Wet Condition	- kg-m			-			
Concrete	Damage-Left	L M S			-		Torque	Dry Condition 1.8 kg-m			RS			
	Damage-Right	L M S			-	Superstructure	Damage: - Corrosion: L M (S)			RS				
	Damage-Bottom	L M S			-									

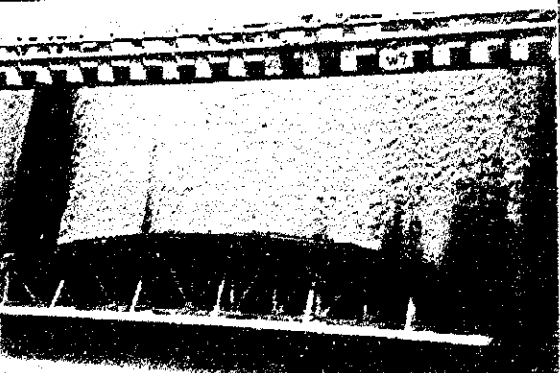

Remarks: Judgement = N: Totally Replace, C: Partly Replace, RL: Large Repair, RM: Medium Repair, RS: Small Repair, G: No Repair, -: No Data.

( ) shows design dimension.

Survey Results of Gate Structure

(17 / 96)

Gate No. W9 (Main Weir Gate)

Survey Item		Survey Result	Judge	Survey Item	Survey Result	Judge	Photograph	
Gate Leaf				Hoisting Device			 	
Skin Plate	Thickness-Avg	Top 10.2 Mid 9.9 Low 9.9 Blm - (9.5mm)	G	Wire Rope	Main-Left	y: - Distortion: - Corrosion: - Oil: -		G
	Corrosion	U/S-Bottom L M S	-		Main-Right	y: - Distortion: - Corrosion: - Oil: -		G
	Damage-Rivet	Corner-L - Corner-R -	-		Roller Train-L	y: - Distortion: - Corrosion: - Oil: -		C
Truss	Thickness-Avg	Bottom Flange - Bottom Web - (19.1mm)	-		Roller Train-R	y: - Distortion: - Corrosion: - Oil: -		C
	Distortion		G	Drum	Left	Damage: - Function: -		RS
End Girder	Thickness-Avg	L-Bottom - R-Bottom - (11.1mm)	C		Right	Damage: - Function: -		↑
	Remodeling	Left No Right No	↑	Bearing	Drum	Damage: - Oil: -		
	Distortion	Left - Right -			Counter Shaft	Damage: - Oil: -		
Bottom	Thickness-Avg	Flange - mm (16.3), Web - mm (9.4)			Reduction Gear	Damage: - Oil: -		
	Corrosion	L M S		Gear	Drum Gear-L	Damage: - Fitting: - Backlash: - Oil: -		
Girder	Remodeling	Left No Right No			Drum Pinion-L	Damage: -		
	Distortion	Left - Right -			Drum Gear-R	Damage: - Fitting: - Backlash: - Oil: -		
Rocker	Remodeling	Left No Right No			Drum Pinion-R	Damage: -		
	Distortion	Left - Right -			Gear-Middle	Damage: - Fitting: - Backlash: 10 mm Oil: -		
Assembly	Others	No Function		Pinion-Middle	Damage: Dangerous to Operation			
	Roller Train	Missing	Left - Right -		Basement	Drum-L		Damage: - Corrosion: L M (S)
Diameter-Roller		Average - mm		Drum-R		Damage: - Corrosion: L M (S)		RS
Distortion		Left - Right -		Drive Device		Damage: - Corrosion: (L) M S		C
Seal	Left	-		Drive Chain	Damage: - Looseness: - Oil: -	↑		
	Bottom	-		Chain Sprocket	Damage: - Corrosion: L (M) S			
	Right	-		Reduction Gear	Damage: - Corrosion: L (M) S			
	Inclination	Top Level Difference 140 mm	↓	Cover	Drum-L	Damage: - Corrosion: L M (S)		
Leakage	L (M) S	C	Drum-R		Damage: - Corrosion: L M (S)	↓		
Sill	Side Seal	Abrasion-Max	Left: mm, Right: mm		RS	Gear-Middle		Damage: - Corrosion: L (M) S
		Roller Truck	Abrasion-Max	Left: mm, Right: mm	RL	Counter Shaft	Damage: - Corrosion: L M S	G
	Roller Guard	Missing	Left 0 Right 0	N	Counter Weight	Damage: - Corrosion: L M S	RS	
Defect		Left 0 Right 0	N	Hoisting	Wet Condition	kg·m	-	
Sill Beam	Abrasion	L M S	-		Dry Condition	kg·m	-	
	Concrete	Damage-Left	L M (S)	RS	Superstructure	Damage: - Corrosion: L M (S)	RS	
Damage-Right		L (M) S	RS					
Damage-Bottom		L M S	-					

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.

A-31

Survey Results of Gate Structure

Gate No. W10 (Main Weir Gate)

Survey Item		Survey Result	Judge	Survey Item	Survey Result	Judge	Photograph	
Gate Leaf				Hoisting Device				
Skin Plate	Thickness-Avg	Top 10.0 Mid 9.9 Low 10.0 Btm 9.2 (9.5mm)	G	Wire Rope	Main-Left	y: - Distortion: - Corrosion: - Oil: -		G
	Corrosion	U/S-Bottom L M S	-		Main-Right	y: - Distortion: - Corrosion: - Oil: -		C
	Damage-Rivet	Corner-L - Corner-R -	-		Roller Train-L	y: - Distortion: - Corrosion: - Oil: -		C
Truss	Thickness-Avg	Bottom Flange 18.7, Bottom Web 18.6 (19.1mm)	G		Roller Train-R	y: - Distortion: - Corrosion: - Oil: -		C
	Distortion		-	Drum	Left	Damage: - Function: Miss Alignment		RS
End Girder	Thickness-Avg	L-Bottom 10.4, R-Bottom 9.5 (11.1mm)	C		Right	Damage: - Function: -		↑
	Remodeling	Left: No Right: No	↑	Bearing	Drum	Damage: - Oil: -		↓
	Distortion	Left - Right -			Counter Shaft	Damage: - Oil: -		RS
Bottom	Thickness-Avg	Flange 14.8 mm (16.3), Web 8.4 mm (9.4)			Reduction Gear	Damage: - Oil: -		C
	Girder	Corrosion	L (M) S	Gear	Drum Gear-L	Damage: - Fitting: - Backlash: - Oil: -		RS
		Rocker	Remodeling Left: No Right: No			Drum Pinion-L		Damage: -
Assembly	Distortion	Left - Right -			Drum Gear-R	Damage: - Fitting: - Backlash: - Oil: -		
	Others	No Function			Drum Pinion-R	Damage: -		
	Roller Train	Missing	Left - Right -			Gear-Middle		Damage: - Fitting: - Backlash: - Oil: -
Diameter-Roller		Average - mm			Pinion-Middle	Damage: -		
Distortion		Left - Right -		Basement	Drum-L	Damage: - Corrosion: L M (S)		↓
Seal	Left	-			Drum-R	Damage: - Corrosion: L M (S)		RS
	Bottom	-			Drive Device	Damage: - Corrosion: (L) M S		C
	Right	-		Drive Chain	Damage: - Looseness: - Oil: -	↑		
Inclination	Top Level Difference	140 mm	↓	Chain Sprocket	Damage: - Corrosion: L (M) S			
	Leakage	(L) M S	C	Reduction Gear	Damage: - Corrosion: L (M) S			
Sill				Cover	Drum-L	Damage: - Corrosion: L M (S)		
Side Seal	Abrasion-Max	Left: - mm, Right: - mm	RS		Drum-R	Damage: - Corrosion: L M (S)		↓
Roller Truck	Abrasion-Max	Left: - mm, Right: - mm	RL		Gear-Middle	Damage: - Corrosion: L (M) S		C
Roller Guard	Missing	Left 0 Right 0	N	Counter Shaft	Damage: - Corrosion: L M S	G		
	Defect	Left 0 Right 0	N	Counter Weight	Damage: - Corrosion: L M S	RS		
Sill Beam	Abrasion	L M S	-	Hoisting	Wet Condition	4.2 kg·m		RL
Concrete	Damage-Left	L M (S)	RS		Torque	Dry Condition	5.9 kg·m	RS
	Damage-Right	L (M) S	RS	Superstructure	Damage: - Corrosion: L M (S)	RS		
	Damage-Bottom	L M S	-					

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

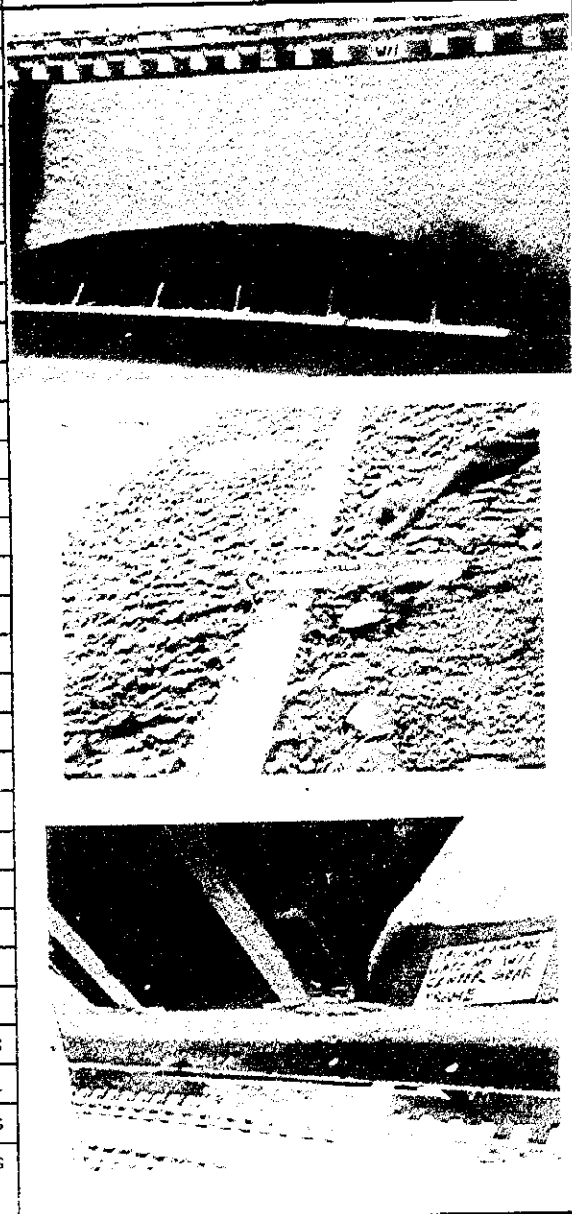
( ) shows design dimension.



Survey Results of Gate Structure

( 19 / 96 )

Gate No. W11 (Main Weir Gate)

Survey Item		Survey Result	Judge	Survey Item	Survey Result	Judge	Photograph		
Gate Leaf				Hoisting Device					
Skin Plate	Thickness-Avg	Top 10.2 Mid 10.0 Low 9.9 Btm 9.1 (9.5mm)	G	Wire Rope	Main-Left	γ: - Distortion: - Corrosion: - Oil: -		G	
	Corrosion	U/S-Bottom L M S	-		Main-Right	γ: - Distortion: - Corrosion: - Oil: -		G	
	Damage-Rivet	Corner-L - Corner-R -	-		Roller Train-L	γ: - Distortion: - Corrosion: - Oil: -		C	
Truss	Thickness-Avg	Bottom Flange 18.4, Bottom Web 18.5 (19.1mm)	G		Roller Train-R	γ: - Distortion: - Corrosion: - Oil: -		C	
	Distortion		-	Drum	Left	Damage: - Function: -		RS	
End Girder	Thickness-Avg	L-Bottom 9.6, R-Bottom 9.7 (11.1mm)	C		Right	Damage: - Function: -		↑	
	Remodeling	Left No Right No	↑	Bearing	Drum	Damage: - Oil: -		↓	
	Distortion	Left - Right -			Counter Shaft	Damage: - Oil: -		RS	
Bottom	Thickness-Avg	Flange 15.0 mm (16.3), Web 8.3 mm (9.4)			Reduction Gear	Damage: - Oil: -		C	
	Girder	Corrosion L M S		Gear	Drum Gear-L	Damage: - Fitting: - Backlash: - Oil: -		RS	
Rocker	Remodeling	Left No Right No			Drum Pinion-L	Damage: -		↑	
	Assembly	Distortion	Left - Right -			Drum Gear-R		Damage: - Fitting: - Backlash: - Oil: -	
Roller Train		Missing	Left - Right -			Drum Pinion-R		Damage: -	
		Diameter-Roller	Average - mm			Gear-Middle		Damage: - Fitting: - Backlash: 10 mm Oil: -	
Seal	Distortion	Left - Right -		Pinion-Middle	Damage: -				
	Left	-		Basement	Drum-L	Damage: - Corrosion: L M (S)		↓	
	Bottom	-			Drum-R	Damage: - Corrosion: L M (S)		RS	
Right	-		Drive Device		Damage: - Corrosion: L (M) S	C			
Inclination		Top Level Difference 30 mm	↓	Drive Chain	Damage: - Looseness: - Oil: -	↑			
				Chain Sprocket	Damage: - Corrosion: L (M) S				
Leakage		(L) M S	C	Reduction Gear	Damage: - Corrosion: L (M) S				
Sill	Side Seal	Abrasion-Max Left: - mm, Right: - mm	RS	Cover	Drum-L	Damage: - Corrosion: L M (S)			
					Roller Truck	Abrasion-Max Left: - mm, Right: - mm		RL	Drum-R
	Roller Guard	Missing	Left 0 Right 0		N	Gear-Middle		Damage: - Corrosion: L (M) S	C
Defect		Left 0 Right 0	N	Counter Shaft	Damage: - Corrosion: L M S	G			
Sill Beam	Abrasion	L M (S)	RS	Counter Weight	Damage: - Corrosion: L M S	RS			
Concrete	Damage-Left	L (M) S	RS	Hoisting	Wet Condition	52.5 kg-m		RL	
	Damage-Right	L (M) S	RS		Dry Condition	82 kg-m	RS		
	Damage-Bottom	L M S	-	Superstructure	Damage: - Corrosion: L M (S)	RS			

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.

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Survey Results of Gate Structure

( 20 / 96 )

Gate No. W12 (Main Weir Gate)

Survey Item		Survey Result	Judge	Survey Item	Survey Result	Judge	Photograph	
Gate Leaf				Hoisting Device			  	
Skin Plate	Thickness-Avg	Top 10.1 Mid 10.0 Low 10.0 Btm 9.2 (9.5mm)	G	Wire Rope	Main-Left	γ: - Distortion: - Corrosion: - Oil: -		G
	Corrosion	U/S-Bottom L M S	-		Main-Right	γ: - Distortion: - Corrosion: - Oil: -		G
Damage-Rivet	Corner-L	-	-		Roller Train-L	γ: - Distortion: - Corrosion: - Oil: -		C
	Corner-R	-	-		Roller Train-R	γ: - Distortion: - Corrosion: - Oil: -		C
Truss	Thickness-Avg	Bottom Flange 18.6, Bottom Web 18.6 (19.1mm)	G	Drum	Left	Damage: - Function: -		RS
	Distortion	-	-		Right	Damage: - Function: -		↑
End Girder	Thickness-Avg	L-Bottom 9.2, R-Bottom 9.8 (11.1mm)	C	Bearing	Drum	Damage: - Oil: -		↓
	Remodeling	Left No Right No	↑		Counter Shaft	Damage: - Oil: -		RS
	Distortion	Left - Right -	-		Reduction Gear	Damage: - Oil: -		C
Bottom Girder	Thickness-Avg	Flange 15.1 mm (16.3), Web 9.5 mm (9.4)	-	Gear	Drum Gear-L	Damage: - Fitting: - Backlash: - Oil: -		RS
	Corrosion	L (M) S	-		Drum Pinion-L	Damage: -		↑
Rocker Assembly	Remodeling	Left No Right No	-		Drum Gear-R	Damage: - Fitting: - Backlash: - Oil: -		↑
	Distortion	Left - Right -	-		Drum Pinion-R	Damage: -		↓
Roller Train	Missing	Left - Right -	-		Gear-Middle	Damage: - Fitting: - Backlash: - Oil: -		↑
	Diameter-Roller	Average - mm	-		Pinion-Middle	Damage: -		↓
	Distortion	Left - Right -	-	Basement	Drum-L	Damage: - Corrosion: L M (S)		↓
Seal	Left	-	-		Drum-R	Damage: - Corrosion: L M (S)		↓
	Bottom	-	-		Drive Device	Damage: - Corrosion: L (M) S		RS
	Right	-	-	Drive Chain	Damage: - Looseness: - Oil: -	C		
Inclination	Top Level Difference 5 mm	↓	Chain Sprocket	Damage: - Corrosion: L (M) S	↑			
Leakage	(L) M S	C	Reduction Gear	Damage: - Corrosion: L (M) S	↑			
Sill				Cover	Drum-L	Damage: - Corrosion: L M (S)	↑	
Side Seal	Abrasion-Max	Left: - mm, Right: - mm	RS		Drum-R	Damage: - Corrosion: L M (S)	↓	
	Roller Truck	Abrasion-Max	Left: - mm, Right: - mm		RL	Gear-Middle	Damage: - Corrosion: L (M) S	C
Roller Guard	Missing	Left 0 Right 0	N	Counter Shaft	Damage: - Corrosion: L M S	G		
	Defect	Left 0 Right 0	N	Counter Weight	Damage: - Corrosion: L M S	RS		
Sill Beam	Abrasion	L M S	-	Hoisting Torque	Wet Condition	45.5 kg·m	RL	
Concrete	Damage-Left	L M (S)	RS		Dry Condition	6.2 kg·m	RS	
	Damage-Right	L (M) S	RS	Superstructure	Damage: - Corrosion: L M (S)	RS		
	Damage-Bottom	(L) M S	RS					

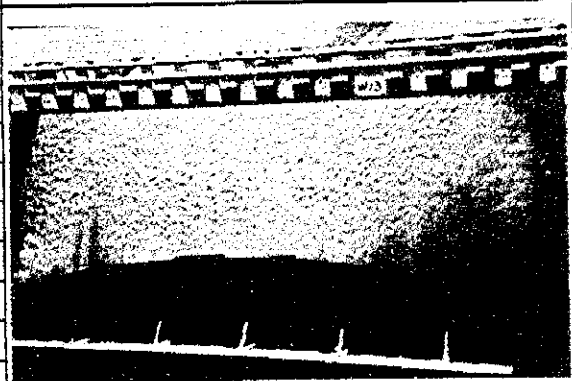


Remarks: Judgement ≠ N: Totally Replace, C: Partly Replace, RL: Large Repair, RM: Medium Repair, RS: Small Repair, G: No Repair, -: No Data.

( ) shows design dimension.

A-34

Survey Results of Gate Structure

Gate No. W13 (Main Weir Gate)

Survey Item		Survey Result	Judge	Survey Item	Survey Result	Judge	Photograph		
<b>Gate Leaf</b>				<b>Hoisting Device</b>			  		
Skin Plate	Thickness-Avg	Top 10.0 Mid 10.1 Low 9.9 Blm 9.0 (9.5mm)	G	Wire Rope	Main-Left	y: - Distortion: - Corrosion: - Oil: -		G	
	Corrosion	U/S-Bottom L M S	-		Main-Right	y: - Distortion: - Corrosion: - Oil: -		G	
Damage-Rivet	Corner-L	-	-		Roller Train-L	y: - Distortion: - Corrosion: - Oil: -		C	
	Corner-R	-	-		Roller Train-R	y: - Distortion: - Corrosion: - Oil: -		C	
Truss	Thickness-Avg	Bottom Flange 18.5, Bottom Web 18.5 (19.1mm)	G	Drum	Left	Damage: - Function: -		RS	
	Distortion		-		Right	Damage: - Function: -		↑	
End Girder	Thickness-Avg	L-Bottom 9.8, R-Bottom 10.1 (11.1mm)	C	Beaning	Drum	Damage: - Oil: -		↓	
	Remodeling	Left No Right No	↑		Counter Shaft	Damage: - Oil: -		RS	
	Distortion	Left - Right -			Reduction Gear	Damage: - Oil: -		C	
Bottom	Thickness-Avg	Flange 14.7 mm (16.3), Web 9.1 mm (9.4)		Gear	Drum Gear-L	Damage: - Fitting: - Backlash: - Oil: -		RS	
	Corrosion	L (M) S			Drum Pinion-L	Damage: -		↑	
Rocker	Remodeling	Left No Right No			Drum Gear-R	Damage: - Fitting: - Backlash: - Oil: -		↑	
	Distortion	Left - Right -			Drum Pinion-R	Damage: -		↑	
Others		No Function			Gear-Middle	Damage: - Fitting: - Backlash: - Oil: -		↑	
Roller Train	Missing	Left - Right -		Pinion-Middle	Damage: -	↓			
	Diameter-Roller	Average - mm		Basement	Drum-L	Damage: - Corrosion: L M (S)		↓	
	Distortion	Left - Right -			Drum-R	Damage: - Corrosion: L M (S)		↓	
Seal	Left	-	Drive Device		Damage: - Corrosion: L (M) S	RS			
Seal	Bottom	-		Drive Chain	Damage: - Looseness: - Oil: -	C			
	Right	-			Chain Sprocket	Damage: - Corrosion: L (M) S		↑	
	Inclination	Top Level Difference 30 mm	↓	Reduction Gear	Damage: - Corrosion: L (M) S	↑			
Leakage	(L) M S	C	Cover	Drum-L	Damage: - Corrosion: L M (S)	↓			
Sill	Side Seal	Abrasion-Max		Left: - mm, Right: - mm	RS	Drum-R		Damage: - Corrosion: L M (S)	↓
		Roller Truck		Abrasion-Max	Left: - mm, Right: - mm	RL		Gear-Middle	Damage: - Corrosion: L (M) S
	Roller Guard	Missing	Left 0 Right 0	N	Counter Shaft	Damage: - Corrosion: L M S	G		
Defect		Left 0 Right 0	N	Counter Weight		Damage: - Corrosion: L M S	RS		
Sill Beam	Abrasion	L M S	-	Hoisting	Wet Condition	37.5 kg-m	RL		
Concrete	Damage-Left	L (M) S	RS		Torque	Dry Condition	5.1 kg-m	RS	
	Damage-Right	L (M) S	RS	Superstructure	Damage: - Corrosion: L M (S)	RS			
	Damage-Bottom	L M S	-						

Remarks: Judgment = 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	Survey Item	Survey Result	Judge	Photograph	
Gate Leaf				Hoisting Device				
Skin Plate	Thickness-Avg	Top - Mid - Low - 8m 8.8 (9.5mm)	G	Wire Rope	Main-Left	y - Distortion: - Corrosion: - Oil: -		G
	Corrosion	U/S-Bottom L M S	-		Main-Right	y - Distortion: - Corrosion: - Oil: -		G
Truss	Thickness-Avg	Bottom Flange 18.3, Bottom Web 18.5 (19.1mm)	G	Roller Train-L	Broken	C		
	Distortion	15 mm (T5, Center)	RS	Roller Train-R	y - Distortion: - Corrosion: - Oil: -	C		
End Girder	Thickness-Avg	L-Bottom 9.9, R-Bottom 9.9 (11.1mm)	C	Drum	Left	Damage: - Function: -		RS
	Remodeling	Left No Right No	↑		Right	Damage: - Function: -		↑
	Distortion	Left - Right -		Bearing	Drum	Damage: - Oil: -		↓
Bottom	Thickness-Avg	Flange 14.1 mm (16.3), Web 9.1 mm (9.4)			Counter Shaft	Damage: - Oil: -		RS
	Corrosion	L (M) S		Reduction Gear	Damage: - Oil: -	C		
Rocker	Remodeling	Left No Right No		Gear	Drum Gear-L	Damage: - Fitting: - Backlash: - Oil: -		RS
	Distortion	Left - Right -			Drum Pinion-L	Damage: -		↑
Assembly	Others	No Function			Drum Gear-R	Damage: - Fitting: - Backlash: - Oil: -		
	Roller Train	Missing Left - Right -			Drum Pinion-R	Damage: -		
Seal	Diameter-Roller	Average - mm			Gear-Middle	Damage: - Fitting: - Backlash: - Oil: -		
	Distortion	Left - Right -		Pinion-Middle	Damage: -			
	Left	-		Basement	Drum-L	Damage: - Corrosion: L M (S)		
Bottom	-		Drum-R		Damage: - Corrosion: L M (S)	↓		
Right	-		Drive Device		Damage: - Corrosion: L (M) S	RS		
Inclination	Top Level Difference	10 mm	↓	Drive Chain	Damage: - Looseness: - Oil: -	C		
	Leakage	(L) M S	C	Chain Sprocket	Damage: - Corrosion: L (M) S	↑		
Sill				Reduction Gear	Damage: - Corrosion: L (M) S			
Side Seal	Abrasion-Max	Left: - mm, Right: - mm	RS	Cover	Drum-L	Damage: - Corrosion: L M (S)		
	Roller Truck	Abrasion-Max Left: - mm, Right: - mm	RL		Drum-R	Damage: - Corrosion: L M (S)		↓
Roller Guard	Missing	Left 0 Right 1	N		Gear-Middle	Damage: - Corrosion: L (M) S		C
	Defect	Left 1 Right 0	N	Counter Shaft	Damage: - Corrosion: L M S	G		
Sill Beam	Abrasion	L M (S)	RS	Counter Weight	Damage: - Corrosion: L M S	RS		
	Concrete	Damage-Left	L (M) S	RS	Hoisting	Wet Condition	66.6 kg-m	RL
Damage-Right		L (M) S	RS	Dry Condition		11.7 kg-m	RS	
Damage-Bottom		L (M) S	RS	Superstructure	Damage: - Corrosion: L M (S)	RS		

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.

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Survey Results of Gate Structure

Gate No. W15 (Main Weir Gate)

Survey Item		Survey Result	Judge	Survey Item	Survey Result	Judge	Photograph	
Gate Leaf				Hoisting Device				
Skin Plate	Thickness-Avg	Top - Mid - Low - Btm 9.5 (9.5mm)	G	Wire Rope	Main-Left	y: - Distortion: - Corrosion: - Oil: -		G
	Corrosion	U/S-Bottom L M S	-		Main-Right	y: - Distortion: - Corrosion: - Oil: -		G
	Damage-Rivet	Corner-L - Corner-R -	-		Roller Train-L	y: - Distortion: - Corrosion: - Oil: -		C
Truss	Thickness-Avg	Bottom Flange 18.7, Bottom Web 18.5 (19.1mm)	G		Roller Train-R	y: - Distortion: - Corrosion: - Oil: -		C
	Distortion		-	Drum	Left	Damage: - Function: -		RS
End Girder	Thickness-Avg	L-Bottom 10.2, R-Bottom 10.2 (11.1mm)	C		Right	Damage: - Function: -		↑
	Remodeling	Left No Right No	↑	Bearing	Drum	Damage: - Oil: -		↓
	Distortion	Left - Right -			Counter Shaft	Damage: - Oil: -		RS
Bottom	Thickness-Avg	Flange 14.6 mm (16.3), Web 8.9 mm (9.4)			Reduction Gear	Damage: - Oil: -		C
	Girder	Corrosion	L (M) S	Gear	Drum Gear-L	Damage: - Fitting: - Backlash: - Oil: -		RS
		Remodeling	Left No Right No		Drum Pinion-L	Damage: -		↑
Rocker Assembly	Distortion	Left - Right -	Drum Gear-R		Damage: - Fitting: - Backlash: - Oil: -			
	Others	No Function	Drum Pinion-R		Damage: -			
	Roller Train	Missing	Left - Right -		Gear-Middle	Damage: - Fitting: - Backlash: - Oil: -		
Diameter-Roller		Average - mm	Pinion-Middle		Damage: -			
Distortion		Left - Right -	Basement	Drum-L	Damage: - Corrosion: L M (S)	↓		
Seal	Left	-		Drum-R	Damage: - Corrosion: L M (S)	↓		
	Bottom	-		Drive Device	Damage: - Corrosion: L (M) S	RS		
	Right	-	Drive Chain	Damage: - Looseness: - Oil: -	C			
Inclination	Top Level Difference	40 mm	Chain Sprocket	Damage: - Corrosion: L (M) S	↑			
		(L) M S	Reduction Gear	Damage: - Corrosion: L (M) S				
Leakage				Cover	Drum-L	Damage: - Corrosion: L M (S)		↓
Sill					Drum-R	Damage: - Corrosion: L M (S)		↓
Side Seal	Abrasion-Max	Left: - mm, Right: - mm	RS		Gear-Middle	Damage: - Corrosion: L (M) S		C
	Roller Truck	Abrasion-Max	Left: - mm, Right: - mm	Counter Shaft	Damage: - Corrosion: L M S	G		
Roller Guard	Missing	Left 0 Right 0	N	Counter Weight	Damage: - Corrosion: L M S	RS		
	Defect	Left 1 Right 0	N	Hoisting	Wet Condition	54.4 kg-m		RL
Sill Beam	Abrasion	L M S	-		Dry Condition	5.9 kg-m	RS	
	Concrete	Damage-Left	L M (S)	RS	Superstructure	Damage: - Corrosion: L M (S)	RS	
Damage-Right		L (M) S	RS					
Damage-Bottom		L (M) S	RS					

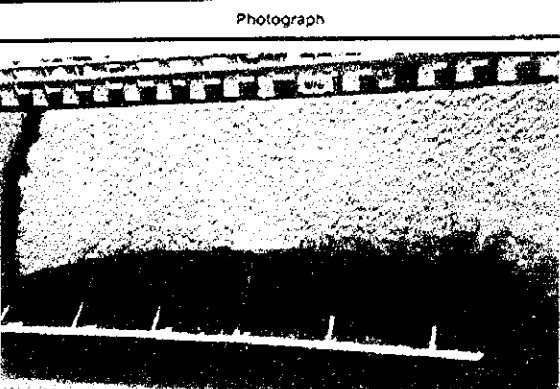
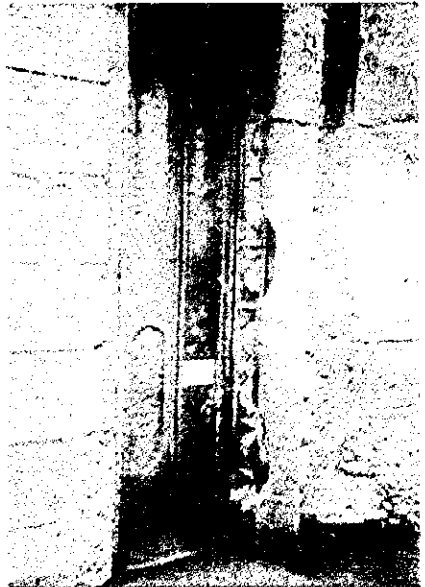
Remarks: Judgement = N: Totally Replace, C: Partly Replace, RL: Large Repair, RM: Medium Repair, RS: Small Repair, G: No Repair, -: No Data.

( ) shows design dimension.

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Survey Results of Gate Structure

Gate No. W16 (Main Weir Gate)

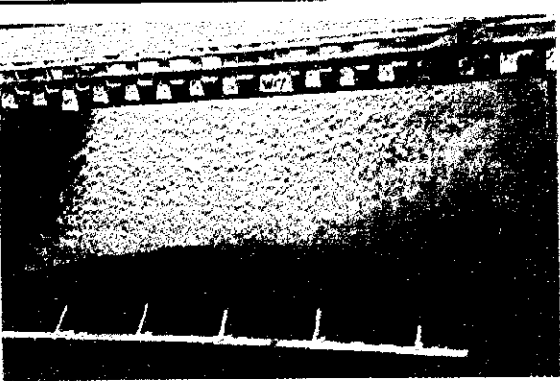

Survey Item		Survey Result		Judge	Survey Item		Survey Result		Judge	Photograph
Gate Leaf					Hoisting Device					 
Skin Plate	Thickness-Avg	Top - Mid - Low - Btm 8.8 (9.5mm)		G	Wire Rope	Main-Left	Y: - Distortion: - Corrosion: - Oil: -		G	
	Corrosion	U/S-Bottom L M S		--		Main-Right	Y: - Distortion: - Corrosion: - Oil: -		G	
Truss	Thickness-Avg	Bottom Flange 18.8, Bottom Web 18.5 (19.1mm)		G	Roller Train-L	Broken		C		
	Distortion			--	Roller Train-R	Y: - Distortion: - Corrosion: - Oil: -		C		
End Girder	Thickness-Avg	L-Bottom 10.2, R-Bottom 10.3 (11.1mm)		C	Drum	Left	Damage: - Function: -		RS	
	Remodeling	Left No Right No		↑		Right	Damage: - Function: -		↑	
	Distortion	Left - Right -			Bearing	Drum	Damage: - Oil: -		↓	
Bottom	Thickness-Avg	Flange 14.4 mm (16.3), Web 8.6 mm (9.4)				Counter Shaft	Damage: - Oil: -		RS	
	Corrosion	L (M) S				Reduction Gear	Damage: - Oil: -		C	
Rocker Assembly	Remodeling	Left No Right No			Gear	Drum Gear-L	Damage: - Fitting: 100% Backlash: 1.0 mm		RS	
	Distortion	Left 0.5 m Broken Right 1.5 m Heavy Ab.				Drum Pinion-L	Damage: -		↑	
Roller Train	Others	No Function				Drum Gear-R	Damage: - Fitting: - Backlash: - Oil: -			
	Missing	Left 1 Right 2				Drum Pinion-R	Damage: -			
	Diameter-Roller	Average - mm				Gear-Middle	Damage: - Fitting: - Backlash: - Oil: -			
Seal	Distortion	Left - Right -				Pinion-Middle	Damage: -			
	Left	-			Basement	Drum-L	Damage: - Corrosion: L M (S)			
	Bottom	-				Drum-R	Damage: - Corrosion: L M (S)		↓	
Right	-			Drive Device		Damage: - Corrosion: L (M) S		RS		
Inclination		Top Level Difference 10 mm		↓	Drive Chain	Damage: - Looseness: - Oil: -		C		
	Leakage	(L) M S		C	Chain Sprocket	Damage: - Corrosion: L (M) S		↑		
Sill					Reduction Gear	Damage: - Corrosion: L (M) S				
Side Seal	Abrasion-Max	Left: - mm, Right: - mm		RS	Cover	Drum-L	Damage: - Corrosion: L M (S)			
	Roller Truck	Left: - mm, Right: - mm		RL		Drum-R	Damage: - Corrosion: L M (S)		↓	
Roller Guard	Missing	Left 0 Right 0		N		Gear-Middle	Damage: - Corrosion: L (M) S		C	
	Defect	Left 2 Right 0		N	Counter Shaft	Damage: - Corrosion: L M S		G		
Sill Beam	Abrasion	L M S		--	Counter Weight	Damage: - Corrosion: L M S		RS		
	Concrete	Damage-Left	L M (S)		RS	Hoisting	Wet Condition	59.5 kg-m		RL
Damage-Right		L (M) S		RS	Dry Condition		7.8 kg-m		RS	
Damage-Bottom		(L) M S		RS	Superstructure		Damage: - Corrosion: L M (S)		RS	

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)

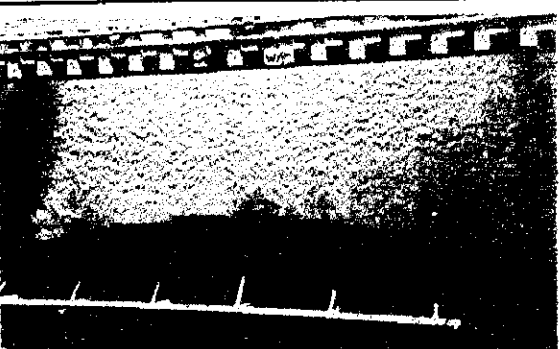


Survey Item		Survey Result	Judge	Survey Item	Survey Result	Judge	Photograph	
Gate Leaf				Hoisting Device			  	
Skin Plate	Thickness-Avg	Top - Mid - Low - Btm 8.5 (9.5mm)	G	Wire Rope	Main-Left	y: - Distortion: - Corrosion: - Oil: -		G
	Corrosion	U/S-Bottom L M S	-		Main-Right	y: - Distortion: - Corrosion: - Oil: -		G
	Damage-Rivet	Corner-L - Corner-R -	-		Roller Train-L	y: - Distortion: - Corrosion: - Oil: -		C
			Roller Train-R		y: - Distortion: - Corrosion: - Oil: -	C		
Truss	Thickness-Avg	Bottom Flange 18.4, Bottom Web 18.4 (19.1mm)	G	Drum	Left	Damage: - Function: -		RS
	Distortion	Vertical Truss 20 mm (L4, Top)	RS		Right	Damage: - Function: Miss Alignment		↑
End Girder	Thickness-Avg	L-Bottom 9.6, R-Bottom 9.6 (11.1mm)	-	Bearing	Drum	Damage: - Oil: -		↓
	Remodeling	Left No Right No	C		Counter Shaft	Damage: - Oil: -		RS
	Distortion	Left - Right -	↑		Reduction Gear	Damage: - Oil: -		C
Bottom	Thickness-Avg	Flange 14.6 mm (16.3), Web 8.7 mm (9.4)		Gear	Drum Gear-L	Damage: - Fitting: - Backlash: - Oil: -		RS
Girder	Corrosion	L (M) S			Drum Pinion-L	Damage: -		↑
	Remodeling	Left No Right No			Drum Gear-R	Damage: - Fitting: - Backlash: - Oil: -		
Rocker	Distortion	Left - Right -			Drum Pinion-R	Damage: -		
	Others	No Function			Gear-Middle	Damage: - Fitting: - Backlash: - Oil: -		
Roller Train	Missing	Left 3 Right 1			Pinion-Middle	Damage: -		
	Diameter-Roller	Average - mm		Basement	Drum-L	Damage: - Corrosion: L M (S)		↓
	Distortion	Left - Right -			Drum-R	Damage: - Corrosion: L M (S)		
Seal	Left - Bottom - Right -		Drive Device		Damage: - Corrosion: L (M) S	RS		
Seal	Left	-		Drive Chain	Damage: - Looseness: L Oil: -	C		
	Bottom	-		Chain Sprocket	Damage: - Corrosion: L (M) S	↑		
	Right	-		Reduction Gear	Damage: - Corrosion: L (M) S			
Inclination	Top Level Difference 30 mm	↓	Cover	Drum-L	Damage: - Corrosion: L M (S)	↓		
Leakage	(L) M S	C		Drum-R	Damage: - Corrosion: L M (S)			
Sill	Side Seal	Abrasion-Max		Left: - mm, Right: - mm	RS	Gear-Middle		Damage: - Corrosion: L (M) S
		Roller Truck	Abrasion-Max	Left: - mm, Right: - mm	RL	Counter Shaft	Damage: - Corrosion: L M S	G
	Roller Guard	Missing	Left 1 Right 0	N	Counter Weight	Damage: - Corrosion: L M S	RS	
Defect		Left 0 Right 0	N	Hoisting	Wet Condition	52.5 kg-m	RL	
Sill Beam	Abrasion	L M S	-	Torque	Dry Condition	5.9 kg-m	RS	
Concrete	Damage-Left	L (M) S	RS	Superstructure	Damage: - Corrosion: L M (S)	RS		
	Damage-Right	L (M) S	RS					
	Damage-Bottom	(L) M S	RS					

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	Survey Item	Survey Result	Judge	Photograph		
Gate Leaf				Hoisting Device			  		
Skin Plate	Thickness-Avg	Top - Mid - Low - Btm 8.9 (9.5mm)	G	Wire Rope	Main-Left	γ - Distortion: - Corrosion: - Oil: -		G	
	Corrosion	U/S-Bottom L M S	-		Main-Right	γ - Distortion: - Corrosion: - Oil: -		G	
	Damage-Rivet	Corner-L - Corner-R -	-		Roller Train-L	γ - Distortion: - Corrosion: - Oil: -		C	
			Roller Train-R		γ - Distortion: - Corrosion: - Oil: -	C			
Truss	Thickness-Avg	Bottom Flange 18.9, Bottom Web 18.4 (19.1mm)	G	Drum	Left	Damage: - Function: -		RS	
	Distortion		-		Right	Damage: - Function: -		↑	
End Girder	Thickness-Avg	L-Bottom 9.2, R-Bottom 10.1 (11.1mm)	C	Bearing	Drum	Damage: - Oil: -		↓	
	Remodeling	Left No Right No	↑		Counter Shaft	Damage: - Oil: -		RS	
	Distortion	Left - Right -			Reduction Gear	Damage: - Oil: -		C	
Bottom	Thickness-Avg	Flange 15.0 mm (16.3), Web 8.8 mm (9.4)		Gear	Drum Gear-L	Damage: - Fitting: - Backlash: - Oil: -		RS	
Girder	Corrosion	L (M) S			Drum Pinion-L	Damage: -		↑	
	Remodeling	Left No Right No			Drum Gear-R	Damage: - Fitting: - Backlash: - Oil: -		↑	
Assembly	Distortion	Left - Right -			Drum Pinion-R	Damage: -		↑	
	Others	No Function			Gear-Middle	Damage: - Fitting: - Backlash: - Oil: -		↓	
Roller Train	Missing	Left 1 Right 2			Pinion-Middle	Damage: -		↑	
	Diameter-Roller	Average - mm		Basement	Drum-L	Damage: - Corrosion: L M (S)		↓	
	Distortion	Left - Right -			Drum-R	Damage: - Corrosion: L M (S)		↓	
			Drive Device		Damage: - Corrosion: L (M) S	RS			
Seal	Left	-		Drive Chain	Damage: - Looseness: - Oil: -	C			
	Bottom	-		Chain Sprocket	Damage: - Corrosion: L (M) S	↑			
	Right	-		Reduction Gear	Damage: - Corrosion: L (M) S	↑			
Inclination	Top Level Difference 15 mm		↓	Cover	Drum-L	Damage: - Corrosion: L M (S)		↓	
Leakage	(L) M S	C	Drum-R		Damage: - Corrosion: L M (S)	↓			
			Gear-Middle		Damage: - Corrosion: L (M) S	C			
Sill	Side Seal	Abrasion-Max	Left: - mm, Right: - mm	RS	Counter Shaft	Damage: - Corrosion: L M S		G	
		Roller Truck	Abrasion-Max	Left: - mm, Right: - mm	RL	Counter Weight		Damage: - Corrosion: L M S	RS
	Roller Guard	Missing	Left 0 Right 0	N	Hoisting	Wet Condition		63 kg-m	RL
		Defect	Left 0 Right 0	N		Torque		Dry Condition	5.9 kg-m
	Sill Beam	Abrasion	L M S	-	Superstructure	Damage: - Corrosion: L M (S)		RS	
Concrete	Damage-Left	(L) M S	RS						
	Damage-Right	(L) M S	RS						
	Damage-Bottom	(L) M S	RS						

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.